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THE LOCATION SELECTION FOR NEW URBAN AREA; A CASE STUDY REAL ESTATE BUSINESS NEW LOCATION IN PHNOM PENH BASED ON AHP METHOD

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Abstract

Urban planning and location selection for new urban area has become the challenging issues. Selection of best potential location for new urban area development allows the socio-economic benefits of urbanization providing vibrant and livable urban spaces. The study aims to determine the criteria for selecting new location for urban areas in Phnom Penh, Capital city of Cambodia. It also identified and selected the alternative area that has higher potential for new urban area using AHP method. Five main criteria and three areas in Phnom Penh were selected with the in-depth interview from nine experts from nine real estate companies and two experts from ministry of Land Management, Urban Planning and Construction. With the structured questionnaires, data were also collected from 12 experts. The AHP method selected alternative 2 (CHROUY CHANGVAR) as the best location for new urban area. Amongst the main criteria, it showed that Political factors is the most importance factors with the weight of (42.2%). It was followed by Locational factors (26.7), Demographic factors (18.6%), Neighbor factors (7.2%) and Environmental factors (5.3%). These results can be used for planning new location selection for new urban and cities.

Keywords: Urban, Location selection, Location criteria, Cambodia, AHP

1. INTRODUCTION

Phnom Penh is the capital city of Cambodia. It is a center for political, economic, and cultural activities. From the total population of 15 million people in Cambodia, 30% of live in urban areas. According to the Global green growth institute (2017), the number of people in urban areas is expected to increase to 44% of the total population in 2030. Phnom Penh, the capital of Cambodia has the highest number of people living in urban areas. According to world Bank Group (2018), Cambodia bucked in the regional trend of almost the developing county in East Asia after the real GDP growth eased to 6.8percent in 2017 from 7 percent in 2016. The report also mentioned that Cambodia is in the critical juncture of urbanization as there are many opportunities that create competitive and sustainable cities. As the capital city of Cambodia, the development of Phnom Penh is particularly important as it is the largest and fastest growing city in the country and serves as the gateway to the global economy (Baker et al, 2017).

Although there is significant growth over the last ten years in Phnom Penh, Access to basic services remains variable, with mounting challenges in the drainage, wastewater treatment, public transport and solid waste sectors are still the biggest challenges faced by the city dwellers. The main reason for the housing shortages and informal settlements are the lack of proper study on the location and poor law that govern the rights of land. The city's ambitious Master Plan 2035 lays out a strategic vision for growth but lacks a corresponding detailed land use plan and accompanying regulatory framework to support implementation (World Bank, 2017). Well-planned cities allow the socio-economic benefits of urbanization to be fully harnessed, and can create vibrant, livable urban spaces. Selection of new urban area which has higher potential development for real estate business will increase the economic growth, providing safe and good environment facilities. According to World Bank Group (2018) Only Four Khans (District) which are in Phnom Penh are developed into urban area leaving Eight Khans in Rural area. However, these eight Khans has good location for new urban planning. As the current city faces many challenges, the government should plan and select the new urban area with proper study and planning. The three places are selected as the alternatives for the final location. the three location are Mean Chey, Chrouy Changvar and Sen Sok.



Therefore, this research aims to study on the location selection for new urban areas in Phnom Penh, Cambodia, determining the criteria for selecting new location and identify the alternative area that has higher potential for new urban area.

2. LITERATURE REVIEW

Real estate market is one that is characterized by almost predictable cycles of booms and busts (Smith, 2010). To establish and maintain a competitive advantage reducing the impact from changing social and economic conditions, routine capital movement, and growing competition from the international market, selecting property to locate a business is very important Rymarzak & Siemińska (2012). Location selection for real estate business is crucial and it is a common understanding that the value and the potential value of a property are fundamentally determined by its location (Zeng & Zhou, 2001). Selecting the best location for real estate is complex, dynamic and difficult problems (Rymarzak & Siemińska, 2012) and it required more studies on the particular sites. Many real estate businesses failed due to poor decision while selecting the specific location. Location is not just about finding any site but finding the best site. (Podor & Nyiri, 2010).

2.1 Political factors

In the study of (Lieser & Groh (2014), Smersh et al (2003) and Zhou et al (2017) political factors are considered as the important factors that determine the location selection of new urban area in term of real estate business properties. Some of the factors under political includes Land property rights Benchmark land price and Urban planning. The policy and law govern and control by the government in respect to any political party to power has influence and impact many real estate companies on land law and property right.

2.2 Demographic factors

Lee (2014) identified demographic factors as the important criteria and factors that affect the selection of location for real estate brokerage services. The demographical factors include number of densities of population and income and consumption level of the population.

2.3 Locational factors

Under the location, accessibility to public transportation facilities, distance to urban commercial centers and availability of city government, offices, schools are important factors which lead to location selection Smersh et al (2003), Oloke et al (2013) and Zhou et al (2017). For the selection of location for urban area for the development of real estate business properties, location of that particular area is well studied and should meet the criteria of location selection.

2.4 Environmental factors

Environment play the vital role in developing the real estate business properties. The success of the real estate business depends on the environment of that place and location of the property. Three important factors which are view from property, noise levels and pollution levels are selected under environment Zeng & Zhou (2001) and Oloke et al (2013).

2.5 Neighbor factors

Socio-economic characteristic, quality of neighboring structure and ethnic composition are important factors while considering the location of new urban area development in respect to real estate business property development Smersh et al (2003), Lahoz, (2007) and Rymarzak & Siemińska, (2012).



Table 1: Factors affecting the selection of real estate property business

Main factors	Sub-factors	References
Political factors(C1)	Land property rights(C11) Benchmark land price (C12) Urban planning (C13)	Lieser & Groh (2014) Smersh et al (2003) Zhou et al (2017)
Demographic factors(C2)	Number of density of population(C21) Income and consumption level(C22)	Lee, W. S. (2014)
Locational factors(C3)	Accessibility to Public transportation facilities(C31) Distance to urban commercial centers (C32) Availability of city government, offices, schools(C33)	Smersh et al (2003) Oloke et al (2013) Zhou et al (2017)
Environmental factors (C4)	View from property (C41) Noise levels (C42) Pollution levels (C43)	Zeng & Zhou (2001) Oloke et al (2013)
Neighbor factors (C5)	Socio-economic characteristic (C51) Quality of neighboring structure (C52) Ethnic composition(C53)	Smersh et al (2003) Lahoz (2007) Rymarzak & Siemińska (2012)

3. METHOLODOLY

The Analytic Hierarchy Process (AHP) is a Multi Criteria Decision Making (MCDM) method introduced by Saaty (1977). AHP provides a solution for decision makers to create the hierarchical structure of a complex problem, using the relationships of the overall priority, objectives, criteria, and alternatives. It is a technique for solving problems with complex multiple criteria which is called hierarchical analysis method (Corner et al, 2001). It is mostly applied to help decision-makers for prioritizing alternatives in order to determine the optimal alternative using pair-wise comparison judgments (Yoo & Choi,2006).

Step 1: Construct pair-wise elements matrix and the elements which are compared by the different criteria. Each alternative identified as a_{ij} (the entry in i^{th} row and j^{th} column) (Saaty, 1996) are illustrated as; Let P be the name of this matrix. For a matrix of pair-wise elements. (Akalin et al 2016).

$$P = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{bmatrix} \quad (1)$$

Step 2: To compute the sum of each column of the pair-wise comparison matrix c_i and divide each element in the matrix by its column total to generate a normalized pair-wise matrix can be illustrated as: (Meixner and Haas, 2010).

$$c_i = \sum_{j=1}^n a_{ij} \quad (2)$$



$$P = \begin{bmatrix} \frac{a_{11}}{c_1} & \frac{a_{12}}{c_2} & \dots & \frac{a_{1n}}{c_n} \\ \frac{a_{21}}{c_1} & \frac{a_{22}}{c_2} & \dots & \frac{a_{2n}}{c_n} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{a_{n1}}{c_1} & \frac{a_{n2}}{c_2} & \dots & \frac{a_{nn}}{c_n} \end{bmatrix}$$

And then calculate the weighted matrix dividing the sum of the normalized column of matrix by the number of criteria used.

Step 3: Calculates the consistency Ratio. Consistency vector is calculated by multiplying the pairwise matrix by the (weight) eigenvector and can be shown as:

$$\begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{bmatrix} * \begin{bmatrix} w_1 \\ w_2 \\ \vdots \\ w_n \end{bmatrix} = \begin{bmatrix} av_1 \\ av_2 \\ \vdots \\ av_n \end{bmatrix} \quad (3)$$

Then it is accomplished by dividing the weight sum vector with criterion weight. (Akalin et al (2016).

$$\begin{aligned} av_1 &= \frac{1}{w_1} [a_{11}w_1 + a_{12}w_2 + a_{1n}w_n] \\ av_2 &= \frac{1}{w_2} [a_{21}w_1 + a_{22}w_2 + a_{2n}w_n] \\ av_n &= \frac{1}{w_n} [a_{n1}w_1 + a_{n2}w_2 + a_{nn}w_n] \end{aligned} \quad (4)$$

λ is calculated by averaging the value of the consistency vector.

$$\lambda = \sum_{i=1}^n av_i, \quad i=1,2, \dots, n \quad (5)$$

The validity of comparisons can be calculated through the consistency ratio. It is necessary to calculate a consistency index (CI) of an $n \times n$ matrix, which is defined as under the ratio (Ishizaka & Labib, 2011).

$$CI = \frac{\lambda_{max} - n}{n-1} \quad (6)$$

where n = dimension of the matrix & λ_{max} = maximal eigenvalue

The consistency ratio (CR) is calculated as

$$CR = \frac{CI}{RI} \quad (7)$$

RI value is the random consistency index. If $C.R. \leq 0.10$, the calculation of relative criteria significance is considered acceptable. In the inverse case, the decision maker needs to examine the purposes behind unsuitably high evaluation inconsistency.

Table: 3.1 Random Consistency Index Values *R.I.*

n	1	2	3	4	5	6	7	8	9	10
R.I.	0.00	0.00	0.52	0.89	1.11	1.25	1.35	1.40	1.45	1.49

Source: Thomas Saaty (1980)

4. RESULT

Table 4.1 The pairwise comparison matrix for main criteria

	C1	C2	C3	C4	C5
C1	1	5	2	6	3
C2	1/5	1	1	5	3
C3	1/2	1	1	6	6
C4	1/6	1/5	1/6	1	1



C5	1/3	1/3	1/6	1	1
CR : 0.08					

Table 4.2 The pairwise comparison matrix for Political factors(C1)

	C11	C21	C31
C11	1	4	4
C21	1/4	1	2
C31	1/4	1/2	1
CR: 0.05			

The above table 4.1 and 4.2 showed the pairwise comparison matrix for main criteria and first criteria pairwise comparison. These results are obtained from the real estate industry perspective and their perception on location selection. Due to page constraint, the four main criteria matrices are not included here. For every matrix, consistency ratio are calculated and the result were less than 10% which according to Saaty (1980) is acceptable values. The result obtained from the calculation of main and sub criteria are shown in table 4.3.

Table 4.3: The importance weight of main criteria and sub criteria

Main Criteria	Sub-criteria
Political factors (42.2%)	Land property rights (65.5%)
	Benchmark land price (21.1)
	Urban planning (13.3)
Demographic factors (18.6%)	Number of density of population (34.1%)
	Income and consumption level (65.9%)
Locational factors (26.7)	Accessibility to Public transportation facilities (70.7%)
	Distance to urban commercial centers (20.1%)
	Availability of city government, offices, schools (9.2%)
Environmental factors (5.3%)	View from property (41.1%)
	Noise levels 26.1%)
	Pollution levels (32.8%)
Neighbor factors (7.2%)	Socio-economic characteristic (58.9%)
	Quality of neighboring structure (15.9%)
	Ethic composition (25.2%)

Similarly, the same procedure is applied to three alternatives. The experts from real estate industry are asked to establish the pairwise comparison matrix under each criterion. After calculating for 14 criterions, the consistency ratio is found to be acceptable thus from the 14, table 4.4 is given as an example.

Table 4.4 The pairwise comparison matrix for alternatives under Land property rights(C11)

C11	A1	A2	A3
A1	1	1/3	3



A2	3	1	4
A3	1/3	1/4	1
CR: 0.07			

The final result obtained from each criterion is given in the table 4.5.

Table 4.5: The final weightage of the location selection

MEAN CHEY(A1)	33.89%
CHROUY CHANGVAR(A2)	38.79%
SEN SOK(A3)	27.32%

Table 4.5 showed the final weightage result obtained from AHP method. Based on AHP method, it showed that alternative A2, which is Chrouy Chanvar is the best location for new urban area from the real estate industry perspective. The final ranking of the three alternatives are A2, A1 and A3. The result was discussed with real estate business companies in Phnom Penh and it was found that all real estate business companies are satisfied with this AHP method ranking.

5. CONCLUSION

The selection of new urban area is taking the complex decision-making situation. It is required to adopt and use the efficient method. From the many MCDM method, this study used AHP method where it helped decision makers to decide the importance of criteria and alternatives used in this study. The location selection for new urban area in Phnom Penh, based on real estate perspective show the significant result in this study. To select the location, five main criteria with 14 sub criteria are used to select the best alternative location. In the first phrase, five main criteria are compared and analyzed. It showed that Political factors is the most importance factors with the weight of (42.2%). It was followed by Locational factors (26.7), Demographic factors (18.6%), Neighbor factors (7.2%) and Environmental factors (5.3%). Similarly, in the second phrase, the sub criteria under each main criterion are compared and analyzed, the result is shown in table 4.3. Finally the three alternatives are compared under 14 criterion and selected alternative 2 (CHROUY CHANGVAR) as the best location for new urban development area in Phnom Penh.

This method is useful and it found that the result from this study can provide a framework or guidelines to assist the concern authority and real estate business companies in selection of location using the appropriate criteria and method. Moreover, this study helped real estate companies on decision making process as well as establishment of criteria with respect to the objectives.

As the study focused on real estate business companies, in the future studies, author recommend to used and includes other sectors who are involved in urban planning. Further, additional criteria may take into consideration with changed and development of urban area.

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