## MALAYSIAN SUSTAINABLE GREEN DEEN MSW MANAGEMENT INDICATOR FOR LAND-USE PRACTICE

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### ABSTRACT

The Malaysian government has launched and promoted a series of municipal waste management awareness, policies and other related programmes. Despite these policies and programmes carried out by government agencies, there is plenty of room for full implementation, even by the stakeholders. One such example is land use planning for municipal solid waste (MSW) management. This paper attempts to identify the most important MSW management indicator that should be focused by the land use planner. To do so, an index is proposed. The objective of the index is to measure the level of land use planning effort by local authorities based on MSW management as a step towards sustainability. The index also indicates the level of MSW management performance indirectly. To improve the behavior and attitude aspects, the green deen principles are considered. Three phases of mixed-method are used; qualitative followed by a quantitative phase, were adopted in this research. Those phases are content analysis, Delphi process, and Analytic Hierarchy Process (AHP). The main indicator is divided into two parts. Part A focuses on the commitments towards waste hierarchy elements and Part B focuses on commitments and responsibilities concerning the MSW management in land use planning. The results from AHP showed the weightage of each indicator, which are waste collections (0.2031), landfills (0.1690), 3R (0.2398) for Part 1; while Governance (0.1690), education (0.0682), stakeholder (0.1129) and services (0.0380) for Part 2. It concludes with a discussion that the 3R activities need to be focused in land use planning by providing space area for these activities regardless whether the zone is small or large.

Keywords: MSW management, land use, sustainable index, human factors, Malaysia

#### **INTRODUCTION**

There are numerous existing plan, acts, guidelines; index and awareness for municipal solid waste (MSW) management, but the implementation effort by local authorities should be accounted too because a successful planning and management is also closely related with the reliability of human factor (Dragan & Isaic-Maniu, 2014). It is important to measure the level of local authorities' commitment in carrying out their duties and responsibilities towards sustainability. Anilkumar in her study revealed that residential land-use based is a major generator of solid waste (Anilkumar & Chithra, 2016). The study also found that the results were due to housing typology, lifestyles of the resident and household area. Table 1 shows the critical land use and its weightage from the MSW perspective. The research also found that the waste generation values are different between residential areas due to the differences of housing typology, lifestyles of the resident and household area. The inadequate waste management also can be due to poor urban planning. This issue can be seen in the research by Onu et al (2014). The unplanned settlement can cause indiscriminate waste disposal. The main waste management practice in a country is one of the factors that cause the inefficient waste management (Leal Filho et al., 2016). The open dumping practice gives very high environmental impact, but it can be lowered with the implementation of sanitary landfill. On the

other hand, the incineration practice gives medium impact to the environment. The material recycling is suggested to be the one of the best MSW management practice as it has low impact. In addition, the presence of landfills always appears on land-use planning map. However, the least desirable action in the waste management hierarchy; a process tool which represents an order from most to least preferred actions in managing solid waste; is the disposal of waste at the landfills. Soler et al. 2017 did their research on the relationships between land use management and MSW in Province of Malaga. The results show the negative relationships between waste production and financial assets. This scenario creates the unproductive land and the production of hazardous waste.

It is important to adopt an environmental planning to develop sustainable communities and protect undeveloped lands. Land use planning is commonly related to zoning and leads to land-use regulations. Zoning determines the suitable activities, amount of spaces, types and shapes of building that can be accommodated on a space given. Land-uses give impacts on economics, social and environment, which are the 3 pillars of sustainability. Some of the related journals can be reviewed in research by Piuchan et al. (2017), Lishchuk (2014), Guzha et al. (2018), Michelsen (2008) on sustainability development. Land-uses also bring impacts on detailed aspects for example neighborhood safety (Twinam, 2017), social problems (Ashe et al., 2003) and social capital (Nabil & Eldayem, 2015).

Land Use	Relative		
	Weightage		
Residential Land use	0.349		
Commercial Land use	0.216		
Industrial Land use	0.145		
Recreation and open space Land use	0.122		
Transportation Land use	0.065		
Public Land use	0.058		
Agriculture Land use	0.045		

Table 1: Relative weightages of Land uses from MSW perspective

(Source: Anilkumar & Chithra, 2016)

Since waste policy makers, planners, general public, in fact; almost all stakeholders use the hierarchy, it affects and give impacts to the environment (Danthurebandara et al., 2013). Other waste management activities such as 3R (reuse, reduce, recycle) and waste collection must be taken into land-use planning. To do so, benchmarking or index principles is one of the effective tools to gather all the limitations, effects, impacts, and quality of any management and development. The ideas can be changed continuously and make improvements to the system in the way an existing activity or process is performed (Borglum, 2011). It is a self-improvement tool; nonetheless, every method must have its disadvantages. Benchmarking encompasses many indicators and some of them need demanding data requirement. Hence the assessment might take time to be evaluated (Benetatos, 2008).

A sustainable land planning towards MSW management is not only about technical aspects. According to Arnold (2007) land use planning should be given an environmental justice. The writer also stated that increasing collaboration, and shared resources for land-use planning decision; such as choosing sites, types of land activities, location and deciding who gets which land; are the best methods instead of the traditional procedure which is determined by political power. He added that residential people also should be involved in the MSW management. The attitude and behaviour towards the environment must be absorbed in everyone. The Islamic method of sustainable environment teaches peace and harmonious life. According to Stern et al. (1999), religious beliefs play a critical role in leading individuals to promote the value of biocentrism, adherence properties, and norms dispositive balance for a better environmental action, regardless whether the person is a Muslim or not. The use of index in managing the environment is vital as in any development planning; specific benchmark, indicators, impact and quality should be considered. This paper attempts to develop a green deen MSW management index using land use approach.

### **RESEARCH BACKGROUND**

Before further discussions, it is important to know the differences of MSW management in waste manager and land planner perspective view. Waste managers has roles to deal with waste management program from generating point until disposal point that comprising population growth, treatment capacity, treatment prices and more. On the other hand, land planners deal with strategic planning, regional characteristics such as land-use zoning, routing and future development. The parameters of their role are including land price, economic growth, settlement concentration and more. They also have common parameters considered such as the environmental impacts and the population growth. Which considers the implications of residents, as well as flora and fauna, and providing adequate facilities for waste storage and collection (Dewi, Koerner & Harjoko, 2012).

Before the development of the index, the discussion of previous research about the factors that can affect an organisation to achieve their target is discussed below. The national plans, land use regulations and several researches towards waste management in Malaysia and the miniconcept of practicing religious values and its implementation are also elaborated. Much research has been done to investigate the commitments and barrier to achieve an organization's goals. Ikediashi et al. (2013) studied the level of commitment to sustainable facilities management in Nigeria and suggested that the government should create awareness on sustainability in general. Elmualim et al. (2010) in the same type of research concluded that lack of knowledge and lack of senior management commitment are the main barriers for the implementation of reliable and comprehensive sustainable policy and practice. Jingkuang and Yousong (2011) studied about waste management performance in an architectural engineering project. They found that the main influence factor of waste management in construction site is "commitment of contractor's representative on site, collecting packed material back by suppliers, and; and appointment of labourers solely for waste disposal". They also suggested that the government should promote the environmentally sustainable development of architectural industry. Another research regarding construction site is by Crawford et al. (2017). Brunet et al. (2018) in their study revealed that actionable knowledge is a key for land use planning in order to make ecosystem services (ES) operational and mentioned the techniques that can be practiced to achieve actionable knowledge, 1) Measures of ES in specific units, (2) visualisation of the results, (3) storytelling to discuss future options and (4) gamification to enact a culture of cooperation. They identified that lack of education and lack of financial incentives are some of the barriers to improving environmental performance of construction waste management in remote communities. Coker et al. (2016) did a research on solid waste management practise by private institution in Nigeria, and discovered that positioning the mobile bin at strategic corners of the university and using appropriate waste collection bags segregates all collected waste are some strategy of successful solid waste management. Zaman (2014) through his feedback research for the key areas of his research on Zero Waste Index development found that behaviour change aspects, public participation, optimum recycling, cradle-to-cradle design and creating market for waste were rated as the key areas for future waste strategy. Reliable waste data for assessment, rules and regulation, public awareness were evaluated as moderately important.

Malaysian Syariah Index (MSI) is developed by Department of Islamic Development Malaysia (JKIM) to measure the level of the government's commitment in carrying out duties and responsibilities in accordance with the sharia law. The scoring tools are based on 8 main indicators, which are Islamic law, politics, economics, education, health, culture, and social and infrastructure and environment (Zainal Abidin et al., 2016). Another index related with Islamic law is Islamicity Index. It is designed to serve as benchmarks on how good the country or its society and economy in following the Islamic law by measuring at what degree the societies have adopted and practiced the Islamic philosophies and rules (Rehman & Askari, 2010).

#### Existing Researches, National Plans, Regulations and Policy

In Malaysia, all development plans, policies and regulations that related to town planning are based on Town and Country Planning Act 1976 (Act 172Currently, MSW management is carried out by the Ministry of Housing and Local Government, with the support of private sectors. The Federal government is involved at three different levels of governance, which are Federal, State and local. One of its roles is to advise local authorities regarding the policies and control of land use and building. The National Strategic Plan for Solid Waste Management (established in 2005) has planned a strategy about securing land for the development of sanitary landfills and transfer station. Developing master plans to determine the facilities proposed, specific sites; technologies and operational plans were also some of the strategic plans. World Wide Fun for Nature (WWF) policy supported the National Strategic Plan Tools to avoid the land use planning development conflict. The National Physical Plans suggested similar strategies; with an additional plan to close the old landfills properly. The National Urbanization Policy 2 has included a policy about providing a systematic and safe infrastructure for the disposal and treatment of solid wastes and toxic wastes. Besides the strategic plan, there were also specific land uses planning guidelines concerning the MSW management. Some of them are Guidelines for Siting and Zoning of Industry and Residential Areas, developed by the Ministry of Water, Land and Natural Resources, and specific guidelines for former solid waste disposal site by the Ministry of Housing and Local Government. Before 2007, the solid waste management in Malaysia was under the purview of local government act 1976 (Act 171) and managed by local authority. In 2007, Solid Waste and Public Cleansing Management Act (Act 672) was introduced. It controlled the solid waste and public cleansing with proper sanitation services. Solid Waste and Public Cleansing Management Corporation (SWCorp) was then established and managed the waste collections with proper services. In 2011, the federalization of solid waste and public cleansing management started. Moh and Abd Manaf (2017) reviewed the strategies and challenges of MSW management after these federalizations. Man campaign and regulations were implemented including the enforcement on separation at source. Samiha (2013) studied the importance of 3R principles in MSW management to achieve

sustainable development and stated that citizens are educated about 3R but lack participation. The roles of indicator based is also one of the best ways to achieve sustainability in policy and decision making (Dizdaroglu, 2017). Zaman and Lehmann (2013) suggested that Zero Waste Index (ZWI) could bring a city or a township to another level of green living as ZWI covered almost all aspects of it such as management, technical, behaviour and performance. Those aspects would achieve their highest performance if an area, a city or a country fulfilled all the ZWI indicators, which included awareness and education, new infrastructure and system thinking, sustainable consumption and behaviour, transformed industrial design, 100% recycling and recovery, and zero depletion legislation and policies. The Green Rating Index (GRI) focused on the industrial product using recyclable soda can and the integration management recommended by Baud et al. (2001). Many other current MSW management practise done in Malaysia and can be reviewed in journal by Mohd Yusof and Muhammad (2010), Muhaimin Samsudin and Mat Don (2013), Tey et al. (2013) and Zainu and Songip (2017).

### The Implementation of Islamic Values towards Environmental

There are many research, guidelines and indices regarding practising religion values while taking care of the earth at the same time. Deen is an Arabic word that means religion or path. Green deen means the Muslim lifestyle with environment responsibilities (Abdul-Matin, 2010). Azizan and Wahid (2012) suggested that the environmental stewardship (ES) as one of the behaviours needed to do so. They pointed out that religion should represent the human belief, personal norms, and behaviour towards environment.

Auda (2007) in his book agreed the importance of Islamic Law. The reasons behind those principles such as why Muslims banned the alcohol, why Muslims paid zakat and so on have been explained as a Maqasid Shariah, in which to protect faith, life, prosperity, property and heredity. According to Al-Qarafi (1868 CE), the purpose (Maqasid) could not be valid unless it is directed to the fulfilment of some good or the avoidance of some mischief (Chapra, 2007). Roughly, following all the laws is actually creating purposive transformations by transmitting ecologically positive habit of practice. Mamat et al. (2010) in their research developed five Muslim environment ethics based on Islamic law and Maqasid Shariah. Those five are tauhid (oneness), khalifah (leader), amanah (trust), wasatiah (moderate) and tawazun (balance) and all of them should be the fundamentals and emphasized in the environmental ethics. These theories also discussed by the same writers, on developing Hadhari environmental attitude test as an instrument to evaluate Malaysia environment attitude. The instrument has been tested and it is reliable for assessing the right environmental attitude among the Malaysia people. Mohamad et al. (2012) studied on the role of religious community in environmental practice such as recycling. They found that emphasis should be given on the characteristics of each religious community, and it could be helpful in supporting various aspects of environmental attitude. Mohd Nor et al. (2012) in his journal discussing about the application of Magasid Shariah in administration of the Islamic country and concluded that sharia plays an extremely important role in matters related to the administration and politics of a country.

All in all, the planning is important as well as the execution. Islamic principles are closely related with human behavior towards protecting environment. Moreover, the sharia principle itself is easier to commit with the help of tools such as index and guidelines manual.

### **METHOD**

There are 3 phases of mixed-method; qualitative followed by a quantitative phase, were adopted in this research. Those phases are content analysis, Delphi process, and Analytic Hierarchy Process (AHP). The objective of each phase is simplified in Table 2.

Phase	Objective		
Content analysis process	To list all the possible criteria without limit but within research limitation.		
Delphi Process	To reach the agreement through a group of experts with skill and reliability		
Analytic hierarchy Process	To determine the weightage for each assessment criteria by comparison of results in pairs		

Table 2: The objective of each research method process

## **Content Analysis Process**

During the content analysis process, the selection of indicators was made using the journal reading materials of thesis report, project report and case study report. This method has two main objectives, namely to formulate existing research and identify conceptual content in related fields. Both goals will lead to the development of new theories (Franzosi, 2008). The method of content analysis is more efficient with the support of statistical techniques. The use of content analysis methods and the support by statistical techniques will result in repeated and valid conclusions for more practical purposes (Krippendorff, 2004). For the study of this paper, summative study is suggested as the determination of the source is determined prior to and during the analysis and the source is according to the suitability and tendency of the study. This is because the study has no clear theories and observations during the start of the study to determine the elements and indicators for the index to be developed. 171 sub-indicators have been identified and divided into 11 main indicators.

For agreement and the reliability test, this study uses two coefficients coefficient namely kappa ( $\kappa$ ) and alpha ( $\alpha$ ). Raubenheimer (2004) stated that when the value of  $\alpha$  coefficient is greater than or equal to 0.70, it is appropriate for application in the study instrument. The  $\kappa$  coefficient is accepted when the results give the same value or greater than 0.50 (Viera & Garrett, 2005). Both tests will 'approve' the indicator lists to be used in this research. Table 3 shows all the identified main indicators. Indicators were divided into two parts; Part A focuses on the commitments towards waste hierarchy elements and Part B focuses on commitments and responsibilities concerning the MSW management in land use planning. Sub-indicators represent the detailed criteria and elements that should be focused by the land-use planners.

Part	Identified Indicators	Sub-
	( <b>n</b> <sub>a</sub> )	Indicators
Α	Waste collections n <sub>1</sub>	26
	Landfills, n <sub>2</sub>	21
	3R, n <sub>3</sub>	38
В	Governance, n <sub>4</sub>	19
	Education, $n_5$	18
	Stakeholder, n <sub>6</sub>	15
	Services, n <sub>7</sub>	9
	Safety, n <sub>8</sub>	9
	Health, n <sub>9</sub>	7
	Finance, $n_{10}$	5
	Resource Conservation,	4
	n <sub>11</sub>	

Table 3: Identified possible indicators with sub indicators

Delphi Process and Analytic Hierarchy Process (AHP)

The selection procedure is to ensure the election and the eligibility of a panel of judges who can delegate only relevant professions. According Renzi and Freitas (2015) after undergoing content analysis process, samples were given to the panel of experts and the document will be returned after non-critical data is issued and additional data is entered. The document or questionnaire went through the same process up until 3 rounds. Different rounds were determined by levels of agreement of data obtained from the panel of experts (Skulmoski & Hartman, 2007) Interquartile deviation values (IQDs) were used to evaluate consent or agreement between panels while McNemar tests were used to calculate the degree of change in opinion between rounds, which is pvalue, should be  $\geq 0.05$ . The IQD assesses the agreement between the first and third rounds. If the IQD does not score zero (0), the data does not reach the consent standard. Table 4 shows the total panel that were involved in this research. 14 total panels from different backgrounds changed, developed new ideas and rejected unnecessary ideas. Different to ordinary questionnaires survey, Delphi method needs not many respondents since it requires the commitment of repetition survey. According to Akins et al. (2005), the stability of respondent depends on well-defined knowledge area of the respondent even if it is just a small group. The summary of Delphi process is in Figure 1.

The AHP process is one of the techniques for reviewing the consistency of decision-makers as well as reducing bias in the decision-making process (Strojny, 2015), other than the Analytic network process (ANP). AHP produces weightage for each assessment criteria by comparison of results in pairs. Higher weightage value indicates the importance of criteria. The comparisons are based on the panel's judgement agreement on how much more the criteria dominate another with respect to a given attribute. Finally, AHP combines the weight of the criteria and the score of choice.

Therefore, the determination of global scores and consequential positions is determined for each choice.

			-
D P	eveloper & Town lanner	4	
Ν	ISW Management	4	
C	ity Council	4	
Ν	Iuslim religious affairs	2	
Round 1 Elimination repetition and unsuitable sub indicators (Expert panels)	Analysis -IQD McNemar (Researcher)	Round 3 Survey (Expert panels)	Analysis-IQD Mcnemar (Researcher)

Table 4: Total panellist background

Fig. 1: Summary of Delphi process

### **RESULTS AND DISCUSSIONS**

The first round of alpha ( $\alpha_1$ ) test shows that  $\alpha_1=0.819$  with  $n_a=11$  and  $n_a$  with kappa ( $\kappa_1$ ) value less than 0.50 were eliminated; safety  $n_8$ , health  $n_9$ , financial  $n_{10}$  and resource recovery  $n_{11}$  were eliminated from the list. Although the  $\alpha_1$  has reached its pass value, it is still not achieved its maximum level yet. The second test is executed with  $n_b=7$  and gave  $\alpha_2=0.887$  and its  $\kappa_2$  values are in Table 5. The increasing value of  $\alpha$  coefficient and the consistency of  $\kappa$  indicate that the indicators or main element of the research is reliable. The results show that governance remains as the most used criteria in waste management field; as concerning the financial aspects and their roles as a decision maker.

Tał	ole	5:	Indicate	or's	kap	pa va	lue
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n <sub>b</sub>	$n_1$	<b>n</b> <sub>2</sub>	n <sub>3</sub>	n <sub>4</sub>	n <sub>5</sub>	n <sub>6</sub>	n <sub>7</sub>
κ <sub>2</sub>	0.682	0.682	0.53	0.83	0.53	0.68	0.53
			3	7	3	2	3

The first round of Delphi was about filtering and eliminating process of repetition and unsuitable sub-indicators which 33 sub-indicators left. These sub-indicators were brought to the second and third round. Figure 2 shows Number of Sub-indicators before and after round 1 of Delphi process and Appendix A shows the final sub-indicators for this research. The decreasing number is mainly cause by repetition statement. The results of Mcnemar test is p = 0.63. In other analogy, McNemar test results show that the panels felt confident with the sub-indicators decision.



Fig. 2: Number of Sub-indicators before and after round 1 of Delphi process

From Table 6, it is observed that 3R and waste collections activities are important and need to be focused in land use planning, followed by governance, stakeholder, landfills, education and services. It is essential to identify the number of existing programmes for 3Rs at local and national levels, and the number of NGOs or civic organisations, which are active in 3R promotion in order to ensure that they have their own space and facilities. It is also essential to provide an area for recycling process and market for green and recycle products as a pioneer to all ordinary shops, malls and market for selling green products as indirectly generating the economy. In addition, a city should have a specific place to centralize the 'report centre' to receive all the statistics data and make it into official documented data of recycle rate for research purpose since it is difficult to get the international level data collection in Malaysia. It is an essential matter to improve the MSW management. The recycling centres also must be accessible and visible (Bolaane, 2006). The results also imply that the city council need to be focused on 3R, landfills, services and waste collections in the land-use planning by providing the developer, MSW service manager and town planner a formal or certified education and training for related matters; suitable with their responsibilities (Wilson et al., 2015). A detailed information such as how much bins needed for a square metre of residential area, or how many MSW workers are needed for 1 residential area or, where to place the recycling stop centre in a residential area might give impact to the public participation. This is based on research by McAllister (2015) on factors influencing solid waste management. The public participation is one of the important things and residential is considered as one of the stakeholders. In terms of waste collection point's storage, overestimating the generation's waste by the waste manager would be the safest method instead of underestimating it.

Hence, the space provided by the land use planner must also bigger than estimated. Not only that, each waste collection point must be provided with waste segregation facilities. The panels also agreed to the idea of attaching SWM fee billing for another utilities service such as electrical supple or water supply. This is the best way to discipline and educate the public that MSW management is as important as other utilities.

Table 6: Weightage of sustainable green deen MSW management indicators for land-use practice

Indicators, nb	Total
	Weightage
Waste	0.2031
collections n <sub>1</sub>	
Landfills, n <sub>2</sub>	0.1129
3R, n <sub>3</sub>	0.2398
Governance, n <sub>4</sub>	0.1690
Education, n <sub>5</sub>	0.0682
Stakeholder, n <sub>6</sub>	0.1690
Services, n7	0.0380
Total Score	1

The next practice that should be followed by the land-use planner is identifying the sensitive area for human and nature system for landfills and waste collection (solid waste transfer station planning). The survey area also must follow the Guidelines for Siting and Zoning of Industry and Residential Area by the Ministry of Natural Resources and Environment Malaysia. To identify an illegal landfill and open dumping areas, land use planner should have a public survey. This survey can also measure the satisfaction level of waste collection service and landfills' actual condition; hence improvement can be made year by year. At least 1 new alternative or "training" every 6 month can initiate a better policy and regulations in order to achieve 100% rate of waste diversion and zero landfills. The communication between land-use planners and stakeholders is one of the best key practices to achieve 11<sup>th</sup> Malaysian plan – inclusive and sustainable by 2020. According to Wilson et al. (2015) journal, the effectiveness of city's MSW management depends on how good the governance is. The governance must be held by trust and able to do business as a team. This is to prevent the lack of enforcement of monitoring and regulating the land use planning towards MSW. Non-political management must monitor the standard operating procedure (SOP) of MSW land use planning to avoid major problem during any changes of government after the election.

Reduce and reuse activities are more about individual's attitude and behavior. Most of the panels agreed that schools, universities, offices and shopping malls are the best places to provide MSW education and is least needed in the MSW zoning process although it is a very important issue. However, the content of the education and campaign should involve religious issues especially based on Al-Quran and Sunnah, as Islam is the official religion in Malaysia. By doing so, the residence will appreciate nature and environment more than they think. The purpose of taking care of the earth is becoming more relevant with this kind of education.

## CONCLUSION

Even though the Malaysian government has launched and promoted a series of municipal waste management campaigns, and policies, only a few practiced according to the plan stakeholders. This study has found that the land-use planners should focus on 3R and waste collection (reduce, reuse, and recycles) platform to encourage the public in behavioural-changes towards the environment. The landfills also must be included in the method of reducing waste. The management and responsibilities aspects also must be attached with the land-use planning by providing the space for education, governance, services and stakeholders. The indicator can be done by mapping the master plan for MSW management that focuses on the waste hierarchy.

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# Appendix A. List of Sub-indicator

- 1. Waste Collection
- · Identifying the sensitive area -Natural System before the land-use planning
- · Identifying the sensitive area- Human System before the land-use planning
- The zoning of solid waste transfer station in the land-use planning and must be follow the Guidelines For Siting And Zoning Of Industry And Residential Areas (GZIR)
- The zoning of mini solid waste transfer station for every 15 houses
- The main route for main and mini solid waste transfer station to the waste segregation, recycles centre, and to landfills according to GZIR
- · Planning the Solid Waste Transfer Station in rural area as well as the urban area.
- A formal education and training about city sustainability and impact waste collection to the environment
- A public survey once every year to measure the satisfying level of waste collection service and identifying the illegal waste dumping area.
- Considering public health for animals and human
- 2. Landfills
- · Identifying the sensitive area -Natural System before the land-use planning
- · Identifying the sensitive area -Human System before the land-use planning
- The zoning of landfills must be according to GZIR
- The zoning of waste segregation and recycles facilities in the landfills.
- · Formal education and training about city sustainability and impacts of landfills to the environment.
- A waste manager survey once every year to measure the satisfying level of waste landfills service and the identifying the illegal landfills.
- Only sanitary landfills is allowed to be operating
- Considering public health according to The Technical Guideline for Sanitary Landfill, Design and Operation
- 3. 3R (Reuse, reduce, recycle)
- The zoning for Recycle/Recovery Plant or Facility
- The zoning for recycling research Centre (To gather the recycles official information and reliable data for waste)
- A formal education and training about recycling and impacts of recycling to the environment (Developing skilled/expertise of 3R land use planner)
- Collaboration between land-use planner management and land-use planning research by local university to exchange data every 6 month
- Collaboration between land-use planner and architecture to improve recycle facility by make the building access-able and visible to public –building rotation etc.

- The zoning of green space (A public park/garden) for publics to do the recycling education activities recycled goods markets and related services that access-able and visible.
- 4. Governance
- The Zoning of MSW centre that centralized the MSW management (A place to government collaboration with key stakeholders and sharing of responsibilities and information).
- Waste Bank as Community-based Environmental Governance -The transparency regarding financial and funding on MSW management
- 5. Education
  - The zoning of MSW education centre
  - Campaign and programs at schools about the importance of land-use planning towards environment and how an illegal land owning affects the MSW management.
  - The formal education towards land-use planning on MSW for political, policy makers, decision maker and implementers.
- 6. Stakeholder
- Communication Space- Land-use planners considering all ideas and opinion from all the stakeholders (public and private) for decision making process.
- Community space Where all publics and stakeholders can do public hearings on problems, anonymous letter, the results from land use and waste collection survey
  - 7. Services
  - The zoning of distribution centre. The enough storage for bins for compost and recyclable before the distribution.
  - Attaching the MSW bill fee with other utilities bills such as water or electrical.