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The Impacts of Visual Factors on Resident's Perception, Emotion and Place Attachment

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Abstract
This study aimed to explore the underlying visual factors in a community environment and how the visual factors affect the resident's perception, emotion, and place attachment. Factor analysis and multiple regression had been employed to clarify this relationship. The factor analysis extracted visual environment into four factors: "architecture", "outdoor furnishing", "indicative symbol," and "healthy environmental element." The regression indicated that environmental perception and place attachment have different predictors. The former had predicted by "outdoor furnishing" and "healthy environmental element" while the latter affected by "architecture" and "indicative symbol". The emotion was only influenced by "outdoor furnishing".

Keywords: Community environment; Visual elements; Environmental perception; Place attachment.

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1.0 Introduction

In the field of environmental behaviour, researchers focus on human behaviour toward the environment. It is considered a kind of human perception in the space. People perceive the characteristics of the environment or place through the landscape. They use the five senses to observe and reacts to the environment. The human perception toward the landscape environment is a result of the interaction between the human and the landscape. More than 80% of the landscape perception comes from the vision. Therefore, the visual elements of the landscape environment are essential for planning and design. However, the designers often focus on the material aspect, the building shape, the form of space, and activities. In contrast, the sense of the visual elements in the community behind the environment rarely is emphasized. Through the theory of environmental behaviour research, the study conducted a community survey in Tainan City. The goal of this research is to discover the underlying visual factors of the community's landscape environment. Besides, the paper will evaluate the effect size of each factor on the three resident's behaviours, including the perception, emotion, and place attachment toward the environment.

2.0 Literature Review

2.1 Visual landscape of community

The community environment is understood as the environment of a place. The people almost use the vision to perceive the place by seeing the landscape (Tudor, 2014). In the landscape interaction process, more than 80% of the human perception comes from the vision (Rock & Harris, 1967). Therefore, the image plays a critical factor in the resident's perception, emotion, and place attachment

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toward the environment. The visual landscape element of the community is considered an essential thing in the interaction process, which connects the people and the environment. The visual landscape element is the natural element and artificial element, including planting, paving, architecture, outdoor furniture, pedestrian, open space, public facilities, building shape, and activity factors (Zhang & Lin, 2011). Depending on the previous researches, the study divides the landscape elements of the community environment into "architecture," "landscape," "symbol," "environmental element," and "others."

2.2 The relationship between the visual factors of the community and the resident's environmental behaviours

The landscape reflects the relationship between human culture and the natural environment of its place (Tudor, 2014). The quality of visual landscape elements in a community environment strongly impacts the psychology of citizens' environmental behaviour (Zhang, Ou, & Chang, 2018). Each community has the specified characteristic of the landscape environment, and the people tend to have different landscape perceptions as well. Besides, people's landscape perception could be affected by time (Bai, Chen, & Shi, 2012).

The environmental perception of the residents is considered as the process of human behavioural psychology, which is produced by the combination of three elements: human, environment, and interactive process (Rapoport, 2016). In this process, the human element is defined as the experience, mood, emotion, education, culture, and the information they can receive. The landscape reflects the culture as well as can be changed by the culture (Nassauer, 1995). The landscape element is referred to as a physical element, place, sound, living. These elements interact together and create certain individual feelings; sometimes, it is the emotional vibration. From then, this process leads to changes in human behaviour.

Landscape emotion is a feeling in each person affected when the people are standing in the natural environment (Zhang & Lin, 2011). The happiness, sadness, boredom, relaxation, and safe feeling, are the emotional elements almost influenced by the physical environment (Miwa & Hanyu, 2006). The visual landscape emotion of people is entire, not the same because each people also has landscape perception and landscape cognition differently. Moreover, the different age, gender, or period of experience is also the effect element significantly (Masumoto, Taishi, & Shiozaki, 2016).

The visual elements not only reflect the unique beauty but also show the outstanding features of each place. Additionally, these elements effect on the feeling, mood, emotions (Manzo, 2003), what the people can feel the uniqueness of the place where they birth, live, education and work, or maybe the place where they desire to live or to return (Maria Vittoria Giuliani, 2003). This relationship between the people and the local-emotion is called place attachment. Place attachment is proved as a particular place, including place dependence and place identity (Jorgensen & Stedman, 2001).

The place dependence is described as the process by which the human spends time for living, working in a particular place. The characteristics and the conditions create a potent combination between human and place (M Vittoria Giuliani, Ferrara, & Barabotti, 2003; Stedman, 2002).

The place identity is made when the belief, thought, environmental behaviour and personal identity are consolidated and based on a historical process or after an experience in a particular place (Scannell & Gifford, 2010).

The above theory expressed that when humans experience a landscape environment, the visual elements help them to perceive the place, as well as impact the human-environmental behaviours. Therefore, this study assumed that the visible items have an impact on the resident's perception, emotion, and place attachment.

2.3 Proposed hypothetical model

Based on the literature review, the study proposes a hypothetical model of the relationship between the community's visual environment and the resident's environmental behaviours (Figure 1).

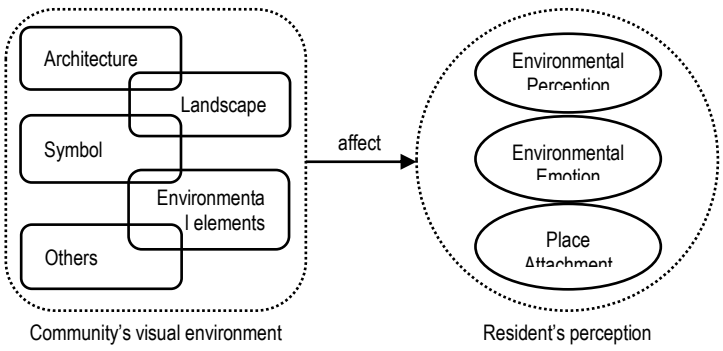

Fig. 1. Proposed hypothetical model for research.
(Source: Author)

3.0 Methodology

3.1 Study site

The study site is Tainan City, located in southwestern Taiwan (Figure 2). This city is known as the ancient capital of Taiwan, with old buildings associated with the development history of this land. Nowadays, about 1,884,284 residents are living here. From the 1980s,

the City government planned to develop this city with the industrial, commercial, financial centre. There are a lot of high rise buildings for the residential-business function or mixed residential-retail function. Also, many types of row houses, traditional and reconstructed housings. The people are interested in the landscape environment of Tainan because this city has a lot of green parks, open spaces, also many worth tourism locations, including the Beimen coast, Anping old fortress, a salt museum, and an art museum. Many residents, mainly in the fisheries industry and agriculture. The living of most families in the community is multiple generations. The characteristics are typical of residential environments in Tainan.

Based on the existing advantages, the government also gives the development policy to improve the landscape environment and enhance the life quality of the residents (Government, 2016). Thus, the Tainan City was suitable for this study.

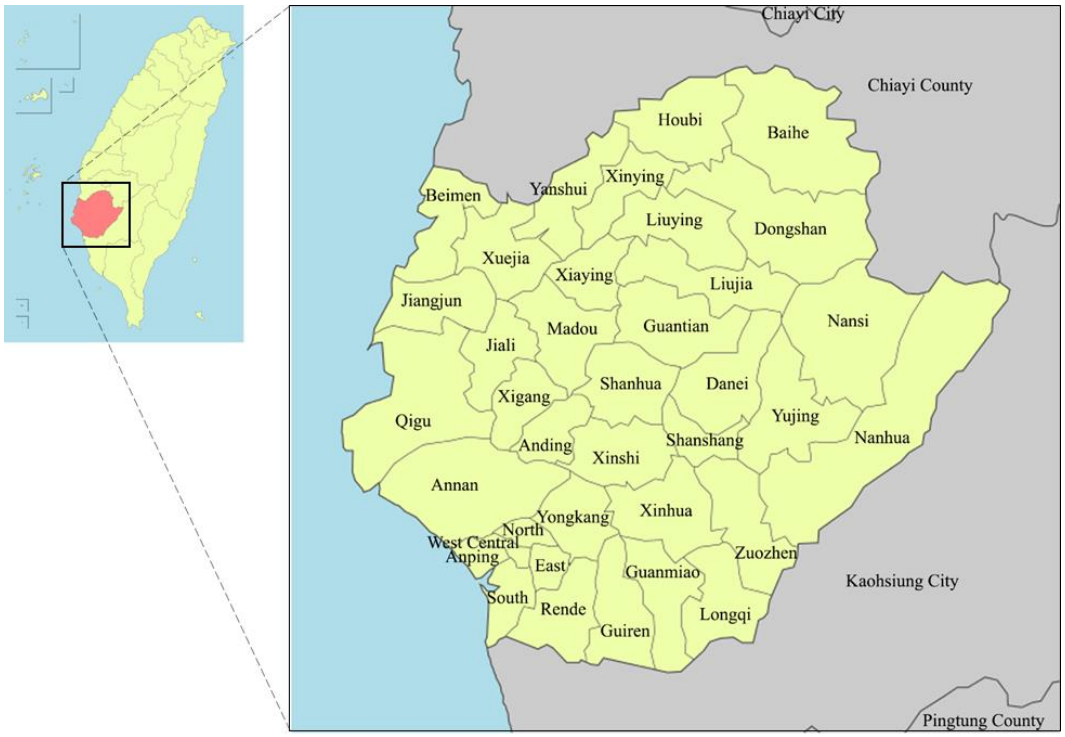

Fig. 2. Map of the study site.

3.2 Measurement of variables

The study designed the questionnaire to measure the residents' attention to the visual landscape elements by using a 5 point of Likert scale, including 1 represents "very weak attention," 2 "weak attention," 3 "ordinary," 4 "attention," and 5 "very strong attention."

In order to measure the observed variables of environmental emotion, the study provided nine questions in terms of the resident's daily feelings about the regional landscape, including sad and happy, low and excited, irritability and calm, tension and relax, oppression and free, anxiety and peace of mind, anxious and alleviate, emptiness and satisfy, alienation and close. The responders only choose one in five levels, including -2, -1, 0, 1, and 2.

Both items of environmental perception and place attachment were measured by using a 5 point of Likert scale, including 1 indicates "strongly disagree," 2 "disagree," 3 "normal," 4 "agree," and 5 "very agree."

3.3 Data collection

According to the population of 1.884.284, the research needs 384 required number of samples (Naing, Winn, & Rusli, 2006). After a face to face survey from April 30 to May 30, in 37 districts of Tainan City, the study collected the questionnaires relevant to the visual landscape element, and the human's environmental behaviours. There were 411 questionnaires collected, but 395 questionnaires were valid. The residents from under 20 up to over 65 years old were the responders.

3.4 Statistical analysis

The visual factors of the community environment and three essential resident's responses, including perception, emotion, and place attachment, were extracted by the exploratory factor analysis. By using the extraction method in the principal component, and the rotation method in varimax, the analysis process can achieve a simplified factor structure. Besides, the KMO and Barlett's test examined whether the observed variables are acceptable for factor analysis. In order to test the internal consistency of the new factors, the study assesses the value of Cronbach's alpha.

By using the multiple regression analysis, the relationship between the community environment's visual factors, and the resident's perception, emotion, and place attachment toward the environment was explored. Linear regression was used between them to define the effect of independent variables on dependent variables.

4.0 Results and Discussion

4.1 Profile of samples

The surveys were conducted from 8:00 am to 5:00 pm. Most of the men go to work; thus, the proportion of "female" was higher (63.29%) than "male" (36.71%) (Table 1). Respondents in the age group 20-30, 31-40, 41-50, and 51-64 were over 20%, whereas respondents below 20 were 2% because they spend the time learning. Besides, respondents above 65 were 10.89%; they were unwilling to answer the questionnaire because of their health.

There is a lot of military offices in Tainan; thus, the proportion of "military mission" was very high (31.39%), followed by "other," "service," "home management," "free working," and "retirement," they have graduated and work in offices or free trade. Therefore, the number of "staff," "other," and "free working" was very high. The proportion of the living time above 15 years was highest (59.75%), followed by 10-15 (10.38%), and 5-10 (9.62%). Based on the residence time, the characteristics of the samples were suitable for the study.

Table 1: The characteristics of samples.

Characteristic	Responder	Percentage	Characteristic	Responder	Percentage
Gender			*Position*		
Male	145	36.71	Staff	207	52.41
Female	250	63.29	Middle/ high-level supervisor	23	5.82
Age			Free working	56	14.18
Below 20	8	2.03	Other	109	27.59
20-30	100	25.32	*Religion*		
31-40	91	23.04	Tradition belief	104	26.33
41-50	72	18.23	Taoism	83	21.01
51-64	81	20.51	Christianity	17	4.30
Above 65	43	10.89	Buddhism	77	19.49
Education			No	107	27.09
Elementary school or below	17	4.30	Other	7	1.77
Secondary school	32	8.10	*Living duration*		
High school	112	28.32	Below 1	19	4.81
Graduate	172	43.54	1-3	31	7.85
Undergraduate	61	15.44	3-5	30	7.59
Career			5-10	38	9.62
Agriculture	4	1.01	10-15	41	10.38
Service	47	11.90	Above 15	236	59.75
Industry or manufacturing	16	4.05	Total	395	100
Business	21	5.23			
Military mission	124	31.39			
Student	27	6.84			
Home management	45	11.39			
Retirement	31	7.85			
Free working	31	7.85			
Other	49	12.41			

(Source: Author)

4.2 Item analysis and reliability analysis

After removing the item "interference," which has 0.076 of the corrected item-total correlation, lower than a threshold of 0.30 (Cohen, 1988; Cumming, 2013), the new Cronbach's alpha of the environmental perception was 0.872 exceed a threshold of 0.60 (DeVellis, 2003; Hair, Anderson, Babin, & Black, 2010), and all of the observed variables had the corrected item-total correlation exceed 0.30.

The Cronbach's alpha of both 26 observed variables of visual landscape environment, nine observed variables of the environmental emotion, and nine observed variables of the place attachment reached a value of 0.948, 0.934, and 0.903. On the other hand, the corrected item-total correlation of the items was higher than 0.30. Therefore, these items are acceptable for the exploratory factor analysis.

4.3 Underlying factors of community's visual landscape environment

The results in Table 2 indicated that the visual landscape of the community environment was extracted in four factors after three observed variables were removed including "building greening," "building façade opening," and "telephone poles," because their factor loadings are below than 0.50 (Hair et al., 2010). Moreover, the KMO value was 0.937 (sig. 0.000) more significant than a threshold of 0.50, and the eigenvalue exceeds 1.0, they determined that the observed variables are possible for the factor analysis (Hair et al., 2010).

The four underlying factors were explored and renamed as "architecture," "outdoor furnishing," "indicative symbol," and "healthy environmental element." Also, the analysis indicated that the values of Cronbach's alpha of the four new factors exceed 0.60 (DeVellis, 2003; Hair et al., 2010).

Table 2: Factor analysis of the visual environment of the community.

Item	Factor 1	Factor 2	Factor 3	Factor 4
	Architecture	Outdoor Furnishing	Indicative Symbol	Healthy Environmental Element

A1	Architectural shape	0.772			
A4	Architectural color	0.738			
A5	Building decoration	0.689			
A2	Building volume	0.670			
A3	Building material	0.636			
A7	Roof form	0.605			
A11	Space shape	0.575			
A14	Gazebo facilities (shield)		0.741		
A16	Outdoor furniture (seat, trash can)		0.725		
A15	Activity facilities (sports, physical facilities)		0.705		
A17	Outdoor light		0.630		
A13	Fencing		0.572		
A12	Size of space		0.547		
A10	Paving material		0.541		
A18	Indicator		0.536		
A9	Architectural lighting		0.533		
A20	Artwork			0.705	
A21	Landmark			0.645	
A24	Water Element			0.634	
A19	Advertising signboard			0.501	
A22	Sunlight				0.825
A23	Planting				0.667
A25	Pedestrian space				0.512
Number of Item		7	9	4	3
KMO and Barlett's Test, Extraction, Rotation		KMO=0.937	Sig = 0.000	Principal Components	Varimax
Eigenvalue		1.645	10.201	1.125	1.076
Cronbach's Alpha		0.877	0.903	0.800	0.680
Explained Variation (%)		18.928	19.758	11.462	10.928
Total Explained Variation (%)		38.686	19.758	50.148	61.076

(Source: Author)

4.4 The total effect of the community's visual factors on three environmental behaviours of residents

The visual factors of the community environment had a significant total effect on three environmental behaviours of residents with a medium effect size (Figure 3). The effect size of the visual factors on the environmental perception was largest, followed by on the place attachment, and then by on the environmental emotion.

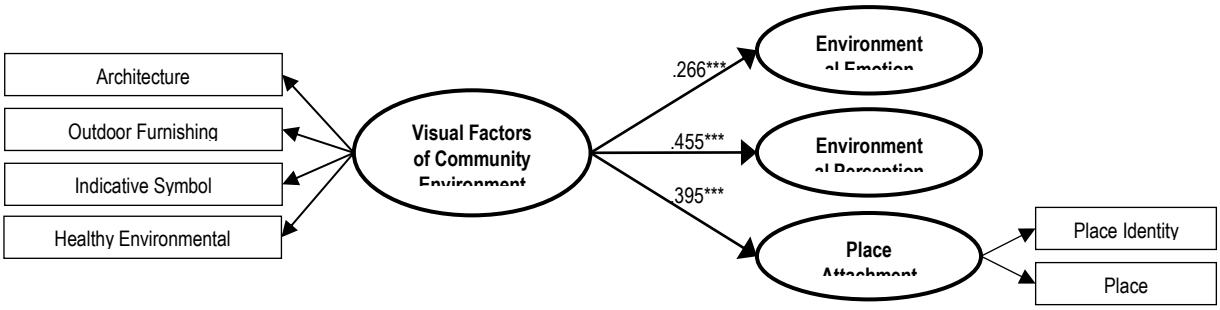

Figure 3: The total effect of the community's visual environment on three environmental behaviours of residents.
(Source: Author)

4.5 The relationship between the community's visual factors and the environmental perception

The regression analysis results found the relationship between the architecture, outdoor furnishing, indicative symbol, healthy environmental element, and environmental perception. Table 3 indicated that only "outdoor furnishing" and "healthy environmental element" had significant effects. In detail, the analysis demonstrated that "outdoor furnishing" had the most substantial impact value of 0.296, followed by "healthy environmental element" with a value of 0.250. Both of these factors reached the medium effect size.

The study pointed out that the outdoor furnishing and healthy environmental elements are the two critical visual factors of the community environment, which can strongly impact the residents' environmental perception. According to the study of Abu-Ghazzeh (1999), pedestrians' outdoor space provides interaction among the people (Abu-Ghazzeh, 1999). Additionally, the sense of planting in the landscape environment is the most significant impact on human perception, including the perceived change and the development change (Zhang et al., 2018). However, in this study, these physical elements are extracted into the healthy environmental element.

Table 3: The relationship between the visual factors of community and environmental perception

Dependent Variable	Independent Variable	Standardized Coefficients Beta	t - Value	Sig.
Environmental Perception	Outdoor Furnishing	0.296	3.808	.000
	Healthy Environmental Element	0.250	4.336	.000
	Adjusted R Square = .229		P = 0.000	

(Source: Author)

4.6 The relationship between the community's visual factors and the environmental emotion

The regression analysis process to explore the relationship between the visual factors of the community environment and environmental emotion revealed that only "outdoor furnishing" has a significant effect (0.282). The effect size was medium (Table 4).

Table 4: The relationship between the visual factors of community and environmental emotion

Dependent Variable	Independent Variable	Standardized Coefficients Beta	t - Value	Sig.
Environmental Emotion	Outdoor Furnishing	0.282	5.817	0.000
	Adjusted R Square = .077		P = 0.000	

(Source: Author)

The result showed that only outdoor furnishing is a significant impact on environmental emotion. As the study of Denes (1993), the furniture in the outdoor environment includes the gazebo facilities, fencing, outdoor light, which are the man-made can inspire the people as well as attract the imagination (Denes, 1993).

4.7 The relationship between the community's visual factors and the place attachment

The regression analysis indicated that only "architecture" and "indicative symbol" have significant effects in the relationship between the visual factors of the community environment and place attachment. The result is shown in Table 5. The effect size of these factors was small. Ranking from high to small effect sizes was "architecture" (0.163) and "indicative symbol" (0.157).

Additionally, the place attachment includes two factors: place identity and place dependence. The effects of the visual factors on the two factors of place attachment were the same. Moreover, the architecture factor influenced both the place identity and place dependence.

Table 5: The relationship between the visual factors of community and environmental place attachment

Dependent Variable	Independent Variable	Standardized Coefficients Beta	t - Value	Sig.
Place Attachment	Architecture	0.163	2.362	0.019
	Indicative Symbol	0.157	2.316	0.021
	Adjusted R Square = 0.151		P = 0.021	
Factors of Place Attachment				
Place Identity	Architecture	0.159	2.266	0.008
	Adjusted R Square = 0.127		P = 0.008	
Place Dependence	Architecture	0.143	2.049	0.041
	Indicative Symbol	0.174	2.549	0.011
	Adjusted R Square = 0.134		P = 0.011	

(Source: Author)

The architecture factor and indicative symbol had a significant impact on the place attachment. Low & Altman (1992) and Giuliani (2003) pointed out that the people desire to live or return if they feel the uniqueness of the place (Maria Vittoria Giuliani, 2003; Low & Altman, 1992). The architecture can transport the specific characteristics of a place through the architecture shape, the material, the colour, and the decoration. Moreover, the indicative symbol includes the artwork, landmark, and advertising signboard, which affect the landscape emotion. They are considered as the uniqueness, which supports the people to distinguish the other places and lead to the place attachment (Jorgensen & Stedman, 2001; Stedman, 2002).

4.8 The scope of the impact of four visual factors on the resident's environmental behaviour

Table 6 showed the scope of impact of the four visual factors on the resident's environmental behaviour. The outdoor furnishing and healthy environmental element strongly affected the environmental perception, whereas the architecture and indicative symbol were a significant impact on the place attachment. Besides, the result indicated that only outdoor furnishing influences environmental emotion.

Table 6: The Impact of four visual factors on human perception toward the environment

Independent Variable	Environmental Perception	Environmental Emotion	Place Attachment	
			Place Identity	Place Dependence
Architecture			○	○
Outdoor Furnishing	●	●		
Indicative Symbol				○
Healthy Environmental Element	●			

○: significant impact; ●: impact greater than 0.250

(Source: Author)

4.9 Limitations

Because of the cross-section investigation, the survey had some limitations due to time and place, sample sampling methods and respondents.

5.0 Conclusion & Recommendations

The study's results showed that the visual landscape of the community environment included four underlying factors. Each visual factor revealed the different impacts on the resident's environmental behaviours, including perception, emotion, and place attachment.

In details, the outdoor furnishing was the strongest influential, followed by the healthy environmental element. These two factors had a medium effect size on environmental perception. Besides, the architecture factor and indicative symbol influenced the place attachment. Therefore, by community environment design, the architecture factor plays a vital role in the consolidation of the attachment

to the place where the people live or experience. Moreover, the outdoor furnishing and healthy environmental element especially should be the most priority in the construction of the community environment to become more attractive as well as increase the life quality of the residents. The results of this study could be considered as the new directions for further research.

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