

# PROCEEDING

ISBN : 978-979-3334-18-9



INSTITUT TEKNOLOGI SEPULUH NOPEMBER  
FAKULTAS TEKNIK SIPIL DAN PERENCANAAN  
JURUSAN ARSITEKTUR



IKATAN ARSITEK INDONESIA



**WRITER INDEX**

**International Conference  
Green Concept in Architecture and Environment**

No	Keynote Speaker	Title	Page
1	Peter Kellett, Elias Yitbarek Alemayehu	Sustainable Rural Housing and the Challenge of Climate Change: Experiences from Ethiopia	i
2	George Ofori	Green Concept in Building Construction	xvii
3	Regan Potangaroa	The Gabion House Revisited	xxxix

No	Author	Title	Page
<b>Sub Theme : Green Concept in Architectural Design</b>			
1	Ni Putu Aryani	Sustainable Architectural Design in a Traditional Balinese Housing in Accordance to the Concept of Tri Mandala	1
2	Ni Ketut Ayu Siwalatri	Sustainable Concept of Bali <i>Aga</i> Architecture	13
3	Titien Saraswati	Managing Green Architecture Through Life Style	29
4	Aprilia Fitriani	The Degradasi (Angle Degree, Gradien, Distance, Stem Diameter) Study of Mangrove <i>Rhizophora Apiculata</i> for Ecotourism Development Based on Mangrove <i>Rhizophora</i> Chitecture (MRAC)	39
5	Satya Wahyuputra Santosa	Rectorate Building Expansion Design in Support of ITS Eco Campus Principles with Solar Envelope Concept	47
6	Mohamad Muqoffa	Designing with Veranda in Javanese Architecture	59
<b>Sub Theme : Architectural Science</b>			
7	Ima Defiana	The Role of Housing's Rear Wall as Generating wind Velocity in Nighttime on Humid Tropic	69
8	Nurrahmi Kartikawati	Spatial Control to Reduce Urban Heat Island Effect in Urban Housing	79
9	Meivirina Hanum	Green Architecture and Energy Efficiency as a Trigger to Design Creativity: A Case Study to Palembang City Library	97
10	Yuswinda Febrita	Effectivity Wind Catcher at Housing in Limited Areas in Hot-humid Tropical Climate	115
<b>Sub Theme : Urban and Landscape Design</b>			
11	Astri Anindya Sari	Optimizing Urban Open Space as Students Favorite Places for Restoration	127



**INTERNATIONAL CONFERENCE  
GREEN CONCEPT IN ARCHITECTURE AND ENVIRONMENT**

No	Author	Title	Page
		Case Study of University Student in Bandung	
12	Himasari Hanan	Do Public parks create a Green Environment? Case Study: Taman Flora Surabaya	137
13	Bambang Soemardiono	Urban Sustainability Performance as the Framework in Evaluating Sustainable City	151
14	Nur Izzah Abu Bakar	Approaching Vertical Greenery as Public Art: A Review on Potentials in Urban Malaysia	173
<b>Sub Theme : Management and Urban Planning</b>			
15	Arif Kusumawanto	Green Urban Waterfront Management Case of Solo, Indonesia	195
16	Johannes Adiyanto	Understanding of Local Knowledge in Sustainable Development Toward Global Perspective (Exploration Studies of Javanese Culture)	215
17	Septiana Hariyani	The Assesment of Connectivity Indexes as Road Network's Parameter of Sustainability in Malang City	227
<b>Sub Theme : Human Settlement and Environment</b>			
18	Mirza Fuady	Green Structure Concept in Coastal Settlement of Banda Aceh	239
19	Winny Astuti	Community-based Sanitation Program (Sanimas) as an Effort for Improving Environment Quality in Urban Slums Settlement	251
20	Amalia Nur Indah Sari	Eco-housing Concept in Coastal Settlement jatirejo Village, Pasuruan regency, East Java	263
21	Shirleyana	The Possibility for Public Green Open space Provision in Informal Settlement Case Study of kampung Kejawan Lor, Surabaya	275
22	Nurul L. Hasanuddin	How Green is the Condition of Low Income Informal Settlement? Case Study: Fishing Village in Keputih, Surabaya	289
23	Anizah Mohd Salleh	The Environmental Benefits of Agroforestry Systems in Relation to Social Sustainability	301
24	Edward Syarif	The Settlement Pattern of Mariso Waterfront to the Environmental Condition	319
25	Rusli	Green Concept Settlement that supports Ecosystem Based on Coastal Ecotourism in Donggala	333
26	Palupi Sri Narisywari	Green Concept of kampung Mangrove Gunung Anyar Tambak in Supporting Sustainable Settlement	345
27	Rita Ernawati	Sustainable Settlement through Green <i>Kampung</i> Approach	359
28	CE. Mediastika	Trend on the Lack of Private Open Space in	369

**INTERNATIONAL CONFERENCE  
GREEN CONCEPT IN ARCHITECTURE AND ENVIRONMENT**



No	Author	Title	Page
		Several Contiguous Housing in Sidoarjo	
29	Luluk Mawardah	Residential Comfort Living on Flat for Urban Community/Families Low Income	381
30	Wiwik Setyaningsih	The Application of the Concept of Eco Green-tourism in Developing the Tourist Village through the Low Impact Development	393
<b>Sub Theme : Theory and History of Architecture</b>			
31	Sherly de Yong	Panopticism Exploration in Sustainable Development	409
<b>Sub Theme : Real Estate Design and Management</b>			
32	Ricca Agnesia Alamsyah	Market Awareness in Sustainable Housing: Past, Present and Future Research	419
<b>Sub Theme : Building Construction</b>			
33	Rabbani Kharismawan	The Uniqueness of Mayangkara House Roof Construction as Part of the Tropical Climate Response in Indonesia	425
34	V. Totok Noerwasito	Effect of Ceiling Height in the Compressed Earth Block Walled Building on Embodied Energy and Heat Energy Case Study Simple House in Surabaya	437

**International Conference  
Green Concept in Architecture and Environment**



**Keynote Speakers  
Green Concept in Architecture and Environment**

**Department of Architecture ITS Surabaya, September 2013**



## TREND ON THE LACK OF PRIVATE OPEN SPACE IN SEVERAL CONTIGUOUS HOUSING IN SIDOARJO

CE. Mediastika

Department of Architecture, Petra Christian University

Jalan Siwalankerto 121-131 Surabaya Indonesia

Email : eviutami@petra.ac.id

### ABSTRACT

*Limited proportion between built area and open space of house-lots in housing district seems to become trend in some housing. Within period of occupancy, house-owners are continuously requiring more rooms. A common solution is to transform available open space in the lot into building. Several contiguous housing in Sidoarjo Regency, comprises of low-to-medium and medium-to high housing types was studied to learn on the trend. The study concluded that definition of low-to-medium and medium-to-high class housing was a correct term here. In average, respondents had duration of occupancy of 15 to 20 years and most were undertaken housing extension. From 83 respondents out of 170 suspected houses of having insufficient open space was significantly proved that the extension leaved open space toward 0%. This means that lack of private open space is a factual trend here. When lack of open space is a trend, we may easily suspect that green open space is in similar term.*

*Interesting phenomenon was found that apart from good level of early and prior awareness on the necessity of open space, average respondents had significantly lower early knowledge on the importance of open space especially in term of providing rainwater absorption bed. Their knowledge increased gradually currently. However, their current knowledge was still lower than their awareness. This finding is expected to be useful in planning further stage of community outreach to give informal lecture among community due to actual procedure in fixing open space inexistence, especially to further generation.*

**Keywords:** house-lot, house extension, open space

### INTRODUCTION

Demand on more and bigger room within house has triggered house-owner to extend their house both horizontally and vertically. Unprepared building sub-structure to bear additional upper structure of two-storey or more buildings leads to horizontal extension as a trend. Horizontal building extension on limited house-lots of housing resulted in insufficient open space. This seems becoming trends in



**INTERNATIONAL CONFERENCE  
GREEN CONCEPT IN ARCHITECTURE AND ENVIRONMENT**

Indonesian house-lots. The trend was suspected as a cause of limited awareness and knowledge among house-owners on the necessity of green open space or simply opens space around houses.

House with sufficient open space will gain many benefits, such as day-lighting and natural ventilation for most of its inner rooms. When the open space is green, it will also provide absorption bed for rainwater harvesting which is constantly redundant during rainy season in Indonesia. House without sufficient open space has significant contribution to local puddle. When houses with insufficient open space are majority in a housing region more puddles toward flood are likely to happen.

Issue and discussion on green open space or open space within private property is very limited. We mostly discuss on the necessity of public green open space and slightly disregard the benefits of private green open space or just open space (OS). A green OS in a private lot is never been any bigger than that of public OS. But, a multiple effects of this insignificant dimension will play a role on the availability of sufficient open space for urban region. That is, a research to study the main cause of lack of private OS is reported here.

## **OBJECTIVE**

The study was aimed to learn on how house-owners having decision on extending their house. In detail the study would see whether there is any correlation among buildings' extension and duration of occupancy, economic class or income, awareness and knowledge on the necessity of private OS. The finding will be use to educate younger generation on the importance of OS through informal classes.

## **THEORETICAL APPROACH**

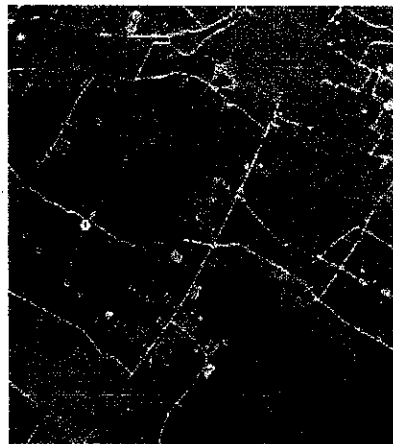
Study by Lacy (1990) has reported that clustered houses with protected OS were appreciated higher by market than those of single conventional housing with larger private yards. This case might not be similar to that in Indonesia. It is suspected that housing with both public open space and sufficient private OS is more appreciated and expected here. This opinion is supported by Connel and Walls (2005) who revealed that OS values are case study-specific. Particular OS area or set of areas is unique to a particular region and time period. Notions of beneficial effects of nearby green space have persisted throughout history, especially to improve people's health and well-being by providing restoration from stress and mental fatigue (Groenewegen, 2006). A research comparing residents with a view of urban greenery to residents without such view showed that those with view gain better well-being (Kaplan, 2001). Moreover, a research has shown that views of nature can improve feelings of neighborhood safety and even lead to decreases in aggression and crime rates (Kuo and Sullivan 2001 a and 2001b). With these so many benefits, it is expected that house-owners are aware and possess knowledge on how OS shall be provided within house-lots. Awareness and knowledge is expected to be effective instrument to fix the trend.

**DEPARTMENT OF ARCHITECTURE ITS SURABAYA**  
*September 26, 2013*

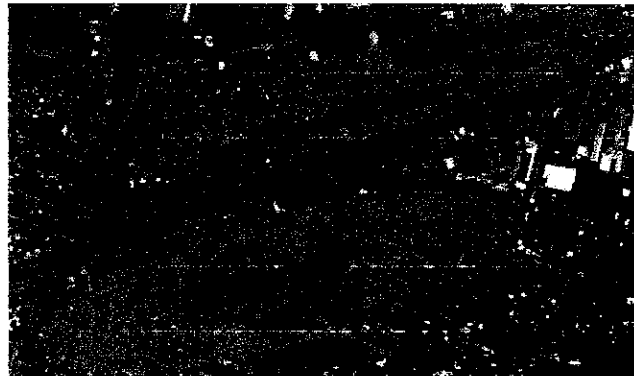


## **METHODS**

The study was conducted as quantitative field survey. Questionnaire was developed as an instrument to collect the data. Respondents were limited to house-owners of several contiguous housing in Sidoarjo, Indonesia. It was Wisma Beringin, Kemendung Indah and Citra Harmoni (Figure 1, Figure 2, and Figure 3). The first two housing was expected to represent low-to-medium class housing, whilst the last was for medium-to-high class housing. The housings were selected based on the constant issue of the existence of local puddle during rainy season. Borderless-contiguous mixed of low-to-medium and medium-to-high class housings was also an issue to determine the research site. Richness of housing types will benefit the study to learn whether monetary factor exists toward decision on building extension.



**Figure 1.** Research site.



**Figure 2.** Contiguous housing of research site.

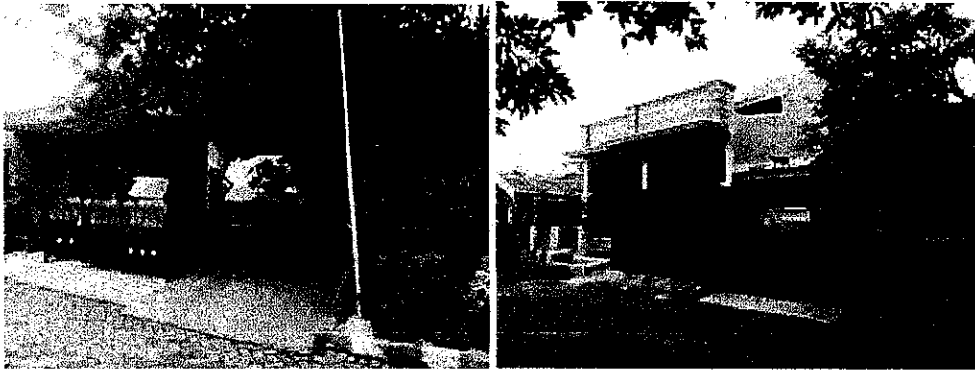
The questionnaire was developed using Likert's scale-like method, as the Likert's might not be use in full term. Likert's scale is a widely used method to study people's opinion on such issues. It usually scores from nethermost to





**INTERNATIONAL CONFERENCE  
GREEN CONCEPT IN ARCHITECTURE AND ENVIRONMENT**

uppermost, such as from "very disagree" to "very agree". It may be scaled from 1 to 5 or 1 to 7 for more detail. As this study was not merely learning on people's opinion, but more of studying on the causal effects of an action, the Likert's was modified to fit the expected data. However, the modification was developed as close as possible to the Likert's.



**Figure 3.** Example of house in Kemendung Indah Residence with full-front roofing. The roofing exaggerates on to the street kerb side.

There were dependent and independent variables prior constructing the questionnaire refer to Table 1. The dependent was building extension on the house-lots, whilst the independents were duration of occupancy, monthly income, and early and current awareness and knowledge on the necessity of green OS. These variables were generated within a set of questions. Answers options were constructed based on easiness, as questionnaire was not interviewed but self-filled by respondents. Comprehensive instruction to fill and pick answers was written before the question lists and delivers orally during distribution. The self-filled method was selected upon time availability of the respondents. Most respondents spend their time working elsewhere and thus very limited time for enumerator to conduct interview. That is, self-filled method was considered more appropriate to gain as many as possible respondents. Checking for errors or bias answers were carried out during collection of filled questionnaires, so as to be directly confirmed to the associated respondent. It was 100 questionnaires distributed, and 83 were returned.

It is written on the questionnaire that the questionnaire was suggested to be completed by family-head to minimize error. In Indonesia, family-head usually husband/father or wife/mother. Options of answers were designed so as to be perceptible by various knowledge backgrounds. Prior to the main survey, pre-survey was conducted by distributing 5 questionnaires to those who were not respondents to be. From here some correction were made toward perfect questionnaire. The questionnaire was constructed sequentially. First was to gain personal data consist of position in family, age, income, and duration of occupancy. Second was to gain data of housing-lots consist of housing-lots dimension, early building dimension, and current building dimension. Current housing-lot was not asked considering that expansion of housing-lot was very rarely to happen. Third was confirmation on



whether any expansion was done by respondents or by previous occupants. Forth was awareness and knowledge on the necessity of OS and the procedure to allocate it.

Variables of respondents' economical background was asked in term of respondents' monthly income, scaled from average of Indonesian lowest income to the possible highest income of the site. Age and duration of occupancy were constructed as opened-question to gain actual data rather than a closed question. Question of lot and housing dimension were also asked as opened questions for similar reason. The answers collected were then to be stratified in the analysis. Awareness and knowledge were asked as closed-question with option of answers was "was not aware" and "aware"; "do not possess knowledge" and "possess knowledge". Those who possess knowledge should continue to the next opened-question on how rainwater to be channeled. Each was scored 0 to 3 respectively. Information on questionnaire concepts and how variables were elaborated within questionnaire is presented in Table 1.

**Table 1. Concept and variables determination.**

No.	Concept	Variables	Term	Answer options	Scores
1	"OS" determinants (X)	Duration of occupancy (X <sub>1</sub> )	n.a.	a. 0- 5 years b. 5.1-10 years c. 10.1-15 years d. 15.1-20 years e. 20.1-25 years f. > 25.1 years	0 1 2 3 4 5
2		Building extension (X <sub>2</sub> )	n.a.	a. Extending with no remaining "OS" b. Extending with remaining "OS" c. No extension	0 1 2
3		"OS" to building ratio (X <sub>3</sub> )	n.a.	a. < 40%* b. ≥ 40%	0 1
4		Monthly income (X <sub>4</sub> )	n.a.	a. < 2 million IDR b. 2-5 million IDR c. 5.1-10 million IDR d. 10.1-15 million IDR e. > 15.1 million IDR	0 1 2 3 4
5		Awareness (X <sub>5</sub> )	Early	a. Was not aware b. Aware	0 1
6			Current	c. Was not aware a. Aware	0 1
7		Knowledge (X <sub>6</sub> )	Early	a. Do not posses knowledge b. Posses Knowledge	0 1
8			Current	c. Do not posses knowledge a. Posses Knowledge	0 1

Note: \*40% was set as benchmark due to generally used of ideal OS to building ratio.



The questionnaire was distributed half randomly, as this was intentionally studying houses with suspected insufficient OS within lots. In the low-to-medium housing, it was found that from the entire 150 houses; 90 house-facades indicated that open space was insufficient. Fifty two of the "insufficient OS" were surveyed. In the medium-to-high housing, questionnaires distribution was narrowed to housing block of small lots, as those with large lots appeared to have large OS and thus did not fit the research scope. From the entire 160 small-lots houses, it was found that 80 houses indicated insufficient OS within lots. Thirty one of the "insufficient OS" were surveyed.

## RESULT AND DISCUSSION

It was 100 questionnaires distributed proportionally among selected housings, and 83 were returned. This was also in good proportion between the low-to medium and the medium-to-high class housing. That is 52 of low-to-medium cost housing and 31 of medium-to-high class housing. The data extracted from questionnaire result was reviewed statistically and the result is presented in Table 2. Data's validity was tested using correlation test, and was found that 2 questions were not valid and should not be used for further analysis. The reliability was tested using Cronbach's alpha and was resulted 0.43 which is considered quite reliable (Urdan, 2010).

**Table 2. Summary of Data's Statistical Review**

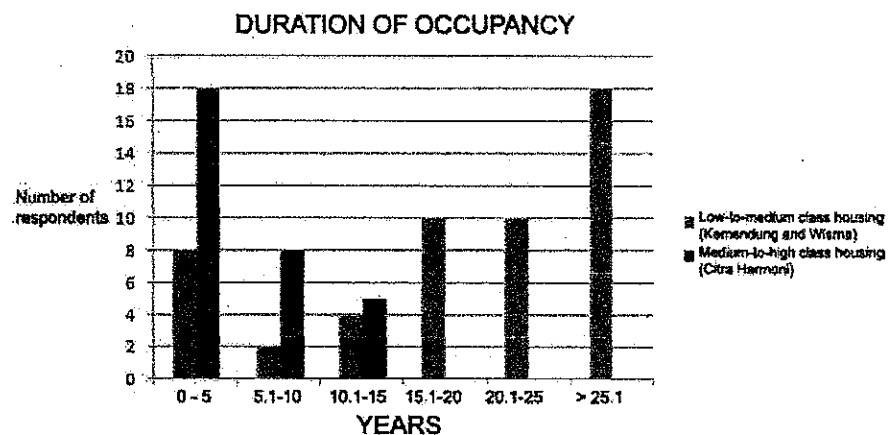
Statistical term	Duration of occupancy	Building extension	Early OS to building ratio	Current OS to building ratio	Income	Early awareness on OS necessity	Current awareness on OS necessity	Early knowledge on OS necessity	Current knowledge on OS necessity
Mean	2.27	0.81	0.75	0.03	1.42	0.82	0.86	0.11	0.43
Standard Error	0.22	0.04	0.05	0.02	0.12	0.04	0.04	0.03	0.05
Median	2.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	0.00
Mode	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	0.00
Standard Deviation	1.98	0.40	0.44	0.15	1.06	0.39	0.35	0.31	0.50
Sample Variance	3.90	0.16	0.19	0.02	1.12	0.15	0.13	0.10	0.25
Kurtosis	-1.55	0.53	-0.68	38.73	-0.05	0.88	2.29	4.69	-1.97
Skewness	0.16	-1.59	-1.16	6.30	0.59	-1.69	-2.06	2.57	0.27
Range	5.00	1.00	1.00	1.00	4.00	1.00	1.00	1.00	1.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	5.00	1.00	1.00	1.00	4.00	1.00	1.00	1.00	1.00
Sum	188.00	67.00	62.00	2.23	118.00	68.00	71.00	9.00	36.00
Count	83.00	83.00	83.00	83.00	83.00	83.00	83.00	83.00	83.00
Largest(1)	5.00	1.00	1.00	1.00	4.00	1.00	1.00	1.00	1.00
Smallest(1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



Statistical term	Duration of occupancy	Building extension	Early OS to building ratio	Current OS to building ratio	Income	Early awareness on OS necessity	Current awareness on OS necessity	Early knowledge on OS necessity	Current knowledge on OS necessity
Confidence Level									
(95%)	0.43	0.09	0.10	0.03	0.23	0.08	0.08	0.07	0.11
r data	0.85	0.60	0.58	-0.03	0.09	0.25	0.27	0.31	0.40
r table	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
Validity	valid	valid	valid	not valid	not valid	valid	valid	valid	valid
Reliability	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43

By Table 1 and Table 2, we may learn that average duration of occupancy is 2.27. Converted to answer's options, this value is duration of occupancy between 10.1 to 15 years. Discrepancy of duration of occupancy between low-to-medium cost housing and medium-to-high cost housing is presented in detail by Figure 4. As the medium-to-high class housing was relatively newer in operation (15 years later), residents were also mostly newer than those of the low-to-medium class housing, which was inhabited approximately 28 years ago.

By Table 1 and Table 2 we learn that monthly income variable should be disregarded for further analysis in association to other variables as it is not valid, but by Figure 5, we learn that what was suspected as to be low-to medium and medium-to-high class housing was correct by factor of income.



**Figure 4. Duration of occupancy between low-to-medium and medium-to-high cost housing**

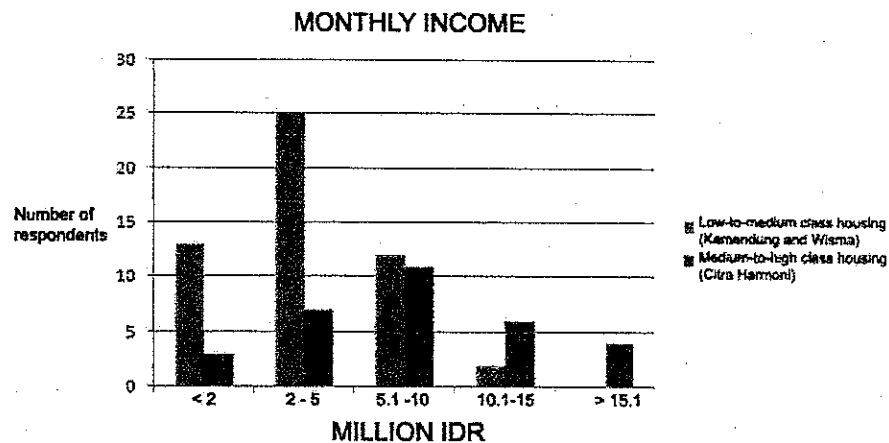


Figure 5. Monthly income between low-to-medium and medium-to-high cost housing

By Table 2, we learn that current OS to building ratio is not valid in statistical term, this was suspected to be caused by the 0 score which was spread evenly throughout the data. This term is supported by Figure 6 that describes the average and the mode of early OS to building ratios were 0.75 and 1.00 (associated to Table 1) which is toward sufficient OS. On the opposite, both average and mode of current OS to building ratios were 0.03 and 0.00. This is made clearer by Figure 7 that presents factual data of OS to building ratio in percentage (%). Within earlier occupancy, it was 50% in average which then sharply descend to 0% all.

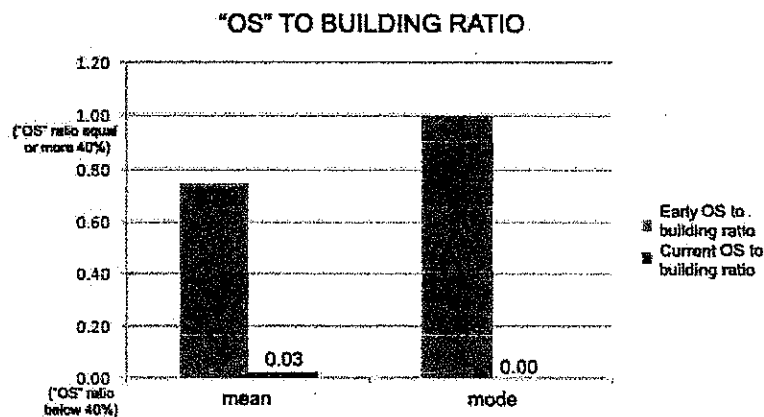
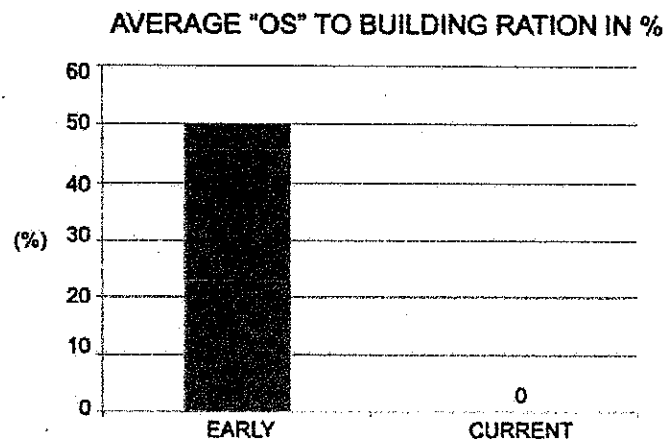
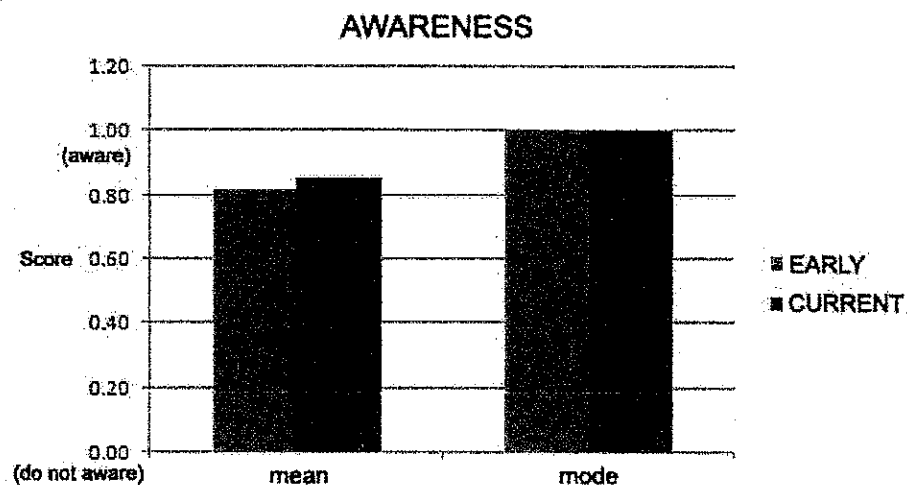


Figure 6. OS to building ratio of early and current.

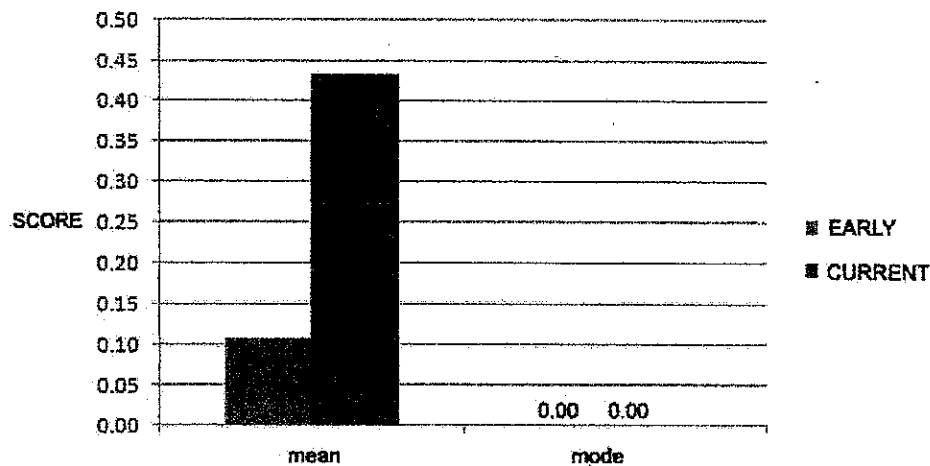


**Figure 7.** OS to building ratio of early and current in actual percentage.

On the awareness point of view, we may be happy to learn that in average, respondents were having good score toward awareness on the necessity of OS (Figure 8). However from knowledge point of view, we learn on something slightly worse. Both early and current knowledge was of lower score than the awareness. The average of current knowledge ascends from early knowledge, but the mode was constantly at 0 score (Figure 9).



**Figure 8.** Respondents' awareness of early and current.



**Figure 9.** Respondents' knowledge of early and current.

Relationship of duration of occupancy and other variables may be studied using Table 3. In total, we see that building extension occurred more to those with longer occupancy period. From early OS to building ratio point of view, we learn that those with shorter occupancy period having lower ratio. This may mean that duration of occupancy do not always correlate to insufficient OS. From current OS to building ratio point of view, we see that insufficient OS happened in all period of occupancy. Early awareness and current awareness remain similar in all period of occupancy. From knowledge point of view, those of shortest period of occupancy seemed to be not having early knowledge due to necessity of OS. Later, the knowledge seemed to be evenly developed, with the highest point is at those of 15.1 to 20 years duration of occupancy.

**Table 3.** Duration of occupancy associated with other variables.

Duration of occupancy (years)	Building extension	Early OS to Current OS		Early awareness	Current awareness	Early knowledge	Current knowledge
		building ratio	to building ratio				
0-5	0.62	0.58	0.04	0.73	0.77	0.00	0.27
5.1-10	0.60	0.40	0.01	0.90	0.90	0.10	0.30
10.1-15	0.78	0.89	0.11	0.78	0.89	0.11	0.44
15.1-20	1.00	0.80	0.00	1.00	0.90	0.20	0.70
20.1-25	1.00	0.90	0.00	0.90	0.90	0.10	0.60
> 25.1	1.00	1.00	0.00	0.78	0.89	0.22	0.50



By Figure 10, we may learn that there was some disparities existed between low-to-medium and medium-to-high class housing. In most issues, those of low-to-medium class possess higher score than those of medium-to-high class housing. However, the disparities is insignificant, with issue of early OS, early knowledge and current knowledge are exception. Figure 10 reveals that medium-to-high class housing possesses significant lesser OS than medium-to-high class. The low-to-medium class housing also possess significant higher early and current knowledge.

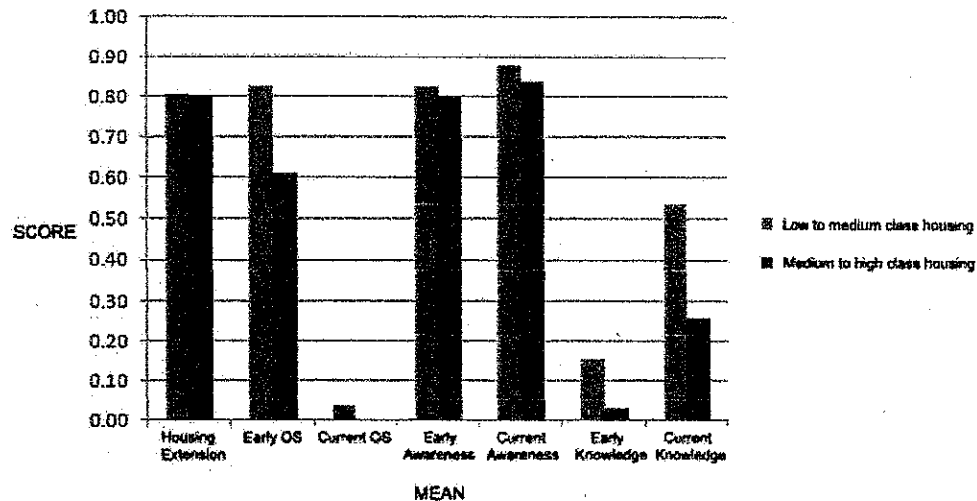


Figure 10. Disparities between low-to-medium and medium-to-high class housing.

## CONCLUSION AND RECOMMENDATION

This study concluded that definition of low-to-medium and medium-to-high class housing was a correct term here, based only on respondents' monthly income. Disparities between the two were existed regarding issue of early OS, early knowledge, and current knowledge. Eighty three respondents out of 170 (almost 50%) houses that were suspected having insufficient OS also proved here. This finding may lead to further finding that housing expansion with lack of OS is a trend here. When lack of OS was a trend, we may easily suspect that green OS was of similar term.

Interesting phenomenon was found that apart from good level of early and prior awareness, average respondents were having significantly lower knowledge. Their knowledge increased gradually currently. Sadly, their current knowledge was still lower than their awareness. This finding is expected to be useful to plan further action of community outreach to informally educate communities due to actual procedure of fixing OS inexistence, especially to further generation.





**INTERNATIONAL CONFERENCE  
GREEN CONCEPT IN ARCHITECTURE AND ENVIRONMENT**

Due to disparities between low-to-medium and medium-to high class housing on respondents' early and current knowledge, further research is recommended to study this issue.

**REFERENCES**

- Groenewegen, Peter P et al. (2006), Vitamin G: effects of green space on health, well-being, and social safety, *BMC Public Health* 2006, (6),149, BioMed Central, London, UK.
- Kaplan R. (2001,) the nature of the view from home: Psychological benefits. *Environment & Behavior*, 2001, (33), 507-542, Sage Publications, New York.
- Kuo FE, Sullivan WC. (2001-a), Aggression and violence in the inner city: Effects of environment via mental fatigue. *Environment & Behavior* 2001, (33), 543-571, Sage Publications, New York.
- Kuo FE, Sullivan WC. (2001-b), Environment and crime in the inner city: Does vegetation reduce crime? *Environment & Behavior* 2001, 33(3), 343-367, Sage Publications, New York.
- Lacy, Jeff (1990), An Examination of Market Appreciation for Clustered Housing with Permanent Open Space. University of Massachusetts-Amherst, Department of Landscape Architecture and Regional Planning Working Paper. Available at <http://www-unix.oit.umass.edu/~ruralma/LacyMarket.html>.
- McConnell, Virginia & Walls, Margaret. (2005), the Value of Open Space: Evidence from Studies of Non-market Benefits, Research Report, Resources for the Future Washington DC. Available at <http://www.rff.org>
- Takano T, Nakamura K, Watanabe M. (2003), Urban residential environments and senior citizens' longevity in megacity areas: the importance of walkable green space, *J Epidemiology and Community Health* 2003, (56), 913-918, BMJ Group of the British Medical Association, London, UK.
- Urdan, Timothy C. (2010), *Statistic in Plain English*, Routhledge, New York, pp. 178-180.