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Identify systematic relationships of effective social parameters on MSW management (Case study: Tehran, urban 22-district)

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Abstract
It seems that success in municipal wastes management has a detectable relationship with citizens' participation and social mechanisms. So, the present study has done for recognition of systematic relations of effective social parameters on municipal solid waste administration. Data have collected in two phase to fill of questionnaires including awareness assessment of MSW office's personnel of urban 22-district Tehran municipality organization and effective factors on MSW management; Then, social parameters relations effective on MSW via S-LCA in different phases such as temporary storage, gathering, transportation and processing, recycling and proper disposal. Results shown that was got 16 grading (than 20) of municipal waste administration awareness by personnel of MSW office in district that has counted including good grades. Waste management of district municipality has got final grading equal 72 (than 100) that shown have good performance (71-90), but the worst was source separation of waste with grading 24 (than 40) rather than other stages. The most important social factor effective on waste's LCA has were social acceptability that got more final weight (0.49) and among these indices such as noise pollution and private space have more importance. Then, social performance and equality play a same role that social performance in addition to the recycling of start point, destination and job creation, be influenced by social acceptability; Social equality is influenced by distribution and locating index, as well as, quality employment. Average of normal values for indices of each component in different scenarios has shown transfer station scenario has the highest ratio of social acceptability (1.8) and performance (0.7) and caused low amount of social impacts. In other side, landfill scenario (direct way) has the lowest normal value of social equality (0.8). Albeit, due to the weight of social acceptability of first scenario (temporary storage of waste in transfer station and transfer of them to final landfill waste), is desirable, environmentally has advantages than two other scenarios, such as direct job creation, lower fuel consumption and visual pollution prevention.

Key words: *Social relationships, Citizens' participation, MSW management, S-LCA.*

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1.Introduction

In last decades, human activity and alternation of life style and consumption patterns have been causing to increase of materials production rate (Demirbas, 2011). These factors caused that illogical disposal of wastes lead to undesirable impacts on natural ecosystems, economic losses and health damages (Afroz et al., 2009). Increase public awareness to health and environmental issues from one side, and resource constraints (energy and materials) in the world level and increased demand especially developing countries. In other side, it causes urban planners consider designing and implementation of MSW optimized methods according on sustainable development attitude and economic, environmental and social issues (Bjornskov, 2008). MSW management program including decline of waste production, source separation, temporary storage, gathering, mechanized transfer, processing (recycling, compost, incineration) and final disposal that applicator of them the most optimized and whole of healthy, economic, conservational and aesthetic considerations along with administrative, financial, legal and planning methods. Design and implementation of a sustainable system for MSW administration need to assess of different aspects such as economic, social and environmental (Ratzinger et al., 2011). Exactly resolution indicated that MSW management planners insist on two (economic and environmental) than three stability components, if social-cultural dimensions are as important as other dimensions in planning and administration. The mid-eighties, conservation of environment has been considered as important subject of national security, economic welfare and social justice. Environmental worries and problems have been clearly transported to people because they have more care about environment. The new ideas and politics were introduced and finally environmental attitudes were formed (Blengini, 2008).

Generally, effective factors on social participation in environmental issues especially MSW management are dividable to internal and external factors. The internals concentrate on optional incentives such as practical decision that is freely gotten by someone. These factors caused of attitudes and responsibility than environment (Lee, 2008). Attitude is existence of inclination that has formed to evaluation of the issue or idea that could be affirmative or negative during before behavior procedure (caused of knowledge and individual's value system) and after it (caused of direct experience) (Mueller et al., 2009). Responsibility has direct correlation with moral concepts such as welfare and rights of others and fair consideration. For performing of responsibility, people need to awareness about something that should do it. As well as, preparation of acceptance of these social expectations is exist (Nummela et al., 2008). External factors are motivational techniques with foreign origin that applicator as behavioral strategies. For example something's including information, knowledge and conviction cause to reinforce of behavioral changes (Jeachul, 2008). The most important of social encouraging could be awareness via mass media, economical encouraging and social impacts (Petti & Campanella, 2010). In addition, improvement of awareness about environmental concepts cause development of novel technologies for pollution control, help to perform of strict rules of waste disposal and minimize of environmental impacts related to municipal solid wastes (Fiorucci et al., 2003).

Integrated waste management (IWM), as a system manages waste stream, gathering, processing and disposal of wastes interact with each other that get environmental, economic

1.The universities are institutions where mostly the young aged 18-25 spend their education process and transitionto-adulthood period. Therefore, it has gained importance that the programs which pay regard to the interests, skills and needs of students need to be developed (Gizir, 2005). It is necessary to make the young of today participate in the programs, except their compulsory course, that they are interested in and that include different skills in the education process for their career development and in order for them to keep pace with fast development (Dündar, 2008).

and social desirable purposes in certain district (Benoît et al., 2010).

Life cycle assessment (LCA) as the tool for integrated developing is a MSW administration strategy in cities. Application of this model could be useful for scenario planning in municipality (with database) and aid to selection of the best methodology. Usage of this tool (LCA-IWM) for evaluation enables MSW management that decides environmental decisions with acceptable and possible economic and social aspects (Den et al., 2007; Chen, 2012). The aim of present study is analysis of systematic relations of effective social parameters on municipal solid waste administration by social life cycle assessment (S-LCA). In addition, this assay intends to determine of participation value and how to intervene of citizens in decline of waste production, source separation, temporary storage in MSW management, environmental awareness of personnel of urban 22-district Tehran municipality organization (MSW office).

2. Material and Methods

This research did in 2014-2015 to form of cross-sectional study to identify of MSW management condition in urban 22-district of Tehran. In order to, regions (and quarters) of district separately assessed; First, sample size estimated by Cochran formula. Data have collected in two phase to fill of questionnaires including awareness assessment of MSW office's personnel of 22-district Tehran municipality organization and influential factors on MSW management; Then, social parameters relations effective on MSW via S-LCA in different phases such as temporary storage, gathering, transportation and processing, recycling and proper disposal.

In the study, related factors has been identified by pundits and faculty research committee and based on has prepared primary questionnaire with Likert spectrum. After validation it, final questionnaire was prepared and other information were gathered. Also, reliability of questionnaire's items has been measured by Cronbach's alpha coefficient. Based on Cochran, counting 0.95 the accuracy of estimate and 500 person (entire MSW office's personnel of 22-district Tehran municipality organization) as statistical society, sample size was estimated equal 217, that they was divided between regions of urban 22-district.

In order to assess of executive management of MSW was used by standard questionnaire includes several open and closed questions, information about public features of family (such as ownership of housing), tasks of MSW office's personnel, number of residents in each residential unit, employees in every trade unit, the entire of staff in MSW office at the regional level, number of active personnel in waste management, condition of source separation, decline of waste production, temporary storage, gathering, transportation, and final disposal of waste. Also, for grading to MSW management, according to 25 entire numbers of questions, it was considered 4 point for each question. So that, if it was given "yes", it would consider 4, otherwise, won't get any score. According to this grading system for waste administration, regions were compared each other. Ranking based on points are: 0-25 "very weak", 26.50 "weak", 51-70 "acceptable", 71-90 "good" and 91-100 "excellent".

LCA is a proper tool for developing of MSW management strategies and a patron for planning with possibility of create and compare different scenarios, according to three sub systems including: (a) temporary storage; (b) gathering and transportation; (c) processing, recycling and final disposal. Method of evaluation used in this program was introduced based on selection of the most appropriate scenario. Assessed indices are including odor, visual impact, convenience, urban space, private space, noise, complexity, traffic, Risk, diffusion in temporary storage location, quality and quantity in final destination.

Qualitative development of criterion and quantitative indices of social stability were applied by LCA for IWM strategy in the economic ad-

Row	Source separation and gathering of wastes	Alpha coefficient
1	Increase of municipality costs	0.7765
2	Profitability for contractors	
3	Parsimony in costs of waste management	
4	Need to high participation	
5	Effective educations	
Row	Transportation of wastes	Alpha coefficient
1	Homogenization of delivery time	0.8665
2	Ineffectiveness of gathering booths	
3	Direct relationship with increase of tanks number	
4	Inadequate number of transfer station	
5	Inappropriate routes and increase of fuel consumption of cars	
Row	Processing and recycling of wastes	Alpha coefficient
1	Mechanization of processing system of dry wastes	0.7991
2	High costs of transportation to transforming industries	
3	Proper recycling of electronic boards	
4	High costs of compost production	
5	Inadequate gain of recycling operation for contractor	
Row	Disposal and elimination of wastes	Alpha coefficient
1	Incineration of infectious wastes	0.7498
2	Standard and impenetrable pits of wastes	
3	Energy production by anaerobic digestives	
4	High costs of sterilization	
5	Criterions of standard landfill	

Table 1. Determinant indices and criterions (questions) of awareness of MSW office's personnel

vancing areas (Kloepffer, 2008). This method is evaluable for all of the inputs and outputs of product, procedure or services (life cycle assessment inventory), evaluation of wastes, impacts on human health and ecological effects (impact assay) and interpretation of evaluated result (Life cycle interpretation) in whole of the life cycle of product or procedure. International organizations such as International standards organization (ISO) and Society of environmental toxicology and chemistry (SETAC) have promoted LCA method as a environmental management tool (ISO, 2006; ISO, 2006). Hence, LCA is a tool for analyzing of environmental impacts of products in whole of life cycle stages from extraction of resources to production of materials, making of components and manufacture of final harvest into administration of after throw away such as recycling, reuse and final disposal, in other words, is cradle to grave. In this research, social dimension of problem was assessed that is known to S-LCA, which has some indices of MSW management program including: (a) social acceptability; (b) social relationships and responsibility; (c) social equality; (d) social performance; (e) health, safety and risk management; (f) public politics and incentive level (Gautam, 2008; Parent et al., 2010; Jørgensen et al., 2010) that here three indices have evaluated including (Dreyer et al., 2006; Arcese et al., 2013):

Row	Source separation and gathering of wastes	Frequency	Ratio (%)	Grade
1	Increase of municipality costs	102	47	0
2	Profitability for contractors	154	70.9	1
3	Parsimony in costs of waste management	163	75.1	1
4	Need to high participation	201	92.6	1
5	Effective educations	145	66.8	1
Row	Transportation of wastes	Frequency	Ratio (%)	Grade
1	Homogenization of delivery time	176	81.1	1
2	Ineffectiveness of gathering booths	133	61.3	1
3	Direct relationship with increase of tanks number	106	48.8	0
4	Inadequate number of transfer station	200	92.1	1
5	Inappropriate routes and increase of fuel consumption of cars	132	60.8	1
Row	Processing and recycling of wastes	Frequency	Ratio (%)	Grade
1	Mechanization of processing system of dry wastes	112	51.6	1
2	High costs of transportation to transforming industries	156	71.8	1
3	Proper recycling of electronic boards	139	64	1
4	High costs of compost production	119	54.8	1
5	Inadequate gain of recycling operation for contractor	166	76.5	1
Row	Disposal and elimination of wastes	Frequency	Ratio (%)	Grade
1	Incineration of infectious wastes	106	48.8	0
2	Standard and impenetrable pits of wastes	124	57.1	1
3	Energy production by anaerobic digestives	99	45	0
4	High costs of sterilization	178	82	1
5	Criterions of standard landfill	167	76.9	1

Table 2. Frequency of correct answers to criterions in 22-disrict Tehran

(A) Social acceptability: it was needed for reach to public participation has several indices (A1: odor emissions, A2: visual impact, A3: convenience and accessibility, A4: urban space, A5: private space, A6: noise, A7: complexity, A8: traffic, A9: perceptions risk).

(B) Social equality: including few indices (B1: distribution and location of temporary storage tanks, B2: quality employment).

(C) Social performance: including few indices (C1: recycling in source and destination, C2 direct disposal).

Finally, to analysis of questionnaire data have been done by SPSS 20.0. As well as, Systematic relationships of effective social components on MSW administration have been analyzed via S-LCA by SimaPro 8.0 that could identify and present the most important parameters in MSW management of 22-disrict Tehran.

3. Results and Discussion

Results of 217 questionnaires with it topic "awareness" assessment of MSW office's personnel of 22-district Tehran municipality organization" were presented in tables (3-1, 3-2 & 3). In this questionnaire four indices have declared by each five questions. In table 1, de-

Grade	Ratio (%)	Frequency	Region
16	68	147.6	1
17	73.1	158.7	2
17	70.9	153.9	3
15	59	128.1	4
16	66.3	143.9	μ

Table 3. Frequency of correct answers to criterions in regions (of 22-disrict)

terminant indices and criterions (questions) of awareness of staff were presented with it reliability coefficient (measured Cronbach's alpha).

According to above table (3-1) could find that transportation of waste index with Alpha coefficient equal 0.8665 has the highest reliability than other indices. Frequency of correct answer to different questions showed that awareness of MSW office's personnel. For measuring of awareness staff grading (1-20), high frequency of each criterion to above of 50% constitutes passing grade (1) and don't it (0). Sum of points determine grade of respondents. Frequency of correct answers (than 217) for each question is shown in table 2.

Thus, MSW office's personnel of urban 22-district Tehran municipality organization for awareness about municipal solid waste management have gotten 16 grades that could categorize in "good" class. Information of respondents than transportation of waste is the highest grade (5), but related to Disposal and elimination of wastes they have obtained the lowest point (3). Table 3 shows got grades by staff of quadruplet regions in studied district.

So, personnel of region 2 and 3 have gotten the highest grade (17) and based on frequency and ratio of correct answers 158.7 and 73.1 respectively, region 2 could sit in first place. Assessment of "effective factors on MSW management of 22-district Tehran" indicated that the most frequency of answer to "tasks of MSW's personnel (question)" related to "these persons should transfer municipal wastes to out of urban confine and clearance it of pollutions (answer)". Number of residents in residual units (in urban 22-district) averagely is 3.4 and employees numbers in every trade unit are 4.1. Assayed social indices in questionnaires for MSW administration are shown in table 3-4.

According to above table (3-4) it was understood that gathering and transportation of wastes with alpha 0.81 has the highest reliability. Frequency of correct clue to different items indicate grading of MSW management of urban 22-district of Tehran. Sum of grades characterize to final grade of waste management condition. Frequency (percent) of "yes" answers have shown in the below table 5.

Therefore, MSW management in urban 22-direct of Tehran including municipal services office and recycling office has a "good (71-90)" performance with final grade equal 72. Details shown that source separation are the weakest (24/40) among other stages; as well as, performance and services of wet waste agents (municipal services office) was better than dry waste agents (contractor of recycling office). Table 6 indicate condition of MSW administration separately regions of urban 22-disrict.

Administration of 2-region's office with grade equal 80 and percent of frequency of affirmative answer has better performance than others. In lower places, 1 and 3-regions have gotten 76 and 72 respectively. Entire of regions placed in "good" class the quality categories. But, 4-regions has "acceptable (average)" performance (64 grade).

Consequences of assessment of effective social components on MSW management by S-LCA shown that impact assessment of social life cycle has concentrated in three castes or

Row	Decline of production and source separation	Number of questions	Alpha
1	Separation of dried bread	10	0.7921
2	Separation of dry and wet wastes each other		
3	Observance to tips of health agents about packing of wastes		
4	Exporting of wastes in regular times		
5	Set of wastes in particular sacs		
6	Delivery of dried wastes to recycling agents		
7	To don't shed of dried bread in waste bins		
8	To don't shed of wet food waste in recycle bins		
9	Take important of recycling		
10	Effort to decrease of wet waste producing		
Row	Gathering and transfer of wastes	Number of questions	Alpha
1	Exist of mechanized waste tanks nearby	10	0.8122
2	Place of waste tanks		
3	Number of waste tanks in quarter		
4	Distance of the nearest tank than houses		
5	On time vacating of tanks (to don't accumulation)		
6	Cleaning and clearance of tanks		
7	Cleanse the environs of tanks		
8	Proper performance of wet wastes agents		
9	Proper performance of dry wastes agents		
10	Opportune visit of wet wastes agents		
Row	Final disposal of wastes	Number of questions	Alpha
1	To don't prevent to underground waters	5	0.7663
2	Polluted space and desirable smell		
3	Landfill with standard condition		
4	Far away from residual locations		
5	Importance of transfer station		

Table 4. Effective criterions on MSW management

stakeholder groups including workers, consumers of sources (or producers of waste) and social community (Dreyer et al., 2006).

Effective social components have gotten points based on existence or naught of indices in different stages of waste management system (Aparcana & Salhofer, 2013). Then relative weight calculated and according on quantitate normal index (I) for each caste that presented in table 7.

Three management scenarios of MSW were assessed:

- First scenario including route: Gathering and transportation---Transfer station---Landfill;

فصلنامه مدیریت شهری
(ویژه نامه لاتین)
Urban Management
No.43 Summer 2016

Row	Decline of production and source separation	Frequency of "yes"	Grade
1	Separation of dried bread	64	4
2	Separation of dry and wet wastes each other	74	4
3	Observance to tips of health agents about packing of wastes	69	4
4	Exporting of wastes in regular times	34	0
5	Set of wastes in particular sacs	36	0
6	Delivery of dried wastes to recycling agents	45	0
7	To don't shed of dried bread in waste bins	68	4
8	To don't shed of wet food waste in recycle bins	54	4
9	Take important of recycling	57	4
10	Effort to decrease of wet waste producing	40	0
Row	Gathering and transfer of wastes		
1	Exist of mechanized waste tanks nearby	78	4
2	Place of waste tanks	65	4
3	Number of waste tanks in quarter	89	4
4	Distance of the nearest tank than houses	78	4
5	On time vacating of tanks (to don't accumulation)	78	4
6	Cleaning and clearance of tanks	56	4
7	Cleanse the environs of tanks	45	0
8	Proper performance of wet wastes agents	67	4
9	Proper performance of dry wastes agents	45	0
10	Opportune visit of wet wastes agents	78	4
Row	Final disposal of wastes		
1	To don't prevent to underground waters	56	4
2	Polluted space and desirable smell	76	4
3	Landfill with standard condition	57	4
4	Far away from residual locations	89	4
5	Importance of transfer station	36	0
Final grade		72	

Table 5. Frequency of answers to effective criterions on MSW management

Grade	Frequency (%)	Region
72	60.1	1
80	70.2	2
76	63.3	3
64	53.1	4
72	61.3	μ

Table 6. Frequency of "yes" clues to criterions in regions (of 22-disrict)

Social components	Ratio (affirmative/ entire)	Taken weight	Relative weight	Number of indices
Social acceptability	15/27	0.55	0.72	9
Social performance	3/6	0.5	0.14	2
Social equality	3/6	0.5	0.14	2

Table 7. Taken weight of social component based on ratio of affirmative clues

Scenario III (Direct)	Scenario II (Compost plant)	Scenario I (Transfer station)	Inventory normalized values
3.5	4.6	1.2	Odor emissions
1.7	1.3	1.6	Visual impact
4.5	2.2	2.5	Convenience and accessibility
1.9	1.4	0.4	Urban space
1.1	5.1	4.3	Private space
0.9	1.2	4.5	Noise
0.5	1.3	1.2	Complexity
1.3	2.2	3.4	Traffic
1	0.6	0.4	Perceptions risk
0.12	0.1	0.2	Distribution and location of temporary storage tanks
0.8	3.3	1.5	Quality employment
0.9	4.2	1.3	Recycling in source and destination
1.45	0.3	0.24	Direct disposal

Table 8.Normalized values of inventory S-LCA for each scenario

- Second scenario including route: Gathering and transportation---Compost plant---Landfill (for residuals);

- Third scenario including route: Gathering and transportation---Landfill (directly);

Model applied for all of them and results presented in table 8. Relative weights, normalized values depend on amounts of managed wastes for each scenario. Normalized inventory values were rewritten for different scenarios.

Based on above table 8, transfer station scenario might not be desirable option for some criterions such as make the traffic, more noise, high complexity, and limit of urban space. Although, in addition of environmental aspects, high complexity could cause the job creation because need to increase of devices in MSW management system. Compost scenario either is exactly as important because recycling of energy to world but could cause to occupy of private space and odor emissions. Third scenario is the most direct method for disposal of MSW that needs to at least cost, though could increase of environmental damage and loos of capital (valuable waste). Normalized values are summarized in impact castes or stakeholder groups (workers, consumers and social community) and are presented in figure1.

According to figure1, third scenario has the most of social impacts especially in workers

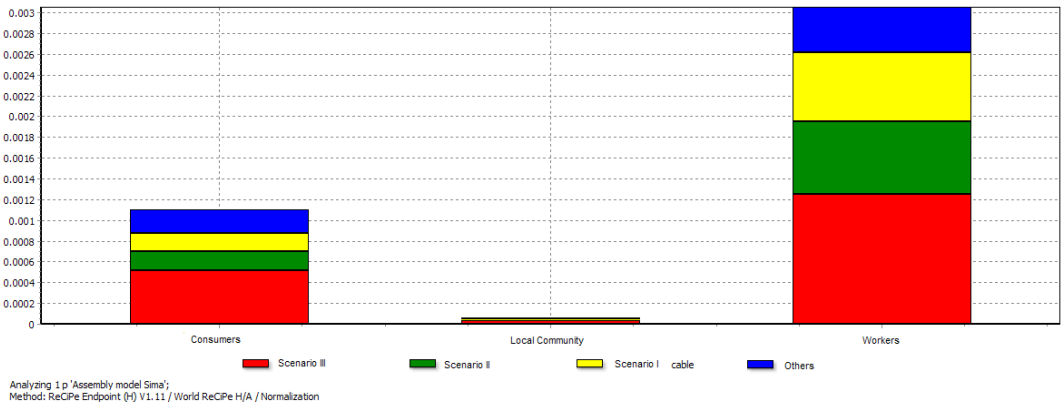

Figure 1. Ratios of impact castes against different scenarios of waste management

Scenario I		
Final weight	Normal index	Impact categories
0.49	0.82	Social acceptability
0.05	0.14	Social performance
0.09	0.13	Social equality
0.21	-	Social index
Scenario II		
1.6	0.67	Social acceptability
0.18	0.11	Social performance
0.23	0.1	Social equality
0.67	-	Social index
Scenario III		
2.56	1.12	Social acceptability
0.15	0.19	Social performance
0.12	0.18	Social equality
0.94	-	Social index

Table 9. Social indices based on S-LCA for each scenario

caste. So that to shorten of route and from gathering stage to landfill transportation cause to delete of transfer station, separation, processing and recycling, and transporting to transformation industries, so could has undesirable effect on occupation condition. In addition, it would cause loose of investments and environmental of pollution. Normal values under the influence of each caste have gotten weight and result of social parameters impacts have presented in table 3-9.

The mentioned table compare social indices (including impact categories: acceptability, equality and performance) together that found if quantitate criterion for each scenario has taken less amounts, undesirable social impacts will be lessen.

The above figure (3-2) show flowchart of S-LCA and effective social parameters on MSW management in first scenario (transfer station). In this schematic, thickness of lines indicates significance of influential factors. So that, acceptability has taken more final weight (0.49); As well as, between indices of this impact category, noise pollution and private space are more important. Average of normalized

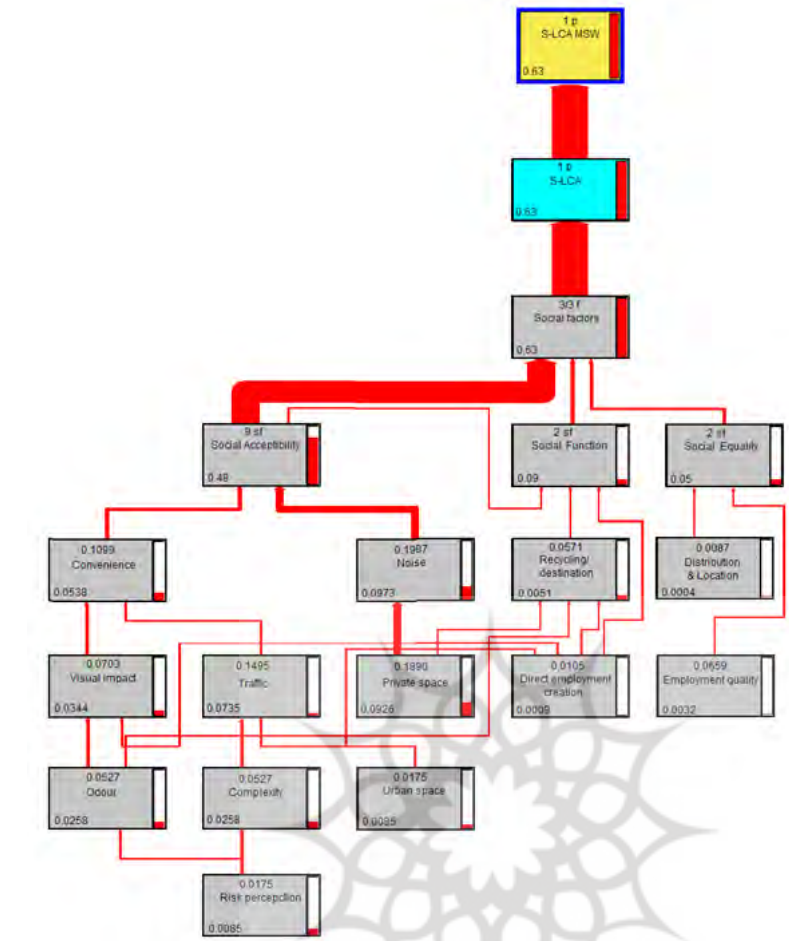

Figure 2. Flowchart of S-LCA, waste management in transfer station scenario

values of indices of each component and in different scenarios shown that transfer station scenario has the highest amount of social acceptability (1.8) and the lowest amount in social performance (0.7). In other hand, landfill scenario (direct) has allocated the least of normalized value for social equality (0.8). Albeit, first scenario, in addition to better condition in the social acceptability, has other advantages such as direct job make, less consumption of fuel and prevention of visual pollution.

Based on flowchart, relationship between indices shown that:

1- The most important effective social factor on LCA of wastes is social acceptability, and after that social equality and performance have the same role.

2- The most important effective factors on acceptability are noise and convenience that among noise pollution has a greater role.

3- Private space has causal relationship with noise pollution.

4- Private space is affecting on recycling in source and destination.

5- Traffic and visual impact indices have causal relationship with convenience.

6- The convenience is influenced by traffic and visual pollution.

7- The traffic is influenced by urban space and job making.

8- The odor emission and direct job making themselves have a causal relationship with visual impact.

9- Perceptions risk has causal relationship with

فصلنامه مدیریت شهری
(ویژه نامه لاتین)
Urban Management
No.43 Summer 2016

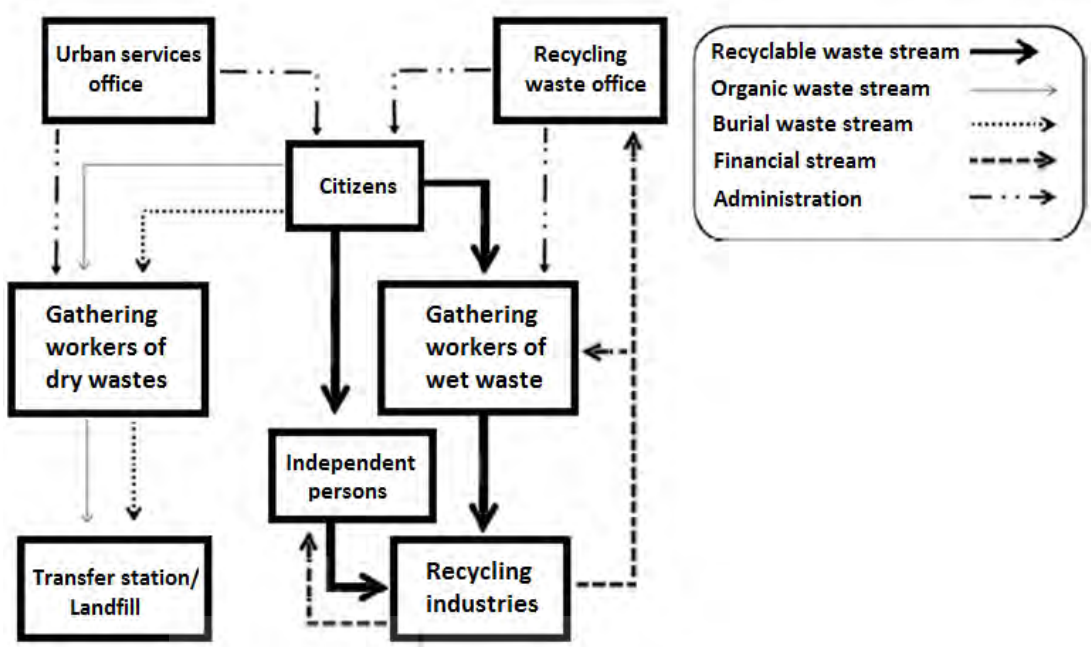

Figure 3. S-LCA streams of waste management of urban 22-disrtict of Tehran

odor emission and complexity too.

10- The odor emission itself is influenced by recycling in source and destination.

11- The Public (urban) space directly influent on job making.

12- Social performance is influenced by recycling in source and destination, direct job making and social acceptability.

13- The recycling in source and destination has causal relationship with direct job making, odor emission and private space.

14- Social equality is influenced by distribution and location of temporary storage tanks and quality employment.

4. Conclusion

Interpretation of S-LCA of MSW in studied urban district (22th of Tehran) results shows that relationships between effective components summarized in figure 3-3.

Recycling and urban services offices apply their administration under supervision of district municipality of Tehran on citizens and workers (have contracts with contractors). Recycling offices instructs via public educations and induct of awareness by mass media and causes to increase of people's participation to recycling design and source separation of wastes. This office as well as, completely supervises on whole of project stages that are done by contractors such as gathering, processing, separation and recycling; Urban services office appoints exporting of wastes in regular times and how temporary storage by citizens, and it is Executive and supervisor entire of activities from gathering to final disposal.

Streams of organic and burial wastes are from citizens to workers and then into transfer station and landfill. Recyclable waste stream is Traceable via two routes. First way is from the gathering worker of dry wastes that is supervised by recycling office and finally into recycling industries. Another route is from independent (to organization) waste gatherers that sell directly to transformation industries. Financial stream merely moves from recycling industries to wastes gatherers (both of them).

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