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Land Use Diversity Indices and Change of Mixed Land Uses in Iskandar Malaysia from 1980s to 2000s

Wan Kassim, Sh. Athirah Izyan*; Majid, M. Rafee
Centre for Innovative Planning and Development,
Department of Urban and Regional Planning,
Universiti Teknologi Malaysia, Johor
Malaysia
shasantek@gmail.com, rafee@utm.my

ABSTRACT: Diversity in the context of land use planning refers to as the variety of uses in land use and in land use planning, the success of diversity can be achieved through mixed use development. Although mixed land uses are popularly practised in mixed use development for the past decades, current land use practices have moved towards the separation of residential and non-residential type of land uses. Thus, this paper discusses the changes in mixed land use from 1980s to 2000s in Iskandar Malaysia, Johor. The study is aimed at identifying the level of land use diversity and its trend during the past few decades by using diversity indices, Simpsons Diversity Index (SDI) and Shannons Diversity Index (ShaDI). The results show that diversity indices have been on the decrease steadily but quicken beyond 2005.

Keywords: Mixed Land Use, Diversity, Simpsons Diversity Index, Shanons Diversity Index, Iskandar Malaysia

1.0 INTRODUCTION

Development started rapidly from the past few decades especially during the industrial revolution in the 19th century. Ideas of having not only residential area for the workers but also to the public which have led to land use zoning. Land use zoning guides specifically the use of certain area or land whether it is suitable for residential or else. Though by applying land use zoning, separation between residential and non-residential land use are obvious where most of the development is concentrated at one part of the neighborhood and it is a standalone development.

This matter has been going on until now where the public facilities and services are located very far away from the public, forcing them to use motorised transportation on daily basis instead of walking. The separation of land use also causes more construction of roads and at the end, resulting in urban sprawl. According to Harris (2000), mixed uses not only increase the density but also gives choices through diversity of land uses. It is also supported by Aurand (2010), who observed that mixed use development means the combination of commercial, residential and industrial uses within one geographical area and not separating of residential and non-residential land uses. Based on Comprehensive Development Plan of Iskandar Malaysia (2006-2025) by Khazanah Nasional (2006), the current condition of development in Iskandar Malaysia are concentrated along the highways and major roads as well as at the city center.

Currently, there is no research that has been conducted on evaluating the level of land use diversity in Iskandar Malaysia neighborhoods in order to assess if the development is in line with mixed use criteria. The use of diversity indices which is actually being adapted from other fields is all about the ecology of an ecosystem that assumed to be healthy and perfect when there are lot of plants and animals. Specifically, it means that the ecosystem itself is not only depending on one type of plant and animal to survive (Reid, 2004). In land use planning this may well mean that the survival of a neighbourhood depends on the existence of a variety of land uses rather than just one.

2.0 MATERIALS AND METHOD

2.1 Study Area

The study area is Iskandar Malaysia, Johor as shown in Figure 1.0 and there are 394 neighborhoods which the study was able to identify. For the purpose of this study, only a few neighborhoods were chosen from 1980s until 2000s. All the neighborhoods are planned housing areas and other than that such as villages are excluded.

Figure 1.0: Iskandar Malaysia

2.2 Data Collection

Data for the study came from secondary sources. Data on type of land uses, road network and also digital maps of neighborhoods were sourced from Iskandar Regional Development Authority (IRDA) office. There are five main categories of land use. The land uses are residential, institution and public facilities, commercial, open space and industry.

2.3 Simpsons Diversity Index (SDI)

SDI is the measure of the probability that two types of land uses in a neighborhood being chosen randomly would be of the same type (Lambin, 2006). In order to use SDI, unit of houses and type of land uses are needed. Formula of SDI is shown below.

$$D = \frac{\sum n(n-1)}{N(N-1)}$$

$$1-D = \text{Neighborhood Diversity}$$

n : Unit of every land uses
N : Total *n* (unit of every land uses)
D : SDI index

2.4 Shannons Diversity Index (ShaDI)

ShaDI is essentially used to measure the uncertainty associated with random variables (Lambin, 2006). It gives the average of unknown variables value. ShaDI is also very sensitive towards distribution size between land uses in a neighborhood. Unit of houses and type of land uses are also needed to use the index. The formula for computing ShaDI is shown below.

$$Pi = \frac{n}{N}$$

$$H = \sum_{i=1}^{S} pi \ln pi$$

$$H \times (-1)$$

pi : Revenue distribution between unit of every land uses and total unit of land uses
ln : Logarithm being used
n : Unit of every land uses
N : Total *n* (unit of every land uses)
H : ShaDI Index

In both cases, values between 0-0.5 are considered less diverse while 0.5-1.0 are more diverse.

3.0 RESULTS AND DISCUSSION

Results for diversity of land uses are based on average of each neighborhoods land uses Figure 2.0 shows the results of land use diversity using SDI.

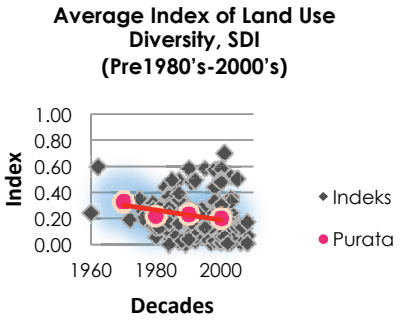

Figure 2.0: Land use diversity using SDI

There are neighborhoods with index value of 0.0 since they contain only one type of land uses such as residential. Outlying values are associated with two neighborhoods that contain all five main categories of land uses (residential, public facilities and institution, commercial, open space and industry). These neighborhoods are assumed to have a well balance type of land uses. Figure 3.0 shows the layout of neighborhood with outlying value and Figure 4.0 shows the layout of neighborhood with 0.0 index value.

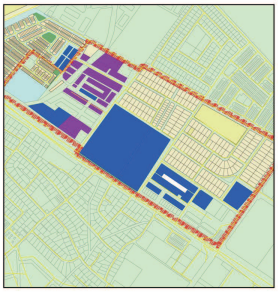

Figure 3.0: Taman Tampoi

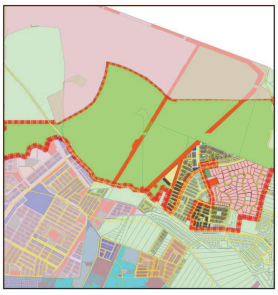

Figure 4.0: Taman Bukit Tiram

Meanwhile for ShaDI, the index of land use diversity are show in Figure 5.0.

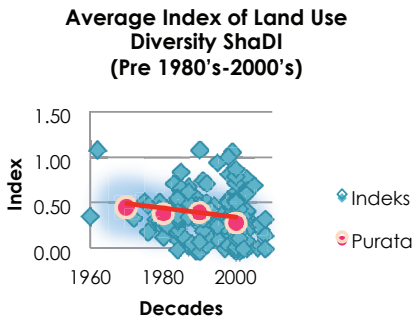

Figure 5.0: Land use diversity using ShaDI

Similar to SDI, ShaDI index too shows that there are outliers as well as indices value of 0.0. For ShaDI, eight neighborhoods with outlying values are mostly from 1980s and 1990s neighbourhoods. Figure 6.0 shows the layout of neighborhood with outlying values and Figure 7.0 shows the layout of neighborhood with 0.0 index value.

Figure 6.0: Taman Tan Sri Yaacob

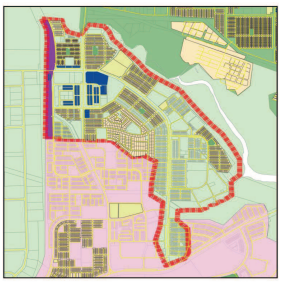

Figure 7.0: Taman Pasir Putih

Both of the indices shows that the highest index values from well-balanced land uses within neighborhoods are during the pre-1980s and 1990s. Current neighborhoods tend to have one and the most is three types of land use only. Back in the 80s, industrial is one the most important land uses in a neighbourhood as it generates income and job opportunities for the residents but now it is different because industrial land uses have its own zoning area just for industrial without mixing it with other land uses.

4.0 CONCLUSIONS

The results of this study clearly show that land uses diversity are decreasing towards 2000s. During pre-1980s, the existing industrial area contributes in attracting more residential areas closer to it making it easier for the workers to commute from home to work. By having industrial area and also residential area within the same neighborhood, it encourages the other land uses to be developed as well.

The existence of other land uses helps in supporting the residential land use. However, during the 1990s, industrial parks were being implemented. This is where industrial area are separated from the other land uses which affected the balancing of land uses and left only with residential and commercial areas. While in 2000s, more and more neighborhoods contain only one type of land uses that is residential area while other types of land use located outside of the boundary of the neighborhoods. According to Hill (1997), only mixed use development would allow the flexibility in land use zone according to suitability and have diversity of land uses.

As for the diversity indices, both SDI and ShaDI are able to identify the level of land use diversity. The diversity indices are very sensitive in any changes of land uses where it is proven that when indices value increase, the level of diversity increases as well.

5.0 ACKNOWLEDGEMENT

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GEOSTATISTICAL ANALYSIS OF DIABETES TYPE 2 AND OBESITY DISTRIBUTION PATTERN IN RAPID URBANIZING REGION

Soheil Sabri*, Zohreh Karbassi**, Foziah Johar*, Mohd Aizat Saiful Bahri*

*Center For Innovative Planning and Development (CiPD), Faculty of Built Environment, Universiti Teknologi Malaysia, **Jeffery Cheh School of Medicine and Health Sciences, Clinical School, Johor Bahru, Monash University Malaysia

Presenter: Soheil Sabri

Email address: soheil@utm.my

Postal address: Center For Innovative Planning and Development (CiPD), Faculty of Built Environment, Universiti Teknologi Malaysia, 81310, Skudai, Johor, Malaysia.

Phone/Fax Numbers: +6075537381 / +6075557411

ABSTRACT:

Diabetes is a non-communicable chronic disease that has been less considered in built environment and urban planning studies. Obesity is also known as a risk factor that contributes to the prevalence of diabetes type 2 and cardiovascular diseases. Obesity and diabetes are on the rise particularly in highly urbanizing areas in the world. Therefore, this study aims to investigate the spatial pattern of distribution of diabetes patients in a rapid urbanizing area in Malaysia. The study also examines the relation of diabetes pattern and obesity and hypotension as indicators of physical inactivity measuring Body Mass Index (BMI), and blood pressure. The general and local methods of spatial autocorrelation statistics was conducted to determine the spatial distribution pattern of 496 patients diagnosed with diabetes type 2 in 165 neighbourhoods of Iskandar Malaysia as a rapid urbanizing region. The results revealed that the distribution pattern of the patients is clustered with statistical significance level of 99%. The pattern of patients with BMI more than 29.88 is matched with the hotspot of diabetes patients. This research has also highlighted the risk of cardiovascular disease with average of 133.35 mmHg, and 75.35 mmHg for Systolic and Diastolic blood pressures respectively, in the neighbourhoods with high cluster of diabetes patients. Overall, this study indicates a significant relation between diabetes type 2 and physical inactivity in highly urbanized areas of Iskandar Malaysia Region. The findings of this study highlight the necessary attention that should be given to public-health and welfare, when a rapid urbanizing is undergoing.

Key words: Diabetes, Obesity, Cardiovascular, Urban Health, Urbanization, Iskandar Malaysia

1. INTRODUCTION

Diabetes is known as the most common non-communicable disease worldwide and has become an epidemic level globally (Papas et al, 2007; WMC, 2010). Diabetes can be generally categorized into two types: Diabetes Mellitus Type 1 that is due to the genetic factor and usually affect children, teenagers, and younger ages while Diabetes Mellitus Type 2 is non-genetic syndrome and usually affects people over the age of 40 years with unhealthy lifestyle (NDIC, 2011). Diabetes type 2 is