

THE RELATIONSHIP BETWEEN SYSTEM ARRANGEMENT OF PUBLIC OPEN SPACE AND LIVABILITY BASED ON USER PERCEPTION IN PUPUTAN BADUNG SQUARE DENPASAR

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ABSTRACT

Puputan Badung Square is a public open space located in central city of Denpasar. Based on initial observation, it is seen that the open space is lack of seating, vegetation, night lighting and cleanliness. Community activities occur only in some areas and at certain times. If the condition persists, it will impact the public open space role as a place to socialize for urban communities. There are several elements that affect the existence of open space including the system arrangements or the physical elements and activities in addition livability or non-physical elements. The study aims to determine the relationship between two variables, system arrangements and livability as well as the user's perception of the factors influencing the composition of open space. This study takes a case study at Puputan Badung Square. The method used is the qualitative method through field observations and place centered mapping. Furthermore, the quantitative methods using a questionnaire with samples were chosen from open space users selected through purposive random sampling techniques. Data were analyzed with SPSS correlation. The results of this study show a strong and significant correlation between the system arrangement and livability. Major elements forming the system arrangements can improve the comfort of activity as forming livability. The main factors which establish the physical elements such as vegetation shade, seating, lighting, playing and exercising area, while nonphysical factors formed a good perception such as legality of place, cleanliness, security, diversity of activities both physical and social, including religious or rituals and functional activities performed periodically.

Keywords: Livability; Public open space; Puputan Badung Square; System arrangement

1. INTRODUCTION

Puputan Badung Square, also known as I Gusti Ngurah Made Agung's Square, is a public open space that has a historical background. It was built to commemorate the local war in 1906 when the Dutch attacked Denpasar. The unpleasant of availability and conditions of the element setting, especially the physical setting makes user activities become uncomfortable. The minimum lighting condition makes the activity does not last long, so that the area gradually becomes desolate. The existence of trash scattered like skewers, food wrappers, even drinking bottles lowered the quality of cleanliness and endangered the user activity. Puputan Badung Square as a public open space does not accommodate the basic needs for users. As stated by Carr (1992), a public open space should meet the criteria of the requirement of human needs. The better the physical structure means the better quality of the activity and vice versa. Haryadi

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2010:28 has confirmed the link between physical and non-physical arrangement to form a certain behavior setting, namely a series of physical elements that have a certain relationship and linked up can be used for a particular activity. The quality of public open space is very important to support the diversity of activities including social and religious activities. The public open space could be a place for national events, community identity, and expression of an urban culture (Carr and Francis, 1992). Arrangement of the open space can have an impact on the level of high quality assessment of public open space; finally, it will attract people to come in to the public open spaces (Gehl, 1996).

It is perceived that there is a tendency of users dominated by specific age groups such as youth activities has created the impression among the public that Puputan is unpleasant for them. Assessment of these conditions becomes an encouragement which can improve the perception among variety of users. Stimulus can be sourced from vision, smell, and touch (Bacon 1992 in Carmona, 2010: 111). Poor environmental conditions for doing activities could create a worse perception for users so that it might threaten the sustainability of public open space utilization in Puputan Badung Square in the future. It is known that a good public open space can contribute to the area and the surrounding environment. The public open space also gives a contribution to economic aspect as it could provide economic activities, furthermore, enhance the property's value (Irwin, 2002; Lutzenhisher and Netusil, 2001; Jim and Wendy, 2006, 2007). Therefore it is important to examine the relationship of system arrangements and livability perception and thus, the planning for a good quality public open space can be taken into account.

2. METHODOLOGY

2.1 Literature Review

a. System arrangement

Schoggen (1989) in Sarwono (2001: 24) states that the notion of setting order is defined as an environment that can affect human behavior. System arrangement can be interpreted as an order of the environment in which there are elements that are interrelated that form a totality affected human behavior while moving around in it. Barker and Wright (1968) in Laurens (2004: 133) state that the important criteria to establish a system arrangement include place, activity, time and behavior of people.

b. Livability

Livability is the level of amenities of a person or community carrying out daily activities in a region (Pramudito 2013: 18). Furthermore, Carr (1992: 318-324) states that livability of a public open space must meet four aspects namely: human need, protection of user rights, things that can be communicated, and maintenance.

In addition, Sahasrabudhe (2011) mentions that there are several aspects that must be met in order for a public open space to have a good condition of livability, namely: good accessibility, self-assurance, visible activity, comfortable, legibility and recognizability, and an opportunity of social interaction.

c. Perception

According to Atkinson, Rita, et al (1983) in Suryat (2013: 31), the perception is the process of organizing and interpreting and environmental inducement. According to Haryadi (2010:29), perception is an interpretation of a given set by the individual. In addition, Haryadi 2010: 30-31 mentions two aspects are included in the study of perception, namely the process of cognition (acceptance, understanding, thinking

about the environment) and affective (feelings, emotions, desires and values about the environment).

2.2 Methods

The methods used in this study are qualitative and quantitative with rationalistic approach. Qualitative methods were used for field observations to determine the condition of the system arrangement and livability. Place centered mapping is used to determine the position of the dots that represent the activities which dominantly occupied within the specified time period, i.e. during weekdays (Monday-Friday) and weekends (Saturday-Sunday), where each time period is divided by four periods of observation i.e. morning (6:00 to 10:00 pm), daytime (10:00 to 15:00 pm), afternoon (15:00 to 18:00 pm) and evening (18.00-24.00 pm). Meanwhile, the livability gradation map is used to determine the fluctuating scale of a group of users that represent a dominant activity observed with the similar time period on the place centered map. Quantitative methods were employed to determine the relationship between the system arrangements with livability through questionnaires of perception that were processed with SPSS 19 using Spearman-rho correlation. Rationalistic approach was used as a basis for preparing the theoretical constructs or statement on a questionnaire of perception which is compiled using a Likert scale (Strongly Agree (SS), Agree (S), Neutral (C), Disagree (ST) and Strongly Disagree (STS). Sample in this research was determined by using purposive sampling technique to the population of open spaces users (not vendors). Samples are selected randomly which represent the dominant activities such as sports, recreation, playing and chatting with other users in the age category of youth and adults as well as male and female categories.

2.3 Variable of Research Component

The independent variable is the system arrangement. The indicators of this variable element consist of physical and non-physical elements. Physical elements include vegetation, lighting, seating, signage, and a litter box, while the non-physical elements include: activities, places, times, and persons. The dependent variable is the livability of public open space. The indicators of livability include: comfort, legibility, security, visibility, sociality, and control of activity.

In this study, the relationship between the system arrangement and livability with the perception approach are structured variable as follows:

Table 1 Variables, Indicators and Research Parameters

No.	Variables	Indicators	Parameter
1.	System arrangements (Independent Variables)	<ul style="list-style-type: none"> Activities, Time Activities, Outdoor activities, Users (<i>non-fixed feature</i>) physical elements: seating, garden lighting, vegetation, trash, gazebo (<i>fixed feature & semi-fixed feature</i>) 	<ul style="list-style-type: none"> Social and physical activities, need for activity, activity period , Physical character condition
2.	Livability (Dependent Variables)	<ul style="list-style-type: none"> Aspects of users protection (security) Quality comfort Aspects of visibility and legibility Aspects of sustainability 	<ul style="list-style-type: none"> Quality: comfort, accessibility, activities, security, visibility, sociality, adaptability, control, legibility, value Circulation roads, vegetation,

- | | |
|---|---|
| <ul style="list-style-type: none"> • The functional aspects • Ecological Aspects • Aspects of perception | land cover, seating, lighting, complementary elements (bins, public phones, flower pots, flagpole, sculpture), signage. |
|---|---|

3. RESULTS

3.1 Validity of Test Results

According to the table 2, the results show the comparison between corrected Item-Total Correlation and r table for system setting;

Table 2: Validity of Test Results for system setting

<i>Item</i>	<i>Corrected Item-Total Correlation</i>	<i>Comparison Corrected Item-Total Correlation and r table</i>	<i>Note</i>
X1 (+)	,144	0,144 < 0,2787	Not Valid
X2 (+)	-,136	-0,136 < 0,2787	Not Valid
X3 (+)	,343	0,343 > 0,2787	Valid
X4 (-)	,226	0,226 < 0,2787	Not Valid
X5 (+)	-,002	-0,002 < 0,2787	Not Valid
X6 (-)	,244	0,244 < 0,2787	Not Valid
X7 (+)	,321	0,321 > 0,2787	Valid
X8 (+)	,393	0,393 > 0,2787	Valid
X9 (+)	,398	0,398 > 0,2787	Valid
X10 (-)	-,112	-0,112 < 0,2787	Not Valid
X11 (+)	,396	0,396 > 0,2787	Valid
X12 (+)	,354	0,354 > 0,2787	Valid
X13 (-)	,301	0,301 > 0,2787	Valid
X14 (+)	,315	0,315 > 0,2787	Valid

The questions are valid in the system variable setting of X3, X7, X8, X9, X11, X12, X13 and X14, while invalid for X1, X2, X4, X5, X6 and X10. The results of comparison between corrected Item-Total Correlation and r table for livability are shown in Table 3.

Table 3 Reliability Test Results for livability

<i>Item</i>	<i>Corrected Item-Total Correlation</i>	<i>Comparison Corrected Item-Total Correlation and r table</i>	<i>Note</i>
Y1 (+)	,295	0,295 > 0,2787	Valid
Y2 (+)	-,094	-0,094 < 0,2787	Not Valid
Y3 (+)	,510	0,510 > 0,2787	Valid
Y4 (+)	-,028	-0,028 < 0,2787	Not Valid
Y5 (+)	,019	0,019 < 0,2787	Not Valid
Y6 (-)	,193	0,193 < 0,2787	Not Valid
Y7 (-)	,084	0,084 < 0,2787	Not Valid
Y8 (+)	,207	0,207 < 0,2787	Not Valid
Y9 (-)	-,276	-0,276 < 0,2787	Not Valid
Y10 (+)	,249	0,249 < 0,2787	Not Valid
Y11 (-)	-,287	-0,287 < 0,2787	Not Valid
Y12 (+)	,383	0,383 > 0,2787	Valid
Y13 (+)	-,012	-0,012 < 0,2787	Not Valid

Y14 (+)	,105	0,105 < 0,2787	Not Valid
Y15 (-)	-,075	-0,075 < 0,2787	Not Valid
Y16 (+)	,367	0,367 > 0,2787	Valid
Y17 (+)	,263	0,263 < 0,2787	Not Valid
Y18 (+)	,314	0,314 > 0,2787	Valid
Y19 (+)	,343	0,343 > 0,2787	Valid
Y20 (+)	,348	0,348 > 0,2787	Valid
Y21 (-)	,187	0,187 < 0,2787	Not Valid

Based on validity test, it is found that a valid variable of livability variable is in Y1, Y3, Y12, Y16, Y18, Y19, and Y20 while the rest is not valid with the value of Corrected Item-Total Correlation less than 0.2787. Thus, the invalid items are not included in subsequent studies.

3.2 Reliability Test Results

The results of reliability test of arrangement system variable which were valid show the Cronbach alpha value of 0,729 (> 0.6 = reliable).

Reliability Statistics

Cronbach's Alpha	N of Items
,729	8

Figure 1 Reliability Test Results for System Setting

The results of reliability test of system variable settings to the questions were valid with the Cronbach alpha value of 0.727 (> 0.6 = reliable).

Reliability Statistics

Cronbach's Alpha	N of Items
,727	7

Figure 2 Reliability Test Results for livability

3.3 Conditions of Livability in Puputan

Puputan Livability conditions on the field can be seen from the observation of the activities occurred. Sports activities performed by users in general are sport jogging, street workout, indoor soccer, yoga and cycling. Playing activities that are seen are light activity such as playing chess and the kid's games on the playground. Recreational activities are generally carried out by more than two people either with family or friends. Other activities are just chatting, these activities either unplanned or accidental.

From the observation it is found that the conversation activity happens all the time both on weekdays and weekends. While the workout activity overall has an activity time till afternoon at both time periods on weekdays and weekends, while the kid's playing activity on playground area has a longer time possibly until night. These conditions are found on weekdays.

Recreational activity cannot be found on weekdays but it is seen on a holiday or weekends. Playing chess activities are found in the eastern side of the field both on weekdays and holidays, both lasted from morning until late afternoon. Street workout activity was not done during the day in both time periods. Yoga activities can be found only on weekdays, especially in the afternoon. Soccer occurred in the morning and afternoon at both time periods.

3.4 Condition of System arrangement In Puputan

The condition of system arrangement can be seen in Fig. 3 which shows the settlement layout of Puputan field. From these images, it is seen that the placement of physical component between one and the other is adjacent to each other and occupies a certain area. The existence of the physical component as a backup facilities can be used to examine the layout of placement of physical setting related to the non-physical setting, in this case is the existence of the activities supported by these facilities. The condition of setting system elements, especially in the physical setting as shown in Fig 3 shows that the vegetation shade is found around the field with a density level of sufficiently high. The existence of a pool on the North side indicates the position where the Statue Puputan established. On the side of the North, East and South it is visible that the arrangement of seating facilities are designed under the shade of vegetation. Facilities such as lighting and garden lights are placed on the pedestrian path around the field and the rests are placed as general lighting on the field. The trash bins scatter over several locations which are generally located in the crowded area. Amenities shading only on the three areas: two on the North side and one on the East side. Playing facilities located on the west side are marked with the shading of vegetation. Amenities seating takes place near the parking area of special vehicles. Sports area is located in the South West square.

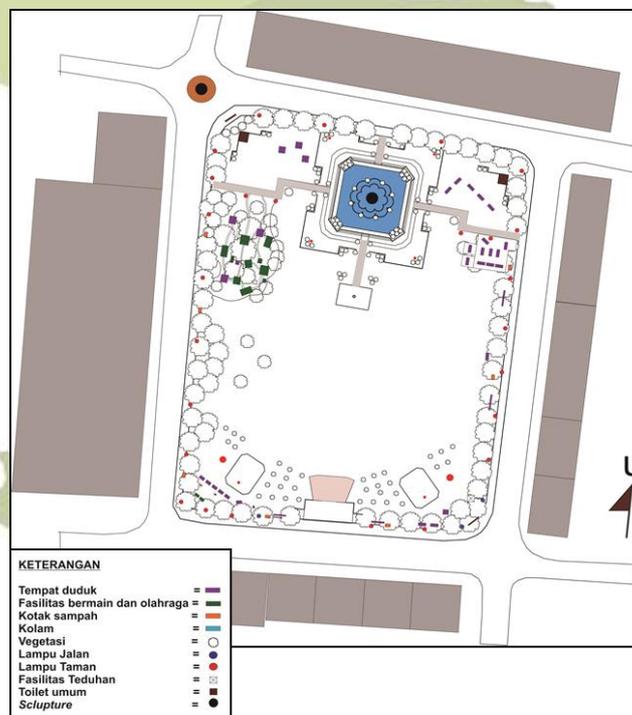


Figure 3 Layout Arrangement in Puputan Badung Square

3.5 Perception Assessment of System Arrangement and Livability

The lowest ratings perception is presented in item X13 on the perception of system arrangement with a mean value of 2.74, while the highest value is found in X3 and X8 with the value of 4.26. It is regarding their impression that Puputan square is memorable and is functioned as a public open space for functional activity and religious rituals. The highest value on the perception livability is presented in item Y1 at 4.38 which is related to the perception of comfort that can support the establishment of neighborhood vitality.

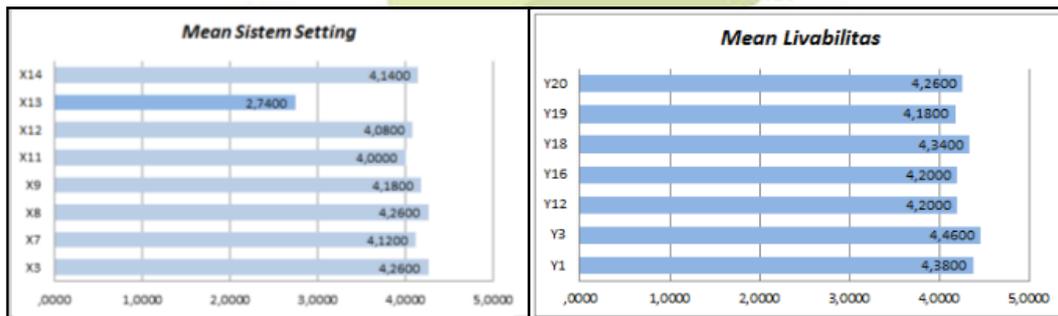


Figure 4 Mean of System arrangement and Livability

3.6 Correlation Test Results

The correlation between the perception of system arrangement and the perception of livability of user can be determined by correlating the relationship between these two variables which are independent variable and dependent variable using a linear bivariate correlation measurement. The used perception scale is Likert scale, in this matter is classified as the ordinal scale thus the analysis used the Spearman's rho.

Correlations			TOTAL_X	TOTAL_Y
Spearman's rho	TOTAL_X	Correlation Coefficient	1,000	,799 ^{**}
		Sig. (2-tailed)		,000
		N	50	50
TOTAL_Y		Correlation Coefficient	,799 ^{**}	1,000
		Sig. (2-tailed)	,000	
		N	50	50

** .Correlation is significant at the 0.01 level (2-tailed).
Sumber : Analisis SPSS 19, 2014

Figure 5 SPSS Results of Correlation Test

Based on the analysis, the correlation coefficient of X and Y by 0.799 or 79%. It can be concluded that there is a strong positive correlation of strong correlation (from 0.6 to 0.799) and significant correlation due to the significant value of $0.00 < 0,05$ (5%).

4. DISCUSSION

4.1 Perception of System Arrangement and Livability

The perception ratings of users on the system arrangement as shown in item X3. It means the impression that the area is so easy to remember. It is proved that the existence of the physical element in the Puputan field can facilitate users to

remember the area. The existence of the physical elements such as landmark Statue of Puputan and Chess Face Sculpture are used as a bookmark by the user to remember the location of the square when a person wants to get there. This is proved in item Y18 in which there is the statue in Puputan field that can become an icon that allows users to remember the area. The existence of religious buildings such as Pura Jagadnatha poses a great influence in increasing the activity in Puputan field as proven in the user's perception ratings in item X8 which was the highest. The majority of users agree when they were asked about the condition of the field. Puputan field is often used for functional activity and religious rituals. Public open space is a place to celebrate the cultural distinction (Thompson, 2002).

The existence of street furniture, especially the vegetation dense is able to increase the sustainability of the activity because the circumstances vegetation is comfortable for the users. This will be able to influence the user's perception ratings as shown in items X14 and X12. Leisure activities as major aspects in forming livability area, evidenced by perception livability scores, were seen in item Y1. The users agree with the establishment of comfort which strongly supports the establishment of livability. Comfortable condition felt by the users will make the place be more livable. The second aspect that supports livability is the legibility condition which means that a region can support established vitality of the area. With an increase of facilities such as road conditions and signpost, the more users will come. The control activity is there a feeling of security as seen in item Y20. Puputan field as an open space is socially important for the community. As seen in item Y16, its existence is important to social services. It is needed by the society as a means to simply chat or do other activities.

4.3 Relationship between System Arrangement and Livability

The function of the region that supports passive activity such as relaxation and enjoying scenery (X11) is supported by the availability of elements of street furniture such as seating, availability of play and sport grounds and the condition of the vegetation that provides cooling and adequate illumination (X12). These can support the establishment of comfort (Y1 activity) including environmental cleanliness condition (Y3) The open space becomes a place to do sports and many other physical activities to support physical health (Sugiyama, 2010; Franzini *et al*, 2009; Maller *et al*, 2009). Unfortunately, the quality of lighting (X13) is lacking. This is capable of lowering the assessment in perception of system arrangement.

Legibility of area that are capable of supporting vitality (Y19) and the presence of the sculpture Puputan as landmarks area (Y18) where the statue is a part of street furniture elements (sculpture) that very easy to spot (X12). This element is easy to remember (legible) so it will give the impression to a user that the area is easy to spot and recognize (X3).

The condition of the control activity (Y20) influences each other, including the passive activities such as enjoying the view (X11). These activities are performed in conjunction with other activities that vary (X7), including the religious activities which are conducted periodically (X8). When these variety of activities are properly controlled, the activities over time can be supported. The public open space could be a place for national events, community identity, and expressing an urban culture (Carr and Francis, 1992). The function of public open space used as social facilities (Y16) is supported by the function as a means of activities which vary to support the

vitality of the region (X7) for both passive activity (enjoying the scenery) (X11), in the form of individual and group (X9), as well as functional activities and religious rituals (X8), is strongly influenced by the presence of dense vegetation as a shade (X14) at the time of the activity. This can create a comfortable atmosphere (Y1) which supports the function of the area as a public open space. In social aspect, public open space is a free access for people to enter, to meet each other and to perform social interaction (Zhang, 2009).

5. CONCLUSION

5.1 Condition of System Arrangement and Livability in Puputan Square

Minimum lighting conditions affects the comfort of activity. That condition may limit the activities. Activities that can be done in the evenings such as exercising become stalled because they are not supported by good lighting conditions. Dense vegetation becomes an attracting factor for users to visit and do some activities in the field. Mild vegetation can support any activity during the day. The existence of supporting facilities such as playing facilities and sports facilities become an attraction for users so that when the condition and availability of components are upgraded, it may support the continuity of the activity.

5.2 Perception on System Arrangement and Livability

The study found that a major factor in shaping the good perception for a public open space is supported primarily by physical and non-physical elements. Physical element factors are the landmarks in the area which make it easier for the users to recognize and recall the area, dense vegetation, comfortable seating, the lighting fixture to increase the duration of activity until the evening, playing and sports facilities. In addition, non-physical factors are legibility of place, cleanliness, the need to control the activities, diversity of activities both physical and social including religious rituals and functional activity periodically.

5.3 Relation between System Arrangement and Livability

The relationship between the system arrangements with livability is a strong and direct relationship; this means that the effect caused by elements of the system arrangement can affect the level of livability of the area and vice versa. Thus, in planning a public open space, one should consider the presence of both major factors forming the system arrangements and livability so that the existence frequency of public open space can be sustainable over time.

7. REFERENCES

- Carmona, M., Heath, T., Oc, T., & Tiesdell, S. (2010). *Public Place Urban Space: The Dimension of Urban Design*. New York: Elsevier.
- Carr, S, Francis, M. Rivlin, L.g., and Stone, A.M. (1992) *Public Space*, Cambridge: Cambridge University Press
- Gehl, Jan; Gemzoe, Lars (1996) *Public Space – Public Life*. The Danish Architectural Press and Royal Danish Academy of Fine Arts School of Architecture Publishers. Copenhagen
- Haryadi, Setiawan, B. (2010). *Arsitektur, Lingkungan dan Perilaku*. Yogyakarta: Gadjah Mada University Press.
- Irwin, E., G. (2002) The Effects of Open Space on Residential Property Values. *Land Economics*.78: 465-480.
- Laurens, J. M. (2004). *Arsitektur dan Perilaku Manusia*. Jakarta: Grasindo.

- Pramuditho, S. (2013). *Master Theses: Optimalisasi Livabilitas Ruang Terbuka Publik pada Bantaran Sungai Winongo (kasus: Kampung Bangunrejo Kelurahan Kricak Yogyakarta)*. Yogyakarta: Universitas Gadjah Mada.
- Sarasbudhe, S. (2011). Exploring Landscape Approach Toward Livable Urban Environment. *Maharata*, 76-85.
- Sarwono, S. W. (2001). *Psikologi Lingkungan*. Jakarta : Gramedia.
- Sugiyama, Takemi; Francis, Jacinta; Middleton, Nicholas J.; Owen, Neville, Giles-Corti, Billie (2010) Association Between Recreational Walking and Attractiveness, Size and Proximity of Neighborhood Open Spaces, *American Journal of Public Health*, vol.100 no. 9, p 1752 – 1757
- Suryat, T. S. (2008). *Master Theses: Hubungan antara Setting Trotoar dengan Tuntutan Atribut Presepsi Pedagang Kaki Lima (kasus: Jalan Prof. H. Soedarso)*. Semarang: Universitas Diponegoro.
- Zhang, Wei; Lawson, Gillian (2009) Meeting and Greeting: Activities in Public Outdoor Spaces Outside High Density Urban Residential Communities, *Urban Design International*, vol 14, 4, 207-214

