Technology for Identifying Determinants of Condominiums Responsible Property Investing in Thailand

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Abstract

This article examines responsible property investment (RPI) determinants of condominiums in The Bangkok Metropolitan Region (BMR), Thailand. The researchers argue that sustainability is proven to hold benefits to investors, developers, and tenants. The development of RPI could strengthen their avoidance of irresponsible development, which results in asset values appreciation for those properties with better sustainability. The methodology used in this research is explanatory factor analysis (EFA) to classify the relationship between the potential dimensions of RPI. The study collected 167 cases from the owners' resale of units between 2018-2019 and from 22 buildings. The results show 14-factor groups that represent the RPI dimensions of condominium buildings. The first 18% of the component represents the unit measurement, value-added, and intangible quality of the unit. Then, 35% of the factors serve financing expenses on the project, such as marketing costs and features and characteristics of the building. The last 47% of the factors represent the location and environmental responsibility. This study demonstrates that RPI can lead developers to be more responsible for their investment as well as performing strategy marketing and financing benefit. RPI standards help customers aware of the product choices of purchases that are responsible for the environment and society. The additional benefit of RPI is that it updates the green building assessment tool to be more favorable for the investment strategy. The result will also be the foundation of RPI research in Thailand. In the end, RPI can establish a common ground objective to develop and implement a long-term sustainable strategy from investment, development, management, and corporate activities with other organizations.

Keywords: responsible property investment, green buildings, investment strategy, building characteristics, condominium

1. Introduction

For a long time, the endorsement of investment as a sustainable approach in real estate development has been the focus of research (Goering John, 2009; Kaklauskas, Zavadskas, Bardauskien, & Dargis, 2015; Zhang, Shen, Wu, & Qi, 2011). The dilemma confronted with real estate development is a deficiency in the connection between RPI practices and financial returns, particularly in condominium development (UNEP FI & PRI signatories, 2018). Despite the challenge, the effort of embedding the principles of sustainability into real estate development applications requires the intense involvement and participation of the construction, design, and finance industries. Polesello and Johnson (2016) concluded that the most practical procedure for the reduction of energy consumption in the building was to integrate an energy plan strategy and policy direction in the design phase. Currently, many leaders within the industry have recognized the risks and benefits of their developments, which have resulted in a standard for interest in energy efficiency, resource preservation, climate change, and human health (Ebeling & Yasué, 2008; Harlan & Ruddell, 2011; Imperatives, 1987). Still, there are not enough academic studies into sustainable development to help the fruition of Thailand's sustainable position in real estate development, especially in the residential market (Rattanaprichavej, 2020). Many investors conclude that real estate is a significant producer of greenhouse gas emissions, which contributes to climate change (Chen et al., 2018; Pivo & McNamara, 2005; Säynäjoki, Heinonen, & Junnila, 2012).

However, problems still occurred repeatedly in many countries due to the limited knowledge of green procurement, ineffective policy by the government, no economic incentives for the investor, and unattractive monetary returns (Goering, 2009; Hiang, & Sharon, 2009; Shen, Zhang, & Long, 2017). Another problem is the overlapping of too many assessment problems within the real estate industry. Krajnc and Glavič (2005) suggested there are many sustainable indices developed by the scholar for a wide variety of application. However, at the company level, there is still no suitable method for integrated sustainability assessment available. When developers hesitate to choose green assessment tools, it shows that overlapping responsibilities can create inconsistent results and uncertainties. The issue explains why the overlap and duplication of policy can cause inefficiencies to the company and can lead to failure in environmental protection and rejection from investors. (Hollander, 2010; Rattanaprichavej, 2020). By adapting RPI, the investment community confirmed that they comprehend the minimum legal requirement on social and environmental issues and go beyond those obligations. Because RPI intends to help solve the social and environmental problems while lowing the risks and optimize the opportunities (Kriese, 2009; Newell, 2009; Pivo, 2008; Squires & Moate, 2012).

Therefore a group of investors gathered to solve this problem by creating a universal assessment strategy to measure portfolios using a scoring model called responsible property investing (RPI) (Bienert, 2016). RPI becomes the leading measurement by global finance for sustainable development, which has unfolded recently under the name of the United Nations Environment Programme Finance Initiative (UNEP-FI)(UNEP-FI, 2016). It intends to simplify the fundamental factors of responsibility that influence the investment process. This is a relatively new subject, especially as this is the first attempt to integrate it into specific building types for Bangkok, Thailand. The first attempt of creating a metric for measuring RPI is in 2008 by Pivo (2008), the study concludes ten underlying dimensions that RPI touches upon can be strategies by using Delphi Method (Pivo, 2008; United Nations Environment Programme Finance Initiative, 2014) (1) energy conservation (2) environmental protection (3) voluntary certification (4) public transport-oriented development (5) urban revitalization and adaptability (6) health and safety (7) worker well-being (8) corporate citizenship (9) social equity and community development and (10) local citizenship. Many studies have been working on the integration of RPI into building assessment tools (Lützkendorf & Lorenz, 2006; Pivo & Fisher, 2009; Reichardt, Fuerst, Rottke, & Zietz, 2012). The objective of RPI is to disrupt traditional real estate practices with the incorporation of responsible and sustainable factors into the investment strategy and real estate development under the strategy. While many countries are studying the strategic use of RPI in their development (Foo, 2017; Kampanaraki, 2018; Robins, Gouldson, Irwin, & Sudmant, 2019). Because there is no previous study was available to investigate the influence of RPIs on condominium values in Thailand. The researcher needs to develop a new tool to evaluate this topic. This article examines what RPI indicators are suitable for condominiums in Bangkok. Because the constant growth of condominium developments in Thailand has caused environmental footprint like a traffic jam, aesthetic pollution, and overcrowdedness (Rattanaprichavej, 2020). RPI will provide opportunities for the real estate industry to simplify the components of being responsible for its impact on the environment. As for benefits, property developers can utilize RPI to promote a responsible way of developing property, such as raising social and environmental awareness during the construction phase, as well as promoting green building and supporting neighborhood communities.

2. Background: Thailand Real Estate Industry

In 2018, the real estate sector in Thailand accounted for 8% of Thailand's GDP, and 60-66% of the market is the residential sector. It is also directly attached to related businesses, such as construction, building materials, finance, furnishings, and decorations. According to Knight Frank's Report, the supply of condominiums was 27,870 units in the first half of 2019. However, there were only 5,257 units sold, and the absorption rate was at 19%. While the average selling price of condominiums in the Central Business District (CBD) was THB 267,281 per square meter, and Non-CBD was at THB 148,466 per square meter (Knight Frank, 2019). Condominiums account for 60% of the market demand. They have been preferred by investors due to connections to a mass transit line, customer preference, and limitation of land, which raises the cost of property in Thailand.

Moreover, the last factor affecting condominiums is availability among investors as Thai Law and regulation allows only 49% of the total saleable area in the building to be owned by foreign investors, which leads to higher demand than low-rise development (Klinchuanchun, 2018). This article concentrates on condominium projects in the Bangkok Metropolitan Area (BMA) and the surrounding area as this has the most significant quantity of condominium projects, compared to other areas in Thailand.

3. Research Methodology

The methodologies selected in this research are literature review and explanatory factor analysis.

Exploratory Factor Analysis

Exploratory factor analysis (EFA) is the method used to classify the complicated relationship among groups of items that are correlated. The application of EFA is to reduce multiple articles into a less number of dimensions (Bryant & Yarnold, 1995; Stapleton, 1997). Then the process will determine the pattern and overlaps of the attributes. It will eliminate multicollinearity in the determinants of the factor groups that do not have enough explanatory value for the selection (Hogarty, Kromrey, Ferron, & Hines, 2004; Kano & Harada, 2000). The research recommends that the EFA result will be accurate if the component group expresses the common factors in the analysis. The recommended number is at least four measured variables for each common factor (Fabrigar, Wegener, MacCallum, & Strahan, 1999). Cited in (Yong & Pearce, 2013), Guadagnoli and Velicer (1988) suggested that if the dataset has high factor loading scores (> 0.80), a small size (n > 150) is sufficient. The "rules of thumb" from the literature review concerning the sample size for factor analysis, where n represents the number of samples involved in the study. The accepted references regarding the minimum sample size range from n= 100 to n=250 (Jung & Lee, 2011; Preacher & MacCallum, 2002). However, there is an argument regarding the rules of sample size for exploratory factor analysis that could be ignored because the nature of the data should determine the suitable sample size(Costello & Osborne, 2005). Each output group should factor in an underlying common factor, and they require additional interpretation. The components will be designated with a quality score called an Eigenvalue. Only components with a high Eigenvalue are likely to represent a real underlying factor.

4. Data Collection

The subject of the research was the RPI of the condominium price. The researchers selected 167 samples from units for resale by the owner between 2018-2019 and from a total of 22 buildings. The location of the condominiums corresponds to the literature review on resident spatial development. The samples were located in the Central Business District, Near CBD, or Outside CBD. The researchers extracted official buildings' physical information from database files from the Environmental Impact Assessment Report (EIA) in 2017 through 2018 (Division of Environmental Impact Assessment Development, 2018). The data give insight into the environmental data such as green space, building population, water, and electric consumption of the condominium building. The researchers combined data from listing on the website with EIA data. This is the best way to understand the actual value of units. The researchers also use Geocoding as the procedure to locate transportation, mass rail transit, public amenities from each of the samples.

5. Factor Analysis and Variable Selection

The dependent variable for the research is the condominium price per square meter, which is quantitatively measured. The chosen independent variables are within the literature review of the RPI framework. There are three groups of independent variables in this research: unit characteristics, building characteristics, and RPI characteristics. Tables 1-3 are the results of the Z-score descriptive statistics of the unit characteristics, building characteristics, and RPI characteristics, which is the conversion of the values of a sample into Z-scores or the standardization for measuring the multiples of the standard deviation of that sample. Calculating the Z-score is a form of standardization used for transforming normal variants to standard score form. The Z-score standardization formula is defined as:

$$Z(x_{ij}) = \frac{x_{ij} - \bar{x}_j}{\sigma_j} \qquad \text{(Eq 1.)}$$

Where x_j and σ_i are the samples mean and standard deviation of the J^{th} attributes. The Z-score transformed variables will have a mean of 0 and a variance of 1. Khump-aisal (2015); Mohamad and Usman (2013); Williams, Onsman, and Brown (2010); Yong and Pearce (2013) have explained the process of EFA with the following steps.

- The first step is to develop the correlation examination to create a matrix of correlation coefficients to identify the related variables.
- The second step is to use the principle component method to extract the factors.
- The third step is to rotate factors to maximize the loadings of factors by using the "varimax rotation method" to create uncorrelated factors.
- The fourth step is to define the factor component by reference to the previous literature that has an association with the component. This step will help to explain the pattern of positive and negative loadings.

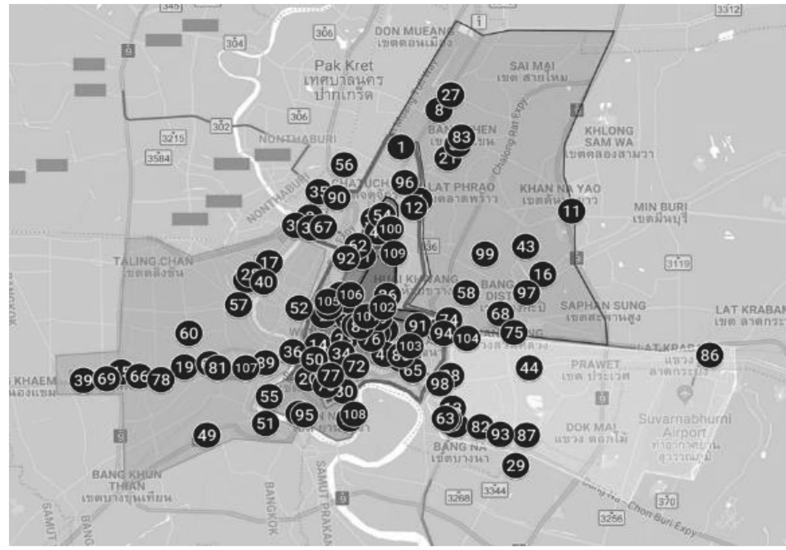

Figure 1. The location of the condominium projects in the study

- The fifth step is to rearrange the factor scores by the weight score of factors loading.

There are 55 determinants in this research, which are from the literature review. They are the known determinants that contribute to the cost of the condominium development, which reflects on the price of the units. The variables are distributed into three groups: unit characteristics Table 1, building characteristics Table 2, and RPI characteristics Table 3. They are linked to socio-economic, location proximity characteristics, sustainability characteristics, and energy efficiency factors of the building from RPI. Initially, the variable reduction method will be performed in each group and then consolidated back together to check for correlation within variables.

Table 1. Descriptive Statistics of Unit Characteristics

	N	Minimum	Maximum	Mean	Std. Deviation
Zscore: Decoration	167	-0.944	1.054	0.049	1.002
Zscore: Unit floor number	167	-1.319	3.821	0.048	1.003
Zscore: Facing View	167	-0.674	2.445	-0.002	1.002
Zscore: Celing Height	167	-0.819	3.139	0.001	1.023
Zscore: Price per Unit	167	-0.653	5.827	-0.017	0.972
Zscore: Price per Area	167	-0.659	8.924	0.006	1.027
Zscore: Room Type	167	-1.074	2.613	-0.014	1.010
Zscore: Room Sizes	167	-0.962	7.608	-0.026	0.946
Zscore: Common Fee	167	-0.968	8.457	-0.022	0.910
Zscore: Sinking Fund	167	-1.775	5.204	0.034	0.990
Valid N (listwise)	167				

Table 2. Descriptive Statistics of Building Characteristics

	N	Minimum	Maximum	Mean	Std. Deviation
Zscore: Architectural Design	167	-0.715	6.637	0.007	1.041
Zscore: Numer of Units in The Building	167	-1.324	2.848	-0.013	0.983
Zscore: Parking/Road Area	167	-1.108	3.197	-0.027	1.009
Zscore: Living Area	167	-1.170	2.977	-0.013	1.014
Zscore: Building Service Area	167	-1.108	2.920	0.002	1.022
Zscore: Building Gross Floor Area	167	-1.215	2.986	-0.017	1.008
Zscore: Building Efficiency	167	-1.815	1.852	0.014	1.013
Zscore: Number of Floor in the Building	167	-1.372	2.002	0.048	1.012
Zscore: Building Height	167	-1.216	2.289	0.046	1.016
Zscore: Number of Parking Spots	167	-1.446	2.736	-0.018	1.003
Zscore: The Ratio of Parking to Unit	167	-0.322	3.418	-0.054	0.923
Zscore: Building Auto Parking	167	-2.339	0.425	0.061	0.938
Zscore: Number of Unit Per floor Numeric	167	-1.690	2.708	-0.027	0.916
Zscore: Building Land Size	167	-1.194	2.794	-0.037	0.922
Zscore: Number of Amenities	167	-0.090	-0.063	-0.074	0.007
Zscore: Number of Basement Floors	167	-0.548	2.668	-0.150	0.711
Zscore: Roof Garden	167	-0.588	1.690	0.026	1.014
Valid N (listwise)	167				

The correlation matrix of unit characteristic determinants removed three variables in the calculation of the correlation in Appendix A. If there is a correlation, a rule of thumb is a correlation is statistically significant if its “Sig. (2-tailed)” < 0.05 (Child, 2006). The strongest Pearson Correlation is between Z-score: ceiling height and Z-score: room type at 0.766. The Z-score: unit price and price per area were removed from the analysis because they were reserved for dependent variables (Child, 2006). Additionally, Z-score: room size was removed because it is highly correlated with the dependent variables (Child, 2006).

There are 16 variables in Appendix B for the prediction of the correlation of Building Characteristic determinants. The correlation value appears twice: above and below the main diagonal. If there is a correlation, a rule of thumb is a correlation is statistically significant if its “Sig. (2-tailed)”< 0.05 (Child, 2006). The strongest Pearson Correlation is between Z-score: living area and Z-score: gross floor area at 0.99, as well as the variables that involve the building area, are highly correlated as expected. Nonetheless, Z-score: architecture design will be rejected because it has the lowest correlation with other variables. To confirm the rejection decision of the variable, when the Z-score: architecture design is included in the factor analysis, the Kaiser-Meyer-Olkin (KMO) test score is below 0.5 (Child, 2006).

There are 27 variables for RPI characteristic determinants, as shown in Table 3. Therefore, it is necessary to reduce the number of variables. The RPI characteristic determinants can be separated into two groups for factor analysis set up; the first group is about the spatial location, and the second group is about sustainable characteristics. There are 12 variables in Appendix C for the prediction of the correlation of the spatial location. As for sustainable characteristics group has 15 variables in Appendix D for the prediction of the correlation. The researchers only rejected the green-certified variable because it is one of the dummy variables that all samples share the same answer within the sample. There is only one condominium in Bangkok that is LEED-certified. The research result showed that the correlation coefficient, r, was 0.992. However, green-certified will be rejected from this study due to insufficient data

When a set of factors has been extracted, resulting in factors represent a set of number that carries the acceptable amount of information (variances)(Peterson, 2000).

	N	Minimum	Maximum	Mean	Std. Deviation
Zscore: Public Transportation	167	-1.301	2.286	0.052	0.994
Zscore: Location of the Building	167	-0.893	1.114	-0.004	1.000
Zscore: Distance to Express Way	167	-0.615	3.421	-0.129	0.748
Zscore: Distance to Airport D	167	-1.472	1.694	-0.095	0.938
Zscore: Distance to Airport S	167	-1.677	2.144	-0.093	0.855
Zscore: Public Trading Company	167	-0.572	1.740	-0.059	0.963
Zscore: Next to Mass Rail Transit	167	-0.923	1.077	-0.061	0.994
Zscore: Green Certified	167	-1.643	0.605	-0.001	1.001
Zscore: EVCharging	167	-2.159	0.461	0.053	0.953
Zscore: OTTV < 30W sqm	167	-3.426	0.605	-0.013	1.041
Zscore: RTTV <10 W sqm	167	-1.414	1.798	0.028	0.954
Zscore: Population in the building	167	-1.309	2.983	0.005	1.017
Zscore: Distance to the Hospitals	167	-0.620	1.041	-0.147	0.501
Zscore: Distance to Large Scale Shopping Mal	167	-0.393	0.181	-0.143	0.179
Zscore: Distance to Community Mall	167	-0.718	2.789	-0.083	0.866
Zscore: Distance to University	167	-0.693	0.838	-0.138	0.524
Zscore: Distance to Public Park	167	-0.987	1.175	-0.156	0.573
Zscore: Building Maximum FAR	167	-1.350	2.353	0.029	1.014
Zscore: Building Using FAR bonus	167	-1.077	0.923	-0.023	1.002
Zscore: Building Foot Print	167	-1.491	3.418	-0.041	0.965
Zscore: Building OSR	167	-1.062	6.818	-0.032	0.961
Zscore: Building Open Space	167	-1.450	1.934	0.020	0.998
Zscore: Building Green Space	167	-1.663	2.119	0.047	1.022
Zscore: Tree Cover Area	167	-1.087	1.224	-0.107	0.616
Zscore: Building Total Water Consumption	167	-1.704	1.670	-0.048	0.955
Zscore: Building Total Waste Water	167	-1.313	2.948	-0.016	0.999
Zscore: Building Total Electricity Consumption	167	-1.605	2.312	0.031	1.017
Zscore: Building Total Waste Product	167	-1.263	2.997	-0.018	0.995
Valid N (listwise)	167				

Table 3. Descriptive Statistics of RPI Characteristics

Table 4. Unit Characteristic Factors

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1 Unit preferences	2.562	36.598	36.598	2.562	36.598	36.598	2.436	34.794	34.794
2 Unit's Strategy	1.288	18.398	54.996	1.288	18.398	54.996	1.359	19.411	54.204
3. Unit Qualities	1.225	17.500	72.496	1.225	17.500	72.496	1.280	18.292	72.496
4	0.718	10.256	82.752						
5	0.619	8.844	91.595						
6	0.400	5.717	97.313						
7	0.188	2.687	100.000						

Extraction Method: Principal Component Analysis.

Table 5. Rotated Component Matrix of Unit Characteristics

Rotated Component Matrix[a]

	Component 1	Component 2	Component 3
Zscore(UCType) Room Type	0.911		
Zscore(UCCeiling) Celing Height	0.840		
Zscore(UCcommon) Common Fee	0.721		
Zscore(UCFur) Decoration		-0.916	
Zscore(UCSinkingF) Sinking Fund	0.522	0.697	
Zscore(UCFloor) Unit floor number			0.774
Zscore(UCView) Facing View			-0.766

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 4 iterations.

The researchers will analyze for the initial Eigenvalues can the interpretative plausibility of the indicator. If Eigenvalues is more significant than one, the research should consider that a factor Eigenvalues is less than one, then the research should not consider that a factor (Cliff, 1988). If the variance extracted value less than 0.7, it should not consider being in the factor (Patil, Singh, Mishra, & Donavan, 2008). Patil et al. (2008) suggest that the average variance extracted (AVE) ranged from 0.62 to 0.69. EFA is exploratory; therefore, the components that do not meet the requirements is not required to define the factor's name.

6. Results

6.1 Defining the Factors of Unit Characteristic

The result of the first-factor analysis group, unit characteristic, explains three of the components that are highly intercorrelated. The total variance explained in Table 4 shows that there are three components with the initial Eigenvalues of more than 1.0. The first component explained 36.60 % of the total variance, followed by 18.40 % and 17.50%. The factors analysis categorized a group of unit characteristics into three factors. These factors related to the units in the condominium building. The result retained three factors from the EFA that met the criteria. We named the three factors (1) unit preference, (2) unit strategy and (3) unit qualities. See table 4 for all of the factor's name.

Unit preferences consist of room type, ceiling height, and common fee. The factor loadings of these variables were indicated between the lowest of 0.721 and the highest of 0.911. This component reflected the customer's preference toward the condominium unit, such as the room type, ceiling height, and typical fee. They indicate the product price and level of luxury (Conley, 2019).

Unit strategy consists of decoration and a sinking fund. The factor loadings of these variables were indicated between the lowest of 0.697 and the highest of 0.916. This component reflected the developer's choice of home staging as a marketing tool. The relationship between the style of decoration and the sinking fund reflects on the value-added of the products. The customer's first impression of the property reflects the willingness to purchase the product (Falcone, 2019; Lönnberg, 2019).

Unit qualities consist of unit floor number and facing view. The factor loadings of these variables were indicated between the lowest of 0.766 and the highest of 0.774. This component reflected the unit view, which measures the significance of the natural features of the unit. The quality of the view indicates the higher price for the unit (Bishop, Lange, & Mahbubul, 2004; Chau, Ma, & Ho, 2001).

The EFA's findings insisted that the customers assess the unit value based on the room type, ceiling, height, and common fee. They are the most basic information that the customer can compare the units between development projects at a similar price. The EFA result also revealed that the developer promotes a sale strategy from the condominium unit's interior decoration and sinking fund. The analysis informed that interior decoration is significant in the factor group because the higher the factor loading, which was derived at 0.916.

6.2 Defining the Factors of Building Characteristic

The FA result of the building characteristic group shows six component groups of variables that are highly intercorrelated. The total variance explained in Table 6 showed that there were six components with initial Eigenvalues more than 1.0. The first component explained 42.193 % of the total variance, followed by 13.265 %, 10.971%, 9.34%, 7.878%, and 6.652%. The factors that met the criteria are named; (1) Building Area, (2) Building Hight, (3) Building Density, (4) Building Amenities, (5) Building Efficiency, and (6) Building Technology. See table 6 for all of the factor's name.

Building Area consists of living area, building gross floor area, parking and road area, number of parking spots, number of units in the building, land size, and building service area. The factor loadings of these variables were indicated between the lowest of 0.822 and the highest of 0.962.

Table 6. Building Characteristic Factors

Total Variance of Building Characteristic Factors Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1. Building Area	6.751	42.193	42.193	6.751	42.193	42.193	6.228	38.924	38.924
2. Building Height	2.122	13.265	55.458	2.122	13.265	55.458	2.238	13.988	52.912
3. Building Density	1.755	10.971	66.429	1.755	10.971	66.429	1.739	10.871	63.783
4. Building Amenities	1.494	9.340	75.769	1.494	9.340	75.769	1.579	9.869	73.652
5. Building Efficiency	1.260	7.878	83.647	1.260	7.878	83.647	1.465	9.159	82.811
6. Building Technology	1.064	6.652	90.299	1.064	6.652	90.299	1.198	7.488	90.299
7	0.570	3.561	93.860						
8	0.361	2.254	96.114						
9	0.311	1.944	98.058						
10	0.162	1.010	99.068						
11	0.086	0.539	99.607						
12	0.048	0.297	99.904						
13	0.008	0.047	99.952						
14	0.005	0.030	99.982						
15	0.003	0.018	99.999						
16	0.000	0.001	100.000						

Extraction Method: Principal Component Analysis.

Table 7. Rotated Component Matrix of Building Characteristics

Rotated Component Matrix[a]

	Component					
	1	2	3	4	5	6
Zscore: Living Area	0.962					
Zscore: Building Gross Floor Area	0.961					
Zscore: Parking/Road Area	0.935					
Zscore: Number of Parking Spots	0.914					
Zscore: Number of Units in The Building	0.905					
Zscore: Building Land Size	0.849					
Zscore: Building Service Area	0.822	0.319				
Zscore: Building Height		0.963				
Zscore: Number of Floor in the Building	0.360	0.918				
Zscore: Number of Unit Per floor			0.881			
Zscore: The Ratio of Parking to Unit			0.786			
Zscore: Number of Amenities				0.886		
Zscore: Number of Basement Floors			0.320	0.838		
Zscore: Building Efficiency					0.891	
Zscore: Roof Garden	0.445		-0.348		0.586	
Zscore: Building Auto Parking						0.959

Extraction Method: Principal Component Analysis.
a. Rotation converged in 6 iterations.

This component reflected the project cost of development. The valuation of the building cost is estimated by the site as they were vacant for its highest and best use, by comparing the data of location, size, physical characteristics, zoning, utilities, and environmental factors (Pagourtzi, Assimakopoulos, Hatzichristos, & French, 2003). Puncreobutr, Pusapukdepop, and Khamkhong (2017) explained that around 68% of the cost of the condominium building in Thailand are materials and labor, where approximately 32% are overheads, profits, and taxes.

Building Height consists of building height and number of floors in the building. In 2008, there was a study of hedonic regression modeling of condominium units in Tokyo (Diewert & Shimizu, 2016). To find the structure area of the unit and another component contributes to the unit's share of land value. The two attributes that contributed to the unit price was the total number of stories in the building and the height of the sold unit. The higher the unit, the higher the expected price (Diewert & Shimizu, 2016; Komai, Moridaira, Kitamura, Morinaga, & Yoshida, 2002).

Building Density consists of the number of average units per floor and the parking ratio of the unit. The factor loadings of these variables were indicated between the lowest of 0.786 and the highest of 0.881. The density of condominiums can be perceived differently by each developer's strategy if they are seeking profit maximization of a higher average number of units per floor. The results indicate that selling prices would be decreased (Hamilton, 1978).

Building Amenities consist of the number of amenities and number of basement floors. The factor loadings of these variables were indicated between the lowest of 0.838 and the highest of 0.886. This component reflected the number of amenities in the building, which contribute directly to the price of the unit. The occupied floor space that accommodates amenities and underground parking should result in a higher price for the unit.

Building Efficiency consists of building efficiency and roof garden. The factor loadings of these variables were indicated between the lowest of 0.586 and the highest of 0.891. The total gross floor area allowed on each site is motivated by the maximum salable space in a building (Trabucco & Miranda, 2019).

Building Technology has only one component, which is auto parking, which has a factor loading of 0.959. This component represents the technology of the building, which gives market value to the customers

6.3 Defining the component of Responsible Property Investment Factors: Spatial Location

The results of the factor analysis calculation of the RPI group I location explains the output of the RPI proximity characteristic determinants. The total variance explained in Table 8 shows that there were four factors with initial Eigenvalues of more than 1.0. The first component explained 41.414 % of the total variance, followed by 14.30%, 10.518%, and 9.764%. Tochaiwat, Likitanupak, and Kongsuk (2017) suggested that the

Table 8. Responsible Property Investment Factors: Spatial Location

Total Variance of Responsible Property Investment Factors: Spatial Location Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1. Public Amenities	4.970	41.414	41.414	4.970	41.414	41.414	3.362	28.020	28.020
2. Vehicle Accessibility	1.732	14.430	55.844	1.732	14.430	55.844	2.542	21.179	49.200
3. Mass Transit Accessibility	1.262	10.518	66.363	1.262	10.518	66.363	1.686	14.054	63.253
4. Domestic Transportation Accessibility	1.172	9.764	76.126	1.172	9.764	76.126	1.545	12.873	76.126
5	0.852	7.096	83.222						
6	0.633	5.278	88.500						
7	0.533	4.439	92.939						
8	0.339	2.822	95.761						
9	0.238	1.985	97.746						
10	0.140	1.166	98.912						
11	0.085	0.710	99.621						
12	0.045	0.379	100.000						

Extraction Method: Principal Component Analysis.

most critical factors for site selection for the development of low-rise condominiums are transportation, workplace, facilities, and utilities (Tochaiwat et al., 2017). Therefore the factors that met the criteria are named; (1) Public amenities, (2) Vehicle accessibility, (3) Mass transit accessibility, and (4) Domestic Transport Assesscility.

Public Amenities Accessibility consists of distance to Suvarnabhumi Airport, distance to closet community mall, distance to the closet public park, distance to large-scale shopping mall, and distance to the closest hospital. The factor loadings of these variables were indicated between the lowest of 0.718 and the highest of 0.760.

Vehicle Accessibility consists of whether it is a public trading company, distance to the expressway, and distance to the nearest university. The factor loadings of these variables were indicated between the lowest of 0.598 and the highest of 0.760. This component expresses the site quality for accessibility to the infrastructure in Bangkok. This component expresses the accessibility from the site to the lifestyle locations in Bangkok.

Mass Transit Accessibility consists of whether the location is next to the mass transit rail system and zoning. The factor loadings of these variables were indicated between the lowest of 0.820 and the highest of 0.848. This component expresses the zoning and neighborhood quality of the building.

Domestic Transportation Accessibility consists of public transportation and distance to Don Muang Airport. The factor loadings of these variables were indicated between the lowest of 0.684 and the highest of 0.834. This component expresses the essential requirement of public transportation, where Don Muang Airport is a popular destination for public transportation.

The result corresponds to the customer decision from the location of the building. It is recognized that transportation and accessibility contribute to the price of the unit (Lieske, van den Nouwelant, Han, & Pettit, 2019; Zhuge, Shao, Gao, Dong, & Zhang, 2016). The results also reveal that customer priority relative distance of the property to public amenities more than

Table 9. Rotated Component Matrix of Responsible Property Investment Characteristics: Spatial Location

Rotated Component Matrix[a]

	Component			
	1	2	3	4
Zscore: Distance to Airport S	0.760		0.326	
Zscore: Distance to Community Mall	0.737			
Zscore: Distance to Public Park	0.728	0.450		0.336
Zscore: Distance to Large Scale Shopping Mal	0.724	0.486		
Zscore: Distance to the Hospitals	0.718	0.615		
Zscore: Public Trading Company		0.891		
Zscore: Distance to Express Way	0.325	0.735		
Zscore: Distance to University	0.559	0.598		0.363
Zscore: Next to Mass Rail Transit			0.848	
Zscore: Location of the Building			-0.820	
Zscore: Public Transportation				-0.834
Zscore: Distance to Airport D	0.435			0.684

Extraction Method: Principal Component Analysis.
a. Rotation converged in 8 iterations.

mass rail transit or distance to the airport. Moreover, the result shows a significant relationship between the public trading company to distance to expressway and university. The result confirms that these locations are the priority for development because the price per square meter is expressively higher than in other locations. Wongleedee (2017) suggests that customer ranks five important market factors which were location, advertising, price, surrounding, areas, and near train or MRT.

6.4 Defining the component of Responsible Property Investment Factors: Sustainability

The result factor analysis calculation of RPI sustainable building characteristic determinants was done after factor analysis calculation. The total variance explained in Table 10 shows that there were four factors with initial Eigenvalues of more than 1.0. The first component explained 34.047% of the total variance, followed by 17.684%, 16.068%, and 9.147%.

Table 10. Responsible Property Investment Factors: Sustainability

Total Variance of Responsible Property Investment Factors: Sustainability Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1. Building Resources Consumption	5.107	34.047	34.047	5.107	34.047	34.047	4.934	32.891	32.891
2. Building Impact to Land	2.653	17.684	51.731	2.653	17.684	51.731	2.702	18.011	50.902
3. Building Environmental Impact	2.410	16.068	67.799	2.410	16.068	67.799	2.531	16.874	67.776
4. Sustainable Technology	1.372	9.147	76.946	1.372	9.147	76.946	1.375	9.169	76.946
5	0.951	6.341	83.286						
6	0.850	5.668	88.954						
7	0.529	3.526	92.480						
8	0.429	2.859	95.339						
9	0.278	1.855	97.194						
10	0.210	1.403	98.597						
11	0.118	0.784	99.381						
12	0.040	0.265	99.646						
13	0.038	0.253	99.899						
14	0.010	0.067	99.966						
15	0.005	0.034	100.000						

Extraction Method: Principal Component Analysis.

Building Resources Consumption consists of the population in the building, building total wastewater, building total waste products, building total electric consumption, building green space, OTTV, and tree cover area. The factor loadings of these variables were indicated between the lowest of 0.554 and the highest of 0.982.

Building Impact on Land consists of building total water consumption, building footprint, and building open space. The factor loadings of these variables were indicated between the lowest of 0.669 and the highest of 0.907.

Building Environmental Impact consists of building total FAR, building OSR, and FAR bonus. The factor loadings of these variables were indicated between the lowest of 0.688 and the highest of 0.886.

Sustainable Technology consists of a building with an EV charger and RTTV. The factor loadings of these variables were indicated between the lowest of 0.688 and the highest of 0.886.

7. Discussion and Conclusion

This EFA identifies seventeen potential RPI to measures in the condominiums in Thailand, reflecting the building's physical and environmental concepts. The result show similarity and consistent with Pivo (2008) 's ten dimensions of RPI. Pivo (2008) concluded that RPI's priorities are less vehicle dependency, energy conservation, worker well-being, and urban revitalization. This analysis allows condominium developers to identify the most responsible approach to use as a guideline for sustainable real estate development. Eichholtz, Kok, and Yonder (2012) investigated the connection between energy efficiency and sustainability of properties in the US Real Estate Investment Trust (REIT) market by monitoring the stock performance of a sample of publicly listed REITs. The study concluded that Green REITs stock performance performs better than regular REITs. Pivo (2008) uses the social investment aspect of real estate (RPI) as guidance for asset managers to select responsible

Table 11. Rotated Component Matrix of Responsible Property Investment Characteristics: Sustainability

Rotated Component Matrix[a]

	Component			
	1	2	3	3
Zscore: Population in the building	0.982			
Zscore: Building Total Waste Water	0.972			
Zscore: Building Total Waste Product	0.949			
Zscore: Building Total Electricity Consumption	0.878		-0.369	
Zscore: Building Green Space	0.731			
Zscore: OTTV < 30W sqm	-0.613	0.611		
Zscore: Tree Cover Area	0.554	0.472	0.436	
Zscore: Building Total Water Consumption		0.907		
Zscore: Building Foot Print		0.850	0.390	
Zscore: Building Open Space		0.669		
Zscore: Building Maximum FAR			-0.886	
Zscore: Building OSR			0.714	
Zscore: Building Using FAR bonus			0.688	-0.368
Zscore: EVCharging			0.303	0.769
Zscore: RTTV <10 W sqm				0.641

Extraction Method: Principal Component Analysis.
a. Rotation converged in 5 iterations.

Table 12. Descriptive Statistics of Responsible Property Investment for Condominiums in Bangkok, Thailand

Descriptive Statistics of Factor Groups: Condominium in Bangkok

	N	Minimum	Maximum	Mean	Std. Deviation
1. Unit preferences	167	-2.36	9.03	-0.03	2.05
2. Unit's Strategy	167	-2.20	4.49	-0.02	1.35
3. Unit Qualities	167	-2.89	3.47	0.04	1.20
4. Building Area	167	-6.45	15.68	-0.10	4.98
5. Building Height	167	-2.43	4.04	0.09	1.88
6. Building Density	167	-1.73	4.81	-0.07	1.26
7. Building Amenities	167	-0.54	2.17	-0.19	0.59
8. Building Efficiency	167	-1.96	2.52	0.03	1.21
9. Building Technology	167	-2.24	0.41	0.06	0.90
10. Public Amenities	167	-2.38	1.86	-0.45	1.22
11. Vehicle Accessibility	167	-1.30	3.74	-0.23	1.38
12. Mass Transit Accessibility	167	-1.70	1.65	-0.05	1.42
13. Domestic Transportation Accessibility	167	-1.76	1.96	-0.11	1.14
14. Building Resources Consumption	167	-6.28	14.58	-0.02	4.85
15. Building Impact to Land	167	-2.78	4.00	-0.04	1.65
16. Building Environmental Impact	167	-3.49	6.15	-0.06	1.80
17. Sustainable Technology	167	-2.46	1.51	0.06	0.98
Valid N (listwise)	167				

development projects for their REITs portfolio. The results both emphasize the financial return and being responsible at the same time. The EFA outcome explains the potential RPI of the condominium property. This result will help developers identify the RPI factors that influence the financial benefits of the property. See Table 12 Sah, Miller, and Ghosh (2013) address the growth in popularity in sustainability investment among investment firms. They concluded that sustainability performance in stocks has higher returns on assets. Our results provide ground evidence of developing a sustainable portfolio. By identify the RPI factor in the development of the building, the results could provide the structure value relationship between factors. For future research, the researchers recommend finding the value influence of RPI on condominium development. If we can measure the value of RPI in the development cost, developers can make a precise decision investment into responsible development in other developments, such as office building, hotel, and housing. Asset managers can also select investments base on RPI's measurement.

The first RPI factors represent the value of the condominium that confirmed with worker well-being in Pivo (2008) 's result; however, in this case, it is customer well-being. Factor group 1-3 highlighted how the consumer appreciates the value of the unit without the status of the building's location. Factor group 4-9 are crucial to the developer and investors. They represent the financing expense of the project, such as marketing costs and characteristic features of the building. The result is also consistent with Pivo (2008)'s urban revitalization, which represents the adaptability to public use that contributes to a specific feature for urban development. Nonetheless, it is also appealing to customers that demand an excellent building along with the purchase of the unit. These are the criteria of this component, which are the density of the units, number of amenities, facilities in the building, and the exclusive technology, such as auto parking. Factor group 10-17, the researchers classified them into two groups. The first group represents the advantageous location of the building in the city of Bangkok. It explains the position of the building correlated with other locations, such as large scale shopping malls, airports, and public infrastructure that is essential to the value of the condominium, and this component is also one of the primary marketing decision factors for customers to purchase the unit because of less dependency on vehicles and saving time for the commute (Wonggotwarin & Kim, 2017; Wongleedee, 2017).

The result confirmed that Pivo (2008)'s top four findings that transit-oriented development, transit level of service, central location, dense mixed-use, and walkable are essential for RPI. The second group represents the environmental factors. They measure how the building consumes natural resources and the direct impact on the environment as well as the attempt to accommodate solutions to the environmental problem. The limitation of this is that there are not many academic research studies on RPI, especially on the specific type of building (Hebb, Hamilton, & Hachigian, 2010). In general, RPI is also a lack of a standardized set of metrics (Galley, Rogers, & Wood, 2009, p. 12; Hebb et al., 2010). It requires additional research to prove that the positive impact of RPI helps the impact of the investment variables of the development. The criteria will be the additional measurement of the metric to evaluate the actual cost of being a responsible developer.

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Appendix A. Correlation Matrix of Unit Characteristic Determinants and KMO and Bartlett's Test

Correlation Matrix of Unit Characteristic Determinants[a]

		Zscore (UCFur) Decoration	Zscore (UCFloor) Unit floor number	Zscore (UCView) Facing View	Zscore (UCCeiling) Celing Height	Zscore (UCType) Room Type	Zscore (UCcommon) Common Fee	Zscore (UCSinkingF) Sinking Fund
Correlation	Zscore(UCFur) Decoration	1.00	0.03	-0.07	0.07	0.02	0.01	-0.39
	Zscore(UCFloor) Unit floor number	0.03	1.00	-0.22	0.25	0.13	0.04	0.25
	Zscore(UCView) Facing View	-0.07	-0.22	1.00	0.02	0.13	0.15	0.07
	Zscore(UCCeiling) Celing Height	0.07	0.25	0.02	1.00	0.76	0.38	0.35
	Zscore(UCType) Room Type	0.02	0.13	0.13	0.76	1.00	0.53	0.50
	Zscore(UCcommon) Common Fee	0.01	0.04	0.15	0.38	0.53	1.00	0.36

a. Determinant = .135

KMO and Bartlett's Test of Unit Characteristic Determinants

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.61
Bartlett's Test of Sphericity	Approx. Chi-Square	355.81
	df	21.00
	Sig.	0.00

Appendix B. Correlation Matrix of Building Characteristic Determinants and KMO and Bartlett's Test

Correlation Matrix of Building Characteristic Determinants[a]

		Zscore: Numer of Units in The Building	Zscore: Parking/ Road Area	Zscore: Living Area	Zscore: Building Service Area	Zscore: Bulding Gross Floor Area	Zscore: Building Efficiency	Zscore: Number of Floor in the Building	Zscore: Building Height	Zscore: Number of Parking Spots	Zscore: The Ratio of Parking to Unit	Zscore: Building Auto Parking	Zscore: Number of Unit Per floor Numeric	Zscore: Building Land Size	Zscore: Number of Amenities	Zscore: Number of Basement Floors	Zscore: Roof Garden
Correlation	Zscore: Numer of Units in The Building	1.00	0.82	0.88	0.71	0.87	0.13	0.51	0.31	0.97	0.16	0.33	0.09	0.84	-0.05	-0.02	0.48
	Zscore: Parking/ Road Area	0.82	1.00	0.96	0.78	0.98	-0.28	0.49	0.33	0.84	0.11	0.26	-0.24	0.69	0.01	0.08	0.38
	Zscore: Living Area	0.88	0.96	1.00	0.80	1.00	-0.08	0.45	0.30	0.88	0.13	0.26	-0.13	0.76	-0.01	0.08	0.42
	Zscore: Building Service Area	0.71	0.78	0.80	1.00	0.82	-0.26	0.58	0.43	0.81	0.07	-0.04	-0.15	0.54	-0.01	-0.04	0.22
	Zscore: Bulding Gross Floor Area	0.87	0.98	1.00	0.82	1.00	-0.16	0.48	0.32	0.87	0.14	0.26	-0.16	0.74	0.00	0.08	0.39
	Zscore: Building Efficiency	0.13	-0.28	-0.08	-0.26	-0.16	1.00	-0.22	-0.28	0.04	-0.05	-0.11	0.27	0.12	-0.07	0.07	0.25
	Zscore: Number of Floor in the Building	0.51	0.49	0.45	0.58	0.48	-0.22	1.00	0.96	0.59	-0.20	0.23	-0.08	0.10	0.02	-0.10	0.23
	Zscore: Building Height	0.31	0.33	0.30	0.43	0.32	-0.28	0.96	1.00	0.40	-0.19	0.22	-0.06	-0.11	0.04	-0.05	0.13
	Zscore: Number of Parking Spots	0.97	0.84	0.88	0.81	0.87	0.04	0.59	0.40	1.00	0.19	0.22	0.03	0.77	-0.02	0.04	0.48
	Zscore: The Ratio of Parking to Unit	0.16	0.11	0.13	0.07	0.14	-0.05	-0.20	-0.19	0.19	1.00	0.13	0.47	0.10	-0.02	0.37	-0.18
	Zscore: Building Auto Parking	0.33	0.26	0.26	-0.04	0.26	-0.11	0.23	0.22	0.22	0.13	1.00	0.06	0.30	0.03	-0.24	0.11
	Zscore: Number of Unit Per floor Numeric	0.09	-0.24	-0.13	-0.15	-0.16	0.27	-0.08	-0.06	0.03	0.47	0.06	1.00	-0.08	-0.20	0.17	-0.22
	Zscore: Building Land Size	0.84	0.69	0.76	0.54	0.74	0.12	0.10	-0.11	0.77	0.10	0.30	-0.08	1.00	-0.10	-0.17	0.44
	Zscore: Number of Amenities	-0.05	0.01	-0.01	-0.01	0.00	-0.07	0.02	0.04	-0.02	-0.02	0.03	-0.20	-0.10	1.00	0.52	-0.04
	Zscore: Number of Basement Floors	-0.02	0.08	0.08	-0.04	0.08	0.07	-0.10	-0.05	0.04	0.37	-0.24	0.17	-0.17	0.52	1.00	-0.05
	Zscore: Roof Garden	0.48	0.38	0.42	0.22	0.39	0.25	0.23	0.13	0.48	-0.18	0.11	-0.22	0.44	-0.04	-0.05	1.00

a. Determinant = 1.81E-014

KMO and Bartlett's Test of Building Characteristic Determinants

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.56
Bartlett's Test of Sphericity	Approx. Chi-Square	5532.66
	df	120.00
	Sig.	0.00

Appendix C. Correlation Matrix of RPI: Spatial Location Determinants and KMO and Bartlett's Test

Correlation Matrix of RPI : Spatial Location Determinants[a]

		Zscore: Public Transportation	Zscore: Location of the Building	Zscore: Distance to Express Way	Zscore: Distance to Airport D	Zscore: Distance to Airport S	Zscore: Public Trading Company	Zscore: Next to Mass Rail Transit	Zscore: Distance to the Hospitals	Zscore: Distance to Large Scale Shopping Mal	Zscore: Distance to Community Mall	Zscore: Distance to University	Zscore: Distance to Public Park
Correlation	Zscore: Public Transportation	1.00	-0.07	-0.22	-0.27	0.08	-0.06	-0.06	0.00	-0.14	0.03	-0.19	-0.22
	Zscore: Location of the Building	-0.07	1.00	0.06	-0.02	-0.38	-0.08	-0.45	-0.14	-0.18	0.09	-0.14	0.00
	Zscore: Distance to Express Way	-0.22	0.06	1.00	0.20	0.27	0.50	-0.14	0.60	0.60	0.24	0.58	0.67
	Zscore: Distance to Airport D	-0.27	-0.02	0.20	1.00	0.19	0.01	-0.29	0.40	0.33	0.15	0.49	0.47
	Zscore: Distance to Airport S	0.08	-0.38	0.27	0.19	1.00	0.02	0.11	0.53	0.53	0.36	0.30	0.46
	Zscore: Public Trading Company	-0.06	-0.08	0.50	0.01	0.02	1.00	-0.02	0.55	0.29	0.09	0.44	0.29
	Zscore: Next to Mass Rail Transit	-0.06	-0.45	-0.14	-0.29	0.11	-0.02	1.00	0.05	0.20	-0.12	0.07	-0.02
	Zscore: Distance to the Hospitals	0.00	-0.14	0.60	0.40	0.53	0.55	0.05	1.00	0.86	0.51	0.83	0.78
	Zscore: Distance to Large Scale Shopping Mal	-0.14	-0.18	0.60	0.33	0.53	0.29	0.20	0.86	1.00	0.47	0.85	0.82
	Zscore: Distance to Community Mall	0.03	0.09	0.24	0.15	0.36	0.09	-0.12	0.51	0.47	1.00	0.36	0.55
	Zscore: Distance to University	-0.19	-0.14	0.58	0.49	0.30	0.44	0.07	0.83	0.85	0.36	1.00	0.74
	Zscore: Distance to Public Park	-0.22	0.00	0.67	0.47	0.46	0.29	-0.02	0.78	0.82	0.55	0.74	1.00

a. Determinant = .000

KMO and Bartlett's Test of RPI : Spatial Location Determinants

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.68
Bartlett's Test of Sphericity	Approx. Chi-Square	1540.19
	df	66.00
	Sig.	0.00

Appendix D. Correlation Matrix of RPI: Sustainability Determinants and KMO and Bartlett's Test

Correlation Matrix of RPI : Sustainability Determinants

		Zscore: EVCharging	Zscore: OTTV < 30W sqm	Zscore: RTTV <10 W sqm	Zscore: Population in the building	Zscore: Building Maximum FAR	Zscore: Building Using FAR bonus	Zscore: Building Foor Print	Zscore: Building OSR	Zscore: Building Open Space	Zscore: Building Green Space	Zscore: Tree Cover Area	Zscore: Building Total Water Consumption	Zscore: Building Total Waste Water	Zscore: Building Total Electricity Consumption	Zscore: Building Total Waste Product
Correlation	Zscore: EVCharging	1.00	-0.10	0.09	-0.07	-0.36	-0.08	0.07	0.19	0.16	-0.12	-0.04	-0.21	-0.04	-0.22	0.07
	Zscore: OTTV < 30W sqm	-0.10	1.00	-0.04	-0.53	0.12	-0.24	0.31	-0.25	0.35	-0.33	-0.14	0.43	-0.52	-0.36	-0.56
	Zscore: RTTV <10 W sqm	0.09	-0.04	1.00	0.10	-0.07	-0.25	0.03	-0.08	0.07	0.00	-0.15	0.05	0.16	0.02	-0.01
	Zscore: Population in the building	-0.07	-0.53	0.10	1.00	0.15	0.09	0.15	0.09	0.09	0.70	0.56	0.32	0.99	0.87	0.93
	Zscore: Building Maximum FAR	-0.36	0.12	-0.07	0.15	1.00	-0.60	-0.32	-0.46	0.25	-0.03	-0.15	0.26	0.12	0.49	0.14
	Zscore: Building Using FAR bonus	-0.08	-0.24	-0.25	0.09	-0.60	1.00	-0.03	0.29	-0.21	0.24	0.19	-0.23	0.07	-0.21	-0.02
	Zscore: Building Foor Print	0.07	0.31	0.03	0.15	-0.32	-0.03	1.00	0.32	0.41	0.27	0.60	0.71	0.18	0.00	0.17
	Zscore: Building OSR	0.19	-0.25	-0.08	0.09	-0.46	0.29	0.32	1.00	-0.14	0.12	0.39	0.04	0.12	-0.07	0.12
	Zscore: Building Open Space	0.16	0.35	0.07	0.09	0.25	-0.21	0.41	-0.14	1.00	0.12	0.02	0.56	0.10	0.18	0.17
	Zscore: Building Green Space	-0.12	-0.33	0.00	0.70	-0.03	0.24	0.27	0.12	0.12	1.00	0.42	0.22	0.66	0.60	0.61
	Zscore: Tree Cover Area	-0.04	-0.14	-0.15	0.56	-0.15	0.19	0.60	0.39	0.02	0.42	1.00	0.55	0.60	0.31	0.57
	Zscore: Building Total Water Consumption	-0.21	0.43	0.05	0.32	0.26	-0.23	0.71	0.04	0.56	0.22	0.55	1.00	0.34	0.33	0.24
	Zscore: Building Total Waste Water	-0.04	-0.52	0.16	0.99	0.12	0.07	0.18	0.12	0.10	0.66	0.60	0.34	1.00	0.83	0.94
	Zscore: Building Total Electricity Consumption	-0.22	-0.36	0.02	0.87	0.49	-0.21	0.00	-0.07	0.18	0.60	0.31	0.33	0.83	1.00	0.82
	Zscore: Building Total Waste Product	0.07	-0.56	-0.01	0.93	0.14	-0.02	0.17	0.12	0.17	0.61	0.57	0.24	0.94	0.82	1.00

a. Determinant = 4.40E-009

KMO and Bartlett's Test of RPI : Sustianability Determinants

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.53
Bartlett's Test of Sphericity	Approx. Chi-Square	3370.47
	df	105.00
	Sig.	0.00