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Urban Ex-landfill Redevelopment in Malaysia: Community Perception

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Abstract:

Malaysia's rapid urban development, with more than two-third of its people living in the urban areas, has forced the government to redevelop urban ex-landfill. Five types of redevelopment for ex-landfill sites have been identified including the redevelopment as public parks. The redevelopment of urban ex-landfill as a public park is claimed to be the best approach to mitigate the issue of ex-landfill and it is widely accepted by the community. Is this true? Hence, this study serves as a background study to identify community's perceptions towards the issues of ex-landfill, the ranks of the suitable development type and the proposal of ex-landfill redevelopment as a public park. A community's perceptions data that comprises feedbacks from 233 respondents who live within 1.0 kilometer radius of two study areas, namely Jinjang Utara ex-landfill and Worldwide Landfill Park indicates that the communities within these areas are receptive towards the redevelopment of ex-landfill as a public park. Thus, redevelopment of ex-landfill as a public park is expected to be the preferred type of redevelopment for future development of the 296 urban ex-landfills in Malaysia.

Keywords: urban ex-landfill redevelopment, community perception and acceptance, public park, future development

1. Introduction

Urbanization requires strategic planning as it is not only capable of creating a city as a sustainable and livable habitat, but also can decrease the urban community's quality of life (Heberle and Werstedt 2006; Town and Country Planning Department 2010). Urbanization also causes the ex-landfill sites, which were previously located outside the city area and being ignored in any development planning, to become part of the urban built environment that needs to be redeveloped as the new urban's open space resources for the benefits of the urban community (Adam et al. 2010). Typically, the redevelopment of ex-landfill is only implemented in developed countries because of its importance in resolving the issue of urban space's inadequacy. However, the situation is different for Malaysia, a member of group 1 developing countries with an urbanization rate of more than 70% (Liu 2013). The changing status of ex-landfill location from rural to urban area which is due to the impact of urban area expansion and the increasing demands for land to provide adequate settlement for 13.1 million urban population, has resulted in the existence of 115 settlements in the vicinity of urban ex-landfill. Although a development policy planned by the government is already available, an increase of public awareness towards the needs to redevelop ex-landfill in accordance to their needs have forced the need to reassess the appropriateness of the urban ex-landfill redevelopment. Hence, this perception study was conducted to generate data that can assist the government in identifying issues, suitability and acceptance of the proposed planned development for urban ex-landfill.

2. Urban Ex-landfill and Redevelopment Policy in Malaysia

In Malaysia context, ex-landfill is defined as a non-operating landfill where waste disposal activities have been laid off or completed (Ministry of Housing and Local Government 2004). Ex-landfill which is known as a final product of landfill development, is also a sub-component of the brownfield, contaminated land and disturbed lands in Malaysia (Town and Country Planning Department 2012; National Landscape Department 2010). According to Fauziah and Agamuthu (2012) and Lisa et. al (2003), people often associate the existence of ex-landfill within their habitat areas with a negative impact to their quality of life and the environment. This is due to the fact that ex-landfill is still producing leachate and landfill gas for a long period of time that may extend beyond the period of 20 years after closure (Ministry of Housing and Local Government 2004; United States of Environmental Protection Agency 2010).

In this study, special focus is given to the ex-landfill in the vicinity of the urban area referred as urban ex-landfills. Urban ex-landfill became an issue in Malaysia as a study in 2003 revealed that 70% of the 147 landfills were located close to the residential areas within the urban area due to the impact of urban rapid development and expansion of urban areas (Ministry of Housing and Local Government 2004). Further study by Chin-Yang and Suhaimi (2006) and Fauziah and Agamuthu (2012) also found that the

high rate of acceptance of waste which exceeds 30,000 tonnes per day has shortened the lifespan of the landfill. Those factors have been identified as the major causes in the increasing numbers of urban ex-landfill from 115 in 2003 to 165 in 2012. The number of urban ex-landfill in the country is expected to reach 296 by the year 2020, and with a width of 0.2 hectares to 100 hectares per urban ex-landfill, it will be part of the urban image and urban built environment (National Solid Waste Department 2012). Recognizing these problems and the need to improve urban space for future development, the government has taken steps to specify the requirements for redevelopment of the urban ex-landfill in the policy and planning guidelines.

The 'Guidelines for the safe closure and rehabilitation of municipal solid waste landfill' is the first guidelines that stipulate the needs of urban ex-landfill redevelopment (Ministry of Housing and Local Government 2004). These guidelines suggest that the redevelopment of urban ex-landfill should be limited to five types of development namely, (i) agriculture areas (ii) parking areas and roads (iii) public parks (iv) low-density residential areas, and (v) commercial or industrial areas.

The proposed limited development for urban ex-landfill was further detailed in the National Physical Planning Council (2004) where the Council has decided that the redevelopment as a public park should be the main priority. It is also decided that urban ex-landfill redevelopment as residential areas and commercial or industrial areas requires a detailed study before development could take place based on justification of 'community safety and public well-being' factors. These instructions are considered as the basic policy for urban ex-landfill development in Malaysia. Indirectly, it also justifies the needs to redevelop ex-landfill as public parks in the context of Malaysia's urban planning policy.

The needs to redevelop ex-landfill as public parks are further elaborated in other guidelines, such as 'Ex-landfill conservation guidelines for public parks' (National Landscape Department 2010), 'Planning guideline for brownfield redevelopment' (Town and Country Planning Department 2012) and national development policy such as National Urban Policy (Town and Country Planning Department 2010) and National Landscape Policy (National Landscape Department 2010).

According to the National Landscape Department (2010), the development of a public park on ex-landfill sites should be regarded as an alternative for the existing development of a public park which is now facing the issue of inadequate space for new development. This is due to the high demand for urban space for physical and economic development that has led to the conversion of open space land-use status which is specifically gazetted for the public park development (Abd Mutalib 1999, Puteri Haryati et al. 2013). The decline of open space land-use status for public park development has resulted in the failure to achieve sustainable cities status which is based on planning standard of 2 hectares of open space per 1,000 urban populations (Town and Country Planning Department, 2010). With the overall total areas of 13,626 hectares (National Landscape Department), public parks in Malaysia could not provide adequate recreation space for the urban population that is expected to increase to 23.1 million in the year 2020 (Department of Statistics 2010).

Therefore, the proposal to redevelop urban ex-landfill as public parks is expected to increase the number of urban public parks accordingly as per the planning standard and also to create social recreation opportunities to 84,000 urban populations. In addition, the development will also increase the provision of large-scale public parks in the vicinity of major cities in Malaysia with the development of eleven Local Park (minimum area of 8.0 hectares) and two Urban Park (minimum area of 40.0 hectares).

2.1. Community Perception and Acceptance Towards Ex-landfill Redevelopment

Perception is a reflection of human behavior which is influenced by attitudes, emotions and cognitive arising from previous knowledge, insight and perception (Zimbardo and Ebbessen 1970). Perception is also regarded as the basis in the assessment of human's quality of life due to the fact that perception and quality of life could be felt through the notion of an individual's well-being experience (Murdie et al. 1992; Johnston 1992). Therefore, perception is often used by researcher as a tool to explain the status of community's quality of life (Matlin 1989; Ibrahim Yahya 1995; Haryati 2003). According to Abd Rahim (1996), perception study is the best method to prove the acceptance and relationship of human to or with its environment. The use of perception study to identify the acceptance and relationship of human with its environment is also justified based on Letang and Taylor's (2012) opinions on the importance of perception study in order to produce data that could become an indicator to determine the appropriateness of brownfield redevelopment. They also stated that community's perception study will enable the needs and views of a community to be taken into consideration in any future development. The adaptation of planning with consideration of community needs and views will enable any future development to be easily supported by the community, thus be implemented.

Based on that view, this study used perception study to assess the community's opinion on the issue of ex-landfill sites in their living environment, the suitability type of development and acceptance of the proposed development of ex-landfill as a public park. As stated by Bernstan et al. (2013), community is more knowledgeable on what they want for the future development within their environment, thus this study assume that the data gathered from this study will become an indicator to the community perception towards the acceptance of ex-landfill future development. Therefore, it could assist the government especially the Local Authority which functions as an urban administrator and decision maker to plan the most suitable urban ex-landfill development for the benefits of the community.

3. Research Methodology

A questionnaire with close-ended questions and using 5 points Likert's scale as the rank of priority was used as a study method. The samples consist of 233 respondents who are the heads of households. This sample size represents 10% of the total number of household in the residential areas within the range of 1.0 kilometre radius of the study areas, which are Jinjang Utara ex-landfill and Worldwide Landfill Park. Jinjang Utara ex-landfill is located in the urban area of Kuala Lumpur which is under the administrative of the Kuala Lumpur City Hall. It has been closed since 1996 and has not been developed until now. Meanwhile, the Worldwide Landfill Park is located in the new urban area of Puchong which is under the administrative of Subang Jaya

Municipal Council. Formerly known as Ayer Hitam landfill, the redevelopment undertaken in the year 2000 has transformed Ayer Hitam landfill as a public park in the year 2001. The selection of two different study areas was made to study if there is a difference in perceptions among the respondents. The setting of 1.0 kilometre radius as the boundary of the study areas is in accordance to the United States of Environmental Protection Agency's standard in monitoring the impact of landfill gases and it is the standard range for collecting observational data. The justification to use 1.0 kilometre radius as study area is also referred to Lisa (2003) and Robert's (2000) opinions. Both of them claimed that the study area to assess landfill impact should be limited to within 1.0 kilometre radius of the landfill area in order to produce accurate data.

In order to identify the urban ex-landfill based on community perception, five issues namely (i) issue of fire and explosion caused by landfill gas emissions (ii) odor produced by former landfills (iii) water pollution caused by leachate (iv) rubble and soil subsidence, and (v) the risks of health and safety faced by people living nearby the urban ex-landfill, have been selected as the study variables. These five issues are indicated by Hertzman et al. (1987) as the major issues of landfill which often become the community's concern and the basis for community rejection towards the proposed new development if it is not properly managed by the authority or stakeholder. Meanwhile, the selection of variables to determine the types of redevelopment suitable for the urban ex-landfill is based on the suggested types in the limited development policy for ex-landfill (Ministry of Housing and Local Government 2004).

4. Results and Discussion

Descriptive statistics was used to access the community perception towards three main research questions, which are:

- What is the main issue of ex-landfill perceived by the community that needs to be addressed before new development could take place?
- What type of ex-landfill redevelopment is regarded as the most suitable by the community?
- Could the proposal to redevelop ex-landfill as public park be accepted by the community?

In this data analysis, R1 represents the respondents within 1.0 kilometer radius of Jinjang Utara ex-landfill and R2 represents respondents within 1.0 kilometer radius of Worldwide Landfill Park.

For research question (i), the result is as shown in Table 1.

Data Issues of ex-landfill	Respondents	Frequency (%)				
		Extremely hesitant	Hesitant	Not really hesitant	Not hesitant	Extremely not hesitant
Fire and explosion	R1 (N=120)	11 (9.16)	18 (15.00)	17 (14.16)	21 (17.50)	53 (44.16)
	R2 (N=113)	8 (7.07)	12 (10.61)	32 (28.31)	30 (26.54)	31 (27.43)
	Total (N=223)	19 (8.52)	30 (13.45)	49 (21.97)	51 (22.85)	84 (37.66)
Rubble and soil subsidence	R1 (N=120)	5 (4.16)	17 (14.16)	21 (17.50)	49 (40.83)	28 (23.33)
	R2 (N=113)	2 (1.76)	11 (9.73)	29 (25.66)	43 (39.05)	28 (24.77)
	Total (N=223)	7 (3.13)	28 (12.55)	50 (22.42)	92 (41.25)	56 (25.11)
Bad odours	R1 (N=120)	69 (57.50)	23 (19.16)	20 (16.66)	8 (6.66)	0 (0.00)
	R2 (N=113)	67 (59.29)	21 (18.58)	10 (8.84)	14 (12.38)	1 (0.88)
	Total (N=223)	136 (60.98)	44 (19.73)	30 (13.45)	22 (9.86)	1 (0.44)
Water pollution caused by leachate	R1 (N=120)	5 (4.16)	27 (22.50)	33 (27.50)	24 (20.00)	31 (25.83)
	R2 (N=113)	14 (12.39)	35 (26.31)	16 (14.15)	18 (15.92)	30 (26.54)
	Total (N=223)	19 (8.52)	62 (27.80)	49 (21.97)	42 (18.83)	61 (27.36)
Health and safety risk	R1 (N=120)	30 (25.00)	35 (29.16)	29 (24.16)	18 (15.00)	8 (6.66)
	R2 (N=113)	22 (19.46)	34 (30.08)	26 (23.00)	8 (7.07)	23 (20.35)
	Total (N=223)	52 (23.31)	69 (30.94)	55 (24.66)	26 (11.69)	31 (13.90)

Table 1: Respondents' perception towards ex-landfill issues

Table 1 shows the respondents' perception on the five issues that have been identified as the main issues related to ex-landfill areas (National Landscape Department 2010). The results show that the odour issue was the most disturbing issue to the community (60.98%) followed by health and safety risk (23.31%), water pollution caused by the leachate emission to the nearby water body and fire and explosion, which could be caused by the ex-landfill gas production (8.52%) and rubble and soil subsidence nearby the ex-landfill sites caused by the unstable ex-landfill soil conditions (3.31%). Both the R1 and R2 respondents agreed that the odour issue was their main concern. This perception was based on their bad experiences and exposure to the ex-landfill gasses. The respondents also agreed that odours issue should be the main issue that need to be addressed before the redevelopment of ex-landfill could take place. In this case, if the odour issue has been eliminated, the respondents agreed that the issue of health and safety risks should be given priority to ensure that the development that will be carried out does not cause any health and safety problems to the community as the users of the future development. This result is in line with the study conducted by Chung Yang and Suhaimi (2006) which concluded that the community often associated bad odour produced by the landfill with the deterioration of public health due to the higher levels of exposure received by the community compared to the other issues.

The results also show that the issue of fire and explosion was considered by the community as the least important issue (37.66%). This is due to the community perception that the issue is a rare issue and does not give much impact to their residential area. This may be caused by the lack of the community’s knowledge on the impacts of landfill gas emissions such as methane, which can trigger fires and explosions and give impact to the nearby neighbourhood areas. Hence, it could be assumed that if there are changes in the level of community knowledge, the community's perception of preferential issue of ex- landfill sites will also change accordingly. As suggested by Berstan et al. (2013), it is proposed that the issue of urban ex-landfill should be resolved according to its rank of priority so that the suggested new development could be easily accepted by the community.

Table 2 presents the respondents’ perceptions on each type of suggested redevelopment types based on ex-landfill limited development policy. The results show that the redevelopment of the ex-landfill sites as a public park is the type of development that was considered by the respondents as the most suitable (42.60%), followed by parking areas and roads (39.91%), agricultural areas (9.86%), and housing areas (8.96%). The development of ex-landfills as housing areas was found to be less suitable (36.32%). Both groups of respondents (R1 and R2) agreed that the redevelopment of ex-landfill as public park is the main priority. However, there was disagreement over the type of development that is extremely unsuitable, where the respondents of R1 chose agricultural areas (52.50%) while respondents of R2 chose commercial or industrial areas (46.90%).

Data Types of ex-landfill redevelopment	Respondents	Frequency (%)				
		Extremely suitable	Suitable	Not really suitable	Not suitable	Extremely not suitable
Agricultural areas	R1 (N=120)	3 (2.50)	7 (5.83)	31 (25.83)	21 (17.50)	63 (52.50)
	R2 (N=113)	19 (16.81)	27 (23.89)	24 (21.23)	34 (30.08)	9 (7.96)
	Total (N=223)	22 (9.86)	34 (15.24)	55 (24.66)	55 (24.66)	72 (32.28)
Parking areas and roads	R1 (N=120)	51 (42.50)	36 (30.00)	20 (16.66)	13 (10.83)	0 (0.00)
	R2 (N=113)	38 (33.62)	26 (23.00)	21 (18.58)	27 (23.89)	1 (0.88)
	Total (N=223)	89 (39.91)	62 (27.80)	41 (18.38)	40 (17.93)	1 (0.44)
Public parks	R1 (N=120)	54 (45.00)	41 (34.16)	16 (13.33)	7 (5.83)	2 (1.66)
	R2 (N=113)	41 (36.28)	52 (46.01)	10 (8.84)	8 (7.07)	2 (1.76)
	Total (N=223)	95 (42.60)	93 (41.70)	26 (11.65)	15 (6.72)	4 (1.79)
Housing areas	R1 (N=120)	11 (9.16)	21 (17.50)	40 (33.33)	15 (12.50)	33 (27.50)
	R2 (N=113)	9 (7.96)	6 (5.30)	39 (34.51)	11 (9.73)	48 (42.47)
	Total (N=223)	20 (8.96)	27 (12.10)	79 (35.42)	26 (11.65)	81 (36.32)
Commercial or industrial areas	R1 (N=120)	1 (0.88)	15 (12.50)	13 (10.83)	64 (53.33)	22 (18.33)
	R2 (N=113)	6 (5.30)	2 (1.77)	19 (16.81)	33 (29.20)	53 (46.90)
	Total (N=223)	7 (3.13)	17 (7.62)	32 (14.34)	97 (43.49)	75 (33.63)

Table 2: Respondents’ perception towards the types of ex-landfill redevelopment

With the aim to identify the ranks of ex-landfill redevelopment based on types, this study used the scale to determine the priority ranking. For this purpose, the values assigned to each of the weighted responses to produce the rate of percentage are as follows: Value of 5 is for ‘extremely suitable’, 4 for ‘suitable’, 3 for ‘not really suitable’, 2 for ‘not suitable’, and 1 is for ‘extremely not suitable’.

To generate the ranking, this formula is used:

$$\frac{\text{Total value for each type} \times 100}{\text{Total overall value}}$$

As a result, the most suitable development for ex-landfill is public park (28.03%), followed by parking areas and roads (26.22%), agricultural areas (17.33%), and housing areas (16.89%). The most unsuitable development of urban ex-landfill is commercial or industrial areas (11.51%). These results indicate that the community perception on the appropriate type of urban ex-landfill redevelopment is similar to the decision made by the National Physical Planning Council. Redevelopment as public parks should be given the main priority in the redevelopment of ex-landfill sites in Malaysia. Meanwhile, the redevelopment as commercial or industrial areas should be the last option. This result indirectly shows the community’s support of the decision of the National Physical Planning Council (2004) and acceptance of the proposal of National Landscape Department (2010) to develop public park at the ex-landfill sites.

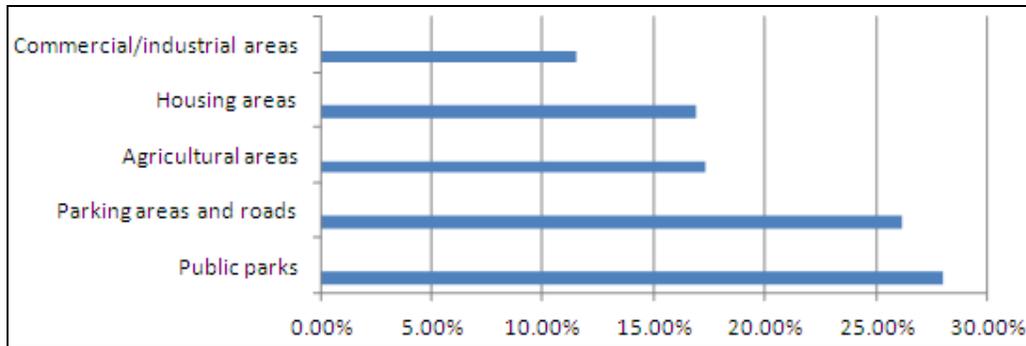


Figure 1: Ranks of ex-landfill redevelopment types based on community perception

Table 3 presents the frequency of respondents’ perception towards the suitability of ex-landfill within their neighbourhood area (within 1.0 kilometre radius of their residential area) to be redeveloped as public park. The results show that the percentage of acceptance was very high, which is 84.29%, compared to 8.51% who disagreed and 11.66% who did not really agree with the redevelopment of ex-landfill as public park. The results also show that the acceptance percentage for strongly agreed for R2 was higher, with the difference of 3.14% compared to R1. This perception was likely due to the influence of the public park that has been experienced by the respondents in R2, whereby the previously known Air Hitam landfill has been developed into Worldwide Landfill Park. Therefore, it could be concluded that these results support the results indicated in Table 2, that public park is accepted by the community as the main priority development for ex-landfill redevelopment.

Data / Respondents	Frequency (%)				
	Extremely agree	Agree	Not really agree	Not agree	Extremely not agree
• R1 (N=120)	35 (29.16)	60 (50.00)	16 (13.33)	7 (5.83)	2 (1.66)
• R2 (N=113)	12 (10.62)	81 (71.68)	10 (8.85)	8 (7.07)	2 (1.77)
Total (N=223)	47 (21.07)	141 (63.22)	26 (11.66)	15 (6.72)	4 (1.79)

Table 3: Respondents’ perception towards redevelopment of ex-landfill as public park within their neighbourhood area

5. Conclusion and Recommendation

In dealing with issues of inadequate urban spaces for future development, urban ex-landfill needs to be redeveloped. Proper planning needs to be implemented by the government as the main stakeholder. However to ensure the optimum benefits to the community and development to be widely accepted by the community, this study suggests that community opinion should be taken into consideration in determining the suitability of the development of the urban ex-landfill. This is based on the fact that community opinion will determine the success status of the future development, especially for developing countries who perceive the redevelopment of the urban ex-landfill as a new field in urban planning.

With Malaysia as an example of developing countries that emphasize the importance of urban ex-landfill in its development, this study has successfully identified the community’s perceptions towards the issue of ex-landfill, the priority of redevelopment types, and the level of acceptance towards the proposal to redevelop urban ex-landfills as public parks. Hence, it can be concluded that urban ex-landfill redevelopment as public park is highly accepted by Malaysians. Therefore, it is most appropriate for the urban administrators in Malaysia to prioritize the redevelopment of ex-landfill site as a public park over the other types of suggested development.

However, to ensure that the redevelopment of ex-landfill as a public park could be accepted by the community, there are needs for the developer or the urban administrator to address the issues of ex-landfill. The odour issue needs to be addressed first, followed by other methods in dealing with other issues, especially the health and safety risks. Besides the issue of ex-landfill, to ensure that the redevelopment could bring out the most of benefits to the community, further study needs to be done. Specific studies on the quality of life, the appropriateness of development in terms of built environment and land use should also be studied in detail. The data should also consist of field data, such as health and air quality. Therefore, it is hoped that with a comprehensive study, the redevelopment of urban ex-landfill as public parks will become the basis of development policy to the 296 future urban ex-landfills in Malaysia by the year 2020.

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