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From Ex-landfill to Public Park: Impact on local community's quality of life and living environment

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Abstract

Regarded as a new development urban planning approach in developing countries, brownfield regeneration, particularly the redevelopment of ex-landfills as public parks in Malaysia, leads to the question of this research: could such development benefit the local communities' quality of life and living environment? We selected as study respondents 163 heads of household within a one-kilometer radius of two pilot ex-landfills as public park areas, namely, Worldwide Landfill Park and Kuantan Passive Park. Results show significant differences in respondents' perception, which indicates the positive impact of such redevelopment.

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*Keywords:*Brownfield regeneration; ex-landfill to a public park; local community's quality of life; living environment

1. Introduction

Customary brownfield regeneration has been implemented in developed countries. However, the increase in

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urban population and scarcity of urban space has increased the importance of implementing brownfield regeneration in the urban planning of developing countries. Malaysia is no exception; it is an emerging country and a member of Group 1 developing countries in Southeast Asia with an urbanization rate exceeding 70% (Liu 2013) and the urban population exceeding 60%. Thus, the need to provide adequate urbanspace for future development has resulted in the inclusion of brownfield regeneration in the country's National Urban Policy. Through the NUP9 Action Plan, the National Urban Policy specifically instructs urban administrators to plan and prepare programs for brownfield regeneration. In this study, special focus is given to Category B brownfield, which refers to ex-landfills and their redevelopment as public parks. The increasing number of ex-landfills near urban areas, especially urban settlement, and inadequate urban green provision based on planning standards of two acres per 1,000 urban population are explicit justifications for the proposal to redevelop ex-landfills as public parks (National Landscape Department 2010; Department of Town and Country Planning Peninsular Malaysia 2012). Until 2014, only two pilot projects of such redevelopment have been implemented in Malaysia, namely, Worldwide Landfill Park and Kuantan Passive Park. This transformation necessitates impact studies. Therefore, this study is conducted with two research objectives, namely, (i) to identify the communities' perception of their quality of life and (ii) to determine the communities' perception of their living environment due to the impact of living next to public parks transformed from ex-landfill sites.

2. Literature review

The concept of sustainable brownfield regeneration is defined as "the management, rehabilitation, and return to beneficial use of brownfields in such a manner to ensure the attainment and continued satisfaction of human needs for present and future generations in environmentally sensitive, economically viable, and socially and institutionally robust acceptable ways within the particular regional context" (RESCUE 2005). Brownfield regeneration has been implemented in the physical planning of developed countries, such as the United States, Japan, and European countries. Given that no consensus on the definition of brownfield has been reached(Armin & Hoda 2013), the location of brownfield sites, either in the city center or within the vicinity of the urban area, plays a significant role in determining the importance of brownfield regeneration in physical planning (Doerle 2012).

In the Malaysian context, brownfield is defined as an area that has been developed but abandoned or neglected, an area with a development structure that is already obsolete, or a development area that is not entirely completed and abandoned (Department of Town and Country Planning Peninsular Malaysia 2012). Brownfield could refer to a contaminated area, covering abandoned buildings or buildings that are already completed but not sold in the period of more than 10 years either on government or private land. To facilitate physical planning in Malaysia, the brownfield is divided into six categories based on the types of areas (Table 1).

Table 1. Brownfield categories in Malaysia

Category of brownfield	Types of areas
A	Former mines/quarries
B	Ex-landfill areas full of solid waste/no longer in use permanently
C	Factory/business/housing/institution/areas that have been abandoned for more than 10 years
D	Incomplete and abandoned development projects in the period of development of more than 10 years
E	Buildings/rows of completed blocks but abandoned for more than 10 years
F	Former depot/public transportation stations, infrastructural facilities, and utilities

The expansion of urban areas due to the effect of fast-paced urbanization and urban sprawl in Malaysia has led to Category B brownfield, which refers to area previously located outside the urban vicinity and have become part of the urban built environment. Comparative analyses in 2004 (Ministry of Housing and Local Government 2004) and

2012 (National Solid Waste Department 2012) showed an increase in quantity and urban space coverage of ex-landfills defined as a "non-operating landfill, where waste disposal activities have been laid off or completed" (Ministry of Housing and Local Government 2004). In 2003, 115 ex-landfills exist, and 40.0% of them were located within urban areas. The number increased to 131 in 2012, and the number is expected to increase to 296 when all existing landfills in Malaysia close operations by 2020. More than 70.0% of the 296 future ex-landfills are expected to be located in urban and within urban residential areas. Out of the total, 13 have been identified to have an average acreage of 8.0 to 100.0 hectares. In addition to being the cause of an increasing number of urban brownfields, ex-landfills have been identified as an issue that has worried local communities (Chun-Yang & Talib 2006; Brender et al. 2011). Living next to an ex-landfill is commonly associated with a perception of decrease in health and safety status and deterioration of the surrounding living environment. Amidst those issues, the existence of ex-landfills has been identified as assets to address the issue of urban space for future development (Department of Town and Country Planning Peninsular Malaysia 2010) and insufficient urban green space provisions following the standard of two hectares per 1,000 urban population (National Landscape Department 2010).

In line with the decision of the National Physical Planning Council (2004), which determines public parks as the main priority for ex-landfill redevelopment in Malaysia, the National Landscape Department proposed the need to redevelop ex-landfills as public parks (2010). The redevelopment of ex-landfills as public parks is seen as an alternative approach to the importance of urban green spaces. Meanwhile, the appropriateness of urban green spaces provision is essential for Malaysia to achieve the sustainable urban status set by UN-HABITAT (2012). The redevelopment of ex-landfills as public parks is also considered a wise development approach, able to change urban derelicts into beneficial land use (Fauziah & Agamuthu 2012). Based on the ex-landfill data in Malaysia in 2003 (Ministry of Housing and Local Government 2004), the prospect of the redevelopment of urban ex-landfills as public parks is shown in Table 2.

Table 2. Prospect of redevelopment of urban ex-landfills as public parks

Ex-landfill within vicinity of urban areas			Potential to be developed as public parks	
Acreage (hectare)	Quantity	Total area (hectare)	Category of public park	Carrying capacity (based on planning standard of 2 hectares: 1,000 urban population)
<0.2	5	2.1	Play lot	1,050
0.2 – 0.6	9	11.4	Playground	5,700
0.6 – 2.0	20	62.9	Community Park	31,450
2.0 – 8.0	11	163.5	Local Park	81,750
8.0 – 40.0	2	90.0	Urban Park	45,000
Total	47	329.9		164,950

Previous studies on public parks showed that development within urban areas,primarily residential areas, improves the local communities' quality of life and living environment (Mansor et al. 2010; Bajunid et al. 2012; El-Husseiny 2013; Rasidi et al. 2013), as does the redevelopment of ex-landfills as public parks (De Sausa 2003; EPA 2012, Benjamin 2012). Is the impact similar in the context of Malaysia's development? This question has led to the present study because to date, no study has been reportedon the impact of ex-landfill redevelopment as public parks in the context of Malaysia. To understand this issue, this study adhered to Dass's (2008) view, who stated that the quality of life of people in urban areas is the outcome of people's interaction with urban environment, particularly the urban living environment.

Based on this understanding, the status of the quality of life was assessed through the perceptions of local communities against the impact of the transformation of ex-landfills into public parks in their living environment. The communities' quality of life is closely related to their living environment. Thus, the success of such redevelopment was also studied based on its impact on the comfort of a living environment as perceived by local communities.

The quality of life, which has both objective and subjective characteristics, causes the existence of different definitions and indicators (Azahan et al. 2008). To achieve the research objectives, this study focuses on two indicators (namely, local communities' health and safety status) and adheres to the definition of quality of life as "a satisfaction environment, where comparison of satisfaction becomes the basis of community satisfaction" (Murdie et al. 1992). Hence, this study applies perception study method to assess communities' perception of the impact of ex-landfill redevelopment as a public park.

In determining the living environment indicator, the study adhered to the opinions of Hallman (1987) and Bender et al. (1997), who stated that living environment is an output of the impact of the surrounding aesthetic view and comfortable residential surrounding area comprising good air quality, low noise level, increased public safety status, scenic surrounding view, and adequacy of surrounding green space provision. Review of literature, which shows that the existence of landfill sites correlates with the deterioration of air quality and views (Heartzman et al. 1987; Zaini et al. 2011),requires that the present study focus on the evaluation of the surrounding air quality and scenic view status. The study also focuses on the assessment of the impact of the adequacy of green space provision based on the local communities' perception, which is the objective of the proposal of ex-landfill redevelopment as a public park in Malaysia.

3. Methodology

3.1. Determination of study area and study respondents

A total of 131 ex-landfill sites exist in Malaysia (National Solid Waste Department 2012). However, only two such sites have been redeveloped as public parks, namely, Worldwide Landfill Park and Kuantan Passive Park. Worldwide Landfill Park is located approximately four kilometers from the new city area of Seri Kembangan, Selangor. Previously known as the Ayer Hitam landfill, Worldwide Landfill Park was opened as a public park in 2012. The residential area is the primary land use within the surrounding area, with ten residential areas within a one-kilometer radius. Meanwhile, Kuantan Passive Park was redeveloped from the Indera Mahkota landfill, located approximately5.0 km from Kuantan, the city center of Pahang. Opened as a public park in 2012, the surrounding area is also a residential area, with six residential areas located within a one-kilometer radius. Based on the justification that both areas are ex-landfill sites redeveloped as public parks within an urban residential area, Worldwide Landfill Park and Kuantan Passive Park were chosen as study areas. These study areas represent 100% of ex-landfill sites redeveloped as public parks in Malaysia.

This study applies Lisa et al.'s (2003) position for determining study respondents to produce high and reliable outcome. They suggested that the study area for the research related to the impact of landfills on the communities' health need to be scaled down to less than a two-kilometer radius. For this study, a two-kilometer radius from the study area was designated as the determinant factor in the selection of study respondents. Only residents living within one kilometer from Worldwide Landfill Park and Kuantan Passive Park are eligible as study respondents. However, only heads of household and residents who have lived over a period of five years (which refers to the time of before and after the redevelopment) are eligible as study respondents. Those criteria are set to ensure that the respondents possess previous experience fundamental to assessing the impact of ex-landfills as public parks.

3.2 Data collection and determination of sample size

Data were collected via a survey method. The questionnaire was divided into two sections, namely,(i) respondents' perceptions toward their quality of life and (ii) respondents' perception toward their living environment before and after the redevelopment of ex-landfills as public parks being.

The sample size in this study was determined by Krejcie and Morgan's (1970) sample size calculation with 95% reliability. To determine the accuracy of the sample size, the total number of occupied housing units within the study area was predetermined, with the number of occupied housing units representing population size. Field study from May to July 2014 determined a population size of 7,251 was determined. A total of 163 were set as the selected sample size for this study. To provide equal opportunities, the respondents were randomly selected based on the study area (Table 3).

Table 3. Sample size based on study area

No.	Study area	Population size (within 1.0km radius)	Location of residential area based on radius (km)	Name of residential area	Population size	Sample size
1	Worldwide Landfill Park	5,170	i)0.00–0.25	Sri Indah Apartment	1,327	30
			ii)0.25–0.50	Desaminium Flora	503	11
				Lestari Perdana LP3	94	2
			iii)0.50–0.75	Lestari Perdana LP2	122	3
				Lestari Perdana LP4	45	1
				Desaminium Rimba	787	18
				Taman Putera Permai	235	5
			iv)0.75–1.00	Lestari Perdana LP7	775	17
				Kota Perdana	670	15
				Lestari Putra	612	14
				Sub-total	5,170	116
2	Kuantan Passive Park	2,081	i)0.00–0.25	Taman Teluk Cempedak	113	3
			ii)0.25–0.50	Medan Tok Sira	167	4
			ii)0.50–0.75	Perkampungan Tok Sira	850	19
				Taman Jaya	211	5
			iii)0.75–1.00	Pelindung Height	540	12
				Taman Taz	200	4
				Sub-total	2,081	47
	Total	N=7,251				163

4. Results and discussion

The data obtained through perception assessment were assessed using the difference in percentage and paired sample t-test. The findings of the impact of redevelopment on quality of life are shown in Tables 4 and 5. Meanwhile, the results regarding the impact of redevelopment toward the living environment are presented in Tables 6 and 7.

Table 4. Respondents' quality of life before and after redevelopment of ex-landfill as a public park

Research indicator	Percentage (%)		Difference in percentage (%)
	Before redevelopment	After redevelopment	(+/-)
i)Health status according to respondents' perception			
'Worst'	60.12	1.84	-58.28
'No difference'	39.88	23.31	-16.57
'Better'	0.00	74.85	+74.85
Total	100.00	100.00	

ii)Frequency of obtaining medical services			
<6 times/year	6.75	12.88	+6.13
6 –12 times/year	41.10	57.06	+15.96
13–18 times/year	42.33	26.99	-15.34
>18 times/year	9.82	3.07	-6.75
Total	100.00	100.00	
iii)Safety status according to respondents' perception			
'Worst'	23.95	1.84	-22.11
'No difference'	41.10	19.63	-21.77
'Better'	34.95	78.53	+43.58
Total	100.00	100.00	

Table 5. Results of paired sample t-test

Before the redevelopment of ex-landfill as a public park	After the redevelopment of ex-landfill as a public park		
	Communities' health status	Frequency of obtaining medical services	Communities' safety status
Communities' health status	t=-33.33 p=0.00*		
Frequency of obtaining medical services		t=9.33 p=0.00*	
Communities' safety status			t=-15.94 p=0.00*

*Significant at p<0.5 level

Table 4 shows the results of a comparative study based on the respondents' perceptions toward their quality of life before and after redevelopment. Results showed that the respondents perceived increased health status after redevelopment with an increment of 74.85%. The perceived improved health status was supported by the difference in the percentage of -22.09% for the frequency in obtaining health services between 16 to more than 18 times a year. Respondents also perceived an increase in the status of safety by 43.58% after redevelopment. Results in Table 4 are strongly justified by the results in Table 5. Paired sample t-test clearly showed the existence of a significant difference in the quality of life experienced by respondents before and after redevelopment. This result is in accordance with EPA (2012) and Benjamin's (2012) findings on the perceived health and safety benefits gained by local communities from the impact of ex-landfill redevelopment as urban green space. Hence, the present study concluded that such transformation positively affects the perceived Malaysian local communities' quality of life, quality of health, and safety status.

Table 6. Respondents' living environment before and after the redevelopment of ex-landfills as public parks

Research indicator	Percentage (%)		Difference in percentage (%) (+/-)
	Before redevelopment	After redevelopment	
i)Surrounding air quality status			

according to respondents' perception			
'Worst'	31.29	9.82	-21.47
'No difference'	36.20	31.90	-4.30
'Better'	32.51	58.28	+25.77
Total	100.00	100.00	
ii)Status of residential surrounding view according to respondents' perception			
'Worst'	47.24	15.95	-31.29
'No difference'	31.90	12.88	-19.02
'Better'	20.86	71.17	+50.31
Total	100.00	100.00	
iii)Adequacy of open green space surrounding the residential area according to respondents' perception			
'Worst'	20.86	16.56	-16.56
'No difference'	53.99	27.61	-26.38
'Better'	25.15	55.83	+30.68
Total	100.00	100.00	

Table 6 shows the results of a comparative study based on the respondents' perceptions toward their living environment before and after redevelopment. Results showed that respondents perceived the status of surrounding air quality as "better" (25.77%) after redevelopment. An increase in total percentages of 50.31% and 30.68% was also found in respondents' perception toward the surrounding scenic view and adequacy of green space provision, respectively.

Results in Table 6 are strongly justified by the findings in Table 7. Results of paired sample t-test prove the existence of a significant difference in the respondents' living environment before and after redevelopment. This result agrees with De Sausa's (2003) findings, which concluded that local communities commonly associate brownfield redevelopment as green space (urban park) with the existence of increased benefits to their surrounding living environment. The result is also in line with EPA's (2012) findings, which stated that green space development in brownfield areas could improve the status of air quality and scenic view of the surrounding local environment. Thus, the present study concluded that the transformation of ex-landfills into public parks could positivelyaffectthe local communities' perception toward their living environment. Through such redevelopment in the vicinity of urban residential areas in Malaysia, the surrounding living environment, air quality, scenic view, and adequacy of surrounding green space are enhanced for the benefits of the local communities.

Table 7. Results of paired sample t-test

Before the redevelopment of ex-landfill as a public park	After the redevelopment of ex-landfill as a public park		
	Status of surrounding air quality	Status of residential surrounding view	Adequacy of open green space surrounding residential area
Status of surrounding air quality	t=-12.04 p=0.00*		
Status of residential		t=-13.55	

surrounding view	p=0.00*	
Adequacy of open green space surrounding residential area		t=-9.33 p=0.00*

*Significant at p<0.5 level

5. Conclusion

The scarcity of future urban space urges emerging developing countries to implement sustainable brownfield regeneration in its urban planning. Meanwhile, the need to provide adequate urban green space and the increase in a number of urban brownfield areas, mainly ex-landfill sites, necessitates the redevelopment of these sites as public parks. Regarded as a new development approach in Malaysia, such redevelopment requires special justification based on its impact toward the local communities' quality of life and living environment. This study has proven that the development of ex-landfills as public parks could improve the quality of life and the comfort of the living environment as perceived by local communities. The result also reflects the community acceptance of the existence of public parks from ex-landfills as their living environment. To strengthen the justification for the appropriateness of the development, further detailed field studies are proposed to be implemented. Such future studies include those on landfill gas emission, leachate, and content of heavy metals in soil. Thus, the development of 296 public parks from ex-landfills could benefit Malaysian quality of life and living environment by 2020.

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