

The Relationship between Land Use Factors and Feeling of Happiness at the Neighbourhood Level

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Abstract—Happiness can be related to everything that can provide a feeling of satisfaction or pleasure. This study tries to consider the relationship between land use factors and feeling of happiness at the neighbourhood level. Land use variables (beautiful and attractive neighbourhood design, availability and quality of shopping centres, sufficient recreational spaces and facilities, and sufficient daily service centres) are used as independent variables and the happiness score is used as the dependent variable in this study. In addition to the land use variables, socio-economic factors (gender, race, marital status, employment status, education, and income) are also considered as independent variables. This study uses the Oxford happiness questionnaire to estimate happiness score of more than 300 people living in six neighbourhoods. The neighbourhoods are selected randomly from Skudai neighbourhoods in Johor, Malaysia. The land use data were obtained by adding related questions to the Oxford happiness questionnaire. The strength of the relationship in this study is found using generalised linear modelling (GLM). The findings of this research indicate that increase in happiness feeling is correlated with an increasing income, more beautiful and attractive neighbourhood design, sufficient shopping centres, recreational spaces, and daily service centres. The results show that all land use factors in this study have significant relationship with happiness but only income, among socio-economic factors, can affect happiness significantly. Therefore, land use factors can affect happiness in Skudai more than socio-economic factors.

Keywords—Neighbourhood land use, neighbourhood design, happiness, socio-economic factors, generalised linear modelling.

I. INTRODUCTION

NOWADAYS, happiness is a goal of many national and local governments since it could enable people to have a better life [1]. There is a renewed interest in different areas such as psychology, social science, and economics in searching for happiness factors [2], [3]. Different factors such as socio-economic (e.g. employment, inflation, and income) and demographic factors (e.g. gender, age, marital status, education, and health) can affect happiness [3]. Dolan et al. [4] mentioned that all needs including income, health, and recreational activities can affect happiness. Therefore, happiness is the experience of satisfaction [5], and this satisfaction can come from everything around a person [6].

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Various studies use different factors such as quality of life, well-being, satisfaction, and pleasure to represent happiness [7]-[16]. Since human living settlements can affect all of the mentioned factors, there should be a significant relationship between the built environment and happiness [8]. For instance, Berry and Okulicz-Kozaryn [17] proposed that levels of development, in addition to personal characteristics, are the key factors to happiness. One of the primary interests of some limited studies in this area is the effect of the living place on respondents' happiness [18]-[22]. However, these limited studies do not indicate which characteristics of place are most crucial, and how components of a place that might affect human happiness can be classified [23].

There are also some studies that consider the relationship between happiness and environment by focusing on macro-level factors such as air pollution, economic, and life satisfaction at country level [24]-[26]. Welsch and Kühling [27] focused on economics at the national level as one of the factors that have considerable effects on the happiness level and well-being. Dolan et al. [4] proposed that some environmental factors at macro level such as green space, blue space, attractive land use, air pollution, noise pollution, and water pollution, in addition to the socio-economic factors, can affect happiness. Hartig et al. [28] also found that attractive landscapes can increase pleasure and happiness.

Currently, rapid urbanisation and industrialisation are the main sources of various negative external factors such as traffic congestions, air pollution, fossil fuel consumption, noise pollution, and health problems [29]-[37]. These negative external factors can affect happiness since everything around people can affect their satisfaction level [6]. Although there is a possible relationship between built environment and happiness, there are limited studies that focus on this relationship especially at neighbourhood level. Therefore, this study focuses on this relationship by considering some land use variables, such as beautiful and attractive neighbourhood design, availability and quality of shopping centres, sufficient recreational spaces and facilities, and sufficient daily service centres (banks, educational centres, etc.), in addition to socio-economic factors (gender, race, marital status, employment status, education, and income), as independent variables, and the happiness score as the dependent variable.

II. METHOD

There are various measurement tools for happiness that measure various happiness related indicators such as quality of life [9], satisfaction [13], [14], well-being [4], [10], [12] and pleasure [15], [16]. Oxford happiness questionnaire (OHQ),

which was developed by Hills and Argyle [38], includes 29 items to estimate subjective well-being (SWB). The OHQ is an improved version of the Oxford happiness inventory [39]. They improved Oxford happiness inventory (OHI) by changing the response format. The Likert scale (1= strongly disagree to 6 = strongly agree) was used in OHQ instead of a 0–3 multiple choice scoring format that was used in OHI. In addition, 9 items also were added to OHI by Hills and Argyle [38] in OHQ. Since OHQ can achieve an acceptable validity by comparing data that were collected with other self-report scales of SWB, this questionnaire was used in this study to estimate the happiness score. However, more questions were added to the mentioned questionnaire to collect some land use data such as beautiful and attractive neighbourhood design, availability and quality of shopping centres, enough recreational spaces and facilities, and enough daily service centres (banks, educational centres, etc.), in addition to the socio-economic factors (gender, race, marital status, employment status, education, and income). The Likert scale was also used for land use data. The modified OHQ was used to collect data from more than 300 people who are living in six neighbourhoods. The neighbourhoods were selected randomly from the main Skudai neighbourhoods in Johor, Malaysia. Cronbach's (alpha) was used for the reliability test.

In this study, the dependent variable is the happiness score, which comes from Likert scale response data that only takes positive and discrete values. Therefore, conventional linear regression models with a normally distributed error structure are not suitable for modelling the happiness score. The GLM framework has been more successfully adopted for this type of data [40]-[42]. Happiness score is a scaled factor because it is the average of Likert scale response data. Lognormal and gamma with log link models are used to scale data in the GLM framework [41], [42]. Exponential family models have been more successfully adopted for the data that come from positive and discrete values [41], [42]. Since lognormal is not in the exponential family, GLMs with a gamma distribution are recommended. The gamma model assumes a log link (1):

$$Y = EXP(\beta_0 + \sum_{i=1}^i \beta_i \times X_i), \quad (1)$$

where Y : dependent variable, i : subscript showing the number of independent variables, X : independent variable, β_0 : constant, calculated in the calibration process, β_i : coefficient of the independent variable, calculated in the calibration process of the model.

III. RESULTS

The results of the GLM analysis are discussed in this section. Table I shows the reliability statistics and the Cronbach's alpha value, which is more than 0.7. Tables II-IV, present descriptive statistics for the variables included in the model. Table V indicates the variables included in the model, their parameter estimates, and the significance of the parameters (5% level). The omnibus test, likelihood ratio chi-square test statistics, scaled deviance (SD), and Pearson chi-square statistic show the model goodness of fit (refer to Tables

VI and VII).

TABLE I
 RELIABILITY STATISTICS

| Cronbach's Alpha | Number of Items |
|------------------|-----------------|
| 0.853 | 36 |

TABLE II
 CONTINUOUS VARIABLE INFORMATION

| Dependent Variable | Covariate | N | Minimum | Maximum | Mean | Std. |
|-------------------------------------------|-----------|-----|---------|---------|--------|-----------|
| | | | | | | Deviation |
| Happiness score | | 300 | 2.34 | 5.24 | 3.9194 | .54197 |
| Monthly income | | 300 | 1 | 5 | 2.78 | 1.162 |
| Education level | | 300 | 1 | 7 | 4.07 | 1.062 |
| Beautiful neighbourhood | | 300 | 1 | 5 | 2.5533 | .77189 |
| Enough shopping centres | | 300 | 1 | 5 | 3.2700 | .79532 |
| Enough recreational spaces and facilities | | 300 | 1 | 5 | 2.4033 | 1.31647 |
| Enough daily service centres | | 300 | 1 | 5 | 2.8833 | 1.47999 |

TABLE III
 CATEGORICAL VARIABLE INFORMATION

| Factor | Gender | Male | N | Per cent |
|--------|--------|----------------------------------|-----|----------|
| | | | | |
| | | Female | 140 | 46.7% |
| | | Total | 300 | 100.0% |
| | | Race | | |
| | | Malay | 135 | 45.0% |
| | | Chinese | 105 | 35.0% |
| | | Indian | 25 | 8.3% |
| | | others | 35 | 11.7% |
| | | Total | 300 | 100.0% |
| | | Marital Status | | |
| | | Married | 176 | 58.7% |
| | | Divorced | 18 | 6.0% |
| | | Widowed | 3 | 1.0% |
| | | Separated | 6 | 2.0% |
| | | Never Married | 97 | 32.3% |
| | | Total | 300 | 100.0% |
| | | Employment Status | | |
| | | Employed for wages | 147 | 49.0% |
| | | Self-employed | 81 | 27.0% |
| | | Out of work for 1 year or more | 15 | 5.0% |
| | | Out of work for less than 1 year | 2 | 0.7% |
| | | A homemaker | 13 | 4.3% |
| | | A student | 35 | 11.7% |
| | | Retired | 3 | 1.0% |
| | | Unemployed | 4 | 1.3% |
| Total | 300 | 100.0% | | |

TABLE IV
 CASE PROCESSING SUMMARY

| | N | Per cent |
|----------|-----|----------|
| Included | 300 | 100.0% |
| Excluded | 0 | 0.0% |
| Total | 300 | 100.0% |

Table VIII indicates that there is no strong correlation

between the independent variables included in the model since tolerances are greater than 0.1 and the VIFs are less than 10. Therefore, the final model can be defined as:

$$HS = EXP (0.735 + 0.019I + 0.121B + 0.035S + 0.027R + 0.026DS), \quad (2)$$

where HS = happiness score, I = income, B = beautiful neighbourhood, S = sufficient shopping centres, R = sufficient recreational spaces and facilities, DS = sufficient daily service centres.

TABLE V
PARAMETER ESTIMATES

| Parameter | B | Std. Error | 95% Wald Confidence Interval | | Hypothesis Test | | |
|-------------------------------------------|-------|------------|------------------------------|-------|-----------------|----|------|
| | | | Lower | Upper | Wald Chi-Square | df | Sig. |
| (Intercept) | .735 | .0545 | .628 | .842 | 181.902 | 1 | .000 |
| [Gender=1] | -.018 | .0093 | -.036 | .001 | 3.607 | 1 | .058 |
| [Gender=2] | 0a | . | . | . | . | . | . |
| [Race=1] | -.013 | .0153 | -.043 | .017 | .703 | 1 | .402 |
| [Race=2] | .007 | .0158 | -.024 | .038 | .222 | 1 | .638 |
| [Race=3] | -.003 | .0204 | -.037 | .043 | .023 | 1 | .880 |
| [Race=4] | 0a | . | . | . | . | . | . |
| [Marital Status=1] | -.014 | .0113 | -.036 | .008 | 1.492 | 1 | .222 |
| [Marital Status=2] | -.019 | .0202 | -.059 | .021 | .883 | 1 | .347 |
| [Marital Status=3] | .012 | .0452 | -.076 | .101 | .075 | 1 | .784 |
| [Marital Status=4] | .001 | .0339 | -.066 | .067 | .000 | 1 | .986 |
| [Marital Status=5] | 0a | . | . | . | . | . | . |
| [Employment Status=1] | .001 | .0401 | -.077 | .080 | .001 | 1 | .976 |
| [Employment Status=2] | -.013 | .0410 | -.093 | .068 | .095 | 1 | .758 |
| [Employment Status=3] | -.004 | .0442 | -.090 | .083 | .006 | 1 | .936 |
| [Employment Status=4] | .042 | .0665 | -.088 | .173 | .408 | 1 | .523 |
| [Employment Status=5] | .020 | .0437 | -.066 | .105 | .205 | 1 | .651 |
| [Employment Status=6] | .015 | .0418 | -.067 | .097 | .134 | 1 | .715 |
| [Employment Status=7] | .003 | .0590 | -.113 | .118 | .002 | 1 | .962 |
| [Employment Status=8] | 0a | . | . | . | . | . | . |
| Income | .019 | .0056 | .008 | .030 | 11.594 | 1 | .001 |
| Education | .007 | .0050 | -.003 | .017 | 1.938 | 1 | .164 |
| Beautiful neighborhood | .121 | .0074 | .107 | .136 | 267.814 | 1 | .000 |
| Enough shopping centers | .035 | .0075 | .020 | .050 | 21.866 | 1 | .000 |
| Enough recreational spaces and facilities | .027 | .0049 | .017 | .037 | 29.544 | 1 | .000 |
| Enough daily service centers | .026 | .0047 | .017 | .036 | 31.442 | 1 | .000 |
| (Scale) | .006b | .0005 | .005 | .007 | | | |

Dependent Variable: Happiness Score
 a. Set to zero because this parameter is redundant.
 b. Maximum likelihood estimate.

This model shows that happiness is significantly affected by land use and neighbourhood design factors. Among these indicators, beautiful neighbourhood has higher positive parameters; therefore, this indicator has greater effects on

happiness in this model. The second effective indicator with a positive relationship is enough shopping centres. Income is the only significant socio-economic indicator. Overall, more beautiful neighbourhoods and enough shopping centres, recreational spaces and facilities, and daily service centres, in addition to higher income, could contribute to more happiness.

TABLE VI
OMNIBUS TEST

| Likelihood Ratio Chi-Square | df | Sig. |
|-----------------------------|----|------|
| 367.934 | 21 | .000 |

Dependent Variable: Happiness Score
 Model: (Intercept), Gender, Race, Marital Status, Employment Status, Income, Education, Beautiful neighbourhood, Enough shopping centres, Enough recreational spaces and facilities, Enough daily service centres
 Compares the fitted model against the intercept-only model.

TABLE VII
SD AND PEARSON CHI-SQUARE GOODNESS OF FIT

| | Value | df | Value/df |
|---------------------------|---------|-----|----------|
| Deviance | 1.699 | 278 | .006 |
| Scaled Deviance | 300.283 | 278 | |
| Pearson Chi-Square | 1.640 | 278 | .006 |
| Scaled Pearson Chi-Square | 289.989 | 278 | |

Dependent Variable: Happiness Score
 Model: (Intercept), Gender, Race, Marital Status, Employment Status, Income, Education, Beautiful neighbourhood, Enough shopping centres, Enough recreational spaces and facilities, Enough daily service centres

TABLE VIII
COLLINEARITY STATISTICS

| | Tolerance | VIF |
|-------------------------------------------|-----------|-------|
| Income | .970 | 1.030 |
| Enough daily service centers | .430 | 2.328 |
| Enough recreational spaces and facilities | .460 | 2.172 |
| Enough shopping centers | .564 | 1.773 |
| Beautiful neighborhood | .656 | 1.525 |

IV. DISCUSSION AND CONCLUSIONS

The relation between land use factors and happiness has not received enough attention to date. Previous happiness studies were overwhelmingly focused on socio-economic as well as demographic factors but only recently scholars across many disciplines have begun to explore the question of happiness and life satisfaction. Previous studies have identified the positive relationship between income and happiness [43]-[48]. Although the present study also endorses this significant relationship, it failed to find significant association between other socio-economic factors such as gender, marital status, education level, and employment status with happiness. Therefore, the results of the present study are unique and interesting from the perspective of land use factors that are significant in the proposed model.

Some of the previous studies proposed a positive relationship between education level and SWB or happiness [49], [50]. There are a number of studies from the perspective of low income countries, which show that education has a positive relationship with happiness [51], [52]. However, the present study is in line with Flouri [53], which proposed no significant relationship between education level and

happiness. Employment status is another key variable which has been discussed widely in the literature. Although previous studies consistently show a large negative effect of individual unemployment on happiness [54]-[56], the present study does not find any significant relationship between employment status and happiness since the present study does not focus on individual unemployment and the proportion of unemployed people is not considerable (1.3%) in this study (refer to Table III).

The present study identifies more significant role for land use factors statistically. It implies that beautiful neighbourhoods and nearby recreational as well as shopping facilities make the people happier. For example, enough recreational facilities at neighbourhood is one of land use variables that have a positive significant relationship with happiness. This association is in line with previous studies which proposed that even simple types of exercise such as gardening [57] may be associated with higher life satisfaction and happiness that is especially important for people over 60 years [58].

Mixed land use planning at neighbourhood level may increase the social activities and increase time for leisure. According to Haworth [59], leisure and happiness are interrelated. An individual may use leisure as an opportunity to cope with work stress [60]. Attractive and beautiful neighbourhood design may produce positive moods, and much of this derived pleasure stems from the social relationships that they foster [39]. The results are in line with previous studies [61]-[64], which identified that social activities and frequency of participation in leisure activities are associated positively with happiness [65]. Neighbourhood design indicators are extensively addressed in literature from sustainability perspective but there is less focus on land use factors from the perspective of resident's feeling of happiness. Our cities, particularly in developing countries, fail to make the residents happy. Some design changes at neighbourhood level may improve the happiness scale of residents.

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