idwell

INTERNATIONAL CONFERENCE ON DWELLING FORM 2015

IN CONJUNCTION WITH
14TH INTERNATIONAL
CONFERENCE
OF QIR

PROCEEDINGS

10 – 13 August 2015
Lombok Raya Hotel
Lombok, Indonesia

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Department of Architecture
Faculty of Engineering
Universitas Indonesia
Kampus UI Depok, 16424, Indonesia

Tel : +62 21 786 3512
Fax : +62 21 786 3514
E-mail : idwell@eng.ui.ac.id
: idwell.submission@gmail.com
Web : i-dwell.net

PREFACE

Heidegger in *Dwelling, Building, Thinking*, suggests a notion of *immateriality* and *materiality* of dwelling: where one dwells is where one is at *home*, where one has a *place*. Human civilisations are growing at unprecedented rate that shapes multiple changes of human living conditions, including how we dwell and how our dwellings have evolved. This conference seeks to gather and redefine global new perspectives on dwelling form through exploration on these changes.

The conference intends to call for an alternative exploration and discourse based on a transformation on our livelihood to complement current dwelling form discourse which is largely emphasizing on the improvement of existing physical dwelling provisions. Such alternative viewpoint is necessary as meaningful and significant improvement on living conditions cannot be achieved without understanding the complex and contemporary ways of dwelling in both Indonesian and global context.

The discussion on International Conference on Dwelling Form 2015 is aimed to be centered on how the notion of dwelling can be reconstructed through redefining life cycles and meaning, how it can be situated beyond the constant and the tangible, how its material can be expanded towards the immaterial in multiple scopes and context. To ensure comprehensive outreach in such discourse, this conference invites global multidisciplinary participants to discuss these objectives. Various articles of past, present, local and global references can be critically used as a basis of investigation and exploration towards the global perspectives of dwelling form.

I-Dwell International Conference Committee

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KEYNOTES

SEVENTY ONE SHADES OF GREEN: WHICH GREEN IS A 'GREEN ARCHITECTURE'?

Veronica Soebarto[1]*

[1]School of Architecture and Built Environment,
The University of Adelaide
*veronica.soebarto@adelaide.edu.au

ABSTRACT

'Green' architecture, often referred to as 'sustainable architecture', is a label applied to a building that is designed, constructed and operated in a way that will use resources efficiently and reduce the negative impact on the natural environment while providing a healthy and comfortable condition for the occupants and in an economical way in the long run. This may seem to be common sense; who does not want to have, live or be, in a healthy and comfortable space or building which requires minimum amount of resources to build and the least cost to run?

The fact is, not all architecture is 'green', and not all claimed-to-be 'green' architecture is truly 'green'. And just as there are seventy one shades of the colour of green, there are also many different shades of claimed-to-be 'green architecture'. Some may be 'deep green', some 'lime green', some may be more 'cyan'.

Achieving a true 'green' architecture requires an integrated approach and holistic considerations of all interrelating aspects – social and cultural, environmental and economic. Even then, one may still argue that there cannot be just one shade of 'green' architecture. As the context, objectives, priorities and constraints of each project can be different from the others, so is the 'green-ness' of its architecture.

This paper will discuss some of the debates around 'green' architecture and suggest ways to achieve it, including building performance assessments

through simulation, monitoring and post occupancy evaluations. More importantly it will be argued that, unless we learn from what has been built and how these buildings actually perform and use this knowledge as input for the next round of design decision-making, the only shade of 'green' architecture that will be left is 'greenwash'.

Keywords: Green architecture, sustainable architecture, building performance

INTRODUCTION

The term 'sustainable architecture' has often been used to mean 'green architecture', 'environmental architecture' or 'ecological architecture' even though the term 'sustainable' means more than simply 'green', 'environmental' or 'ecological'. While this term became popular after the second half of the twentieth century, the concept and understanding of a 'green' approach to architecture existed centuries before [1] as evidenced by the many vernacular buildings that respond well to their surroundings. In the contemporary western world the term 'sustainability' was first used in 1974 by the World Council of Churches in response to developing nations which objected to the idea that we should only worry about the environment, put forward by the developed countries, when in fact human beings in the developing world were suffering from poverty and deprivation [2, 3]. The concept of 'sustainable development' was later put forward by the International Union for Conservation of Nature and Natural Resources in 1980 which emphasized that conservation to protect the environment would not be achieved without alleviating poverty and misery of millions of people [3]. It was in 1987, however, that the links between the social, economic and environmental dimensions of development were addressed holistically, in the World Commission on Environment and Development (WCED)'s publication entitled Our Common Future [4]. According to Lele [5], this document, often referred to as the Brundtland Report, proposes that a sustainable development is a model of societal change to achieve traditional economic development while maintaining ecological sustainability.

It is important to understand the wider context of the term 'sustainability' or 'sustainable development' because, soon after, it was adopted in the built environment area including architecture. According to Williamson et al. [6], the term 'sustainable architecture' is basically "a revised conceptualization of architecture in response to a myriad of contemporary concerns about the effect of human activity". Before this period, the image

of good architecture was a building which would protect the inhabitants from the climate. On the other hand, within the concept of sustainable architecture, a good building is one that is sensitive to its environment and that minimizes the degradation of the environment caused by human habitation [6]. In other words, the emphasis now is on the protection of the environment as opposed to (only) the protection of the inhabitants, but with the understanding that by protecting the environment from human habitation, future generations will continue to have the opportunity to meet their needs [4]. Sustainable architecture, therefore, has social and economic dimensions as well as the environmental dimension.

In the built environment area, however, the emphasis is usually on the environmental dimension with the terms 'green', 'ecological' or 'environmental' architecture often used to replace the broader term of 'sustainable architecture'. This is perhaps unavoidable because architecture deals more with the designed and built 'stuff'. According to Vale and Vale [7], 'green architecture' refers to a building that is designed, constructed, and operated using resources efficiently, while providing the occupants with a healthy environment. However, as the term 'green' was rooted from the term 'sustainable', I argue that it is not only the health and well-being of the occupants that must be provided by a 'green' building, but the social-economic impact (as well as the environmental impact) of the surroundings that should also be taken into account.

The problem is that, just as there are so many shades of the colour green on earth, there are also many shades of 'green architecture'. One building claimed to be 'green' does not necessarily look the same or have the same attributes as another building also claimed to be 'green'. How much 'greener' is the former compared to the latter? How much environmental impact should be reduced by a building so that it can be called 'green'? What should be the limit of resources used for the construction and operation of a 'green' building? What should be the parameters for a 'green' building in terms of providing a healthy environment for its occupants? What social-economic impacts must be considered in designing a 'green' building?

It is not realistic to have all the answers to these questions in this one paper; however, it is very important for us to face these questions so we can confidently say whether or not a building is a truly 'green' (or sustainable), or perhaps, only a 'light green'. This paper attempts to offer some thoughts in responding to these critical questions.

GOAL SETTING

One way to answer the various questions above is by clearly understanding the main goal(s) of a building design or project. Similarly, if one has a plan or desire to design, have or build a 'green' building, then the first thing to be clear about is what the real goals are and what definition of 'green' building is being adopted. If the goals are to have a building that will be constructed and operated by using resources efficiently, providing the occupants with a comfortable and healthy environment and contributing positively to the social-economic habitation around the building, do all the goals have the same level of importance? Or, which goal is more

important – minimising the use of resources for construction? Or for operation? Similarly, which goal needs to be achieved first – minimising the use of resources or providing the occupants with healthy environment? And so on. Figure 1 provides some illustrations of the various possibilities of the level of importance of these three dimensions of sustainability.

Once the goal or goals have been clearly defined, the second step is to clearly set the parameters and target for each of the goals. For example, what would be the parameters for the objective 'using resources efficiently'? What would be the parameters for determining that a space or building is 'comfortable' and healthy for the occupants? What are the attributes of a building that contributes positively to the surrounding social-economic habitation? Can we actually put real figures into these?

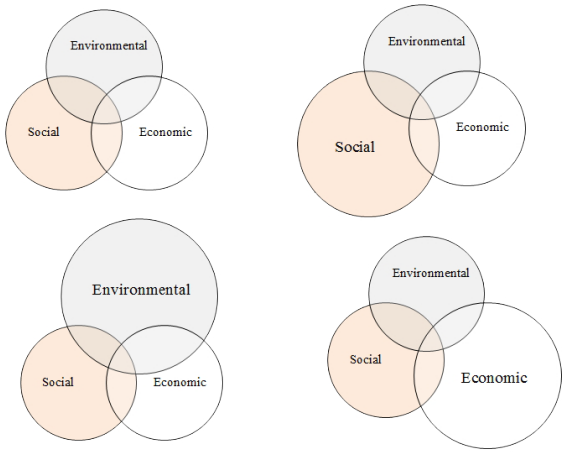

Figure 1. Examples of possible goal settings in the beginning of a project

The parameters and targets to help define the goals vary from project to project and can be set up by the relevant stakeholders: the owners,

users, designers, architects, or design teams. While this may be appropriate for some projects, leaving the parameters and targets to be set by individuals may also result in confusion around a broader consensus of what constitutes a 'green' building. In order to develop a common framework and principles, in 2002 a number of building industry groups from several countries formed the World Green Building Council (WorldGBC) [8, 9]. Some of the objectives of WorldGBC are to "[a]ccelerate the initiation, development and implementation of market-based green building policies, program technologies, design practices, and operation procedures around the world", "[s]upport and foster the development and administration of scientifically-based standards and programs for building materials and whole building practices" and "[s]upport the adoption and ongoing development of market-based green building transformation tools that facilitate the sharing of information and building performance, and meet local needs for each country or economic zone" [9]. What this means is, while each member country (there are more than 100 of them) can initiate, develop and implement its own policies, programs and tools to help achieve 'green' building practices (which can be different from other countries), at least within the same country there is a common understanding of what is considered 'green' building.

Within this framework, many WorldGBC members have developed their own tools which are used to assess the 'greenness' of a building (as designed, built and operated). While there are differences, most of these tools address similar parameters and then rate the 'greenness' of the building according to the extent of which each of the parameters is fulfilled. These parameters address issues around: the design process and management, indoor environment quality, energy use, landscape and ecology, impact on biodiversity and surrounding environment, transport, water and waste management, and innovative ideas. Assessment tools such as LEED in the US, BREEAM in the UK, Green Star in Australia, Greenship in Indonesia, Green Mark in Singapore and Green Building Index in Malaysia, all have similar parameters although how the design is rated by each of the tools is different. Most of these tools rate the building design rather than the building in operation.

One may argue, however, that the main focus of the GBC is on the environmental dimension of sustainable or 'green' design. Whether or not buildings assessed as 'green' by such schemes are also considered 'green' by the occupants can be questioned. Studies by Menadue et al [10, 11], for example, show that while some office buildings were rated 'green' by the building performance rating tool, Green Star, they were not necessarily

perceived as providing a healthier and more comfortable environment for the occupants than a 'normal' building. Shari and Soebarto [12] demonstrate that when socio-economic factors are considered in addition to environmental performance, a building design rated as 'green' could become 'less green'. The scope of 'greenness' of buildings assessed by such environmental performance tools is also unclear. Kaatz et al. [13] and Cole [14] for example argue that such assessment often disregards the impacts that a 'green' building may have on the wider scale or globally.

Another critique of adopting the GBC way of defining green building is that achieving a 'green'-rated design often comes at a premium cost while the result may not always be as good as expected. To achieve the highest level of 'greenness' using the available GBC assessment tools often requires additional investment though Langdon [15] and Ross et al. [16] claim that the extra upfront cost would not be more than 10% of the upfront cost of non 'green'-rated buildings. In regard to the result, Newsham et al. [17] found that even though, on average, buildings that were LEED-rated used 18-39% less energy than conventional buildings, about 28-35% of them used more energy than their counterparts.

Note that in most countries, adopting the GBC's way of defining the 'greenness' of a building or project is not compulsory. The adoptions of GBC's schemes and tools are voluntary but for those who adopt them, they claim to have gained the benefits, both from the point of view of the environmental performance of the building [18, 19], economic [20] and social performance [21].

In the past 20 years many countries around the world also have developed and implemented compulsory performance measures for buildings through their building codes. Such codes do not necessarily use the terms 'green' or 'sustainable' but they tend to focus on the environmental aspects of building often by setting a minimum target or maximum allowable (predicted) energy or water consumption in order for a building design to receive building approvals. Examples of these are the Energy Efficiency Provisions of the Building Code of Australia and the Building Energy Code Program in the US [22, 23].

Nevertheless, whether it is to adhere to compulsory compliance or to achieve a voluntary 'green' target the message is that it is important to have a clear and common understanding about the goals that need to be achieved, whatever the goals might be.

WORKING TOWARD ACHIEVING THE GOALS

Once the goals have been set, the next step is to work toward achieving those goals. As there might be multiple goals, ranging from environmental, socio-cultural to economic aspects, concepts and strategies need to be developed for each of these goals. Williamson et al. [6, Appendix] provides an example of this process.

It is commonly understood that one of the main objectives in designing a building is to provide spaces within the building that meet the needs of the users or occupants. These needs may include having spaces that are beautiful, functional, and comfortable (thermally, visually and aurally). Applying context-sensitive, ecological and passive design principles has been understood to help achieve these goals while minimising the impact on the environment and the costs to operate the building [24, 25]. Developing design concepts and strategies based on these principles is a skill that, presumably, architects should employ. The question is how does an architect know that the building she or he is designing to achieve those goals will in reality perform as expected? Wendler [26] suggests that design optimisation may be needed to ensure the best outcome but that perhaps this is something that many architects rarely do. While architects may make design changes when considering the impact of the design on construction costs, they rarely make changes or optimise the design to reduce future operational costs such as the cost of energy to run the building, costs of maintenance, and costs of future replacements.

Experienced architects usually have some sense and understanding of the impact of their design decisions on the long-term performance of the building through years of 'trial and errors'. Without much experience, however, it is difficult for young designers to confidently predict how the building they are designing will perform in the future. Even architects who have years of experience may not be sure about the future performance of a building simply because every design problem is unique.

In this case, building performance simulation offers a way to provide designers with more accurate predictions of future building performance. Building simulation can help by testing various design strategies both at the preliminary and later stages of a design process, fine tuning design alternatives, verifying design to comply with standards, and predicting future operational costs [24, Ch. 9]. Using building simulation during earlier stages of a design process can reduce the risks of future and costly changes as design solutions that 'may not work' can be detected much earlier in the process.

Numerous building performance simulation tools have been developed in the past 30 years. These tools vary from stand-alone ones that are intended to be used for small scale buildings to more complex tools which link with various simulation engines in the background and can be operated through commonly used CAD programs or Building Information Modelling tools[1].

A recent survey among architects, however, indicates that there are still very few building designers or architects who use building performance simulation tools in the design process [27]. Several reasons for this include lack of specialists within the design office, the cost of the software and performing the simulation is too expensive, there are other things during the design process that need to be prioritized, there is not enough time to conduct the simulation, and performing such analysis is not covered by the fee structure.

Considering the benefits of performing simulation during the design process, this paper argues that it is worthwhile for building designers or architects to attempt to perform building simulation even by using the most simplified tool. While many projects that use building performance simulation tend to be large, even a small scale design project such as a residential building can benefit from the use of such tools for example to predict the impact of various design strategies on thermal and visual comfort.

The survey mentioned above [27] also identified that one of the reasons why performing building simulation has not yet become common within the architectural practice, despite realizing its potential to help achieve green buildings, is that it is not a compulsory subject in most architectural education and on-going professional training in building performance simulation is rare.

When introduced early, building simulation can help architecture students explore ideas about how to achieve a 'green' design, not just in term of environmental benefits but also long-term economic benefits. It helps students understand the impact of various aspects of design, from building orientation and landscaping, building materials, openings, to how the building is operated, the indoor environment, temperature and humidity, illumination levels and brightness, and the embodied and operational energy use, as well as life cycle costs. Figures 2 and 3 show some examples of students'

[1]For a thorough list of building simulation programs available around the world, see: http://apps1.eere.energy.gov/buildings/tools_directory/

exploration of strategies to achieve a small 'green' building through performing building simulation to predict indoor temperatures. Other issues explored in this design project include strategies for self-sufficiency in energy and water, strategies to achieve well day-lit space, and design that reduces life-cycle costs (not shown).

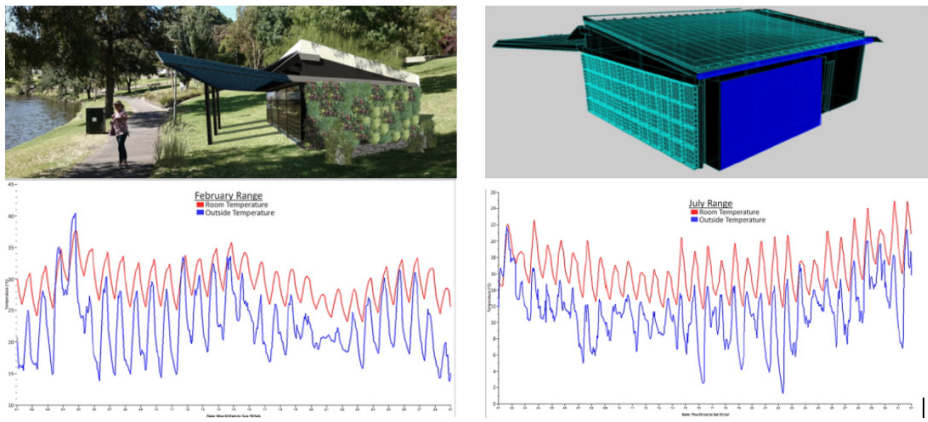

Figure 2. Predicting indoor temperatures of a building with green wall

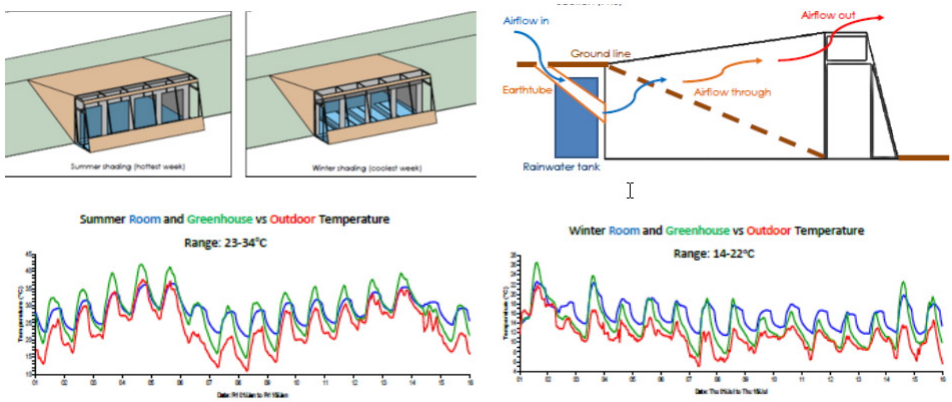

Figure 3. Predicting indoor temperatures of an earth-bermed building

ENSURING THE RELIABILITY OF THE RESULTS

Simulation is usually employed as part of environmental performance rating tools, some of which are mentioned above. The result of such assessment is often expressed as a 'star' rating, for example, 3 stars, 4 stars, or 5 stars. While this kind of rating system is helpful in indicating the level of environmental performance (in this case, the energy performance) of a building design, such labelling can also be misleading. People often think that the simulation predicts actual performance and that a 5-stars design

means the building, in reality, is truly 'green', energy efficient, environmentally-friendly, and so on, where in fact, it may not be.

The problem with a star rating system is not so much that the simulation is not trustworthy, but that many simplifications are built into the system such as a standard weather file, standard occupation pattern and standard way of operating the building. In reality, people are likely to use the building in different ways and people's reactions to things that happen around them cannot always be easily predicted. As an example, a recent study conducted in the tropical climate of Darwin shows that people's tolerance to heat is more than what an international Standard suggests [28, 29] thus predictions based on a standardised assumption are likely to be quite different from reality. Buildings are also often not built according to the specifications and standard expected, and any discrepancy between what is on the drawing board and what is finally built can affect the building's actual performance.

To ensure that a building design predicted to be 'green' is indeed 'green' in reality, this paper suggests that Post Occupancy Evaluation (POE) be conducted after the building has been occupied or used for a period of time. POE allows for the actual performance of a building to be revealed while at the same time it helps identify problems so changes or improvements can be made [30]. There are various forms of POE, from asking the users or occupants about their experience and satisfaction about the building, monitoring indoor environment (such as temperature, humidity, air flow, daylight availability, glare, indoor air quality), to examining energy and water use and other environmental parameters. While rarely done, this paper also suggests that POE include investigating the experience and perception of others who are not necessarily using the building but experience the building from the outside.

There have been a number of POEs conducted by researchers at The University of Adelaide. Menadue et al. [11, 30] conducted POE of a number of 'green'-rated and non 'green'-rated office buildings in Adelaide, South Australia. The study revealed that while all the 'green'-rated buildings performed better in term of energy and water use when compared to non 'green'-rated buildings, occupant satisfaction, perceived health and perceived productivity in the 'green'-rated ones were not necessarily better, and sometimes worse, than that in the non 'green'-rated buildings. A study of thermal comfort in housing for low to middle income people by Soebarto and Bennetts [31] showed that while the building designs met the criteria to be called a 'green' design (in this

case, a 7.5 star ratingaccording to the Australian's Nation-wide Home Energy Rating Scheme, NatHERS), during hot weather, the occupants could experience very uncomfortable indoor environments as there was insufficient air movement in the houses. On the opposite side, a POE of a number of houses deemed not to be 'green' according to the standard, showed that in reality not only were the occupants delighted with the spaces but that the houses used much less energy than predicted and still maintained reasonable indoor conditions [32].

Unfortunately, despite the fact that much can be learned from POE, there is far less POE conducted compared to the number of buildings out there claimed to be 'green'. Many professionals in the built environment are too scared that POE conducted on their buildings may reveal negative results, which in turn can affect their reputation [33]. However, unless POE is conducted to 'close the loop', there will always be a question about whether a building that is claimed to be 'green' is 'true green' or in fact only 'very light green' if not simply a 'greenwash'.

HAVING 'VIBE'

There is one last aspect that needs to be considered when talking about and trying to achieve a 'green', sustainable design. While it is important to set the goals, define clear targets, develop strategies to achieve those goals, test the design strategies, predict the results, and conduct post-occupancy evaluation, it should not be forgotten that any design in the built environment is aimed at providing a space for people to use and to dwell, be it for a short or long time. A space and a building is more than a series of numerical targets to be achieved. A 'green' building must and foremost provide spaces that make people want to be there, not because it has a reputation of being 'green', but because it provides spaces that fulfil their physical and spiritual needs. There is no point creating or having a building that is considered 'green' according to some common definition and consensus, but no one wants to be in it.

While addressed last, this paper argues that achieving a 'green' design must begin by involving the (future) users of the building. It is the most important step in a design process to listen carefully to the users to capture their needs, desire, dream and expectation in order to avoid things that they do not want to have in the building. Then as the process starts to become more formal to achieve the goals and targets, it is critical that the designer does not lose sight of the purpose of creating a building in the first place – to provide a space for people to use and to dwell.

LAST NOTE

This paper has discussed some of the debates around 'green architecture' and suggests ways to achieve it. As the first step, it is important to understand the needs of (future) occupants of the building, including their physical and spiritual needs. The next step is to clearly set the goals so that everyone involved understands what level of 'greenness' the building aims to have. It is important to be clear whether the design needs to address the environmental, socio-cultural and economic aspects all at the same level or one aspect needs to be prioritised on top of the others.

Once the goals are clearly set, specific targets for each goal need to be defined. With these, appropriate strategies to achieve each of the goals can then be explored. This paper focuses on the environmental dimension of 'green' architecture, and as an example, a way to achieve this goal is discussed. Building performance simulation is offered as a way to explore, test and optimise strategies to achieve a 'green' design as it allows future performance to be predicted. It is argued, however, that unless this prediction is coupled with a post occupancy evaluation, there is no proof that a building predicted or claimed to be 'green' is indeed 'green' in reality.

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REFERENCES

[1] V. Olgyay (1963). Design with Climate. Bioclimatic Approach to Architectural Regionalism. Princeton: Princeton University Press.
[2] S. Dresdner (2008). Principles of Sustainability. London: Earthscan.
[3] World Council of Churches (2002) Report on the World Summit on Sustainable Development (WSSD). Available from: https://www.oikoumene.org/en/resources/documents/wcc-programmes/public-witness-addressing-power-affirming-peace/poverty-wealth-and-ecology/neoliberal-paradigm/report-on-the-world-summit-on-sustainable-development-wssd. Accessed 29 June 2015.

[4] WCED. (1987). Our Common Future: Report of the World Commission on Environment and Development. Oxford: Oxford University Press.
[5] S. Lele (1991). Sustainable development: A critical review. World Development, 19(6), pp.607-621.
[6] T. Williamson, A. Radford, H. Bennetts (2003). Understanding Sustainable Architecture. London: Spon Press.
[7] B. Vale and R. Vale (1975). The Autonomous House: Design and Planning for Self-Sufficiency. London: Thames and Hudson Ltd.
[8] World Green Building Council (2015). About WorldGBC. Avalailable from:http://www.worldgbc.org/worldgbc/about/. Accessed 29 June 2015.
[9] World Green Building Council (2012). Bylaws of the World Green Building Council. http://www.worldgbc.org/files/4413/6449/4946/WorldGBC_Bylaws_12-11-2012_-_Current.pdf. Accessed 29 June 2015.
[10] V. Menadue, V. Soebarto, T. Williamson (2012). Occupant Satisfaction in Adelaide's Commercial Office Buildings, Proceedings of Healthy Buildings 10th International Conference, Brisbane, 8-12 July.
[11] V. Menadue, V. Soebarto, T. Williamson (2015). Perceived and Actual Thermal Conditions: Case Studies of Green-rated and Conventional Office Buildings in the City of Adelaide. Architectural Science Review, Vol. 57, No. 4, 303–319.
[12] Z. Shari, V. Soebarto (2012). Green vs. Sustainability Performance Assessment: A Case Study of an Office Building in Putrajaya, Malaysia. In Proceedings of the 28th International PLEA Conference on Sustainable Architecture & Urban Design, PLEA 2012 (pp. 1-6). online: Pontifica Universidad Catolica del Peru.
[13] E. Kaatz, D. Root, P. Bowen (2005). Broadening Project Participation through a Modified Building Sustainability Assessment. Building Research & Information, 33(5), pp.441-454.
[14] R.J. Cole, R. J. (2006). Building Environmental Assessment: Changing the Culture of Practice. Building Research & Infor mation, 34(4), pp. 303-307.
[15] D. Langdon, D. Cost and Benefit of Achieving Green. Davis Langdon & SEAH International. Available: http://www.usgbc.org/Docs/Archive/General/Docs2583.pdf. Accessed 29 June 2015.
[16] B. Ross, M. López-Alcalá, A.A. Small (2007) Modeling the private financial returns from green building investments, Journal of Green Buildings, 2 (1) (2007), pp. 97–105.

[17] G. Newsham, B. Benjamin, C. Arsenault, et al. (2012). Do green buildings outperform conventional buildings? Indoor environment and energy performance in North American offices. NRC Publications Archive. National Research Council Canada.
[18] A. Coelho, J. de Brito 2012). Influence of Construction and Demolition
Waste Management on The Environmental Impact of Buildings, Waste Manage, 32 (3) (2012), pp. 532–541.
[19] C. Turner, M. Frankel (2008). Energy Performance of LEED for New Construction Buildings, Vancouver: New Buildings Institute.
[20] K.M. Fowler, E.M. Rauch, J.W. Henderson, A.R. Kora, Re-Assessing Green Building Performance: A Post Occupancy Evaluation of 22 GSA Buildings (No. PNNL-19369). Pacific Northwest National Laboratory (PNNL), Richland, WA (US) (2010)
[21] A. Smith, M. Pitt (2011). Sustainable Workplaces and Building User Comfort and Satisfaction, Journal of Corporate Real Estate, 13 (3) (2011), pp. 144–156.
[22] ABCB. NCC Volume One Energy Efficiency Provisions (2014). Second Edition Handbook, Australian Building Codes Board.
[23] ABCB. NCC Volume Two Energy Efficiency Provisions (2015). Second Edition Handbook, Australian Building Codes Board.
[24] R. Hyde (Ed.) (2007) Bioclimatic Housing: Innovative Designs for Warmer Climates. London: Earthscan.
[25] D. Mumovic, M. Santamouris, M. (2009). A Handbook of Sustainable Building Design & Engineering. London: Earthscan.
[26] S. Wendler, W. Odell, M.A. Lazarus (2006). The HOK Guidebook to Sustainable Design. New York: John Wiley & Sons.
[27]. V. Soebarto, C. Hopfe, D. Crawley, R. Rawal. (2015). Capturing the Views of Architects About Building Performance Simulation To Be Used During Design Processes, Proceedings of Building Simulation 2015 (under review), International Building Performance Simulation Association, Hyderabad, 7-9 Dec.
[28] L. Daniel, T. Williamson, V. Soebarto, D. Chen (2014). A Study of Thermal Mavericks in Australia. Proceedings of 8th Windsor Conference: Counting the Cost of Comfort in A Changing World, Cumberland Lodge, Windsor, UK, 10-13 April. London: Network for Comfort and Energy Use in Buildings. http://nceub.org.uk
[29] L. Daniel, T. Williamson, V. Soebarto, D. Chen (2014). Learning from Thermal Mavericks in Australia: Comfort Studies in Melbourne and Darwin. Architectural Science Review, http://dx.doi.org/10.1080/00038628.2014.976537.

[31] V. Soebarto, H. Bennetts (2014). Thermal Comfort and Occupant Responses During Summer in a Low to Middle Income Housing Development in South Australia. Building and Environment 75 (2014) pp. 19-29.
[32] T. Williamson, V. Soebarto, A. Radford (2010). Comfort and Energy Use in Five Australian Award-Winning Houses: Regulated, Measured and Perceived. Building Research & Information (2010) 38(5), pp. 509–529.
[33] B. Bordass, R. Cohen, M. Standeven, A. Leaman, (2001). Assessing Building Performance In Use 2: Technical Performance of the Probe Buildings, Building Research and Information, (2001) 29(2), pp. 103-113.

PAPERS

DWELLING SPATIAL ARRANGEMENT, ACTIVE BODY MOVEMENT, AND HEALTH

Paramita Atmodiwirjo[1]*, M. Mirza Y. Harahap[2], Yandi Andri Yatmo[3]*****

[123]Department of Architecture, Faculty of Engineering
Universitas Indonesia

*paramita@eng.ui.ac.id, **mmyharahap@gmail.com,
***yandiay@gmail.com

ABSTRACT

This paper addresses the role of dwelling in urban contemporary living, particularly its contribution to the health of the occupants. It attempts to explain the relationships between the spatial arrangement of the dwelling and the body activity level of the occupants. This paper argues that dwelling could become a potential setting that encourages active body movement and promotes health. This role becomes important within the current context of urban lifestyle where people tend to be more sedentary with less movement. The role of dwelling to encourage active body movement was examined through an analytical study of human body movement in relation to spaces and objects by using the concept of hodological space as an experienced space beyond the abstract, geometric space. An exploratory study was conducted to trace the hodological space in a number of houses, and analyze the emergence of hodological space in relation to body movement and everyday activities. The findings of this study suggest the importance on reconstructing the role of dwelling through understanding the dynamic of hodological path as experienced by the body of the occupants.

Keywords: Hodological space, dwelling, body movement, activity, health.

INTRODUCTION

Urban contemporary living is characterized by the tendency for the people to have increased time spent for sedentary activities; people tend to perform lighter physical job with less energy, more sitting, and less exercise (Owen et. al., 2010). Human living space also tends to be arranged based on efficiency, functional proximity and accessibility of spaces and objects. However, such efficiency might also reduce opportunities for body movement which is actually needed for human body to be healthy. This paper discusses how dwelling could perform as a setting to promote active body movement.

Human occupation in dwelling could be considered as a form of connection between body and place. Human dwells in certain space in order to have a fixed place, a space in which he has connection with and rooted to as a way to find stability and security (Bollnow, 2011). The relationship between the body and dwelling is to some extent manifested through bodily-experience, "a certain possession of the world by my body, a gearing of my body to the world" (Dovey, 1985: 2). Human engagement to the world could be achieved through this bodily movement and activity (Franck & Lepori, 2000). Such engagement is manifested by 'gearing' our body to the world, the house, which mediates us with the space beyond (Lockard, 2006).

Dwelling is also a manifestation of human attempts to have a fixed location. "The house is a physical structure with a fixed location", (Lockard, 2006: 5); it is a structure consisting of a horizontal plane and vertical axis (Bollnow, 2011). These horizontal plane and vertical axis exist in a conceptual space which is abstract, geometric, and objectively measured (Dovey, 1985). Human occupation of dwelling occurs within such physical structure, in which the human body is interacted with the horizontal plane and vertical axis through various forms of body movement during everyday actions and activities.

However, dwelling is more than just an abstract, geometric space which contains human body. An inquiry into the human body experience within the context of dwelling needs to consider the role of dwelling as an experienced space. Derived from the long-established idea of "life-space" from Lewin (1939), Bollnow (2011) suggested a concept of "hodological space" as an experienced space, as a space of inhabitation. It is the understanding of space as experienced rather than as merely geometrical, measured space. This study intends to examine the role

of dwelling to promote active body movement based on the idea of hodological space. By tracing the hodological space of the occupants, this study attempts to uncover the relationship between space, body and health.

SPACE, BODY AND HEALTH

A body of research has attempted to explore the relationship between quality of physical space and health, particularly in relation to physical activity and obesity (Ding and Gebel, 2012). Many of the studies explained the relationship between certain features or conditions of the physical environment and certain health indicator such as BMI and level of activity. For example, a study found that the physical conditions of exterior and interior of a neighbourhood were associated with BMI of urban young children and their mothers (Duarte et al, 2010). Another research suggested the importance of quality of design of the physical environment to promote walking as a healthy behavior (Lu, 2010). It becomes important to consider the elements of physical environment that could influence health condition of the inhabitants.

There have been some attempts to encourage more active movement through design (Pollak, 2012), especially in urban public space or public buildings. There is, however, still a lack of studies addressing the role of dwelling on health. More studies are needed to address how housing tend to become an obesity-mediating environment (Chambers and Fuster, 2012) and how such tendency needs to be reversed.

Some studies addressed the relationship between the spatial configuration of the physical environment and the activities performed by the occupants. For example, a research found that the residents living in higher floor tended to have lower BMI (Shenassa et al, 2008). Another study found that the spatial organization of the house, particularly integration among the rooms was correlated to social and incidental participation in sedentary activities, such as watching TV, sitting and reclining. The more integrated the spatial organization, the more the residents tend to be involved in social, sedentary activities (Bafna and Chamers, 2013).

These studies suggest the potential of spatial organization of the house to either encourage or discourage active movement of the occupants. However, these studies tend to consider the house as the unit of study as a whole, without any further inquiry into how the relationship among space, body and health occur within the everydayness and habitual actions of

the residents. This will become the main concern of this study through the concept of hodological space.

TRACING HODOLOGICAL SPACES IN THE DWELLING

Hodological spaces of dwelling: Conceptual understanding

Hodological space is a mathematical space which concerns with distance and path (Bollnow, 2011), however this concept suggests the presence of distance and path as elements of experienced space or space of inhabitation. One could not discuss hodological space without mentioning the hodological path. Path of human movement in certain space creates a hodological space which reveals how the space is experienced mathematically as manifested in human movement along the horizontal plane and vertical axis. Generally, hodological path is described as a straight line from one point of where the human positioned to another point of where certain goal is located (Bollnow, 1936). There are two important aspects in this hodological path concept (Brown, 1936): locomotion, a force which makes human move, and medium, a space with its barriers in which the locomotion pass through, as illustrated in Figure 1.

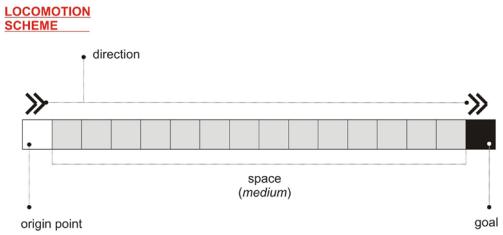


Figure 1. Modified diagram of the hodological path concept
Adapted from Brown (1936)

In a house (the medium), the spatial arrangement of the house (the barrier) determines the paths of the occupants while walking around the house for certain purpose or goal (the locomotion). The path of the occupants determines the actual distance as experienced, rather than the metric distance. For example, two points in two different rooms in a house separated by the wall might have an actual distance of only few centimeters, yet based on this hodological space concept, this distance might change depending on how the body actually moves from one room to another. Hence, the distance between the two points could increase as influenced by the spatial arrangement of the house which

determine the walking path of the occupant. Thus, by tracing the relations of body movement and space which exist as the hodological path, the study reveals not only the physical path of the occupants in their houses, but also how the path takes its role as a part of everyday living.

The methods

This study is an exploratory study of hodological spaces in the house as an attempt to reveal the relationship between body movement and space. Only a small number of cases were observed and analyzed in order to generate indicative findings. In this paper, two cases will be presented in details. The first is a two-storey house with four occupants, while the second is a single-storey house with six occupants. The analysis of hodological spaces in these two cases was based on the observation of occupants' movements during their morning routine, thus only reflecting a small portion of their everyday activities.

The methods of this study combined two contrasting approaches of studying hodological space (Brown, 1936). First, we traced the hodological space by quantifying the distance and path that were experienced by the occupants in the medium of space along both horizontal plane and vertical axis. Second, we traced the locomotion of the movement in order to understand how the occupant's hodological paths occurred in the context of everyday activities.

Quantifying the area of hodological space

Hodological space is based on the body orientation to the physical world (Franck & Lepori, 2000: 31), then it refers to the triaxial structure of human body: the front and back, right and left, and up and above (Dovey, 1985). Movement occur on horizontal plane that represents the front-back-left-right, and along vertical axis representing the up-above (Bollnow, 2011).

Hodological space is essentially a mathematical space, thus the activity paths of the occupants could be quantitatively measured. Although the real paths are more likely to occur as curved or arbitrary lines, this study uses straight-line path as the representation of the occupants' movement (Bollnow, 2011), In the analysis, the movement paths were then converted into space area. Since human body has dimension, the paths are represented as a series of squares, which were then termed movement intensity squares, with different colors indicating different levels of intensity. This path representation is needed as the hodological path is "between

the topological regions rather than between points" (Brown, 1936: 13). The square diagrams attempt to represent hodological space not merely as a mathematical space that is totally structured, but as a conceptual space which is not entirely structured (Brown, 1936).

Analysing the spatial locomotion through event diagram

In addition to quantitative measurement, this study analyses the details of occupants' movement paths through event diagrams. This approach is necessary to uncover the more qualitative aspects of hodological space. The explanation through diagrams allows a deeper understanding of the hodological paths in relation to the spaces, boundaries, furniture and other objects in the dwellings.

By combining quantitative measurement and qualitative analytical diagrams of hodological space, this study attempts to reveal the relationship among spatial organization, physical entities and the occupants' movement habit, and how they could contribute to active body movement and health.

FINDINGS

Variety of movement path of occupants

The observation of morning routines in the two cases indicates a variety of movement paths of different occupants. Figure 1 illustrates the movement paths of two occupants, Mr. H and Mrs. R in House #1. Mrs. R showed a more active path both horizontally and vertically than Mr. H. While Mr. H only moved vertically once, Mrs. H moved vertically more actively, from the second floor to the first floor back to the second floor and down again to the first floor.

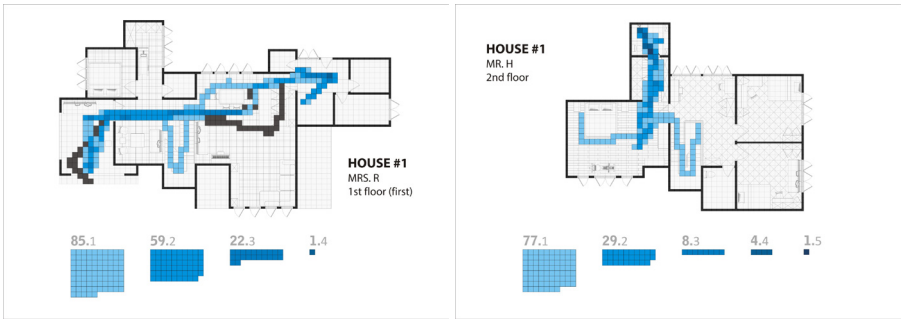


Figure 2. Movement intensity square diagram of two occupants in House #1

These different movements generate more area of hodological space of Mrs. R compared to Mr. H as illustrated in Table 1. Mrs. R performed more movement paths with the total number of 478 movement intensity squares which is approximately 202.00 sqm, while Mr. H only performed half of it, with 230 movement intensity squares or approximately 97.20 sqm.

Table 1. Occupants' movement path area in House #1

Occupant	Total no. of squares		Total area of squares		Total area of hodological space
	1st Floor	1st Floor	1st Floor	2nd Floor	
Mr. H	111	119	46.90	50.30	**97.20**
Mrs. R	168	112	71.00	47.30	**202.00**
	92	106	38.90	44.80	

Further analysis in Table 2 indicates that both occupants performed a range of movement intensity from 1 to 5. However, Mrs. R had more active hodological paths in vertical axis which then had implication on the more active hodological space in horizontal plane as well. Her hodological path indicated larger number of movement intensity square and larger total area number compared to those of Mr. H.

Table 2. Occupants' movement intensity in House #1

Occupant	Floor	Level of Intensity				
		1	2	3	4	5
Mr. H	1st Floor	78	36	3	2	-
	2nd Floor	77	29	8	4	1
	Total no of square	**155**	**65**	**12**	**6**	**1**
	Total area	**64.49**	**54.93**	**15.21**	**10.14**	**2.11**
Mrs. R	1st Floor (1)	85	59	22	1	-
	1st Floor (2)	87	5	-	-	-
	2nd Floor (1)	67	41	4	-	-
	2nd Floor (2)	56	36	7	5	2
	Total no of square	**295**	**141**	**33**	**6**	**2**
	Total area	**124.64**	**119.15**	**418.38**	**10.14**	**4.23**

The measured area of hodological space in Table 1 and Table 2 indicates that the more complex the activity level of the occupant, the higher his/her scope of movement which then affects the further distance of his/her hodological path. Figure 2 also illustrates different levels of intensity performed by two occupants in different areas of the house. The high

intensity path area of Mrs. R was located around the stairs on the second floor and the kitchen on the first floor. Meanwhile, the high intensity path area of Mr. H was around bathroom area on the second floor.

The analysis of hodological path in House #2, which is a single story house, is presented in Figure 2. It illustrates the movement path during the morning routine of two occupants, Mrs. B and Mrs. N.

Figure 3. Movement intensity square diagram in House #2

The data shows quite different intensity on their movement paths. Table 3 shows that Mrs. N had 369 movement intensity squares which cover an area of 155.90 sqm while Mrs. B had 241 movement intensity squares which cover an area of 101.82 sqm. In general, Mrs. N performed more active movement paths than Mrs. B.

Table 3. Occupants' movement path area in House #2

Occupant	Number of square	Total area of hodological space
Mrs. N	369	155.90
Mrs. B	241	101.82

The difference could also be observed in the level of intensity performed by both occupants, as can be seen in Table 4. While Mrs. B performed only level 6 out of 11 of the movement intensity square, Mrs. N performed higher intensity on her movement up to level 11. Such high intensity

movement of Mrs. M was also reflected in the total area covered by her movement path, which was almost twice as total coverage of movement path of Mrs. B.

Table 4. Occupants' movement intensity in House #2

Occupant	Level of Intensity								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**9**	**11**
Mrs. N	136	102	51	27	19	19	10	4	1
Area coverage	57.46	86.19	64.64	45.63	40.15	48.17	29.58	15.21	4.65
Mrs. B	112	74	26	16	12	1	-	-	-
Area coverage	47.32	62.53	32.96	27.04	25.35	2.54	-	-	-

Figure 3 also reveals the difference in the spaces experienced by the occupants experienced. Compared to Mrs. B, Mrs. N experienced almost every room in the house. However, the movement intensity squares also indicated a slight similarity where the highest intensity movement path of both occupants (level 6 of Mrs. B and level 11 of Mrs. N) occurred in the small space between the sofa in the living room and the kitchen table set in the dining room.

The findings above suggest that the analysis of hodological path could illustrate the variety of movement paths of the different occupants in certain house. They illustrate that the same spatial setting of living space could generate different active movement paths for the occupants.

Elements involved within the hodological path

The elements involved within the hodological path need to be further analyzed in order to know the fluidity of the hodological space, the tension, and also its vector implication (Brown, 1936). Findings on this section explain the experiential and psychological aspects involved in the hodological path within the spaces of the houses as represented through event diagrams. Yet the quantitative measurement is still needed to support the diagrams, as "the psychological space is quasi-physical, i.e., where initial position and goal may be ordered to infinitely structured space" (Brown, 1936: 8).

Based on the observation of the hodological path in House #1 and #2, there seem to be four elements that might have impacts on the occupants' movement intensity and movement area: the objects, the types of activities, the boundaries and the occupant's habit.

The objects

This study indicates that the hodological path of the occupants of a house might depends on the presence of objects which are relate both directly and indirectly to the activity of which the occupants performed, as shown in Figure 4 to 6.

Figure 4 is the event diagram of Mr. H in House #1 illustrating his activity during breakfast. The object with direct influence was the sink, the tissue and the trash can, while the object with indirect influence was the cabinet beside the dining table set. The location of these four different objects had certain impacts on his movement intensity and movement area. The movement intensity increased as he had to go back and forth to wash his hand before and after eating, took the tissue and went to the sink again to throw away the used tissue into the trash can beside the sink. This going-back-and-forward movement intensified his path thus at the same time extended his movement area. The cabinet indirectly added the effect of this going-back-and-forward movement. The position of the cabinet in-between the tissue, the dining table and the trash can tended to force Mr. H to take longer path; hence he performed a longer movement distance and larger area coverage.

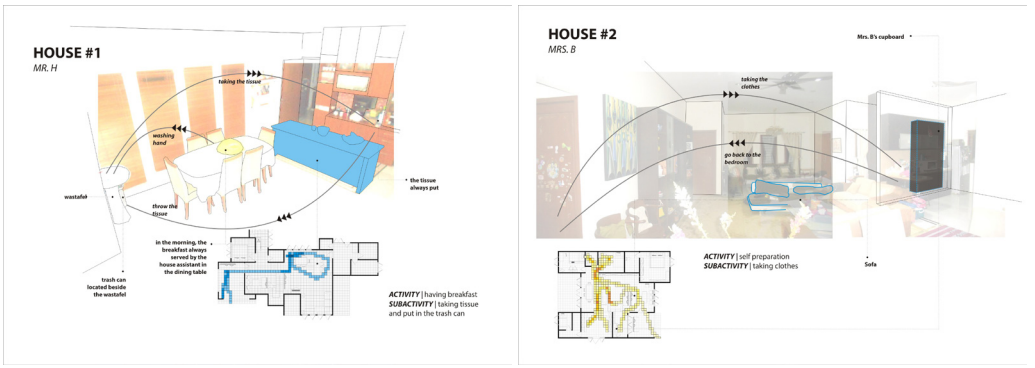


Figure 4. Event diagrams of Mr. H in House #1 and Mrs. B in House #2

Such situation also occurred in Mrs. B's movement path while going back and forth between the bathroom and the kitchen in House #2, as also illustrated in Figure 4. Similar to the example of Mr. H the objects also took role as either the direct or indirect influence. In Mrs. B's case, the cupboard has direct influence while the sofa had indirect influence.

The types of activities

Another finding of the study is that different type of activities which

undoubtedly resulted in different movement paths, although performed in the same location, may lead to different movement area coverage and movement intensity. This could be identified by comparing the different activities of two occupants in the same space. For example, both Mr. H and Mrs. R had movement path in the dining space (Figure 5). They experienced this space in different ways as their activities are different, yet there was a similarity between these two events in terms of the influence of the object. Both had the movement paths that were influenced by the presence of the cabinet in that space.

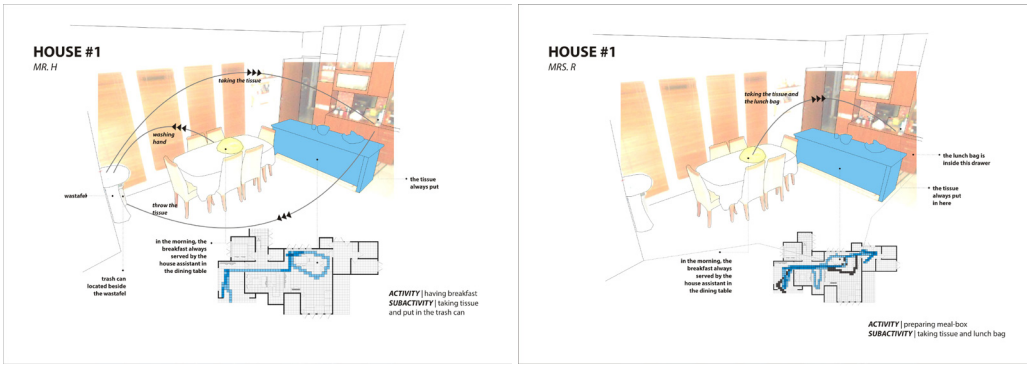


Figure 5. Event diagrams of Mr. H and Mrs. R in the dining space, House #1

The boundaries

The analysis of movement path also indicated that boundaries might influence the occupant's movement; either lengthening or shortening the distance. Figure 6 is an example of how boundaries could shorten the movement path in the case of Mrs. R's preparation before going to work, especially when dropping the things at the stairs. When she needed her house assistant to iron her clothes, she dropped her clothes from the second floor to the first floor through the void. This action suggested that although there was a boundary between the first and the second floor, Mrs. R managed to find the shortest distance through the presence of the void. This allowed her to cut her movement path up to approximately 23 movement intensity square, or about 9.72 sqm.

Another event diagram in Figure 6 indicated the opposite situation, when Mrs. N faced the boundary in the form of an object; the sofa located between her bedroom and kitchen. When she needed to go to her bedroom from the kitchen, instead of taking a straight path, she had to take a round path, thus she walked further distance than if there was no sofa. Instead of walking approximately just 18 movement intensity squares

or about 7.6 sqm area, she had to walk approximately 26 movement intensity squares or about 10.9 sqm area. Furthermore, Mrs. N's case also indicates a high tension that occurred in the space between the sofa and the dining table set. This tension occurred since this small space was the only access to and from the kitchen, and the movement path from the occupants' activity is quite high in this area.

Figure 6. Event diagrams of Mrs. R in House #1 and Mrs. N in House #2

The occupant's habit

The occupant's habit seems to also play certain roles on the hodological path in the house. Figure 7 illustrates how Mr. H was encouraged to move more actively when he performed his routine activity of wearing shoes before going to work. As Mr. H has above-average weight, it was difficult for him to wear shoes without sitting down, hence he was forced to perform going-back-and-forth from the sofa where he put her bag to the shoes rack, got back again to sofa to wear the shoes, and leaved the room passing the shoe rack again. This resulted in a further movement path compared to if he wore shoes near the shoe rack.

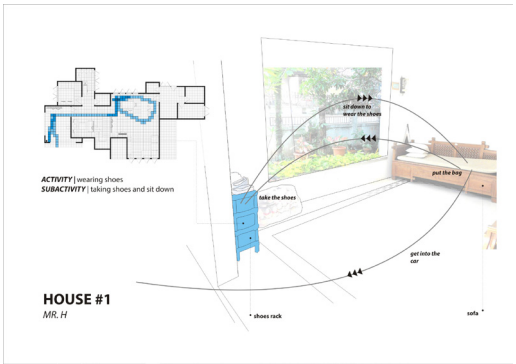


Figure 7. Event diagram of Mr. H in House #1 that encourages movement

On the contrary, as already illustrated in Figure 6, Mrs.R's habit of dropping her clothes from the second floor to the first floor through the stairs void discouraged her to move more actively. However, her habit to take clean clothes hung in the cupboard outside her bedroom might encourage her to walk more.

The locomotion and the medium

Based on the variety of movement paths and the different elements involved in the hodological path, we developed the modification of Brown's diagram of hodological path as already illustrated in Figure 1. The following diagrams attempts to illustrate the *locomotion* and the *medium* involved in every stage of certain activity. Figure 8 illustrates a diagram of stages of movement during one of Mrs. R's morning activity, indicating the influence of the different barriers on the *medium* and different kind of *locomotion*. In the first movement stage, the presence of two kinds of barrier in the *medium* of two spaces and two *locomotion* has resulted in quite significant modification of the path from the original diagram in Figure 1. Meanwhile, the second and third movement stage indicates only slight modification from the original diagram.

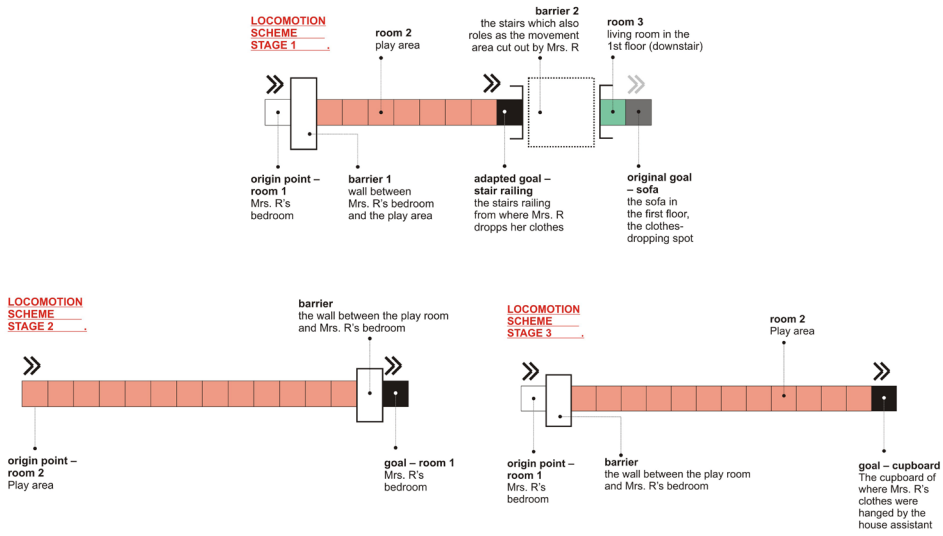


Figure 8. Modification of Brown's movement path diagram of Mrs. R's activity

By understanding the modification of the Brown's diagram, we might argue that the *medium* through its fluidity which exist as the barriers (both material or immaterial) would have impacts on the ease of the *locomotion* in the *medium* itself. "Ease of locomotion depends not only on the fluidity

of the medium, but also on the distribution of barriers in the medium and on internal psychological factors" (Brown, 1936: 8). This series of diagrams represents the dynamic of movement path performed by the occupants in a house, which could be influenced by various spatial elements. Eventually, such dynamic of movement paths may either encourage or discourage the active movement of the occupants in their everyday life.

CONCLUDING REMARK

The findings of this exploratory study indicate that the analysis of hodological space of dwelling could reveal the variety of movement paths performed by the occupants, in terms of both movement area and movement intensity. The more detailed observation of each activity space as hodological space could also reveal the elements involved, consisting of objects, types of activities, boundaries and occupant's habit. These elements could be mapped onto the diagrams of locomotion and barriers, which further explained different possibilities of hodological path in everyday activities. The findings also suggest that the spatial arrangement of the house and its interaction with the occupant daily routine may encourage or discourage the occupants to move more actively, thus indicating the potential of the house as a setting to promote health.

This exploratory study undoubtedly has limitations, especially due to limited number of cases and limited portions of everyday actions observed. However, this study might become a basis for further study on the relationship between human body movement, dwelling space and health. The concept of hodological space becomes a useful concept to describe the tangible and intangible aspect of the dwelling space, especially in relation to movement path.

The methods of analyzing the hodological space in this study consist of the quantitative measurement of hodological path and the analysis through event diagrams. This analytical method is potentially useful in the studying the relationship between space, body and health. Yet further inquiry is needed regarding the technical representation of the hodological space. The technical representation should be more performative as the hodological space is the *lived space*. The representation should be able to show not just how *lived space* occurs as a result but more on how lived space occurs as a process. This should be applied for both quantitative and qualitative inquiries of hodological space.

REFERENCES

Bafna, S., & Chambers, E. C. (2013). The influence of spatial organization of the home and inhabitant activity. Proceedings of the Ninth International Space Syntax Symposium. Seoul.

Bollnow, O. F. (2011). Human space. London: Hyphen Press.

Brown, J. F. (1936). On the use of mathematics in psychological theory. Psychometrika: 1(2), 7-15.

Chambers, E. C., & Fuster, D. (2012). Housing as an obesity-mediating environment. International Journal of Public Health, 57(2), 453–454.

Ding, D. & Gebel, K. (2012). Built environment, physical activity, and obesity: What have we learned from reviewing the literature? Health & Place, 18, 100-105.

Dovey, K. (1985). Home and Homelessness: Introduction. Human behaviour and environment: Advances in theory and research. New York: Plenum Press

Duarte, C. S., Chambers, E. C., Rundle, A., & Must, A. (2010). Physical characteristics of the environment and BMI of young urban children and their mothers. Health & Place, 16(6), 1182–1187.

Franck, K. A. & Lepori, R. B. (2000). Architecture inside out. West Sussex: Wiley-Academy.

Lewin, K. (1939). Field theory and experiment in social psychology: Concepts and methods. American Journal of Sociology, 44(6), 868-896.

Lockard, E. S. (2006). Habitation in space: The relationships between aesthetics and dwelling. 2nd International Space Architecture Symposium (SAS 2006), AIAA SPACE 2006 Conference & Exposition. Virginia: American Institute of Aeronautics and Astronautics.

Lu, Z. (2010). Investigating walking environments in and around assisted living facilities: a facility visit study. HERD, 3(4), 58–74.

Owen, N., Sparling, P. B., Healy, G. N., Dunstan, D. W., & Matthews, C. E. (2010). Sedentary Behavior: Emerging Evidence for a New Health Risk. Mayo Clinic Proceedings, 85(12), 1138–1141.

Pollak, L. (2012). Architecture as infrastructure of interactivity: The need for desire. In G. Borasi & M. Zardini (Eds.), Imperfect health: The medicalization of architecture (pp. 267-291). Zurich: Lars Muller Publishers.

Shenassa, E. D., Frye, M., Braubach, M., & Daskalakis, C. (2008). Routine stair climbing in place of residence and Body Mass Index: A pan-European population based study. International Journal of

Obesity, 32(3), 490–494.

SITE PLANNING OF POTTERY CRAFTMEN'S SETTLEMENT WITH COMMUNITY BASED DEVELOPMENT APPROACH

Dyah Kusuma Wardhani[1]*

[1]Interior Architecture, Universitas Ciputra
*dyah.wardhani@ciputra.ac.id

ABSTRACT
The existence of pottery industry in Dukuh Krajan, Desa Pagelaran is a potential domestic industries that can be developed in Malang. But the existence of the settlement is not planned and managed well, so there are several problem that exist such as the lack of natural lighting and ventilation inside the house, kiln in the middle of the settlement pollutes the air and fire risk,and space conflict in craftmen settlement between domestic and economic needs. Community based development approach is used in design process so the results can meet the needs, behavior and values that prevailing in society. Design begins with qualitative research that put emphasis on local community's social condition. Samples for this study consists of three elements, place, actors, and activity. For activity sample, data that being observed is covert behavior (collected through interviews and questionnaires) and overt behavior (collected through observation). After data collecting, data is selected to produce design criteria. Design criteria then being explored to several design alternatives. The final process for the design is evaluating design alternatives to get the most appropriate solution that can be developed. The expected results is model of alternative models of building mass and open space arrangement of pottery craftmen's settlement that can provide security and comfort for the occupants, also support the occupants local economy. Design is held on selected existing location and the process that will be done is limited from survey to design process.

Keywords: community based development, pottery craftmen's settlement, site planning.

INTRODUCTION

Dukuh Krajan, Desa Pagelaran, is one of the pottery producers in Malang. The existence of pottery industry in Dukuh Krajan, Desa Pagelaran is a potential domestic industries that can be developed in Malang. In this pottery craftsmen's settlement, the craftsman house is not only function as shelter but also as a place for domestic industry which is better known as Home Based Enterprises (HBEs). Silas (2000) stated that HBEs will increase family social economic condition and in the end also improving environmental quality itself. Unfortunately the existence of pottery craftmen settlement in Dukuh Krajan is not planned and managed well, so there are several problem that exist due to the space needs for pottery production activity that have not been accommodated. Location of pottery craftmens settlement that will be design in this discussion is in Dukuh Krajan, Desa Pagelaran with approximately area 24.583 m2 that consist of 67 households. The boundary of area that will be design can be seen in Figure 1.

Figure 1. Location of pottery craftmens settlement
Source: google earth

In this pottery craftsmen settlement there are some major problems related to arrangement of mass and open space in existing that needs to be solved, namely :

1. The distance between craftsman house inside the settlement less than 1 meter which cause lack of natural ventilation and lighting inside the house.
2. Kiln for pottery located in the middle of settlement produce

smoke,pollutes the air, and also potential fire risk.

3. Some part of the settlement streets are being used by the craftsmens as raw material storage and pottery drying area, because there is no more space available inside the house.

Figure 2. The close distance between craftsman house
Source: personal documentation

Figure 3. Part of the street settlement that being used as raw material storage and pottery drying area
Source: personal documentation

Figure 4. Traditional kiln
Source: personal documentation

EXISTING CONDITION

Exixting Condition of Pottery Craftsmen House

The pottery making process from raw material processing, making and pottery drying done in each craftsman house, but the pottery burning process done communally in pottery kiln area. Johan Silas (2000) states based on the proportion or ratio of productive area and domestic area in productive house can be divided into 3 types:

a) Mixed Type

Workplace become one with residence, but residence still the main function inside the house. In existing there are 39 houses that categorized as mixed types with an average area about ±96 m2. These type of productive house do not provide workplace inside the house, but use side part of the house or terrace as workplace.

b) Balanced Type

Residence separated with the workplace but still inside the same building, access to workplace sometimes also separated. In existing there are 21 houses categorized as balanced type with an average area about ±104 m2.

c) Separated Type

The workplace take dominant part in the house, taking most part of the house. Sometimes residence placed behind or in front of the workplace. In existing there are only 3 houses categorized as separate type with an average area ± 126 m2. Separate workplace usually in form of a simple building separate from the house. Work area separate from the residence, this workplace not only used as place for pottery making but also as pottery storage.

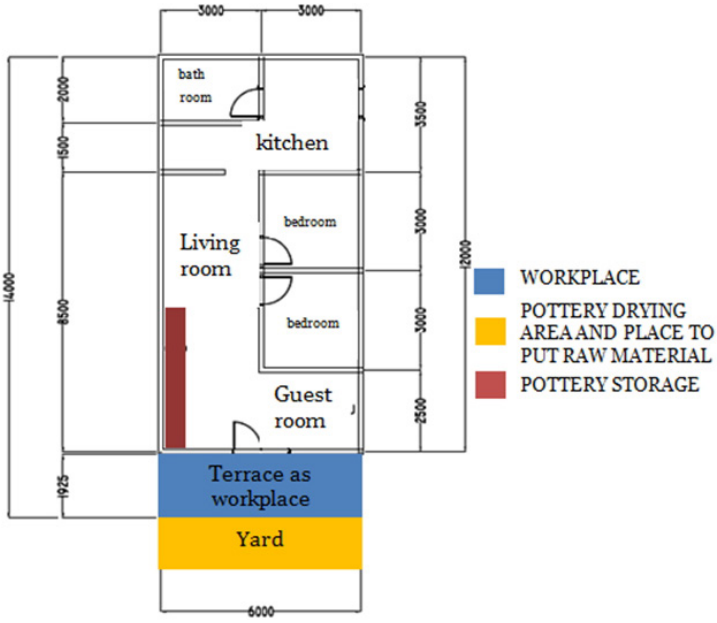


Figure 5. Layout of mixed type productive house
Source: personal documentation

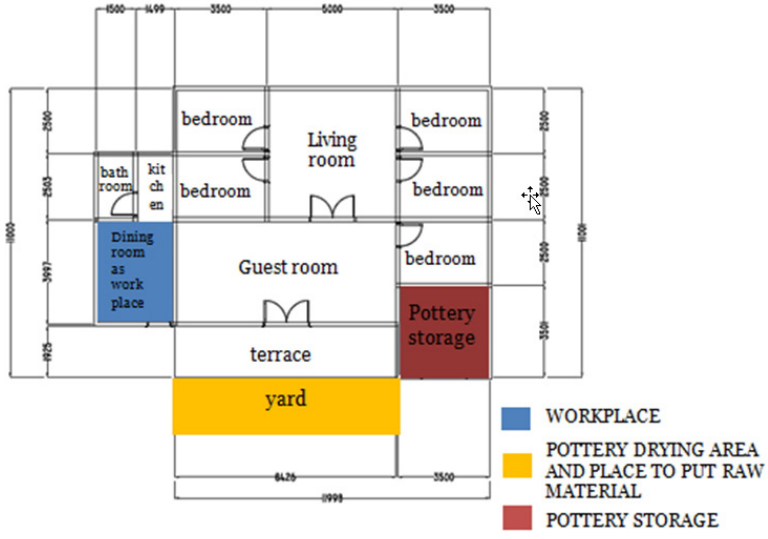


Figure 6. Balanced type productive house
Source: personal documentation

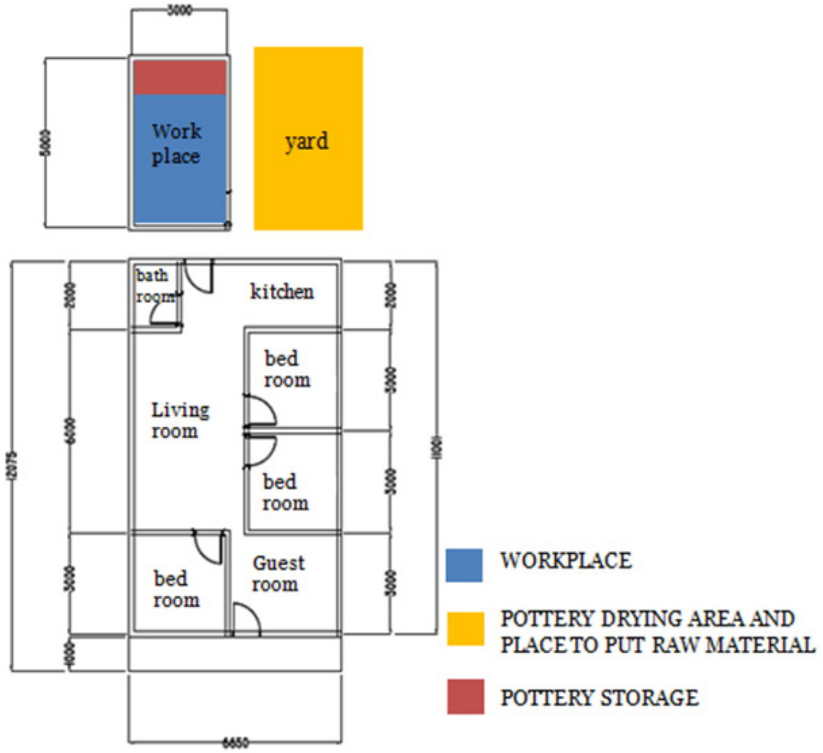


Figure 7. layout of separate type productive house
Source: personal documentation

Aside from these three types of productive house there is also another type founded in this pottery craftsmen settlement. This type is pottery collector house.

d) Pottery Collector House Type

The function of this house type is to collect pottery products from another pottery craftsmens. In existing there are 4 house that categorized as pottery collector house with average area about ±120 m2. This house types have no workplace but a large space for pottery products storage and trucks garage that used for delivering a large quantities of pottery products. Terrace and yard used as pottery drying area and also as display for pottery products, so the buyer can choose the products easily.

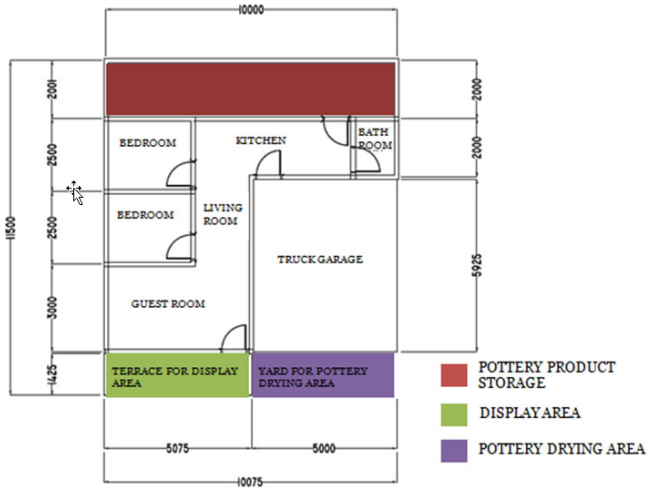


Figure 8. Layout of pottery collector house type
Source: personal documentation

Existing Conditions of Open Space Inside The Settlement

According Widayati (2002), each of house is part of a settlement. Clustered house create settlement with certain pattern. Settlement grouping is based on some basic similarities, one of them is profession similarity. Profession similarity in Dukuh Krajan create an open space that being used together, open space in form of pottery kiln and hay storage. Inside Dukuh Karajan, there are 7 pottery kiln where each used interchangeably by the craftsmen.

Figure 9. Pottery kiln and hay storage inside the settlement
Source: personal documentation

THEORETICAL REVIEW

Since 1960s in the United States and Europe have been growing movement that against planning and design approach with technical-rational dominant way.At this era also strike for the establishment of social justice and the practice of citizen empowerment. This movement then produces some participatory planning and design paradigms such as Community architecure (Christopher and Rossi, 2003). Community architecture in planning and developing an area becomes the basis for mobilizing and optimizing public participation. Thus the community based development program is an important part of architect/ urban designer task, so that in every design has a sociological dimension that is able to critically analyze behavior patterns of society and translate the pattern into an architecture product.

Community Based Development

Community based development suggests the importance of community needs for design development. Arstein (1969) states that the depth level of community participation will lead to community empowerment. The level of community participation is divided into three, namely:

a. Non participation/passive participatory
   At this level, the community is not involve in the process of development program.
b. Tokenism participation
   In this level, community directed to make it look as an active participant, however when examined more deeply the community do not participate in development process.
c. Citizen power/Active participatory
   At the level of active participatory, community started to become a subject in the development process. Community already know and understand about their community needs.

The level of active participation consists of :

- Partnership
  Community serves as decision makers in exploring idea based on community exact condition.
- Delegated Power
  At this level, community as decision maker because the community already able to independently carry out the development process.
- Citizen Control
  Society as subject to decide on what kind of development they need, also control the construction process.

Behavioral Approach on Architectural Design

Community based development plays important role in architect / urban designer so in every design has a sociological dimension that is able to critically analyze the behavior patterns of society (Widianingsih, 2007). Hence in this community based development, community behavior pattern must be considered so the design results can meet the needs and values of the prevailing society. In behavioral architecture, "space" is not only understood in physical form, but also as behavior setting that assembled with user setting, activity and time. Heimsath (1977) states that human activity is complex and can not be separated from role, pattern, background and goals. All three are attached to each participant involved in a setting. These three things can be explained as follows :

1. Role
   Role performed by someone or participants involved in a setting behavior
2. Pattern
   Pattern is actions or movements by individuals, pattern different with activity, because activity is the movement by group of people.
3. Background and Goals
   Background and objectives concerning matters that affect someone behavior in a setting. Goals affected by the background. Background regarding age, gender, marital status and so on

METHODOLOGY

According Spradley (in Sugiyono, 2007) samples taken in qualitative research in form of social situation which is composed of three elements, namely:

1. Place
2. Actors
3. Activity

That interact synergistically.

Samples of activity in form of behavior can be divided into two, namely:

1. Covert behavior
   An individual's response to the stimulus in the form of disguised or covered (covert). Response or reaction to a stimulus is still limited to attention, perception, knowledge/awareness, and attitudes that occur in people who receive the stimulus and can not be clearly observed by others (Skiner in Notoatmojo, 2003).

2. Overt behavior
   An individual's response to the stimulus in the form of action or open. The response to the stimulus is already evident in form of action or practice (practice), which can easily be observed or seen by others (Skiner in Notoatmojo, 2003).

In this site planning of pottery craftmen's settlement pottery these three samples can be explained as follows:

a. Place : settlements area that is used to perform the activity of pottery production
b. Actors : inhabitants of settlements living as artisans and pottery collectors
c. Activity : These activities include the behavior as described previously. Ie the overt behavior in form of movement or activity, and covert behavior in the form of what is thought and felt by the participants.

Information gathering techniques for covert behavior conducted through unstructured interviews and enclosed questionnaires. Unstructured interviews conducted to collect behavioral information which is then analyzed to obtain behavioral issues that are important and affect design results. While the information gathering techniques for overt behavior conducted by observation.

Community participation used in this research in partnership level, so the community act as decision makers in the ideas exploration for site planning design. For further idea exploration using community opinion regarding the desired settlement conditions. And to retrieve data regarding community opinion about the desired conditions of their settlement using an open questionnaire. After data collecting through observation, interview and questionnaires, the results of data collection are selected and then analysed that led to the design criteria. For the next stages, Idea exploration based on the design criteria generating alternative design modeling for pottery craftsmen settlement. Results of the design in the form of settlement site planning then evaluated whether it be the ideal form of problem solving and contextual.

RESULTS AND DISCUSSION

Behavior and Activity Pattern Analysis

Miles and Huberman (1984), suggests that activity in qualitative data

analysis is done interactively and continues over time until data saturated. Heimsath (1977) in his book Behavioral Architecture states behavioral issues that acquired eventually developed into design concept, therefore observation and interview results is analyzed using a series of tables. To determine activity pattern and the use of space, interviews and observations of the pottery craftsmen are conducted, especially related to the use of open space in the settlements. From observations and interviews results, the data analyzed using area-role-activity table. This table is used to find out about the implications of the role, furniture or equipment, and the period of time when the events took place. In this table, the analysis has begun to lead things that affect the design results especially for open space in the settlements.

OPEN SPACE IN THE SETTLEMENT					
AREA	ROLES	ROLE IMPLICATION	ACTIVITY	TOOLS	TIME FRAME
POTTERY KILN	Pottery crafts-men	1. Require special consideration to overcome smoke produced during burning process 2. Considering distance between the pottery kiln with craftsman house to reduce fire risk 3. During the pottery burning process, craftsmen tend to waiting near kiln while so-cializing with other craftsman, so this area also have so-cialization function.	Used inter-change-ably by craftsmen	1. Kiln 2. Whell-barrow to transport pottery	Once in a week

HAY STORAGE	Pottery crafts-men	1. Requires close access to pottery kiln 2. Requires close access to street, because the hay suppliers use trucks for distribution. 3. Requires a large space for storage due to irregular hay distribution and as a commu-nal	Hay storage for pottery burning pro-cess	Crafts-men move the hay man-ually	Once in a month. Irregu-lar hay distribu-tion by supplier.

Table 1. Area, Role, Activity Chart of Open Space in the settlement
Source : Heimsath (1977)

Analysis of Community Participation

According Arstein (1969) there are several levels of community participation, one of the level is partnership. Partnership is a level of participation in which community as the decision-makers to explore the idea based on local community conditions. In this site planning design of pottery craftsmen settlement community participation at partnership level. To get enough information about local conditions, data collected through questionnaire.
Questionnaires were distributed to pottery craftsmen to know:
a. The ideal condition of settlements desired by residents
b. Assuming the amount of space required by craftsmen

Samples taken to fill questionnaire about 10% of the settlement population. The results of questionnaire can be tabulated as follows:

1	Areas that can be used together in settlements	Conclusion
40% of the samples answer only kiln that need to be used together	60% of the samples answer they need both kiln and hay storage	Open space in the settlements that can be combined and used to-gether by craftsmen is kiln and hay storage

2	The smoke as a result of pottery burning process		The need to overcome smoke because interfere with population comfort.
75% of the total sample answer bothered by the smoke.		75% of the total sample answer bothered by the smoke.	
3	The need of public space that can be used together as place for community gathering and kids playground		Community need of public space that can be used together as place for community gathering and kids playground
100 % of samples answer they need public space that can be used together as place for community gathering and kids playground			
4	The need of pottery products center or gallery as exhibition center and product sales.		Community need pottery handicraft center or gallery as exhibition center and product sales.
100 % of samples answer they need pottery products center or gallery as exhibition center and product sales.			
5	Community need pottery handicraft center or gallery as exhibition center and product sales.		Clear boundaries between houses is something that necessary, yet still allow private land to be used together because high familial bond of the community.
100 % of the total samples answer they still don't have land certificate, Community still propose for land certificate to village government. In determining boundaries of land ownership must be known and witnessed by village officials. 65 % of the samples answer the need of clear boundaries between houses, yet still allow private land to be used together.			

Table 2. Tabulation of Desired Condition Settlement Region

Concept of mass order and open space inside the settlement

Design criteria of mass order and open space inside the settlement was obtained after analyzing craftsmens behavior, activity patterns and also from the analysis of community participation collected through questionnaires.

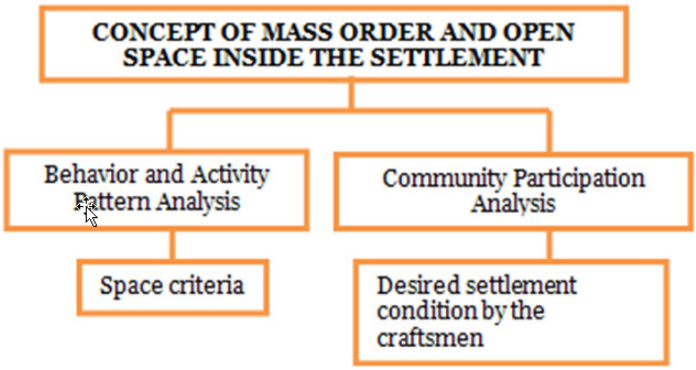


Figure 10. Concept of mass order and open space inside the settlement

Based on this criteria, concept for mass order and open space in this settlement can be described as follows:

1. Pottery kiln as open space inside the settlement as community center and to keep craftsmen cultural identity.
2. Adding new function for commercial areas in form of gallery to sell pottery products that placed along the main road.
3. Provide cover for pottery kiln to prevent smoke spreading in settlement cover made of zincalume steel placed on top of the kiln to create air funnel system that prevent smoke from spreading
4. Provide open space used as children's playground and place for community to socialize.

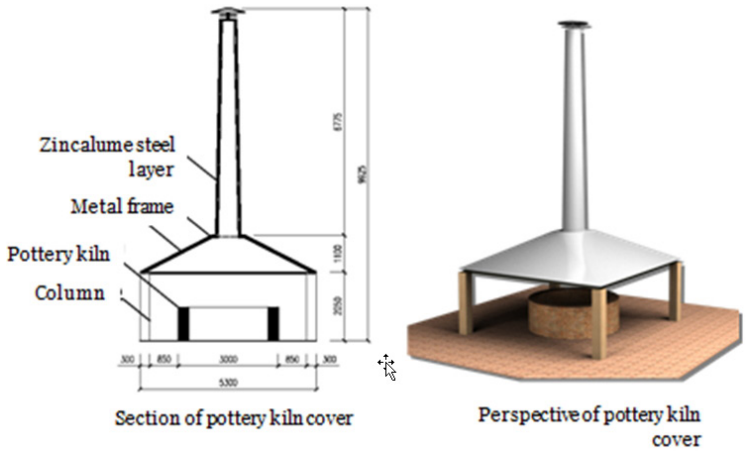


Figure 11. Detail of pottery kiln cover

From the design concept mentioned above then explored further into several alternative models of mass order and open space in settlements. In this design exploration order of mass and open space using Rapoport (1977) theory about orientation in space organization inside the settlements. There are 3 types of settlement orientation:

1. along the road / along the streets orientation
2. towards the inside (inside-out city) orientation
3. central space orientation

The concept of mass order and open space in the settlements for each orientation can be described as follows:

1. Along the road / along the streets orientation
   For this orientation, design exploration is bounded with street and productive land position in settlement that assume in fix condition and cannot be removed from the existing.
2. Inside-out city orientation
   For this orientation, design exploration is bounded with street position in settlement that assume in fix condition and cannot be removed from the existing.

Figure 12. Concept of settlement using along the streets orientation

Figure 13. Concept of settlement using inside-out city orientation

3. Central space orientation
   For this orientation, design exploration for this site planning have more free flow because not bounded with any constraint in existing.

Figure 14. Concept of settlement using central space orientation

CONCLUSION

From analysis of three type settlement orientation concept can be concluded as follows:

1. Along the streets concept has biggest percentage of productive site which is 30%. The greater percentage of productive site also means greater opportunity for site that can be used to support community economy

Land percentage
Housing lot
: 7866 m2 (32%)
Commercial Area
: 1131 m2 (4%)
Settlement main road
: 4525 m2 (18%)
Productive Site
: 7130 m2 (30%)
Open Space inside the settlement
: 3931 m2 (16%)

Figure 15. Land percentage of along the street concept

2. Inside-out city concept has advantage over the other two concepts, Open space position for pottery kiln and hay storage on this concept have easier access to craftsmen for the pottery burning process, since each cluster of craftsman house has their own open space for pottery burning (divided into 5 clusters). Shared space for pottery process can strengthen the bond of relationship between groups of craftsmen. While open space that is used as childrens playground and a place for community to socialize placed separately so the security and comfort in doing their activity is not disturbed by pottery making process

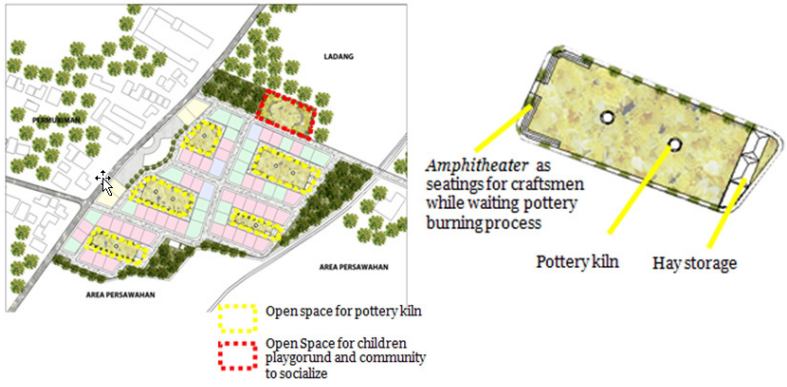


Figure 16. Open space position in inside-out city concept

3. Inside out city concept has advantages over two other concepts, as pottery production space both in craftsmen house and in settlement (in form open space for pottery kiln) located behind house cluster. This positioning at the back part of the settlement cause production activities centered on "the inside" and become more private.

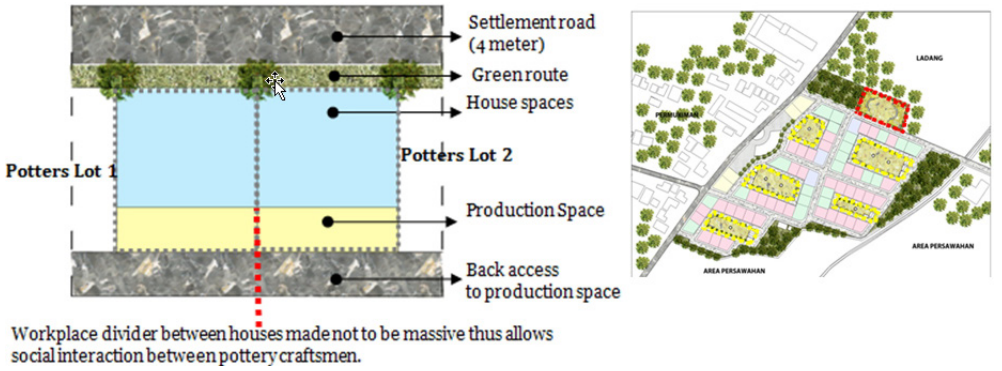


Figure 17. Ease of production access in inside-out city concept

Based on this conclusion, the settlement orientation concept that selected for further development is inside out-city. Inside out city concept chosen because it has more advantages in terms of open space and pottery kiln positioning, and also ease access of production process compared to the two other concepts.

Changing in settlement site planning with inside out city orientation provides the following benefits :

1. Make clear and easy access for the vehicle to distribute raw material of clay in every craftsmen house and hay in communal storage.
2. Provide spaces for production activities in each craftsmen house so there is no more part of the settlement that used for drying areas or as place to put raw material.
3. Divide the settlement into two areas, residential areas on the front and on the back part as production area. By this division there are two separate area inside the settlement for different function as residential and as pottery production area.
4. Divide the spread of pottery kiln by locating open space for pottery kiln into several clusters behind the craftsmen houses to give ease access for craftsmen to pottery kiln.

REFERENCES

Arnstein, S 1969, A Ladder of Citizen Participation, Vol. 35, No. 4, hh. 216-224

Heimsath, Clovis AIA (1977), Behavioral Architecture. New York, Mc. Graw-Hill Book Company.

Miles, Mathew B. Michael Huberman. 1984. Qualitative Data Analysis: A Sourcebook of New Methods. London: Sage Publication, Inc.

Rapoport, A. 1993. Development, Culture, Change and Supportive Design. USA: University of Wisconsin-Milwaukee

Silas, Johan (1993), Housing Beyond Home, Case Study of Surabaya, ITS-Surabaya.

Silas, Johan, 2000, Rumah Produktif, Laboratorium Perumahan dan Permukiman, ITS, Surabaya

Spradley, James P., (1997), Metode Etnografi, terjemahan oleh: Misbah Zulfa Elizabeth, PT Tiara Wacana, Yogyakarta.

Widayati, N. (2002). Permukiman Pengusaha Batik Di Laweyan Surakarta. Jakarta: Program Pascasarjana Fakultas Sastra Universitas Indonesia.

Widianingsih, dkk. 2007. Community Architecture dalam Pengelolaan Ruang Publik di Permukiman Kampung-Kota (studi kasus ruang publik di daerah bantaran Sungai Cihalarang Kelurahan Sukapada kec. Cibeunying Kidul Kota Bandung). Bandung : Universitas Pendidikan Indonesia.

ADAPTATION PATTERN OF SOCIAL INTERACTION FROM HORIZONTAL TO VERTICAL HOUSING STUDY CASE IN INDUSTRI DALAM AND CIGUGUR TENGAH FLAT

Feni Kurniati[1]*, Bunga Sakina[2], Adrian Immanuel[3]***, Theolifus[4]*****

[1234]School of Architecture, Planning and Policy Development, Institut Teknologi Bandung

*fenikurniati@gmail.com, **sakinabunga@gmail.com,

***adrianimmanuel92@gmail.com,

****theofilusmartasundjaja@gmail.com

ABSTRACT

Flat's residents, who were previously living in horizontal housing, facing a different way of socializing in the flats due to different spatial condition. This requires residents to adapt in order to be able to interact among themselves. One factor that affects variation of adaptation pattern is residents' origin. This study aims to identify the characterictics of social adaptation pattern in *rumah susun* conducted by two different types of residents' origin. Data were collected by using behavioral mapping observation techniques, direct interviews and structured questionnaire. The findings show that the residents' origin and communal space characteristic simillarities have a high impact on their adaptation pattern of social interactions. These results are expected to provide some insights for the development of social spaces' design in flats, to improve the quality of life of the residents.

Keywords: horizotal housing, vertical housing, residents' origin, social interaction, adaptation

INTRODUCTION

Flats' residents, who were previously living in horizontal housing, facing a different way of socializing. The social interaction habits in horizontal housing cannot be fully applied in flats due to the separated social spaces because of its floors' level differences. This condition requires residents to adapt in order to be able to interact among themselves.

The pattern of adaptation formed vary. One factor that affects it is residents' origin. Residents who were previously living in the same area are expected to have a different adaptation pattern of social interactions compared with residents originating from different locations. This study aims to identify the characterictics of social adaptation pattern in flats conducted by two different types of residents' origin. This study takes Industri Dalam flats in Bandung and Cigugur Tengah flats in Cimahi, as a case study. Residents of Industri Dalam flats are mostly from settlements around its site, whereas the residents of Cigugur Tengah flats are from the outside areas.

Data are collected by using behavioral mapping observation techniques (Haryadi, 1995) to map the kinds of social interactions and social spaces which are generated through the process of adaptation of interactions among the residents. Direct interviews with residents are also conducted as a complement to the observational data, while quessionair was used to discover the adaptation pattern conducted by residents from horizontal to vertical housing.

SOCIAL INTERACTION

Interaction, according to Soekanto (1977) is a dynamic and reciprocal relationship, either between person and person, person and group or group and group. Furthermore, he says that there are two required conditions to create social interaction, which are social contact and communication. Social contact covers two types of contacts, direct physical contact and non-physical contact such as having conversation (Gunawan in Subadi 2009). Those can take place in two nature of contacts, primary social contact such as face-to-face meeting or secondary social contact such as communicating through electronic devices.

According to the type and the nature of social contact, social interaction can be classified into three categories, which are high-level, middle-level and low-level interaction (Lawson, 2010). Social interaction involving

only visual contact is classified as low-level of social interaction, while interaction involving visual and verbal contacts is classified as mid-level and interaction involving visual, verbal and physical contacts is classified as high-level of social interaction.

SOCIAL INTERACTION ADAPTATION FROM HORIZONTAL TO VERTICAL HOUSING: A ROLE OF RESIDENT'S BACKGROUND

Given that social interaction is a key in creating togetherness (Purwanto and Wijayanti, 2012), then any residential environment is expected to facilitate social interaction needs of the residents (Sumiarto, in Anwar 1998). Thus, it is important to provide communal spaces in living environments to accomodate residents' need of social interaction (Purwanto, 2012), both formal and informal interaction (Anwar 1998).

In horizontal housing, there are some communal spaces where the residents usually meet and socialize, namely assembly hall *(balai desa)*, alley, terrace and front yard. However in vertical housing like flats, communal spaces can be devided into two caretories, the expected spaces like halls and multi function rooms and unexpected spaces like a corridor and stairs (Anwar, 1998). These differences of spatial pattern between horizontal and vertical housing affect the adaptation process of social interaction among the residents when they live flats environment.

According Hendratno (1999) and Sarwindah (1995), adaptation is an effort of individual to adjust to the environment, both physical and socio-cultural environment in order to survive (Chaplin and Evan in Suhaeni, 2011). Based on such understanding, the adaptation of social interaction is an individual effort to adapt to the new physical and social environment to be able to accommodate the needs of social interactions.

Furthermore, in the process was discovered two forms of adaptation, which are passive and active adaptation (Omar et al., 2010). Passive adaptation is an adjustment performed by residents in themself though the behavioral adaptation, while active adaptation is adjustment performed by modifying the physical environment such as expanding and separating the room. Therefore, according to Berry (1997), adaptation can be identified through comparing the changes that occur during social interactions take place, both on the physical and behavioral aspects from horizontal to vertical housing.

The changes that are created from the process of adaptation are very

diverse. In the context of flats, beside the spatial condition, residents' background also considerably influence the adaptation process of social interaction (Hendratno, 1999). One of the social background that should be taken into account is the origin of the residents. Flats with residents who are from the same area, are assumed to have the high level of closeness among them. Consequently, they have an established social relationship that significantly affects the their willingness to maintain the community solidarity though intense social interaction (Susanti, 2013 and Yanto, 2015). However, the flats with residents who are from variuous areas, will have less of communal solidarity. It causes the resident' prefer to live individually. Thus, it is clear that the social background has a big impact on social interaction adaptation pattern formed by flats' residents.

ADAPTATION PATTERN OF SOCIAL INTERACTION WITHIN VERTICAL HOUSING (FLATS)

In the continous process of adaptation, there is a repetition of the adjustment, setting a pattern of adaptation. Suyono (cited in Ratnaningrum, 2013) describes pattern is a series of elements that are settled on a phenomenon which then can be used to describe the phenomenon itself. According to that, adaptation patterns are the elements that have been settled in the process of adaptation, which can describe the adaptation process itself through the everyday life, either in the form of behavior or social interaction.

In terms of social interaction, the pattern can be read through the daily behavior of a group of individual that takes place in particular space. To read the pattern, Wigglesworth and Till (1998) mentions time can be used to discover the relationship between actors, places and events. Inkeles (cited in Sarwindah, 1995) further explains that the time propoeties can be used to measure the patterns of social interaction are 'when' and 'level' of social interaction conducted in communal spaces.

Research conducted by Yatmo & Atmodiwirjo (2011) explained that to see the usage pattern of communal space, there are parameters can be used, namely: [1] the physical characteristics of the setting, [2] the type of activity, [3] the intensity of activity, [4] time, [5] the type of actors (women/men, children/adult), and [6] number of actors.

Meanwhile, according to Purwanto & Wijayanti (2012), the parameters used to identify usage patterns of flat's communal space are divided into five, namely: [1] the nature of the activities (formal/informal), [2] the

frequency of activity, [3] the space used (space planned/unplanned), [4] scale activities (internal scale RT / inter-RT), and [5] the distance to the communal space.

Based on those studies, it can be understood that there are four patterns of communal space usage, which are [1] activity pattern, [2] spatial patttern, [3] time pattern, and [4] user pattern, as seen in the table 1.

Table 1. Classifying usage pattern of communal space

1	Activity Pattern	Activities Type	Yatmo & Atmodiwirjo, 2011
		Activities Intensity	Yatmo & Atmodiwirjo, 2011
		Activity Nature	Purwanto & Wijayanti, 2012
2	Place Pattern	Activity Frequency	Purwanto & Wijayanti, 2012
		Place Characteristics	Yatmo & Atmodiwirjo, 2011
		Place Type	Purwanto & Wijayanti, 2012
3	Time Pattern	Place Distance	Purwanto & Wijayanti, 2012
		Activity Time	Yatmo & Atmodiwirjo, 2011
4	Actor Pattern	User Type	Yatmo & Atmodiwirjo, 2011
		User Quantity	Yatmo & Atmodiwirjo, 2011
		Activity Scope	Purwanto & Wijayanti, 2012

Source: Adapted from Purwanto & Wijayanti (2012)
and Yatmo & Atmodiwirjo (2011)

Those formulatings of usage pattern of communal space generate indicators to identify adaptation pattern of social interaction in flats, they are:

1. Activity pattern, identified by type of activity, intensity, and duration of activity.
2. Place pattern, identified by type of place and its distance to dwelling unit.
3. Time pattern, identified by when activity conducted.
4. User pattern, identified by type and quanity of users involved.

Table 2. Indicators of adaptation pattern of social interaction conducted in flats

1	Activity Pattern	Activity Type
		Activity Intensity
		Activity Duration
2	Place Pattern	Place Type
		Accesibility

3	Time Pattern	Activity Time
4	User Pattern	User Type
		User Quantity

Source: Authors' analysis adapted from Purwanto & Wijayanti (2012) and Yatmo & Atmodiwirjo (2011)

DESCRIPTION OF STUDY CASE

Description of Industri Dalam Flats

Figure 1. Industri Dalam Flats
Source: Authors' documentation

Industri Dalam Flats is an owned flats located in Kelurahan Arjuna, Kecamatan Cicendo, Bandung. It is located in a strategic location because there are several public facilities and infrastructure (such as public transportation, mosque, market and school) nearby. These flats were built due to the flood concern that comes annually from Citepus River, which flows though the Industri Dalam dwelling area. In the process, the government replaces each land which owned by the private dwellers that were being evacuated to the flats, with the flats' unit.

According to the manager's data (2005), this flats has three four-story building blocks called Block A, B, and C. It has 156 units and 780 residents in total. Each unit contains of one bathroom, one bedroom, and one multipurpose room. There are also some communal facilities, such as communal kitchen and bath inside the Block A. Nearby this block, there are some convenient shop booths. This flats also has an open space which located on the center of the flats complex. In normal days, it becomes parking space. Sometimes it could become public space or sport field, when vehicles are not there.

Figure 2. Industri Dalam flat complex conditions
Source: Authors' documentation

Description of Cigugur Tengah Flats

Cigugur Tengah Flats is a rental flats located in Kelurahan Cigugur Tengah, Cimahi. It was built in 2003 and became operational in 2006, according to the manager's data (2009). This flats already rented and being inhabited by 1921 families or 5317 people in total.

Figure 3. Cigugur Tengah Flats
Source: Authors' documentation

The complex of Cigugur Tengah Flats has 5 building blocks (block A, B, C, D, and E). Each of them has 5-storey, where there are public space, parking lot, and building manager office on the ground floor; and also residential units on the upper floors. Each floor has 12 typical units with 21 m2 floor area eachincluding one kitchen and one bathroom. There is also a mosque located inside this flats complex.

Figure 4. Cigugur Tengah flat building conditions
Source: Authors' documentation

INDUSTRI DALAM FLATS SOCIAL INTERACTION ADAPTATION PATTERN ANALYSIST AND DISCUSSION

Communal Space Usage Pattern in Industri Dalam Flats

To analyze the social interaction adaptation pattern that happens in Industri Dalam Flats, identification towards the social interaction along with the created social space was conducted through observation and open interview with some flat dwellers. The observation using activity mapping (figure 5 and 6) was used to discover the social interaction activity on the ground level and block B flats, which block has similar facilities as the one in Cigugur Tengah flats – for equal comparison.

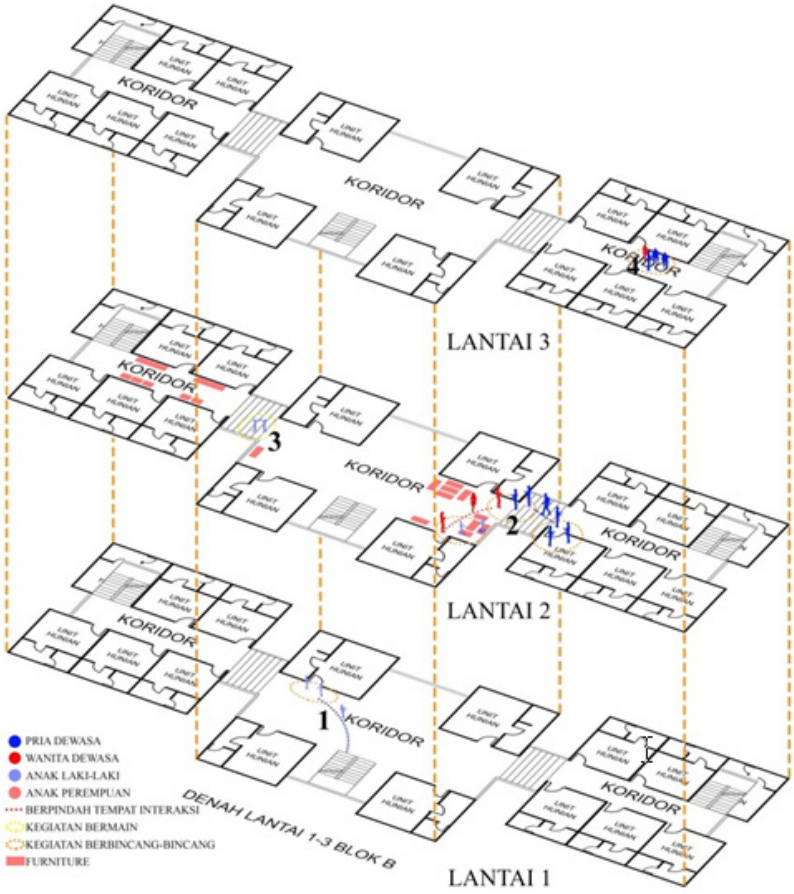


Figure 5. The use of communal spaces pattern on 1st-3rd floor area of Industri Dalam flats
Source: Authors' analysis (spatial map is adapted from flats' manager data)

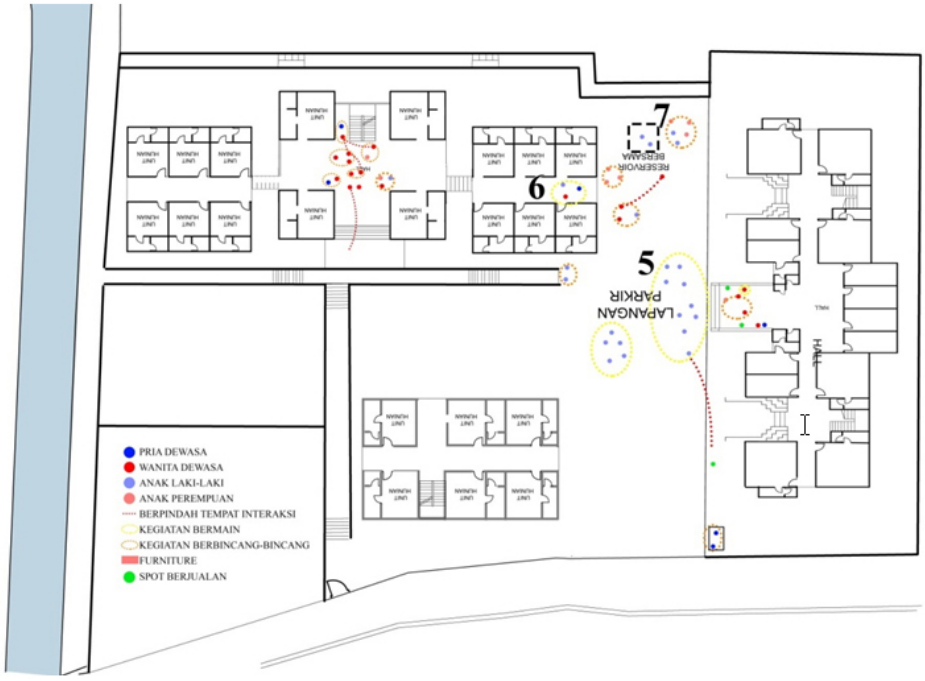
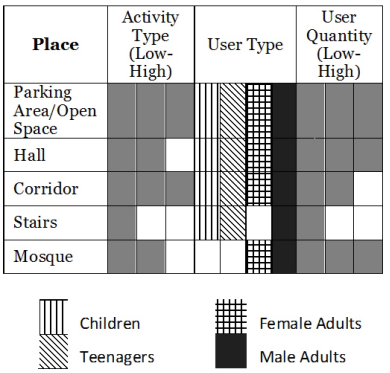


Figure 6. The use of communal spaces pattern on the ground floor area of Industri Dalam flats
Source: Authors' analysis (spatial map is adapted from flats' manager data)

Based on the result of activity mapping and open interview, social interaction spaces are created in (1) parking area and open field; (2) lobby and hall inside flat buildings; (3) corridor; (4) stairs and (5) mosque. At the same time, the pattern of social interaction, which are activity type, user's type, and quantity of doers were discovered. The preliminary conclusion of this identification was summarized in table 3.

In table 3, it is shown that there are more variety of social interaction activities in the parking field and corridor, compared to the other areas. Based on age of users, parking field, lobby/hall, and corridor are used by all groups of age. While based on number of interacting people, averagely they prefer to interact around the parking field, lobby/hall, and mosque. This phenomenon is also influenced by activities that could possibly perform on those spots.

Table 3. Classification of communal space usage pattern in Industri Dalam Flats



Source: Authors' analysis

These identification result of social interaction pattern was used as reference to make questionnaire and as supplementary to identify social interaction adaptation pattern in the flats.

Industri Dalam Flats Residents Background

Background of Industri Dalam Flats residents were obtained through structured questionnaire. Respondents in total are 25 people (11 male and 14 female), which majority are adults (25-70 year). Their occupation generally are housewives (42,9%), self-employments (32,1%), office workers (14,3%), college students (7,1%) and students (3,6%).

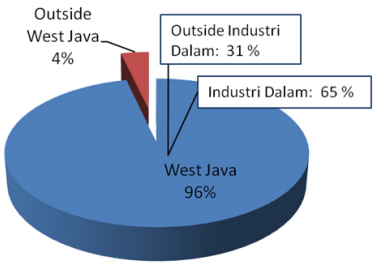


Figure 7. Industri Dalam flats residents origin
Source: Authors' analysis

Majority of the respondents are originally from horizontal housing. Generally they come from West Java (96%), which all of them are from Industri Dalam neighborhood (65%). They also already had known each other before they moved to the flats. This kind of social background also influences their social adaptation pattern in the Industri Dalam Flats.

This established social relationship is then becoming an important key to support the process of social interaction adaptation among the residents in Industri Dalam flats.

Social Interaction Adaptation Pattern from Horizontal Housing into Industri Dalam Flats

Social interaction adaptation behaviors of the residents were achieved through questionnaire. The questionnaire based on activity pattern including activity type, intensity and duration of social interaction activity; location pattern including location and accessibility; time pattern including when the interaction happened; and users pattern including numbers of doers.

The questionnaire compares social interaction pattern between horizontal and vertical neighborhood, to identify whether they kept their social interaction habits in horizontal neighborhood or adapting by change their interaction habits. The pattern could be seen form table 4.

Table 4. Comparation of social interaction pattern between horizontal and vertical housing in Industri Dalam flats

Social Interaction Pattern			Percentage (%)	
			Horizontal Housing	Vertical Housing
Activity Pattern	Activity Type (Low-High Interaction)	Mid-Level	79.6	85.7
		High-Level	20.4	14.3
	Activity Intensity	Almost never	7.1	
		Rarely	3.6	15.4
		Every once in a while	14.3	11.5
		Sometimes	42.9	26.9
		Almost always	32.1	46.2
	Duration	<15 min		3.6
		15-45 min	32.1	28.6
		45-60 min	21.4	10.7
		1-2 hrs	28.6	32.1
		2-3 hrs	10.7	10.7
		>3 hrs	7.1	14.3

Place Pattern	Place Type	Front yard/terrace	42.3	
		sidewalk	9.6	
		Open space/ field	13.5	32.1
		Alley	21.2	
		Mosque	9.6	13.2
		In the house	1.9	
		Assembly hall	1.9	18.9
		Stairs		3.8
		Corridor		32.1
	Accesibility	Very difficult		3.8
		Difficult		
		Average	3.6	7.7
		Easy	25	26.9
		Very Easy	71.4	61.5
Time Pattern	Activity Time	Morning	23.9	16.7
		Afternoon	13	16.7
		Late afternoon	37	35.4
		Night	26.1	31.3
User Pattern	User Quantity	< 3	3.6	3.6
		3-5	39.3	32.1
		6-10	32.1	28.6
		> 10	25	35.7

Source: Authors' analysis

Based on the comparison result of social interaction pattern in horizontal and vertical neighborhood, it was found the adaptation patterns which are including the activity pattern, location pattern, time pattern, and performer pattern.

Activity Pattern

From table 4, it is shown that the level of social interaction activities that happened in both horizontal and vertical housing is generally average. There are some incline of social interaction intensity after they move to the flats, from 42.9% to 46.2%. It is the same for the social activity duration, which increase from 15-45 minutes to 1-2 hours.

Based on observation and open interview, this incline of social interaction intensity and duration was caused by the relation between residents since lived in horizontal neighborhood. This also happened due to the transformation of interaction space, where it was scattered around in horizontal neighborhood, and centralized in smaller scale in the flats. This new environment also supported by communal facilities which make them easier to meet with others.

Activity Location Pattern

Social interaction activity location pattern in both horizontal and vertical neighborhood are relatively the same. The most favorite interaction spot horizontal neighborhoods are on the terrace or the front yard (42.3%), as the rest are in alley ways (21.2%) and open field (13.5%). On the other hand, the spot that most likely used for social interaction is the corridor (32.1%) and ground level of the flats that consist of open field (32.1%) and hall/lobby (18.9%).

Accessibility factor is the reason of those chosen social interaction spots, like in horizontal neighborhood (71.4%) and vertical neighborhood (61.5%). Similarity of social interaction space physical characteristic is also become one of the influencing factor, such as the similarity between alley and units' corridor.

Activity Time Pattern

Based on comparison in table 4, time pattern in both horizontal and vertical neighborhood are relatively the same. Social interaction activities majorly happen from daytime until evening, which is 37% and 26.7% in the horizontal neighborhood and 35.4% and 31.3% for vertical neighborhood. Those chosen times are caused by residents' occupation background that majorly are housewives and workers that are away from morning until late afternoon.

Activity User Pattern

The scale number of social activity performer incline, from 3-5 people (39,3%) in horizontal neighborhood, until more than 10 people (35.7%). It is factorized by neighborhood scale and gathering event schedule of Industri Dalam Flats residents.

STUDY AND ANALYSIS OF THE SOCIAL INTERACTION ADAPTATION PATTERN IN CIGUGUR TENGAH FLATS

Communal Space Usage Pattern in Cigugur Tengah Flats

As in Industri Dalam flats, the identification process of the social interaction adaptation pattern in Cigugur Tengah flats starts from the observation of the social interaction form and the spaces that are created from the interaction process by observing and interviewing some of the inhabitants. The observation is done through every floor of tower A and B–for these towers have the similar facilities as Industri Dalam flats, where the bathroom and kitchen are located inside every unit—by mapping the utilization pattern of the shared space. The usage pattern of the communal space mapping can be seen in picture 8, 9 and 10.

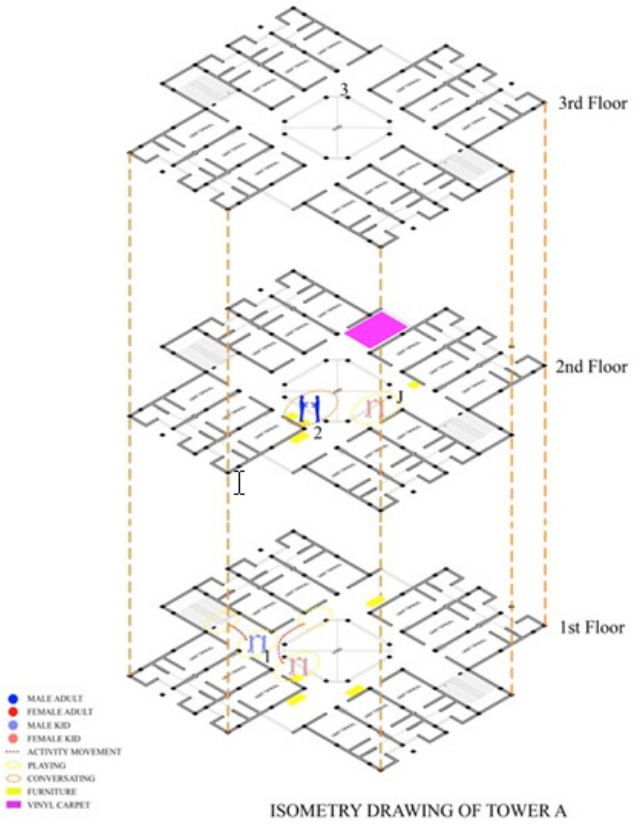


Figure 8. The use of communal spaces pattern on 1st-3rd floor area of Cigugur Tengah flats, llock A
Source: Authors' analysis (spatial map is adapted from flats' manager data)

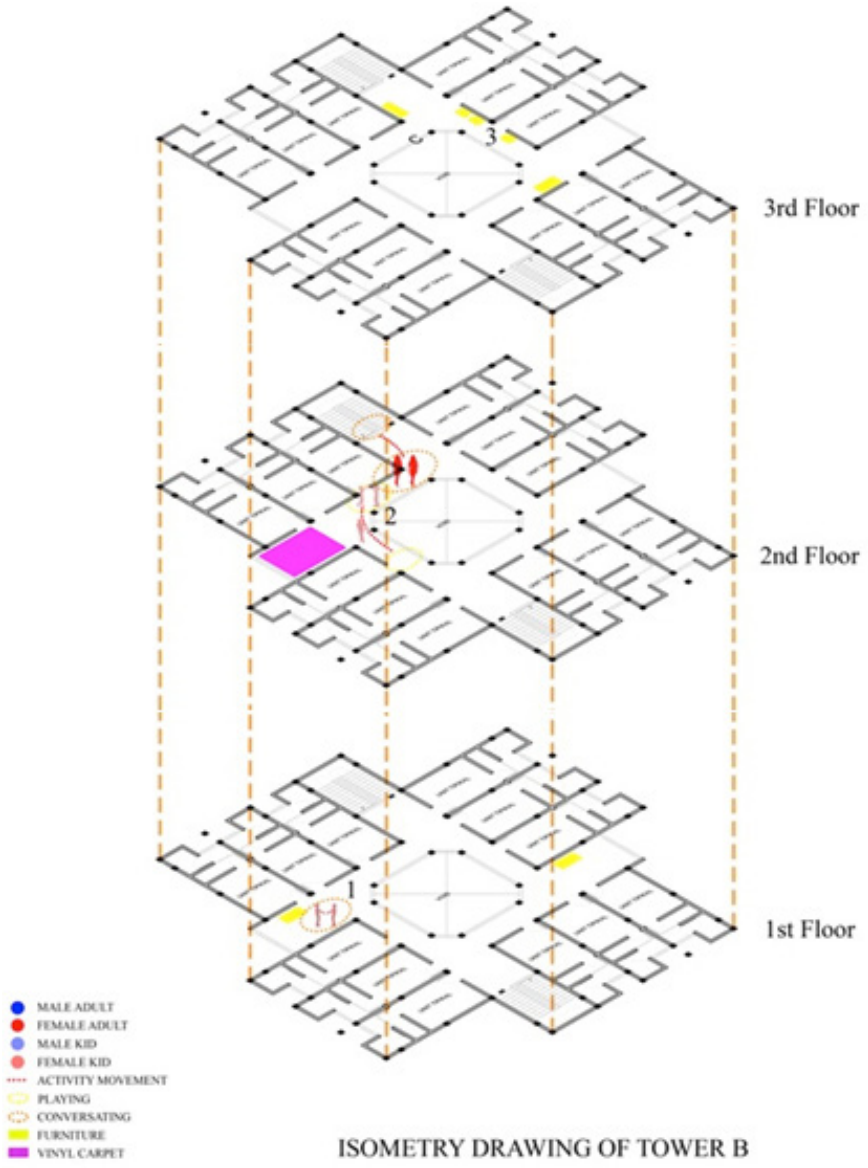


Figure 9. Usage of shared space in 1st-3rd floor of Tower B in Cigugur Tengah Flat
Source: Authors' analysis (spatial map is adaptaed from flat's manager data)

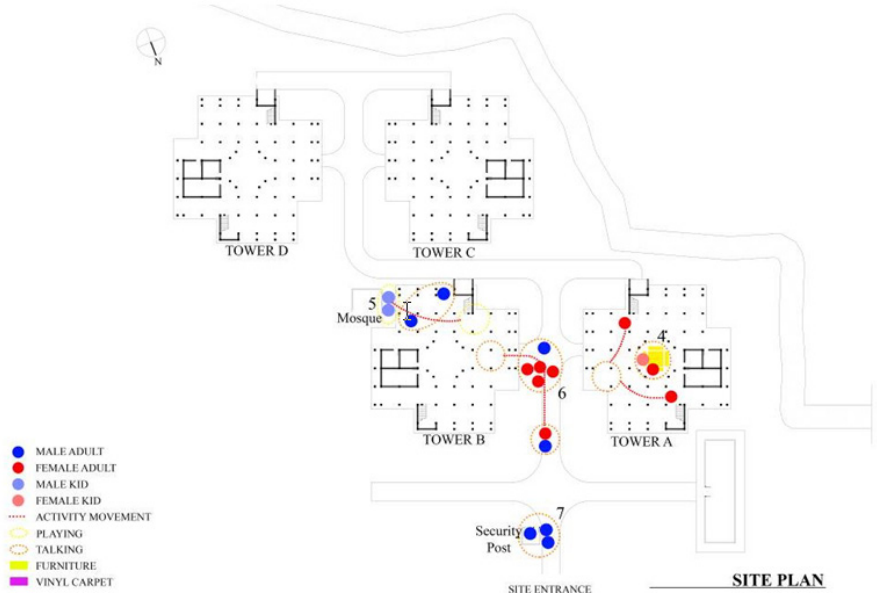


Figure 10. Usage of shared space in ground floor of Cigugur Tengah Flat
Source: Authors' analysis (spatial map is adaptaed from flat's manager data)

Based on the observation and interview, some places are identified as social interaction place, such as (1) parking area/open field, (2) hall/ lobby, (3) corridor and (4) mosque. The type of interaction, subject type and the number subjects involved are also identified in every location. The conclusion of the identification is summarized in table 5 (see below).

Table 5. Classification of communal space usage pattern
in Cigugur Tengah Flats

Place	Activity Type (Low-High)	User Type	User Quantity (Low-High)
Parking Area/Open Space			
Hall			
Corridor			
Mosque			

Children
Teenagers
Female Adults
Male Adults

Source: Authors' analysis

In table 5, it is seen that the type of social interactions at the corridor are more diverse than other areas. At the same time, the lobby and parking area have the largest diversity based on the age group of subjects. It is also found that the subject's scale of social interaction are tend to be bigger in the open field/parking area, corridor and mosque. This is affected by the type of activities that are contained in those places.

The result of this social interaction pattern is used to be the reference in compiling the questionaire and as a supplement data to see the social interaction adaptation pattern which occurs among the flats' residents.

The Residents' Background in Cigugur Tengah Flats

As in Industri Dalam flats, the questionaire is used to get the complete data of the residents' background in Cigugur Tengah Flats. At the total, there are 25 respondents to the questionaire—15 respondents are male and the rest are female. The age range of the respondents is between 25 and 70 years of age, while the occupations of the respondents are entrepreneur (37,5%), office employee (28,1%), houswife (21,9%), labour (6,3%) and student (6,3%).

Before moving to the flats, most of the respondents used to live in the horizontal housing. The majority of the inhabitants in Cigugur Tengah flats come from West Java (84%)—26,4% from Cigugur and 58% from outside of Cigugur—and so it is known that almost all of the inhabitants were strangers one to another.

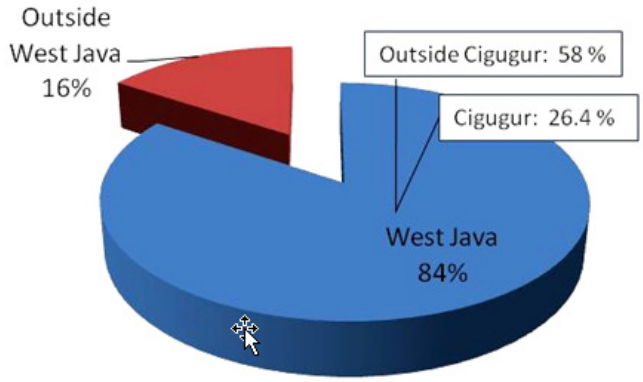


Figure 11. The origin of the inhabitants in Cigugur Tengah Flats
Source: Authors' analysis

The social conditions where the Cigugur Tengah flats inhabitants do not know each other affects the closeness between them, which later create a domino effect to the adaptation of the social interaction patterns formed in the Cigugur Tengah flats.

Social Adaptation Pattern from the Horizontal Housing into Cigugur Tengah Flats

As in the case of the Industri Dalam flats, all respondents in Cigugur Tengah flats were also asked to fill out a questionnaire that includes information about their interaction habits in horizontal dwelling and after living in the flats. The comparison result of the social interaction patterns in both horizontal dwelling and vertical dwelling can be seen in table 6.

Table 6. Comparation of social interaction pattern between horizontal and vertical housing in Cigugur Tengah flats

Social Interaction Pattern			Percentage (%)	
			Horizontal Housing	Vertical Housing
Activity Pattern	Activity Type (Low-High Interaction)	Mid-Level	89.4	82.2
		High-Level	10.6	17.8
	Activity Intensity	Almost never	16.7	22.6
		Rarely	16.7	12.9
		Every once in a while	16.8	
		Sometimes	23.3	19.4
		Almost always	26.7	22.6
	Duration	<15 min	6.3	12.5
		15-45 min	37.5	46.9
		45-60 min	28.1	18.8
		1-2 hrs	21.9	15.6
		2-3 hrs	6.3	6.3
		>3 hrs		

Place Pattern	Place Type	Front yard/terrace	37.3	
		sidewalk	9.8	
		Open space/ field	11.8	17.4
		Alley	11.8	
		Mosque	23.5	21.7
		In the house		
		Assembly hall	2	13
		Security post	2	
		Store	2	
		Stairs		
		Corridor		47.9
		Very difficult	3.3	
		Difficult		3.1
		Average	13.3	6.3
		Easy	26.7	21.9
		Very Easy	56.7	68.8
Time Pattern	Activity Time	Morning	10.3	17.5
		Afternoon	17.9	10
		Late afternoon	46.2	50
		Night	25.6	22.5
User Pattern	User Quantity	< 3	15.6	18.8
		3-5	53.1	59.4
		6-10	18.8	18.8
		> 10	12.5	3.1

Source: Authors' analysis

Based on the above comparative table, it was obtained that the social interaction adaptation patterns includes the pattern of activity, time, and its subjects.

Activity Pattern

Based on the type of social interaction activities carried out, it appears that the majority of social interaction both who currently live in the horizontal dwelling and vertical dwelling are relatively at the same level of interaction, namely the intermediate level. Similarly, the intensity of

social interaction, both in the horizontal dwelling and vertical dwelling show no significant difference. It can be seen from the even distribution of the intensity levels, from the rarest intensity to the most frequent intensity (See table 6). While the election of the social interaction duration that takes place, relatively declines from the horizontal dwelling and vertical dwelling inhabitants in a span of 15-45 minutes. This is demonstrated by the growing percentage of the election of the social interaction duration of the horizontal dwelling (37.5%) to the vertical dwelling (46.9%).

The decreasing of the intensity and duration of the social interaction from such horizontal dwelling to the Cigugur Tengah flats are caused by the inhabitants' conditions that they do not recognize each other. In addition, the background of the majority of the inhabitants' occupation also become a crucial factors since it limits the social interaction time of the inhabitants and lower the opportunity to adapt socially, for example the frequency of chatting is also on the wane. Accordingly, it results in the low social interaction that were currently formed in the Middle Cigugur flats.

Activity Location Pattern

As shown in Table 7, it appears that the venue or the location that is most widely used to interact is the porch or the front yard (37.3%) and mosques (23.5%) for the horizontal housing, and corridors (47.9%) and mosques (21,7%) for flats. Based on the selection of the type of location to interact, it can be seen that there are similarities in the characteristics of residential social interaction space both in the horizontal dwelling and in vertical dwelling, i.e. porch and yard at the horizontal dwelling that have similar functions and closeness to the corridors at the vertical dwelling, so that inhabitants can adapt easily to use these spaces as a place for their social interaction.

In terms of accessibility level of the spaces that are widely used, both in the horizontal and vertical housing are relatively easy to be accessed. This is because the location is very close to the housing units that it enables the inhabitants to have access to it.

Activity Time Pattern

Based on the comparison results in Table 7, the time pattern of the social interaction course, both in horizontal dwelling and in apartment are relatively the same. The percentage of social interaction in the horizontal

dwelling are shown with figures of 46% in the afternoon and 25.6% at night, while in the apartment are shown with figures of 50% in the afternoon and 22.5% at night. Lower social interaction during night time can be caused by the factor of resident's working hours. Inhabitants are more likely choosing to rest rather than socializing with other inhabitants.

Activity User Pattern

As for the number of actors involved in the social interaction was found relatively the same, namely on a scale groups of between 3-5 people, both in horizontal dwelling (53.1%) and vertical dwelling (50%). The conditions of origin and occupation background of the inhabitants lead to the increasingly poor opportunities to be able to adapt socially among fellow tenants, which later caused all interaction to take place only on a small scale and unplanned in nature.

SOCIAL INTERACTION'S ADAPTATION PATTERN: A ROLE OF RESIDENTS BACKGROUND

Based on discussion of social interaction adaptation pattern of Indutri Dalam and Cigugur Tengah Flats, it is found that residents background (Hendratno, 1999), especially neighborhood origin and occupation are the most influencing factor. Industri Dalam Flats residents that majorly are from the same neighborhood are socially adapting easier than Cigugur Tengah Flats residents that majorly are from different neighborhood background. This is due to the sense of closeness and togetherness between residents (Susanti, 2013 and Yanto, 2015). The difficulty of social interaction adaptation in Cigugur Tengah is also complicated by unfamiliar feeling between each other, and working time factor which majorly are from morning until evening, which shorten their time to meet and interact with others.

Social adaptation rate is also influenced by the similarity of neighborhood origin background. Spaces that have similar ambience are most likely being preferred by people for interaction. As an example, corridor that become the most used space for interaction in both Industri Dalam and Cigugur Tengah flats are similar (in physical, scale and activity context) to terrace or alley ways in horizontal neighborhood.

On the other hand, it is found that adaptation of residents to make the same interaction space ambience as the one in horizontal housing, by adding some additional physical elements in those spaces. As many of

residents who did active adaptation (Omar et al. 2010) by providing chair and table on units' corridor area to make the same ambience as the one in horizontal housing neighborhood.

CONCLUSION

It was found that factors such as; the origin, background as well as the similar characteristics of the common social space have influences on the pattern of social interaction adaptation of the inhabitants. In addition, the form of active adaptation by adding physical elements in certain spaces is part of the adaptation process to the new residential neighborhood.

Results of this study are expected to provide an additional background information in connection to the social interaction in the horizontal dwelling that might become one of the basic considerations when designing social spaces in apartment. In that respect, social space provided may help to improve the quality of social interaction, as well as to improve the life quality of the residents.

REFERENCES

Anwar. (1998). Analisis Model Seting Ruang Komunal sebagai Sarana Kegiatan Interaksi Sosial Penghuni Rumah Susun. Studi Kasus Rumah Susun Pekunden dan Sombo. Tesis program Magister Teknik Arsitektur, Universitas Diponegoro Semarang.

Berry, J.W. (1997). Immigration, Acculturation and Adaptation. Applied Psychology: An International Review, 46 (1), 5-68.

Haryadi & Setiawan,B. (1995). Arsitektur Lingkung-an dan Perilaku: Suatu Pengantar ke Teori, Metodologi dan Aplikasi. Direktorat Jendral DIKTI, Depdikbud.

Hendratno, E.T. (1999). Rumah Susun dan Penghuninya: Adaptasi Sosial Penghuni Rumah Susun terhadap Lingkungannya. Studi Kasus terhadap Penghuni Rumah Susun Kemayoran, Jakarta. Program Studi Antropologi, Program Paska Sarjana Universitas Indonesia.

Lawson, G.M. (2010). Social Interaction in Chinese Parks: A Walk in Lu Xun Park. International Congress 2010 Healthy Parks Healthy People. QUT Digital Repository: http://eprints.qut.edu.au.

Mustafa, A. F., Trisutomo, S. , & Hamzah, B. 2013. Komparasi Perilaku Penghuni Rumah Susun dengan Penghuni Permukiman Kumuh (Studi Kasus: Rusunwa Mariso Kota Makassar). Jurnal Paskasarjana Universitas Hasanuddin.

Omar, E.O., Endut,E. & Saruwono M. (2010). Adapting By Altering: Spatial

Modifications Of Terraced Houses In The Klang Valley Area. Asian Journal Of Environment-Behaviour Studies, Vol. 1, No. 3, September 2010.

Purwanto, E. & Wijayanti. (2012). Pola Ruang Komunal Di Rumah Susun Bandarharjo Semarang. Dimensi(Journal of Architecture and Built Environment), Vol. 39, No. 1, Pages 23-30.

Ratih, I.W. (2005). Efektifitas Ruang Publik di Rumah Susun: Kajian Perilaku Penghuni Rusun- Studi Kasus: Rusun Industri Dalam. Sostek Perancangan Lingkungan Binaan, Program Magister Arsitektur Alur Perumahan dan Permukiman, Fakultas Teknik Sipil dan Perencanaan, Institut Teknologi Bandung.

Ratnaningrum, A. (2013). Adaptasi Sosial Purnawirawan TNI Studi Kualitatif Proses Penyesuaian Diri Purnawirawan TNI AL Di Lingkungan Perak – Kota Surabaya. Program Studi Sosiologi, Fakultas Ilmu Sosial dan Ilmu Politik, Universitas Airlangga Surabaya.

Sarwindah, S. (1995). Pola Adaptasi Penghuni di Lingkungan Permukiman Rumah Susun: Studi Kasus Kota Baru Bandar Kemayoran Jakarta. Program Studi Ilmu Lingkungan, Program Paska Sarjana Universitas Indonesia.

Soekanto, S. (1977). Sosiologi Suatu Pengantar. Yayasan Penerbit Universitas Indonesia.

Subadi, T. (2009). Sosiologi dan Sosiologi Pendidikan: Suatu Kajian Boro dari Persfektif Fenomenologis.

Suhaeni, H. (2011). Kepadatan Penduduk dan Hunian Berpengaruh Terhadap Kemampuan Adaptasi Penduduk di Lingkungan Perumahan Padat. Jurnal Permukiman, Vol. 6 No. 2 Agustus 2011, hal. 93-99.

Susanti, H. (2013). Repository.usu.ac.id. Accessed on March 10 2015 at 00.35 am (West Indonesia Time).

Wigglesworth, S. & Till, J. (Eds.).(1998). The everyday and architecture. Architectural Design, Academy Press.

Yanto, R. (2015) Pengaruh Perbedaan Budaya Terhadap Proses Komunikasi Interpersonal. Academia.edu. Accessed on March 10 2015 at 00.35 am (West Indonesia Time).

Yatmo, Y.A., & Atmodiwirjo, P. (20112). Collective Spatial Strategies in Urban Kampung Communal Toilet. Asian Journal of Environment-Behavior Studies

INTEGRATED SUBSIDIZED INFRASTRUCTURE IN INFORMAL HOUSING DEVELOPMENT FOR SUSTAINABLE CITY IN BANDUNG

Sidi Boedi Darma

School of Architecture, Planning and Policy Development,
Institut Teknologi Bandung
boedsi@yahoo.com

ABSTRACT
'Sustainable development' is an international environmental issue (Choguill, 1994) which is conceptually should be applied in every sectors of development including human settlement project. Human settlement issues have relationships with demographic and geographical features as well as so called "pressure points" such as food supply and Infrastructure. Infrastructure is one aspect on human settlement which has relation to water, waste disposal, health, street and shelter and it played an important role in realizing a sustainable environment. Its impact especially on air and water influenced the life quality as well as environmental sustainability (Stern R. et.al, 1992).

Informal settlement is more known as unplanned settlements and areas where housing is not in compliance with current planning and building regulations, unauthorized housing, some is illegally constructed on land that the occupants have no legal claim to, or occupy illegally (U.N., 1997). In positive manner it is as a self-help housing production to fulfill basic needs. These housing groups are characterized with inadequate infrastructure, such as clean water, waste water and disposal treatment.

The research is conducted at neighborhood units Sub District Lebak Siliwangi in Bandung as longitudinal overview on infrastructure development and used qualitative method through interview over sub district government

personals and community leaders. Questioner is also used to collect data from house to house in targeted settlement to see how they handled the need of water, waste water and other household waste as well as their opinion on related infrastructure.

It is found that majority of targeted population of this researched area aware on the problem their faced regarding hosing settlement infrastructure but couldn't do much to solve the problem. The land availability and financial problems is raised as main obstacles to overcome the problems. In the other side there were many programs conducted on this site at regional and national government level, seems lack of coordination and is not continually planned.

Keywords: Sustainable, Informal Housing Settlement, infrastructure

I. INTRODUCTION

Bandung the capital city of West Java Province has many famous predicates that attract peoples from any socio economical level from surrounding Indonesians to live in and gain some advantageous for their life. The lower income groups almost live in settlement, characterized with high density housing, informally built with minimal infrastructure, especially clean water, waste water treatment and other physical conditions.

The river bank of Cikapundung settlement in Lebak Siliwangi Neighborhood, which is formerly built along with high urbanization processes, is housing groups of low income people. Strategic geographical position of this area functioned as push factors for fast development and improper controlling by local authority has changed this settlement high density slum housing and become most populated slum housing in Bandung.

Cikapundung River is an important resource for clean water supply for the city beside other social life of peoples. The slum settlement has more negative impact on river quality, especially through its waste and waste water. The river is handled as back yard of their houses, where their waste ended.

Many programs were conducted regarding need of clean water and waste water handling to reduce that problems. Until now it always came to unsatisfied result. It is the question of this research, why this condition happened and what suggestion could be given to have better possibility application to get better settlement?

II. HOUSING INFRASTRUCTURE AND SUSTAINABLE CONCEPT

2.1. Sustainable Concept as Global Issue

Biosphere is "designed" with it complex of self-sustaining system (Clapham, J.W.B. 1983). Material cycles such as water cycles, carbon cycles provide the living organism with materials they need to live. The interaction between living organism or Biotic Component with Non-Living Organism such as water, air, mineral and soil as a-biotic component built an ecosystem with its cycles and continuity processes. This all showed the basic concept of sustainability. An alteration in one component would be followed by changes at other component. This is an automatics chain process.

Human Beings as a living organism are not the same as animals or plants. The social goals of human beings as described by the Maslow Triangle hierarchy (Maslow A.) includes "a never ending" necessity to improve their standards of living. As soon as basic or lower level necessities are fulfilled, human beings would request higher standards for themselves.

The economic activities of human beings as a part of society influence their biotic and a-biotic environment regarding the cycles of materials, with a more negative than positive impact on the environment. This environmental degradation have forced countries around the world to arrange the Rio Earth Summit in 1992, where countries agreed to take action across nations in promoting sustainable development.

The triangular relationship between society, economic activity and environment (http://www.sustainabledevelopmentinfo.com) should also be balanced. The environment has to undergo a regeneration processes to be able to maintain its capacity in supporting society along with its economic activities. The goal of sustainability is, ultimately, the well being of human beings; to fulfill their current needs without neglecting the needs of future generations.

In Agenda 21 of the 1992 Rio Earth Summit (http://en.wikipedia.org/wiki/Agend21), it is stated that poverty, consumption pattern, health, population and housing are al important aspects in realizing sustainable environment. It is also mentioned in the "MDG" or Millenniums Development Goals as a further action from the Rio Summit (http://www.un.org/ millenniumgoals).

It can be concluded that housing is one basic need of human beings,

whose quality is strongly related with the concept of sustainability. In other words, housing, poverty eradication, and health all play an important part in reaching sustainable living. Neglecting those aspects could produce a negative impact on the environment and the continuity of human life in that settlement.

2.2. Human Settlement and Sustainability

Human settlements, as an artificial environment, have a tremendous influence on the quality of the environment itself. Some prerequisites are to be met to ensure a settlement's livability and environmental sustainability. The use of renewable and non-renewable resources should be limited to certain limits .

The effect to the environment is depending on the size of the activities and its environment-related infrastructures (Stren, R. et.al., 1992). Although, in Agenda 21 (Agenda 21, p. 65), the objectives of human settlements are to improve the social, economic and environmental quality of its inhabitants, which is inherent in the basic concept of sustainability, in reality, some data showed that the speed of pollutant generation is not matched by the capacity of their natural cycling processes (Choguill, C.L., p.7, 1994). Those wastes affect very much especially the quality of air, water, rivers, lake, ocean and soil.

The low income income people housing is usually characterized by inadequate infrastructure other environmental problems such as flood, disease etc. Public services such as clean water, safe sanitation and proper drainage system and transport facilities are normally also below standards both in quality and quantity (Choguill, C.L., 1994). These condition are usually connected with polluted air, water and soils, which endanger the life quality of communities.

2.3. Building Embodied and Operational Energy

Housing, as one important human basic need, can nowadays be built from almost any material, provided from natural, manually-processed to industrially-produced materials. Natural products such as timber, bamboos, straw and stone have different endurance, type of construction capabilities and appearances (http://www.yourhome.gov.au/materials) from industrialized materials, such as steel, glass and other synthetic materials which seem to have more flexible construction possibilities, durability and appearance.

Industrialized building materials affect the environment ever since their mining process, industrial production, transportation, construction procedure and possibly even as post-construction waste. The whole process also requires relatively high amounts of embodied energy. In contrast, recycled materials for housing construction is known as a solution in reducing embodied energy and related environmental pollution (Jane Anderson, http://www.greenspec.co.uk/building-design).

Design, material and construction method chosen for building determine the amount of embodied energy. Building maintenance and repair also contribute to total embodied energy. It is strongly related to the so-called Carbon Foot Print, or contribution to air pollution and related material cycles (http://www.circularecology.com/embodied-energy-and-carbon-footprint-database.html). Each building has a complex combination of materials that contribute to total embodied energy and their respective impact on the environment.

In informal housing settlement or low income housing brick clay, wood and bamboo are often used as prime building materials. This phenomenon identical with low embedded energy but has strong relation to natural product, which also related to material cycles, especially water, air and its gases. The better is housing environment the better is the material durability, furthermore it support better living quality.

2.4. Housing Infrastructure

In settlements, housing structures and infrastructure determine the living quality and its impact to the environment. Housing infrastructure in this case is limited in water supply, waste water and solid waste, street and canalization which have direct impact to quality of life and environment. In Urban area, a fast growing housing settlement is usually followed by incomplete or inadequate infrastructure (Stren R. et.al.), which could pose a serious threat to sustainability.

2.4.1. Land and Water

Land is one important resource on earth. Its quality determined the life quality and many cycles of material needed for supporting life. Good water cycles need certain areas of land which allows easy penetration (Clapham JWB, 1983) to build ground water as water reservoir for plantation, microorganisms and human beings. Land covered by development on earth has a reduced absorption capacity, lowering its

capacity to support life.

Runoff water goes into rivers and reaches the sea more quickly, becoming saltwater, which requires costly processes to become potable water. Developed countries like Germany attempt to slow down the water flow in rivers through water dams which use the water for agriculture and produce electricity in same time (http://en.wikipedia.org/wiki/Upper Rhine).

Land and water issues pose very serious challenges to the sustenance of life on earth. Losing clean water and fertile land would inevitably reduce the quality of life. Once their quality is degraded, it is very hard and costly to restore them to their initial condition. For example, the Rhine River required about 50 years, with the help of at least six countries, to enable it to provide clean water and to be used for fresh water fishery.

2.4.2. Waste Water and Solid Waste

Waste water and solid waste from household activities are the most pollutant elements to fresh water and earth. Beside its serious impact on living and non-living organisms on earth, they also reduce the availability of fresh water in the earth (Choguill, CL). Those wastes need to be treated to reduce their negative impact on fresh water availability.

In case of human settlements, as in housing, waste water must at least be done correctly through the use of septic tanks or similar equipments which can reduce pollutants in the water and the risk of polluting the ground. Solid waste could also have a serious impact on fresh water availability and earth ground property if handled improperly. In many developing countries, waste water and solid waste constitute the largest share of pollutants in the water.

2.4.3. Street and canals

Proper planning of different sizes of streets and canalization can contribute to the availability of open spaces, which also affects the environment of settlements. It plays an important role in development planning (Hillier B. 1983). It also determines the movement of peoples and goods. In case of housing, streets and canalization are related to water supply and sanitation, which affects conditions of health in the surroundings.

Street and canalization patterns are interdependent with housing density,

and potentials problems of overcrowding such as stress to citizens, aggression, accidents, spread of diseases and domestic violence. High density settlements are usually also characterized by inadequate public facilities and services such as clean water and sewerage system (Ziss, R. 1988).

2.5. Conclusions

It is clear that infrastructure of housing settlement, especially water availability, water supply and waste water handling played a significant role for in realizing sustainable environment. Low income housing endangered life and environment quality throughout it's under quality or inadequate infrastructure facilities. This interdependent condition between infrastructure quality and environment determined its sustainable status. The waste product of housing settlement influence its environmental pollution level which is affected the resources especially land and water, which is needed for settlement livability.

While sustainable concept shown the balance of three element: Economics, Environment and Society, the housing settlement sustainability depended very much on appropriate and adequate infrastructure, especially for water, waste and waste water handling. Healthy housing environment, where clean water availability and low polluted air, ground and river, support a healthy life.

III. RIVER BANK OF LEBAK SILIWANGI

Sub district Lebak Siliwangi is one section of housing settlement of Distric (Kecamatan) Coblong in Bandung grew at the riverbank of Cikapundung and characterized with high density slum housing. The peoples who lived there belong to lower income group, almost workers or small traders with low education background and students who mostly rented rooms or house during their study in Bandung.

This sub district is divided into 8 neighborhood units. The researched is conducted at three neighborhood units, called RW5, RW6 and RW7. These housing settlements used almost 85% of their land the area and recognized as most populated area. All together this three neighbourhood units have totally 613 Households that lived on 10% of the total land in this sub district. Total area of sub district Lebak Siliwangi is 100Ha. The housing density of targeted settlement is 61,3 household/Ha or nearly 305 person/Ha (about 5 person per Household). Totally this three neighborhoods are populated

by 80% of total population of this sub district.

Figure 1. Location of researched area, Sub District Lebak Siliwangi, Bandung
Source: Google Map (recreated), 2015

3.1. Geo-Topographical condition

The river surface in dry season has about 4 to 5 meters deep from riverside and about 1 meter in rainy season. The riverbank was a fertile agriculture site and was a water catchment area. The Dutch made a subriver, named Cikapayang river at upper course of Cikapundung river and used it for flushing canals for houses at the higher ground surface.

Topographycally these three neighborhoods units from the riverside to the main street level have about 30m high differences. This sloppy land surface determined the housing groups formation in same direction as the river and stepped up to the upper level like staircase until reach the main street level. The high housing density formed narrow alleys or open spaces between houses, characterized with flat surface for houses that parallel to the river and short stair form for houses that perpendicular to the river.

Figure 2. A narrow and sharps sloopy alleys
Source: Private collection

Figure 3. A narrow flat alleys
Source: Private collection

Figure 4. a dried flushing waste water canal
Source: Private collection

Together these alleys formed a labyrinth like structure, which is easy to make disorientations to someone who visited that area. Most of the alleys is constructed with concrete or cement plaster and are not completed with drainage system. In hard rainy days the water flew through those walk ways, find out their way to the river and made temporary flood.

3.2. Population

The population of sub district Lebak Siliwangi could be divided through their citizenships as: 1) permanent residents who are owner of the buildings or houses; 2) Temporary residents who work as shops keepers, as food sellers or other light services and student who came from outside of Bandung.

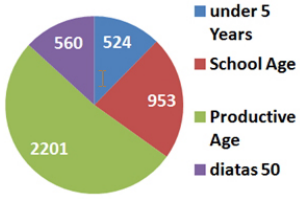


Figure 5. Age Distribution
Source: Profile and Typology of Sub District 2015

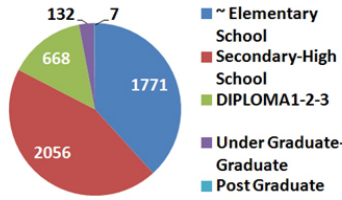


Figure 6. Education background
Source: Profile and Typology of Sub District 2015

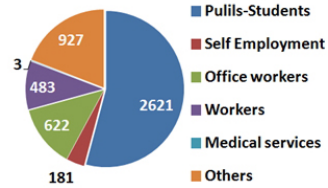


Figure 7. Employment
Source: Profile and Typology of Sub Sub District 2015

According to their age and education background this population can be drawn as above. Most of them are at productive age which education between elementary and secondary school. Their activities can be drawn as the graphic below. Almost 50% is scholar and students. The rest is divided into 5 groups which are self-employed, office workers, workers, health services and difference services

The student population and temporary residents grew up every year and become two important "push factors" for housing development in this area. 54% of the houses are landed one story building, 42 houses are two stories building and the rest is three stories or more.

3.3. Economic Activity

This housing settlement is not so far from shopping area Cihampelas at West side and ITB Campus and Zoo at East side. This condition attracts most of the population at productive age to take advantageous from surrounding economics or academics activity. Most of 10% workers work

or gives services at shopping area, about 55% rent rooms for students and self-employed persons. It found also that some make used the sand or natural stone material from the river, while other tries to grow fish in certain fish net.

It is also found in every alley a kind of small house shops that sold prepared food for breakfast and lunch and household equipment or toys. Most of sellers are household women, who tried to fill their time with some activities to gain their home income. Some mobile food sellers, who tried to get advantage from those who never went far out from their house.

3.4. Housing Condition

As it is informed by community leader that nearly 100% of the houses stand on private owner land. Only some building at the main street belongs to government offices. Those researched subject private houses in this settlement 68% used permanent building material, 30% is semi permanent building and 2% used natural materials. Number of that quantity is shown at the graphic below.

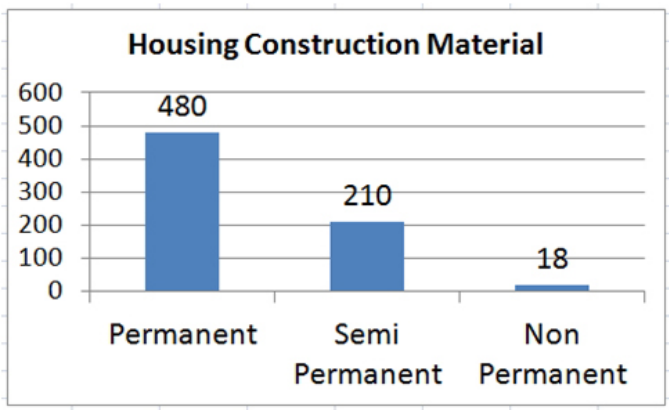


Figure 8. Percentage of Housing condition
Source: Profil & Tipology Kel. Lebak Siliwangi, 2015

The high density condition with narrow alleys between buildings caused a humid atmosphere especially in rainy season, where some time followed by temporary flood at the alleys and houses. This has negative impact on houses which is seen on muddy wall or floor and damaged material

3.5. Utilities Infrastructure Condition

Infrastructure in this housing research is limited of fresh water supply system, solid and liquid household waste treatment, canalization and street or alleys system. Those topics have a strong relation with a healthy environment, which is one important aspect to sustainability achievement (Choguill, 1994). A healthy environment supported a healthy population. It is like circular processes, where one condition influences the other side.

3.5.1. Fresh Water Supply System

Services of Public Water Supp[y (PDAM) is already installed in this area, but as it is said by community leader, the water supply is not steady or continually supplied. Therefore many household tried to get their demand on fresh water by constructing shallow well with or without pumping equipment, either manually or electrically derived.

There are found two water tower built through community empowerment government project, where many household tapped for fresh water they need. At other side on the canal Cikapayang a house like construction named MCK facilities used by many household, where they could do bathing, washing or toileting activities. This facilities built through government project, CSR (Corporate Social Responsibility) program and students community services

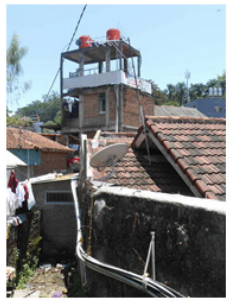


Figure 9. Public water tower
Source: Private Collection, 2015

Figure 10. Private water well, powered by electrical pumping
Source: Private Collection, 2015

In dry season often found that this facilities supplied water less as usual but it still met their needs. They thought that this condition is resulted from big building such as shopping Mall that used deep well for watering.

3.5.2. Drainage System

The alleys in researched settlement are mostly small and had no drainage

system. Rain water as runoff flew followed the alleys surfaces to lower level, passing through in front of houses, which is sometime flooded temporarily, before reached canal or river.

In this Sub District the Dutch built city drainage system through this settlement, this is now laid mostly under housing in this sub district. Some of the canal is working while other is not working or dried especially in dry season. The water is taken from upper course of main river Cikapundung and used at that time for flushing household waste water.

3.5.3. "MCK" Facilities and Waste Water Treatment

MCK is public facilities, provided for bathing, washing and water closet activities. This facility was built to fulfill the water needs by low income people and where availability of fresh water could not afforded by the citizen. The MCK at this area looked mostly emergency-ally built, uncomfortable and some looked dirty. Most of it is built on or near canalization of Cikapundung River. This MCK usually provided with shallow well for clean water.

Figure 11. "MCK"- Public Toilet
Source: Private Collection, 2015

Figure 12. "MCK"- on Canal
Source: Private Collection, 2015

Most houses with clean water from public authority facilities had private bathroom and toilet or WC but generally it didn't equip without Septic tank before reached canal or river. Especially houses that stood at river side they treat the river as their back yards, where they threw out their household waste. The waste water piping laid under the house floors, passing through neighbor houses. It is difficult to repair when it is blocked.

3.5.4.Settlement Alley

As it was shown on the photos that the circulation path or alleys size in this settlement is too small and some of it too sloppy as impact of housing density. The distance between two faced or sided houses sometime just enough for walking of two persons. Through roof overhang of two houses

that stood face to face this alley space became a dark, humid and some looked liked garbage pool. Air movement is low or blocked.

That condition furthermore blocked the air movement or light of sun shine which could give negative impact to human health as well as building. These narrow alleys brought difficulties in emergency situation, such as in fire, earthquake. The alley structure which seems like a labyrinth and its high sloop could be also functioned as trap for human being if emergency situation happened.

IV. RESEARCH ANALYSIS & FINDINGS

The research is conducted in neighborhood (RW) 5, 6, 7 and 8 of Sub District (Kelurahan) Lebak Siliwangi, District Coblong – City of Bandung which have totally 728 Households. Sampling population for this research is taken 15% of household (108 households), who answering question and to fill questioner. Three discussions were made with officer of Sub District who is responsible for public services development, with Chairman of Neighborhood 7 and with NGO personal, who socially responsible for improvement program of Cikapundung River.

4.1. On Site Development Programs

There many upper level government and Non-Government programs already conducted on the side, but seemed it wasn't link one to another. Proposals from the sub district government were not also successfully defined by central government. The district government described, that was very difficult to have a long-term continue programs.

4.1.1. PNPM Program

Government program so called PNPM, stand for Program Nasional Pemberdayaan Masyarakat (National Program for Society Empowerment) seem unpredictable with its financial support in term of continuity and size. Maintenance program could not be guaranteed. In other side community initiative to maintain is low.

A sample was a project called Community Waste Water Installation, which helped the community to have household waste water handling by constructing a community septic tank, equipped with piping system for collecting waste water from houses. The site used for septic tank was a small open space. The piping is constructed at the river wall. Now it is

already broken and no one care, that waste water came direct into the river.

4.1.2. Ministerial Community Services Program

There was one what they called a "gift project" from one ministry with objective to provide the community with deep well construction for fresh water. It was offered to community without any previous information or planning. After construction there was no other communication for further development or maintenance program. This sample grants of project from a ministry is not only one happened in this sub district.

Such project some time difficult to integrate in this settlement because of limited open spaces in this area and land consolidation program is very difficult to conduct. At the other side Sub District continuous development proposals faced problems that the answer on that proposals didn't meet they need and granted its continuity.

4.1.3. Third Parties Community Program

Some social or community services project came from third parties program. A student Social Service Program or Corporate Social Responsibility Program are also found. Those programs seemed like "one time" program. Sample to this project was the construction of "MCK", which seems unplanned and take place where ever it is possible. The most of this "MCK" was built on flushing canals or close to the river.

Implementation such community project is difficult because of land availability. The community is happy to receive such instant project as long as there nothing is asked from them. Everything if it is related with their land will be very hard to realize. They are felt easy uncomfortable and leaning to reject that project.

4.2. Land Use

From the "Google map" and documentation could be imagined how that settlement growth. The land use planning seems neglected or improper implemented. Housing density left no more open spaces until riverbank except the narrow alleys without possibility for car accessibility. From main street Tamansari there is only one secondary street which can be used by car until 200m inside the settlement. The rest is structured like a labyrinth with many sloppy conditions to the river. This alley was not constructed

by design. It was happened through the land ownerships and formed through built houses.

All houses or buildings are constructed on private ownerships land except the buildings at Tamansari Street, which are majority belong to government. The strategic location with high land price made some implementation of communities' empowerment programs very difficult. Land reform or procurement is a sensitive matter to talk.

A cultural approach may be needed but need more time until a development program could be accepted. 36% of respondent refused to have land reform solution, 48% depended on proposals while the rest-16% said no opinion about that. An apartment's project as renewal program is agreed by 32% respondent, 58% gives no opinion and the rest need to see proposed solution. Most of Respondent need a massive socialization

4.3. Housing Condition

The surveyed houses could be described in the following chart:

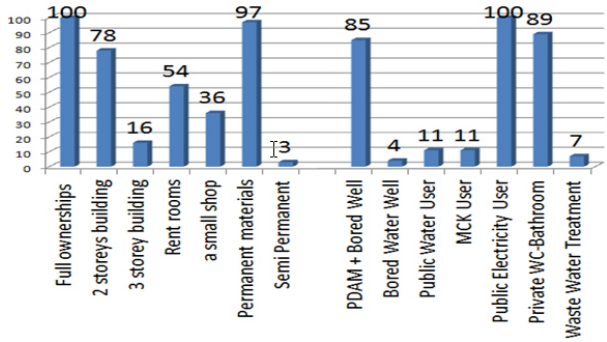


Figure 13. Percentage of Housing Condition
Source: private data visualization, 2015

From distribution chart above it is to understand that all land and houses are already belong to private ownerships and more than 50% have rented rooms while 36% conducts small shop to raise family income.

Regarding fresh water the chart showed that all community member have access to water with different resources. 11% of the houses used public "MCK" and 89% have their own toilet and bathroom but only 7% of the surveyed houses have their own septic tank. The community leader said that the groundwater availability is very good in this area. In dry season

groundwater is still high although Cikapundung River's water descended. In that season the area is smelt from dried household waste at the canals.

According to respondents disease caused by this water wells was rare. They are happy that fresh water and its availability is never been a serious problem in their community.

4.4. Waste and Waste Water Handling

The awareness of community in handling household waste is increased through government programs and rules. 100% respondent collected their garbage and bring ti to sub district temporary disposal, but all of them used PVC/plastic bag. 82% flew it waste water to river or canals without septic tank and 7% through septic tank and the rest 11% used public MCK which mostly flew its waste water into canals.

4.5. Community Environmental Awareness

Knowledge on sustainable concept is answered "Yes" by 9% respondents and the rest 91 person said "No". 93% respondent agreed to have community septic tank regarding waste water treatment but didn't have suggestion for solution while the rest said no idea upon that question.

Awareness on fire hazard is answered "Yes" by all respondents, but they have no idea about what is to do to have safer condition. Fire hydrant is not in the their planning. All community members are always alarmed by community leader about that hazard.

All of respondents understood that their wastewater polluted the river. They said there is no other choice to do. Less land availability and construction and maintenance cost are majority reasoned.

V. RESEARCH RESULTS AND SUGGESTIONS

This research shows serious environment problems in this housing settlement. waste water handling beside settlement safety on by fire hazard, disease and health need to be solved to support sustainability settlement. This need should be prioritized although the physical condition of housing, its density and land status need a costly solution. A continuous program and consistency must be implemented in a long term project.

The participation of the third parties could reduce energy and cost but

it still need to be coordinated with development program and should be disseminated to the community. The community awareness and participation should be built.

REFERENCES

Australian Gov.: http://www.yourhome.gov.au/materials/embodied-energy

Choguill, C. L. (1994), Sustainable Human Settlement in Urbanising World, Centre for Development Planning Studies University of Sheffield, UK

Clapham, J.W.B.: NATURAL ECOSYSTEM, Mac Millan Publishing Co. Inc. 1983

Hillier, B. et.al. : Rehumanizing Housing, Barlett School of Architecture and Planning, University College London, 1983

http://www.circularecology.com/embodied-energy-and-carbon-footprint-database.htm

http://en.wikipedia.org/wiki/Agend 21

http://www.un.org/ millenniumgoals

http://www.greenspec.co.uk/building-design

Maslow, A, (1943): "A Theory of Human Motivation" in Psychological Review in Wikipedia, http://en.wikipedia.org/wiki/ Maslow's hierarchy of need

Stren, R. et. al. Sustainable Cities, Urbanization and the Environment in International Perspectives. USA: Westview Press Inc., 1992

United Nation (1997), Glossary of Environment Statistics, Studies in Methods, Series F, No. 67, New York

Ziss, R. : Shelter and self-help; Development Cooperation for the Improvement of Housing Conditions in Developing Countries, BMZ, Greven and Bechtold GmbH, Cologne, 1988

THE PATH LESS TRAVELLED: VERTICAL CIRCULATION SPACES IN APARTMENT BUILDINGS IN THE SUBTROPICS

Rosemary Kennedy[1]*

[1]School of Design, Creative Industries Faculty, QUT
*r.kennedy@qut.edu.au

ABSTRACT
This paper presents data on residents' use of common stairways and lifts (vertical circulation spaces) in multi-storey apartment buildings (MSABs) in Brisbane, Australia. Vertical movement is a defining aspect of multi-storey living and the energy consumed by lifts contributes significantly to the energy budget of the typical MSAB. The purpose is to investigate whether a reappraisal of vertical circulation design, through the lens of residents' requirements, might contribute to energy reductions in this building type. Data was gathered on a theoretical sample of MSAB ranging from five decades old to very recent schemes. 90 residents were surveyed about their day-to-day experiences of circulation and access systems. The results showed that residents mainly chose to use the stairs for convenience and exercise. Building management regimes that limited residents' access to collective spaces were the main impediment to discretionary stair use. Only two buildings did not have fully enclosed stairwells and these had the highest stair usage, suggesting that stair design, and building governance are two areas that might be worthy of attention. The more that circulation design is focussed on limiting access, the less opportunities there are for personal choice, incidental social interaction and casual surveillance of collective spaces. The more that design of vertical circulation spaces in MSAB meets residents' needs the less likely they are to be reliant on continuous energy supply for normal functioning.

Keywords: Multi-storey apartment buildings, vertical circulation, subtropical, access and egress, residents

INTRODUCTION

Background

Multi-storey apartment buildings are burgeoning on the skylines of Australian cities as governments adopt urban consoldiation policies to manage population growth. However, apartment buildings are contentious in the context of sustainable urban development, being the most energy intensive housing type in terms of both the embodied energy of the structure (Pears, 2005), and the operational energy of an array of functions that are intrinsically linked to the uninterrupted supply of electricity (Oldfield, Trabucco, & Wood, 2009) including vertical movement, hydraulics and mechanical exhaust. While most apartment buildings adopt a form and configuration that rely on air-conditioning, this factor can be overcome by alternative design approaches. However, vertical movement is a defining aspect of multi-storey living, and though stairways have long been an important means of overcoming differences in height in tall buildings, lifts are the principal form of vertical circulation, and stairways are reserved for emergency egress. The energy consumed by lifts contributes significantly to the energy budget of the typical MSAB (GBCA, 2009). Along with lighting and ventilation for the network of vertical and horizontal shared spaces, including building entrances, stairs, and corridors, that link individual dwelling entrances with the rest of the building and the surrounding neighbourhood, lifts can also represent a high percentage of individual households' energy costs (Huxham, 2013). Both the energy consumption of these services and the cost of electricity to residents may be able to be reduced if there is less reliance on lifts for vertical movement, and less reliance on 24-hour lighting and ventilation in stairs and collective areas.

When some apartment buildings in Brisbane were inundated during a major flood in 2011, the problems experienced by residents exposed the short-comings of the energy-dependent approach that characterises much contemporary apartment building design in Australia (Lewis & Kennedy, 2012). In particular, the lack of amentity and utility of shared circulation spaces that normally required artificial lighting and mechanical ventilation was palpable during this crisis. In some cases, damaged lifts were immobilised for a period of many weeks, and residents were obliged to negotiate inhospitable unlit, unventilated corridors and stairwells for access and egress, day and night. Apart from the inconvenience, conditions like these caused anxiety and were perceived by residents as a personal security risk during the prolonged reconstruction phase. Exit doors

that were propped open to admit air or light presented unpredictable security situations where residents might encounter non-resident strangers. This practice also ran counter to Australian fire safety design regulations thus putting residents at fire safety risk as well (Lewis & Kennedy, 2012). The poor performance of collective circulation spaces in abnormal circumstances brings into question the integrity of current approaches to the design of vertical movement systems in MSAB in normal building use. Indeed circulation spaces with limited access to natural light or ventilation may negatively affect residents' overall dwelling experiences in MSAB.

Many typical MSABs are derived from the double-loaded corridor model in which apartments are arranged around a compact central core. The shared circulation areas comprising corridors, lifts, and stairs are usually fully-enclosed with no access to natural light or ventilation. Without the aid of artificial lighting and ventilation, these spaces, particularly stairwells, are dim, airless and these qualities may affect residents' overall dwelling experiences negatively. Though stairways are often conceived as emergency exits rather than for general vertical mobility, it is posited that well-designed, open and well-lit stairwells may encourage more frequent general use and diminish the intensity of energy input required for vertical movement.

Purpose

The purpose of this paper is to present data and discussion on how aspects of the access and circulation spaces of multi-level residential buildings affect residents' everyday lifestyles. It considers whether a re-appraisal of circulation design might be justified to better meet residents' social and lifestyle needs, and reduce both energy use in MSAB and residents' associated energy costs.

Significance

The implications of this research are that architectural aspects of multi-storey apartment buildings (MSAB) can better support lifestyle needs, and reduce energy demand, if entrenched approaches to vertical movement solutions are replaced by more sustainable practice in the development, design and occupation of multi-storey apartment buildings.

LITERATURE REVIEW

Effects of resident behaviour on energy consumption

Ecological footprint analysis (EFA) reduces the relative environmental impact of all categories of a good or service to a land area as a common measure (Wackernagel & Rees, 1995). A UK study into the development of sustainability ratings for homes, cited by Frame and Vale (2006), calculated that the overall EFA of a typical household is determined by:

1. factors related to the building and dwelling, such as resource use in the home and the "fabric" of the structure;
2. factors related to the larger urban context, such as land use and fabric of infrastructure; and
3. behavioural factors related to choices households make regarding transportation mode, food source, attitude to consumer items (choice to acquire, replace and upgrade) and wastage.

Significantly, the four aspects listed under "behaviour" made up over 60% of the total impact of a household and the researchers estimated that behavioural changes could result in at least a 22% reduction in the ecological footprint of the typical household without physical changes to the fabric of the home, or structure of the urban context (Frame & Vale, 2006).

While building users play a critical role in the energy consumption profiles of buildings they occupy, this role is poorly understood by policy makers (Chappells & Shove, 2005) and is often overlooked by designers (Janda, 2011). Janda (2011) notes that the exact proportion of occupant influence is variable, but behavioural changes make an important contribution to more sources of energy savings than are available through architectural and technical strategies alone. This supports Frame and Vale's (2006) assertion that behavioural changes may have the greatest impact on a household's ecological footprint.

There is a wide array of complex societal and technological factors and interrelated behaviours at play in the development, planning, and occupation of MSABs that are difficult to quantify, including residents' normal practices, which are a combination of habits ("my way of doing things") and the technology of the day (Shove, 2003). Shove (2003) conceptualises the rituals we accept as part of our everyday lives, such as using domestic appliances, as the consumption of services rather than consumption of energy. Subtle, or not-so-subtle, changes to conventional practices and acceptance of the normality of these practices are related to the escalating demand for key energy resources (Chappells & Shove, 2005). In this way, the adoption of technology merges almost unnoticed with the rituals of daily life to become normal practice, as

does consumption of energy services associated with such technology. Thus where stairs were once the principal means of vertical movement in multi-storey residential buildings, the "service" of overcoming height is now provided predominantly by lifts. This approach seems to dictate that residents will be satisfied with relying on the lifts for vertical movement to meet their everyday needs.

Residential satisfaction

Studies from the fields of sociology and psychology demonstrate that environmental quality is important to people's feelings of well-being and satisfaction with regard to the "residential environment". For the most part, empirical research on high-rise dwelling satisfaction and socio-environmental factors is concerned with residents' perceptions of a mix of factors, from the management of the building complex to characteristics of collective areas of MSABs. According to a study conducted in Seoul (Lee, Je, & Byun, 2011) residents' perceptions of the quality of collective areas in MSAB is indicated by upkeep, availability of daylight and good air quality, safety and security (freedom from external threats) convenience of use, and the ability to control the intensity of interactions with neighbours. Meanwhile, residents of Singapore's high-rise residential towers worried about security and safety and some were concerned about vertigo and lift breakdown (Yuen & Nyuk Hien, 2005).

The aforementioned research has not looked particularly at the role of resident behaviour with regard to lift usage and potential energy reductions, however, Leaman and Bordass (1999) in their research into workplace buildings note that occupants' ability to control the internal environments according to their personal preference and choice is important to their sense of satisfaction, and may be a key to low-energy design strategies. For example, occupants are less satisfied if building automation systems limit their choice to open or close windows, or to adjust blinds for thermal comfort or glare control. In the same way, personal control over personal space has been identified as an important factor in residential satisfaction in high-density environments. Overall, use of space in the home, and control over privacy and annoyances seem to be behind the preference for detached houses over other types of housing (Bell, Greene, Fisher, & Baum, 2001). Though residents of multi-residential buildings expect to modify their behaviour in order to co-habitate peacefully with their neighbours they also value a certain amount of autonomy, and the freedom to adapt or control their personal lifestyle practices (Queensland University of Technology, 2009).

METHODOLOGY

Data was gathered on residents' behaviour and expectations with regard to vertical circulation systems (lifts and stairways), as part of a larger study focused on the investigation of potential best practice exemplars for high-density subtropical living. Six buildings that were identified as having certain attributes that might be conducive to lifestyle in the subtropical climate (such as availability of natural light and cross-ventilation in common corridors and private dwellings) were selected for study (refer Table 1). An invitation to respond to an electronic user experience survey was distributed to the occupants of all apartments (n=772) via letter drop, with appropriate permissions and ethical clearance. For this particular paper, residents were specifically asked how often they used the stairs in their building with responses being recorded as daily, weekly, monthly or never. Two open-ended questions allowed participants to add extra responses regarding their reasons for choosing to use stairs, or not. A thematic analysis identified key themes regularly invoked by the respondents.

Table 1. Description of selected multi-storey apartment buildings surveyed

	Date	Height (Storeys)	No of dwellings	Circulation type (Sherwood, 1978, 2002)	Stair (number)	Physical form (Sherwood, 1978, 2002)
1	1962	12	98 apartments	Gallery access, semi enclosed	External, semi-enclosed (2)	Slab
2	1996	26	176 apartments	Double loaded corridor	Enclosed with central lift core (2)	Tower on podium
3	2000	6	75 apartments + 19 studios	Single and Double loaded corridor types	Enclosed (3)	Slab
4	2006	13	213 apartments in 4 buildings.	Point access and Skip stop Double loaded corridor	Internal, semi-enc.natural light and vent (1) per building.	Tower and slab

5	2011	10	107 apartments+ 6 townhouses	Gallery access, open	Enclosed (2)	2 x Slabs
6	2012	9	84 apartments	Gallery access, open	Enclosed (2)	Slab

Source: Author

RESULTS

The overall response rate to the survey was 11.65% (Table 2). A very low response rate in Case 4 was attributed to failure to engage a high number of residents from a non-English speaking background. Mean frequency of use for this case is not statistically valid. Nevertheless, useful information was gained from respondents' comments.

Table 2. Survey response rate and data on frequency of stair usage

	Date	Survey response rate	Number of respondents	Daily	Weekly	Monthly	Never
1	1962	19%	n=19	26.3%	42.1%	10.6%	21%
2	1996	13%	n=24	0	0	0	0
3	2000	13%	n=12	33%	25%	25%	17%
4	2006*	3.3%	n=7	57%	29%	14%	0%
5	2011	18%	n=20	25%	15%	20%	40%
6	2012	10%	n=8	0	0	0	0
	Total	11.65%	n=90				

Source: Author

Stair use

More than a quarter of respondents in three cases used the stairs on a daily basis (Cases 1, 3 and 5). Convenience and time-saving – "faster than taking the lift" - and physical activity were the main reasons that residents gave for choosing to use the stairs. Residents who used the stairs on a daily basis in Case 1 lived on the lowest four levels, but those from every level used the stairs on a weekly basis, mostly for exercise, or for travel between floors. A further theme was sociality and convenience – when visiting neighbours on other levels in the building, walking up and down

one or two flights of stairs was much quicker than taking the lift. Residents also appreciated the incidental exercise they obtained in this way.

Residents never used the stairs in Cases 2 and 6 because management decisions restricted resident movement between levels. In these cases, dwellings were only accessible by lift, using an electronic key fob, and only to floor of residence. Reasons given for not taking the stairs, other than management policy, were to do with carrying loads of groceries or other items, or self-described "laziness". A few respondents had physical mobility issues and depended fully on the lifts for vertical movement through the building.

Case 5 had the highest percentage of people who never used the stairs. The building had one lift, and stairwells at either end of a long gallery were designed solely for emergency evacuation rather than everyday use (Fig. 1). Residents were frustrated by various issues including long waiting times for the lifts, and being obliged to use the lifts to ascend (because access from the stairwell to each level was permanently locked) and being unable to use the stairs to visit neighbours on other levels for the same reason regarding management of security. Nevertheless, though the stairwell was "unpleasant", some chose to use the stairs to descend or for exercise because it was more convenient than waiting for the lifts. But the fully-enclosed stair wells were not an inviting alternative. At ground level, the stairwell exited directly to the exterior of the building. Similarly, lack of direct stair access between the residential tower and basement made normal home-based activities such as car-parking garages, storage spaces and recycling bins, inconvenient to access other than by the lift.

Figure 1: Case 5 Typical Floor Plan
Source: adapted from diagram by M. Young QUT

Lack of clear way-finding was another reason stairs were not used more often in some cases: "no clear signage - some people think it is for emergency exits only". For example, in Case 3, the stairways are behind closed doors and not clearly accessible (Fig. 2).

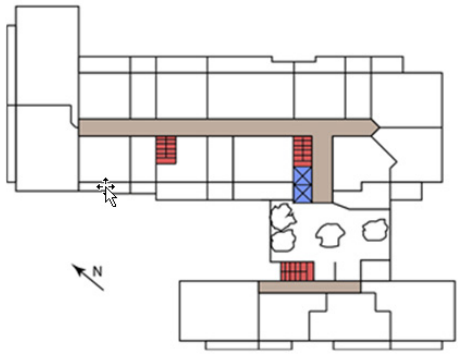


Figure 2. Case 3 Level 2 Floor Plan
Source: Diagram by A di Lembo QUT.

In the buildings where management control prevented the usage of stairs completely unless in case of fire emergency (Cases 2, and 6, see Figs. 3 and 4 below) stairwell doors were fitted with security alarms, and were not accessible. Residents were unhappy about the restrictions to their access to the stairs and movement inside the building, and would have preferred to use the stairs rather than wasting time waiting for the lift. "I would like to use the stairs, rather than waiting for lifts".

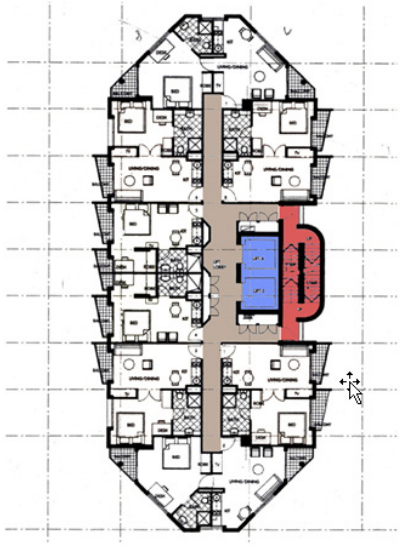


Figure 3. Case 2 Typical Floor Plan
Source: Diagram by E. Vasilyeva QUT

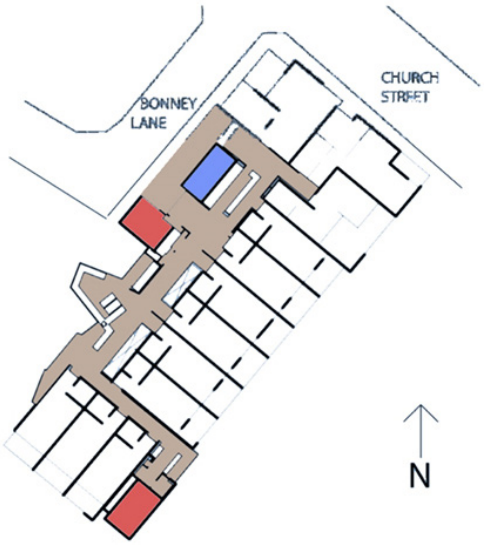


Figure 4. Case 6 Typical Floor Plan
Source: Diagram by R. Callinan, QUT

These findings indicate a mismatch between vertical movement design and management, and resident-identified expectations of reasonable choice of behaviour. Dissatisfaction with perceived lack of autonomy and feelings of being inconvenienced were clear themes. The findings also support the hypothesis that well-designed, open and well-lit stairwells encourage more use, and that residents' day to day access problems are often to do with decisions by others regarding managing security concerns rather than with facilitating choice and convenience in vertical movement. The relationship between decisions regarding lift usage and energy demand reduction was not raised by respondents

DISCUSSION

The study found that residents' experiences of vertical mobility and access were eased or worsened depending on the configuration of stairways and on governance matters within the building. Only two buildings did not have fully enclosed stairwells and these had the highest stair usage, suggesting that stair design, and building governance are two areas that might be worthy of attention. In turn, these factors are interrelated and the product of a complex interaction between regulations, developers' expectations and socio-technological trends. Two contemporary design and development trends are impacting each other: the introduction of keyless locking systems designed to preserve security and reduce the risk

of intrusion by non-residents and criminals, and, the re-assignment of stairs to one specific role – that of emergency exit – rather than as a viable means of moving through a multi-storey building on a more normal basis.

Electronic security

The influence of technologies on our daily lives has benefits and drawbacks. In Vancouver's False Creek North master planned high density high rise community, though residents appreciated the convenience of electronic locking, they regretted that controlled access inhibited neighbourliness floor-to floor (Hofer, 2008). Security systems that exclude residents and visitors from all but the shared areas of the floor level that provides access to their private dwelling produce further conditions for anonymity and withdrawal in a building type where privacy is important but a sense of community is also important to preserve harmony and cohesion (Randolph, 2006). Paradoxically, keyless electronic security measures may effectively contribute to a "gated community" mentality and may create conditions for socially deviant behaviour (Troy, 1996) (p38). Further, power outage and flood damage caused electronic locking systems to fail in Brisbane, leaving residents vulnerable to insecure points of entry (Lewis & Kennedy, 2012).

Regulatory provisions for access and egress

The objectives of Section D Access and Egress of the Building Code of Australia (BCA) Volume 1 are: "safe equitable and dignified access" and to "safeguard occupants from injury while evacuating in an emergency" (ABCB, 2013). The regulations are concerned with the number and location of stairways and ramps that serve as emergency exits in the event of fire, and the dimensions, distances, illumination and fire protection of the "paths of travel" from dwellings to these exits (ABCB, 2013). While mandatory performance provisions in the BCA impose certain constraints, they are designed to prevent harmful outcomes rather than to prevent or encourage best practice design. The BCA provides non-mandatory "deemed to satisfy" (DTS) solutions which have a good safety history, but are usually conservative, and are not necessarily the most cost-effective way of achieving the desired outcome. Stairways are routinely fully enclosed and use by residents is discouraged for any reason other than evacuation in a fire. This approach neglects the other part of Section D, which is about "access" and imposes certain behaviour on residents (increased lift usage, no access between floors). It also contributes to the energy burden (lift usage, lighting and ventilation in stairwells and so

on) and presents problems when power outages or other breakdowns immobilise lifts.

However, regulatory issues per se are not the problem. The regulatory requirements governing the design of such spaces in multi-storey buildings in Australia have changed little in over forty years, but the occurrence of fully-enclosed stairways is more prevalent in contemporary buildings. The oldest building in the sample (Case 1, constructed 1962) complies with the regulations and has the highest frequency of stair use. The stairways are well-lit and ventilated naturally. The physical configuration of the stairways in relation to the main building means they are also clearly visible from the access corridors and this casual surveillance is a potent factor in resident perceptions of security (Figs. 5 and 6).

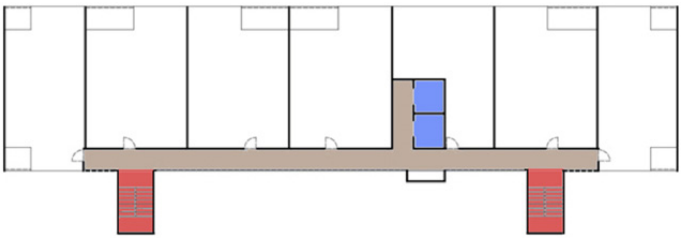


Figure 5. Case 1 Typical Floor Plan.
Source: Diagram by M Fletcher, QUT.

Figure 6. Case 1. View from gallery access corridor toward stairwell.
Source: Image by M Fletcher, QUT.

Building Case 4 provides an example of innovation where day-lit and naturally ventilated semi-enclosed stairwells are conceptualized first and foremost as active circulation spaces, and double as emergency fire egress. The "point access" type is a variation of the double-loaded corridor type,

where apartments are arranged around a lift core. However, the corridors are conceptualized as "breezeways" and individual dwellings feature "breezeway lobbies" with outer louvred doors that provides air movement and privacy, and a single fire door internally that can be closed at the resident's discretion or "held open" with devices using electromagnetic catches that release and safely isolate the units in the event of a fire. (See Fig.7 below). This approach provides the advantage of smoke control and negates the requirement for expensive stair pressurization plant. In this case, residents commented on the positive effect on private spaces and regarded natural ventilation strategies in shared circulation areas as the building's strongest assets. Views to the exterior through the open access stairs also provide an engaging outlook for people waiting for lifts to arrive, and help reduce the perception of wasted time (See Fig 8). These initiatives reduce overall running costs of the building and promote a more liveable environment.

The contemporary path of least resistance to regulatory compliance, which relegates stairs to sealed emergency exits, ignores the advantages of innovative design solutions to meeting the provisions of the code, as well as other beneficial outcomes for residents such as sense of control, convenience and sociality, and physical activity.

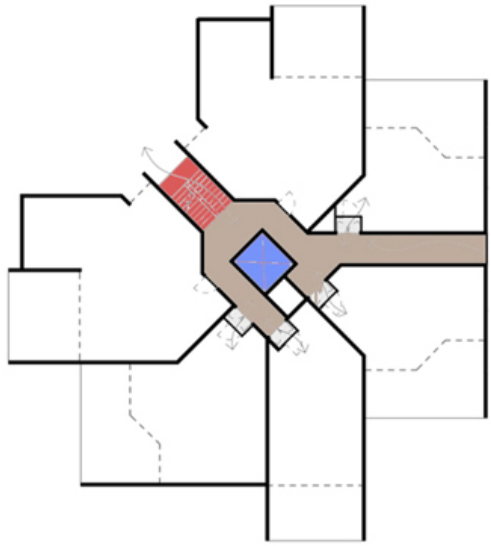


Figure 7. Case 4 Typical Plan showing fire-engineered circulation spaces with natural ventilation and daylight
Source: Diagram by A. Munro, QUT.

Figure 8. Case 4 Stairwell with natural ventilation and daylight
Source: M. Kisluk.

CONCLUSION

A survey of residents of a theoretical sample of MSAB in Brisbane found that vertical circulation spaces designed without access to natural light and ventilation negatively affected residents' experiences of physical activity and way finding, and perceptions of security, privacy, and sociality. Significantly, the study reveals some of the different approaches to stairway design and management expectations over a period of five decades. The occurrence of fully-enclosed stairways is prevalent in contemporary MSAB and the design of circulation spaces is becoming more reliant on energy for normal functioning, and more focussed on limiting access to common spaces through electronic control systems, and less on residents' desires for choice and convenience.

The implications are that circulation design is affecting residents' dwelling satisfaction by limiting their personal control over use of these communal spaces day-to-day, as well as causing disadvantage from an energy and cost perspective. In addition, fully-enclosed corridors and stairwells present mobility and security problems for residents during disruptions such as power-outages.

The design of shared circulation spaces and vertical access systems is

not the sole determinant of sociality, energy use and so on, in apartment buildings, but is very influential on building performance in terms of these indicators. The more that circulation design is focussed on limiting access, the less opportunities there are for personal choice, incidental social interaction and casual surveillance of collective spaces. The more that design of vertical circulation spaces in MSAB meets residents' needs the less likely they are to be reliant on continuous energy supply for normal functioning.

Also, as well as emergency evacuation procedures, the design of shared circulation spaces and access systems needs to take into account the characteristics of the resident population and their expectations of safety and security in normal building use. The findings of this paper signal that a reappraisal of vertical circulation design through the lens of residents' requirements may be justified and is likely to contribute to significant energy reductions in the MSAB type by allowing residents to modify their behaviour regarding choosing to use stairs more often.

Environmentally, designing vertical circulation systems to better meet residents' social needs, may lead to direct reductions in household energy use in apartment buildings and contribute to the stated objectives of urban consolidation policies. This paper has shown that barriers to positive change are literally built in to the fabric of the residential environment, and that re-thinking various aspects in the development, design and occupation of multi-storey apartment buildings is needed to order to overcome entrenched impediments to more sustainable practice.

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REFERENCES

National Construction Codes (Building Code of Australia) Volume 1 (2013).

Bell, P. A., Greene, T. C., Fisher, J. D., & Baum, A. (2001). Environmental Psychology (Fifth ed.). Fort Worth: Harcourt College Publishers.

Chappells, H., & Shove, E. (2005). Debating the future of comfort: environmental sustainability, energy consumption and the indoor

environment. Building Research & Information, 33(1), 32-40. doi: 10.1080/0961321042000322762
Frame, B., & Vale, R. (2006). Increasing Uptake of Low Impact Urban Design and Development: The Role of Sustainability Assessment Systems. Local Environment, 11(3), 287-206. doi: 10.1080/13549830600558788
GBCA. (2009). Technical Manual Green Star Multi-Unit Residential. Version 1 (pp. 390). Sydney: Green Building Council of Australia.
Hofer, N. (2008). Compilation Report of the Process, Findings and Recommendations from the False Creek North Post-Occupancy Evaluation (pp. 257). Vancouver: University of British Columbia, School of Community and Regional Planning.
Huxham, G. (2013). Just how much does it cost to power your apartment building? Retrieved 24 February, 2014, from https://www.lookupstrata.com.au/just-how-much-does-it-cost-to-power-your-apartment-building/
Janda, K. B. (2011). Buildings don't use energy: people do. Architectural Science Review, 54(1), 15-22. doi: 10.3763/asre.2009.0050
Leaman, A., & Bordass, B. (1999). Productivity in buildings: the 'killer' variables. Building Research & Information, 27(1), 4-19. doi: 10.1080/096132199369615
Lee, J., Je, H., & Byun, J. (2011). Well-Being index of super tall residential buildings in Korea. Building and Environment, 46(5), 1184 - 1194. doi: http://dx.doi.org.esp)1.library.qut.edu.au/10.1016/j.buildenv.2010.12.010
Lewis, J., & Kennedy, R. (2012). The impacts of power outages on the residents of contemporary multi-storey apartment buildings in subtropical environments. Paper presented at the SASBE 2012 Sao Paulo, Brazil.
Oldfield, P., Trabucco, D., & Wood, A. (2009). Five energy generations of tall buildings: an historical analysis of energy consumption in high-rise buildings. The Journal of Architecture, 14(5), 591-613. doi: 10.1080/13602360903119405
Pears, A. (2005). Does Higher Density Really Reduce Household Energy Requirements? It Depends …. Urban Policy and Research, 23(3), 367-369. doi: 10.1080/08111470500218809
Queensland University of Technology. (2009). High Density Liveability Guide. from http://www.highdensityliveability.org.au
Randolph, B. (2006). Delivering the Compact City in Australia: Current Trends and Future Implications. Urban Policy and Research, 24(4), 473-490. doi: 10.1080/08111140601035259
Shove, E. (2003). Comfort, Cleanliness and Convenience: The Social

Organisation of Normality
Troy, P. (1996). The perils of urban consolidation: a discussion of Australian housing and urban development policies. Leichhardt, N.S.W: Federation Press.
Wackernagel, M., & Rees, W. (1995). Our Ecological Footprint. Gabriola Island, BC: New Society.
Yuen, B., & Nyuk Hien, W. (2005). Resident perceptions and expectations of rooftop gardens in Singapore. Landscape and Urban Planning, 73(4), 263-276. doi: 10.1016/j.landurbplan.2004.08.001

THE ROUTE AND JOURNEY OF TREE HOUSES

Evawani Ellisa[1]*, Gita Andriani[2]**

[12]Department of Architecture, Faculty of Engineering
Universitas Indonesia
*ellisa.evawani@gmail.com, **gita.andriani22@gmail.com

ABSTRACT
The tree house, a building constructed around, next to or among the trunk on mature trees is mostly identic with romantic images of childhood memory of play and adventure. Historically tree houses also recorded as primitive habitation, deliberate follies, and work's space for arboreal designers, entertainment and even shelters for retreats. Nowadays the growing interests of alternative life styles have led tree houses to develop into the tourist lodging and hospitality business. Tree houses are alternative ideas of organic integration of the buildings into their natural surroundings as they do not require a clearing of certain area of forest.

This paper tried to explore the history of tree houses since their fashionable periods as recreation during Roman era. In modern time we found that a growing interest on direct experience with nature has resurgence the interest in tree houses as the alternative contemporary houses. We explored the work of Andreas Wenning who designed tree houses that provide a house as "neither on the earth nor in the air".

As the case study we chose tree houses complex erected at Taman Buru Masigit Kareumbi located at the conservation park in West Java. Using the theory of "human space" developed by Bollnow (2011), we tried to analyze how the space and surrounding of tree houses offered the visitors the sensory impressions that give dialectical experience of the mind and body with the surrounding environment. We concluded that tree house challenges both stimulating and imaginative design.

Keywords: tree house, historical journey, space, spatial quality

INTRODUCTION

In April 1970, two American architects Hugh Brown and Jim Talbot built a tree house on swampy area of Carribiean Sea in Honduras. The design of the house evolved slowly through the process in which each design decision directed the next through constant argument between both architects. The final design was a five-level tree house built among five trees: from an entry port at one meter to an observation platform at six meters. It designed into a free-form roof to cover all rooms. The roof erected to define its spaces below and yet was still a single, fairly functional, continuous cover. In September 1972 when both leaved the house, they depicted their tree-life as: watching birds, co-existing with insects and solitary life sufficiently removed from anywhere especially United States (Khan and Easton, 1973). More than 2 years experimentally living in tree-house, they gained an extraordinary experience that fundamentally missing in their busy life as American. In this instance, tree house had served as experimental setting for survival to practice the way the early man build and live in tree houses.

This paper started with the exploration of the origin and the historical journey of tree houses since the Roman era into the modern time. To analyze how tree houses have a long culture in human history, we reviewed some literatures and books discussed on tree houses. Considering the growing interests in tree houses as the alternative contemporary houses, we explored the work of Andreas Wenning through his book "Construction and Design Manual Tree houses" published in 2009.

To explore the spasial quality of a tree house, in this research we used the method of interactive participant observation (Groat and Chang, 2002) through experience living in the real tree houses. As the case study we chose the tree houses complex erected at Taman Buru Masigit Kareumbi, a weekend gateway located at the conservation park in West Java. Using the theory of "human space" developed by Bollnow in his book *Human Space* (2011), we tried to analyze how the space and surrounding of tree houses offered the sensory impression that give dialectical experience of the mind and body with the surrounding environment.

TREE HOUSE AS "PRIMITIVE" HOUSE

The word "primitive" does not always refer to the builder's intentions or abilities, but rather to the society in which they build (Rapoport, 1969) of which every aspect of tribal life is everybody's business (Redfield, 1960). In term of building, this implies that everyone is capable to build

his own dwelling, as the average family has all the available technical knowledge. For its own safety, early man in primitive world built houses in trees to escape from dangers on the ground. Threatening enemies, wild animals and natural hazard are some reasons that make conventional landed dwelling impractical in those days.

Sir Walter Releigh in his book the *Discovery of the Empire* of Guiana published in 1595 described that after Christopher Columbus open the way for exploration of America, a tribe of tree dwellers was discovered to live along Orinoco delta (Head, 2011). They inhabited the tree houses to protect themselves from the worst of swarms of mosquito that emerge from the forest at nightfall. In 1668 an engraving in Erasmus Francisci in *Lustgarten* depicted Spanish invaders, which attacked the natives who besieged in their tree nests (Aikman, 1988).

While to dwell in tree houses had been practiced by primitive peoples in many areas of the South Sea along the equator long time ago, in modern days living in the tree houses is almost an obsolete tradition. Yet, deep in the interior of southeast Papua, a primitive community remains represented the link to forgotten world. Here the hunter-gathered tribe of Korowai retains to live in tree houses. It was Johannes Veldhuizen, a Dutch missionary who made initial contact with the tribe in October 1978 and revealed the existence of this fragile community (Netherland Organization for Scientific Research, 1998).

George Steinmetz, a photographer of National Geographic in 1995 visited this tribe to make an accurate recording of their way of life. The tree houses were typically nest-like shelters built 10-12 meters above the ground and some reach as high as 35 meters. The materials of tree houses were strong large *banyan* trees that selected as the pole. The floor bases supported by 4-10 poles erected from temporary platforms. The floor was composed of tightly packed thin wooden spars covered with barks of *nibung* tree. Wall frames and roof coverings were made from the *sago* leaves. Stairs were made of thin poles with notches cut as foot-holes. They smeared both stairs and threshold beams with animal fats. There is the fire placed the central position where the inhabitants cook, sleep and spend time for gathering. A basket wooden spar filled with layer of leaves and clays suspended in a hole with the rattan. When the fire burn out of control the rattan cut and felled down to the ground. As communal home, the Korowai tree house also reflected spiritual beliefs and social hierarchies. They believe that tree house offered protection from black magic. In term of gender, they divided the tree house into separated quarter between

man and woman. Each gender had its own half, which the other was not permitted to enter.

Figure 1. Tree House of Korowai
Source: Steinmetz and Boar, 1995

With minimal maintenance, these tree houses have limited life span of around 2-5 years. Surplus vegetation allows them to simply built tree houses elsewhere once the houses are no longer usable. Korowai people found the construction and material as the modifying factor to determine the concept of tree house. This exemplified the concept of the scale of criticality, paralleling those relating to climate and wealth (Rapoport, 1969). To combat against the practical and natural constrains, Korowai people necessary provides spaces for various domestic, symbolic and social activities by the most direct means. Abundant vegetation but limited means ultimately considered to define the dwelling space. As primitive builders, they are able to conserve their building material because they have detailed and precise knowledge of the behavior and characteristic materials, not just in term of climatic response and construction, but also in regard to weathering. For Korowai tribe, tree house is a clear, straightforward solution to the problem posed by gravity and weathering.

THE HISTORICAL JOURNEY OF TREE HOUSE

While life in tree house was of existential importance for both ancestors in the past and rare primitive people today, history had shown that for a long time man discovered the tree house as recreational uses. Tree house evolution shifted function from the place for survival into a luxurious commodity. Nowadays, in art, literature, and film tree house is also the ideal setting for many scenarios ranging from the magical antiquity to the futuristic.

Middle Age

Many earliest documented evidences which showed the idea of tree houses dated back from the first century AD. Ancient Egyptian built retreats of vine-covered trellis to give much shade and painted arbores in their tombs to provide the symbolic pleasurable setting for the dead. The Assyrians reliefs showed Ashurbanipal (7th century BC) relaxes beneath vine-covered arbors between two trees. The arbors erected high in the branches of a tree to provide spectacular views. Old reliefs revealed that tree houses purely used for pleasure (Nelson, 1994; Henderson and Mornement, 2005).

In Europe the monasteries firstly popularized tree houses during the middle Ages. Pliny in his book *Natural History* (Book XII, Chapter V) described two tree-houses, one was owned by the Roman Emperor Caligula in Velitrae and the other was owned by Lycinius Mucianus. Both owners were described to hold banquets in the branches of grandest tree houses (Roy and Ruth, 2011; Aikman, 1988). In these very early tree houses, Pliny illustrated how the tree-houses were associated with feasting and music. He expressed the transcendent paradox of the tree houses: man is both protected by and made more vulnerable to fluctuations of nature. *Tree houses may be enjoyable, but the experience is enhanced by that frisson of risk* (Henderson and Mornement, 2005).

Renaissance Period

Renaissance Era in Europe marked by the rebirth of science, art, and culture that also embraced landscape gardening. During 16th-17th centuries tree houses were built for important patrons and become fashion. It is fortunate that collections of recorded in drawings, paintings and prints of Renaissance tree houses have been remained as the important source to illustrate the design and ideas of tree houses in 17th century. Likewise, journals of travellers, writers, philosophers and essayist often mentioned famous tree houses. In 1499 Dominican monk Francesco Colonna in his book *Hypnerotomachia Poliphili* captured the magic of the early design of tree house.

Many recorded collections of tree houses illustrated that Italian tree houses reached their peak of popularity during Renaissance Period. Example is tree houses of Medicy family, the merchant princes and rules of Florence. During the time of Cosimo I, he commissioned the architect Tribolo to build *Villa Castello*. Two artists Michel de Montaigne (visited in 1580) and

Fynes Moryson (visited in 1594) admired the water music that played from hidden sources within the tree. In 1599 artist Gusto Utens depicted the Medici garden as *filled with splendid fountains, automata and other works of arts* (Henderson and Adam, 2005). The tree house of *La Fontana della Rovere* (the fountain of the oak) was encircled by spiralled up staircases carving around the tree and disappearing into the abundant foliage. At the topmost branches was located an eight meters of platform with marble table, seats and fountains. The water was fed from water piped along the branches.

The famous painter of Pieter Brueghel's depicted all short designs of tree houses in his allegorical paintings in the series of the *Seven Deadly Sins* (1556-58). His well-known painting *Spring* (published by Hieronymus Cock in 1570) illustrated how tree houses depicted moralistic of elitist absurdity. The painting showed the idle, irresponsible snobbish who feasting, courting and entertained themselves in arbores tree house. This was in contrast with rigorously male and female gardeners who preparing the garden and weaving vines onto an elaborate pergola.

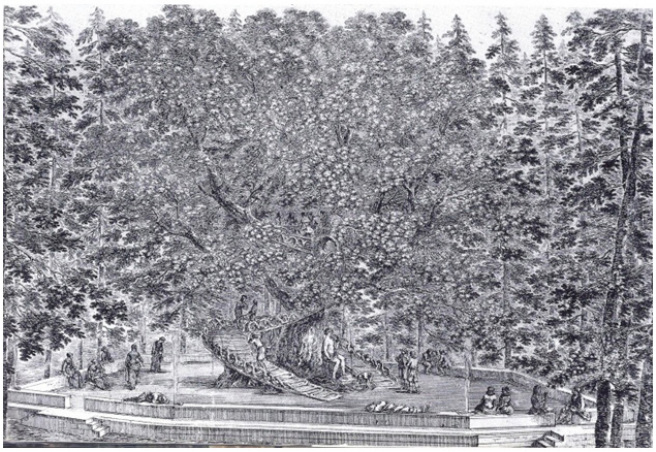


Figure 2. La Fontana della Rovere
Source: Henderson and Mornement, 2005

The change of landscape gardening marked the end of the popularity of Renaissance tree houses. The romanticism of the precious century was considered as barbaric and people attention shifted into the appreciation of the new ideas about the nature (Henderson, 2005). Yet, when tree houses were fading in Europe in the late 18thy century, the New World of America took the idea of tree houses.

Figure 3. Tree house at Pitchford Hall, Shropshire, England
Source: Lyon, 2013

In the book entitles *The Historical Antiquities of Hertfordshire* published in 1700, Henry Chauncy documented the only one survived tree house dated back from 16th century at Pitchford Hall, Shropshire, England. The house survived to this very day, thanks to the owner who brought in plastered to modernize and update the treehouses in 18th century. To maintain survivability until today, both tree and tree house was supported by steel reinforcement that put into the trunk of the tree. Declared as a Grade I listed historic building, it is the oldest example of tree house in the world.

Romantic Period

The romantic period characterized by an appraisal of raw nature. Primitive man or the noble savages were seen as superior to those who corrupted by the western culture and society. Nevertheless, several classical literatures of Chaucer, Dante, and Milton that referenced to tree house failed to encourage the new idea of treehouses. Even, Daniel Defoe in his monumental work *Robinson Crusoe* had ignored the potential of tree house. It wasn't in 1813 when Johann Rudolf Wyss's published the novel entitled *Swiss Family Robinson* that remarked the radical change of it's concept. The novel illustrated the superiority of the Swiss family in their vigorously effort to build a tree house. This caught the imagination of people and aroused the revival popularity of tree house in Western countries.

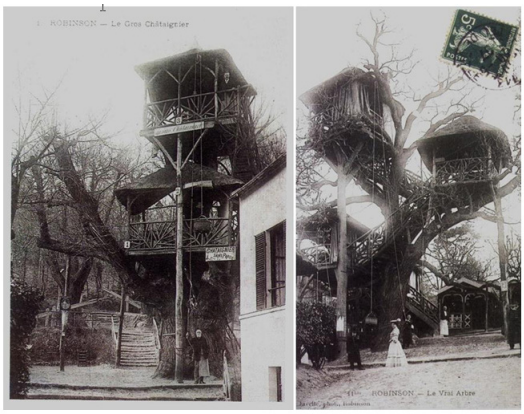


Figure 4. Le Grand Robinson Tree House
Source: Delcampe.net and Keenum, n.d.

In the French village of Plessis, a Parisian restaurant owner M.Gueusquin strongly stimulated by the popularity of the novel and built restaurant *Le Grand Robinson* high in the branches of one largest tree in Parc Robinson. Here visitors could take their meal on any one of a number of different platforms which supported by sturdy wooden stilts.

In 1914 Phebe Westcott Humpreys published the *Practical Book of Garden Architecture*. One of the chapters that devoted to tree houses remained as the first practical guide for building treehouses. She advised that almost any handy man should be able to design and build satisfactory structure of tree house. The tree house is not meant to be ornamental feature of the garden but to provide delightful seclusion up among the breezes in a shelter of tree branches.

Modern Era

While in recent days some tribes proofed that treehouses have been served as habitats for survival, urban people utilize tree houses for refuge, observation, relaxation and also for living. At the forefront of architectural experiment, many treehouses built today are technically so complex and sophisticated. Tree house complete with television, sofa and décor that it would be equally at home. Tree house remains an exercise design that continues to attract architects and designers. For a tree house to survive, Clack (2003) mentioned several coincidental condition should be met, such as 1) the tree must be sufficiently sturdy and long-lived

to survive across many years; 2) the tree house must be cared through the generations with basic maintenance; 3) the environment must be sufficiently placid to avoid hazard; and 4) the location must be fairly stable human environment.

The modern and comfortable design of tree house inspired the tree lodges for wildlife watcher such as in Nepal and Indian sub continents. Usually the lodge built high with a primitive character but is comfortable and overlook on certain spot in the jungle as the center of attraction. They remain as the most unusual and successful hotel in the world, where visitors view wildlife from the tree hotel. Typical tree hotel gained famous since 1953 is Treetop in Kenya when Princess Elizabeth and Prince Philip stayed overnight during their visit to Kenya (Aikman, 1988). In the middle of this royal holiday, suddenly George VI died and the queen took the oath of occasion to the throne in this tree house. This important event marked "Treetops" in Kenya as the most famous tree house in modern age.

THE ROLE OF TREE HOUSES TODAY

Tree Houses for Children

As treehouses offer an escape for children, there was a long standing tradition of children building tree house particularly in Western culture. Treehouses for children are not only associated with "DIY dad" or project by children themselves, as there are several professional companies offer to build children treehouses. *Wild Wood* is a company in England specialized in building tree houses that intends to individually design to meet the requirement of the children. The company applies certain methods to get into the mind of a child- to see things from their point of view so that they will enjoy the treehouses for many years to come. David Clack in his book Ultimate Treehouses (2003) showed selections of the Wild Wood projects. Using the material of solid wood, the company tries to feature tree house into hidden corners, secret hideaways, lookout and castles. To make the child moving round the site without being seen, the company created several ways through different exists and entrance along with the rope bridges, double rope walkways, slides and fireman's poles.

"*A common feature of retreats for kid is that they are small and hidden away, thus a tree house can became a place of kid's own literally, just because of its small*" (Nelson, Nelson and Larkin, 2000). Instead of asking professional, the spontaneity involve in designing and constructing the tree house with the material determined by what in hand often lead to

surprising result. Indeed, building and living in tree house for children are believed to be psychologically good to improve creativity, craftsmanship, climbing skill and courage

Figure 5. Tree house for children
Source: Nelson, Nelson and Larkin, 2000

Tree house as Alternative Dwelling

As tree house associated with the term "self-made architecture" and experimental building, USA offers opportunity to create home in unconventional ways (Clark, 2003). Treehouses in this country has transformed into more than just a refuge retreat or an exotic living place in far-away land but an alternative living space. The problem aroused when tree house located in less isolated area that one has to get along with neighbors. As local laws are vary, most simple treehouses without plumbing or electricity do not require any special building permit or zoning variance as the word "tree house" may not appear in the local building codes. Modern technology opens the possibility to erect treehouses relatively large in terms of size and livability. Some have several floors and can be lived in all year round. In Crossville, Tennessee, Horace Burgess built tree house of 30 meters tall structure and claimed as the tallest tree house in the world.

Andreas Wenning is German architect focused on designing treehouses under the name of *Baumraum* (tree space). While it is widely accept that tree house must be fully anchored in the ground and may not be connected to the ground with any kind of support (Bahamon, 2005; Minguest, 2013; Nelson, 2000) Wenning doesn't agree with such strict definition. He prefers to think that tree house should stand in a close

dialogue with tress in spatial or design term.

> *If the tree is too small or too weak to hold the tree house, supports can be employed without the resulting structure having to forgo the title of tree house. Crucial is that the tree is not overweighed, so that it has the necessary space to move in the wind, and it can continue to grow without obstruction. The determining motivations are the wish to get closer to the trees to enjoy the view and to experience the nature in a special way (Wenning, 2009).*

Wenning advocated a modern tree house over a nostalgic look and post-modern playfulness. Throughout his works he offered two types resolved contradiction between the futuristic design and the handmade look. One is capsule and the other is hut, depending on whether one desires contrast or wishes the treehouses to be blended with natural surroundings. He develops various friendly solutions to connect houses with the trees almost in different way to classic image of treehouses. According to Wenning, one among others of the challenging effort in designing treehouses is the very personal wishes of his clients in their perceptions with nature. For that reason he claimed that tree house can be compared with any other construction work and presented similar challenge to architects.

Figure 6. Two types of tree houses designed by Wenning
Source: Hometreehome, 2013

LIVE IN THE TREEHOUSE AT TBMK

The Tree Houses at TBMK

To experience living in a tree house we decided to live in the real tree houses and conducted an interactive participant observation. As the case study we chose the tree houses complex erected at Taman Buru Masigit Kareumbi (TBMK), a vast of weekend gateway located at the 12

hundred hectares of National Conservation Park in West Java. There are five tree houses with the size roughly 16 square meters. The capacity of tree houses varies between 6-8 persons. Although there was no any power source, the simple toilets with adequate plumbing added at the complex. The whole tree houses arrange into half circle and oriented into the open space set in the middle. Here visitors could arrange gathering activities and bonfire. During the day the surrounding tree houses become social places to hang out with other visitors.

The tree houses designed as a retreat to capture the attention of the all-ages visitors who seek to a return to innocence and escape from the everyday routine. As visitors deliberately visit the tree houses to avoid "every day convenience" the tree houses are not connected to any electrical supply. The complex built deep in the woods so that it is important for visitors to walk for 30 minutes. The buildings are small and hidden away, thus the tree houses can become a place of literally one's own space. Just like an umbrella, under the low branches of single tree, visitors are expected to feel the sensation of "space in between" or being in an outdoor room inside the indoor room.

Figure 7. Environment, Exterior, and Interior of Tree Houses at TBMK
Source: the Author

The Experience Space of Tree House

Bollnow (2011) said that in everyday life, we speak without further consideration of space as we are usually thinking of mathematical space-space that can be measured in three dimensions. Bollnow developed the so called "experienced space" in the sense of merely a psychological reality. Through live in the tree house of TBMK, we took the challenge to attest ourselves on the sensation of the experienced space defined by Bollnow.

Inside the tree house we felt the boundary of space defined by a wall and the view seen from the windows. When we opened the windows, the interior of tree house filled with the dappled light and we felt very close to supporting branches. We could feel the energy that the tree lends itself to make the tree house a part of the living tree. Moving forward the veranda we experienced the space that cannot be called as "finite". There was no border seen outside except the untamed wood. We felt the space turned into incomprehensible and blurred. Referring Bollnow, we need to ask ourselves in what sense the limit defined the finite space. The bordering space turned into invisible, as we were no longer known whether solid boundaries still could be found behind the view of the forest. As we left the tree house and looked back, we could see the tree house gradually disappear and it became just part of the woods.

As tree house was not a full time residence, when compared to the ordinary house, the space was ephemeral. At the ordinary house where we live on the daily basis, the interior divided into some rooms so that each member of the family has each own privacy. Tree house hold the ephemeral quality as it was a single one room where the whole family should share space with the others.

While the woods outside represented the concept of expanse, of which the endless expensed of the woods, the interior of tree house represented what Bollnow called as the opposite of expanse by its narrowness (Bollnow, 2011). When each visitor has to live individually in the tree house as singular renter, he/she needs to share the space with other renters whom literally total strangers. For that reason, inside the tree house he/she needs to define the boundary of each own body, to avoid contact with others. Inside the narrowness, each focuses to the prevention of free movement by something restricts it on all sides of the tree house.

We enjoyed the sense of delight to be in the tree house for being able to

defy gravity while immersed in the natural world. Those who love the nature would value the way tree house takes oneself up to bird's eye view, among the leaves with arboreal animals. We also confirmed the uniquely satisfying qualities of peace, of the detachment from the living creature below and of the closeness to nature. However the feeling of narrowness seemed paradox with the freedom offered by the openness of the woods surround the tree house.

At the tree house of TBMK we enjoyed raw nature without worry about the neighbors, fall asleep in the dark night (as there was no any light) in the gentle swaying of the tree and wake up in the morning to a wonderful view of the sky across the world beneath. However, we felt that being live in this tree house cottage was not living in the place which was really for us. Tree house at TBMK offered different aspects of tree living. It must be incomparable with private tree house as it was not in our own backyard. Although we shared the same experience as Korowai people who enjoy the proximity with nature, this was not the place where we dwell and feel at home. Referring to Bachelard, indeed the tree house of TBMK hold the primary function of the house, to protect and shelter. However, it failed to hold the role as "the happy space", "the beloved space" that Bachelard described as "the possession space", the dwelt-in room. *Dwelling correspond to each other as long as we take the concept of the house far enough* (Bachelard, 1960).

How do treehouses cottage at TBMK compare to tree hotel of Andreas Wenning? To answer this question we chose Wenning work of *Tree hotel Suiten Baumgeflüster*, located at Bas Zwischenahn, Germany (Minquet, 2013). In this project Wenning tried to blend the nature and civilization. The tree house is a self-contained with fully equipped kitchen, living area, bedroom with queen-size bed and luxury bathroom complete with hot tub. For thermal comfort Wenning applied the newest technique for heating and cooling system. The modern furnishing tree hotel designed in contemporary style with almost similar condition with an ordinary living.

Figure 8. Tree hotel Suiten Baumgeflüster
Source: Minguet, 2013

Although located in the forest of Hetchtel-Eksel, Tree hotel is not in exotic remoteness as tree house of TBMK. Unlike the tree house at TBMK, this tree hotel is not associated with adventure and freedom. However one would able to enjoy a sense of wellbeing, as it is equipped with the basic daily living attributes in a special kind of privacy. All combined with adventure as it maintains the close proximity and direct engagement with nature. In this case, tree hotel designed by Wenning might open the possibility to enjoy the experience of relatively closed to dwelling in better way, compare to tree house of TBMK.

CONCLUSION

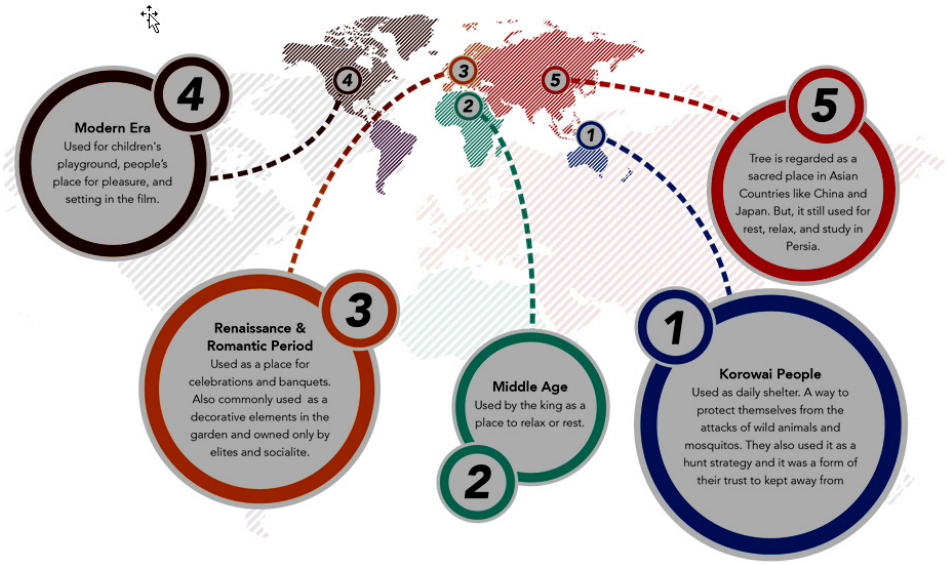


Figure 10. Diagram of the Historical Journey of Tree Houses
Source: the Authors

The historical journey of tree house revealed the interesting evolution of tree house. From the shelter served as habitat for survival during early times, tree house transformed into place for pleasure and delight during the golden ages. Eventually in our own days, tree house turned back as alternative dwelling but in different ways from how the early man inhabited tree house. Aside from the intention to get back to nature, the most common reason for building tree houses is delight. Tree house challenges the design that not only stimulating but imaginative and brings the forefront of architectural experiment. The experience to live in tree house offered an enjoyment of elemental spatial defined by Bollnow. It offered the sensory impression that gives dialectical experience of the mind and body as well as a sensual experience to close to nature. Further research on tree house opens the possibility to shift the tree house as marginal note in architecture into a subject to be taken seriously.

REFERENCES

Aikman, A. (1988). Tree houses. London: Hale.
Bachelard, G. (1958). The Poetic of Space. Boston: Beacon Press.
Bahamon, A. (2005). Treehouses for living. New York: Harper Design.

Bollnow, O., Shuttleworth, C. and Kohlmaier, J. (2011). Human space. London: Hyphen.
Bisht, N. and Bankoti, T. (2004). Encyclopedia of the South-east Asian ethnography. 1st ed. Deli: Global Vision.
Clark, D. (2003). Ultimate treehouses. Philadelphia: Courage Book.
Groat, L. and Chang, D. (2002). Architectural Research Methods, Canada: John Willey & Sons.
Henderson, P. and Mornement, A. (2005). Treehouses. 1st ed. London: Frances Lincoln.
Khan, L., and Easton, B. (1973). Shelter. California: Shelter Production
Minguet, J. (2013). Tree houses. Barcelona: Monsa.
Nelson, P. (1994). Tree Houses: The Art and Craft of Living Out on a Limb. Houghton Mifflin.
Nelson, P. (2004). Treehouses of the World. New York: H. N. Abrams.
Nelson, P., Nelson, J. and Larkin, D. (2000). The Tree House Book. New York: Universe Pub.
Rapoport, A. (1969). House Form and Culture. London: Prentice Hall.
Redfield, R. (1960). The Little Community and Peasant Society and Culture. Chicago: The University of Chicago Press.
Wenning, A. (2009). Tree houses. Berlin: DOM.
_____ Mengintip Rumah Pohon Suku Korowai Kertopati, L. and Laras, A. [online] life.viva.co.id. http://life.viva.co.id/news/read/471411-mengintip-rumah-pohon-suku-korowai [23 September 2014].

REVITALIZING OLD CITY HERITAGE AREA: MENTAL-MAPPING URBAN IMAGE OF SEMARANG OLD CITY

Bintang Noor Prabowo[1]*, Arnis Rochma Harani[2], Resza Riskiyanto[3]***, Mirza Ramandhika[4]****,**

[1234]Architecture Department, Faculty of Engineering, Diponegoro University

*bintangprabowo@gmail.com, **arnis.rochma@gmail.com, ***resza.riskiyanto@gmail.com, ****mirza_ramandhika@yahoo.co.id

ABSTRACT

The old city of Semarang has been abandoned for a long period of time as an important part of the development of the city of Semarang. During the colonial period, this region was functioned as a central of activities with a number of government buildings were established therein. Post-independence, after the Indonesian government took over some of the functions of trade, offices and buildings, the area is not fully utilized as a center of commerce and business area anymore.

Rather than revitalizing the Old City, the local government choose to create new business areas, and also new government buildings outside the Semarang Old City heritage are. Therefore, many owners of the existing buildings in that particular area prefer to leave the area, and left those buildings gradually, so that the building and the area were becoming empty untreated.

To revive this region is not an easy task. Many things become obstacles after the goverment abandoned this region, such as social issues, environmental issues and even political issues related to the status of ownership of several existing buildings. Although the infrastructures problems already been handled, the street is paved well, and the flood is

being takeng cared of, this area is continuing to decrease in its quality. The Old City area looks empty even in the day-time. It looks even more empty in the night, when only several activities still going on through the night.

One of the attempt to revive the old city area to be conveyed in this paper is to construct a mental-map of the Old City of Semarang based on the viewpoint of several communities in the city of Semarang. As we already know, mental-mapping is a way to figure out, which part of a particular area have a meaning for a spesific observer, to orientate themshelves in a spesific area, whether through the landmark, path, node, edges, or districts. The results of the mental-maps identification that have been composed later, is expected to become one of the reference that can be used in development of the old city so it can be revived and become a liveable part of the city of Semarang once again.

Keywords: Semarang old city, mental-map, liveable city

I. PREFACE

Heritage area of Semarang Old City is one of the most outstanding Dutch colonial buildings complex in Indonesia. It consists of hundreds of old building used to be surrounded by fortress called Vijfoek.

It is not like any other colonial area in Indonesia, which consist of geometrical grids. The Semarang Old City seems to be more organically-ordered grids, which can tell us a lot of assumption of how it was built hundreds years ago. It has a lot of potential to be explored and developed.

This particular area used to be the center of the Semarang City during 18th-19th century, and became dense in its population. Some of the building coverage (BC) shows the use of 100% area of the provided site, which means, this area, in the past, was premium and expensive area.

After the independence of Indonesia in 1945, the Old City area was declining in its quality and quantity, due to multi factors. One factor is the mixed-understanding of the legal possession of the land and buildings, and the other factor is the tide flood (locally called "*banjir rob*") that deteriorate the buildings very fast, and creating unhealthy environment.

After the 1990-era, a lot of considerations were taken in this area. The Goverment, NGOs, and Foreigner Foundations put a huge attention to save this heritage area from extinction. A polder is being set between

Semarang Old City and Semarang-Tawang Train Station to reduce the impact of tidal flood and to revitalize this area.

But the unpexpected condition still happening. Although infrastructure is being upgraded, and the condition is becoming a lot better then it was before, this area is still not fully revitalized yet. It becomes a relic from the past, with minimum activities, such as storage, law office, some other offices, etc.

However, many public facilities such as street, benches, parks, lamps and so on, were built nicely in order to facilitate tourists and visitors who come to this area. Some visitors were lovers of old and antique buildings, while some others just ordinary tourist who wants to take photos and walking around the Old City Area.

The visitors and observers walks around this area in a seemingly random movements. But in this journal, a study is being taken down carefully, to understand the mental-mapping of the observer while walking around the Heritage Area of Semarang old City.

As far as our concern, there has not been yet any study related to urban image mapping held in this particular area. The purpose of understanding Image of the city are [1]:
1. Aids navigation through the area
2. Guides Social Interactions
3. Prevents Feeling Lost
4. Helps makes the city feels like home

The Semarang Old City is a unique and easy-to-recognized urban area. It has a strong character that stands-out among the rest of the Semarang area. It would be very easy for an observer to feel inside and outside Semarang Old City. This feeling is recognized as a mental-map. Further, this mental-map can be broken-down into 5 elements of image of the city: path, node, edge, district, and landmark.

II. RESEARCH FRAMEWORK

Research Goals

The purpose of this paper is to obtain an overview of the mental-map of Semarang people about the old town area by using the theory of the City by Kevin Lynch: Paths, Nodes, Edges, District and Landmarks. So the

findings are expected to be a useful input for the stakeholders in the effort to organize the old town area of Semarang in a comprehensive manner.

Research Methods

The research method used in this paper is a Qualitative Methods. A numbers of questionnaires were collected from students, majoring in Architecture Study as a qualitative samples to be quantified, to obtain a more objectives results. This Journal will show how an observer used his mental-map to orientate himself inside the Semarang Old City Heritage Area, using parameters from Image of The City Theory: Paths, Edges, Nodes, Districts, and Landmarks.

III. THEORETICAL BASE

One attempt to revive an area is to maximize the movement of people within the area, both inhabitants and visitors who visit the particular area. The Theory of Image of The City by Kevin Lynch is used in this study, because the mental experience of the dwellers (including visitors and observers), can be a major source of information in identifying elements of path, node, edge, district, and the landmark when they conduct a movement in the particular city area of the Old City of Semarang.

With the above understanding of mental-mapping of urban-dwellers (including visitors and observers) in recognizing and identifying the image of the city, particularly in the area of the Old City of Semarang, it is expected that the mental-maps that have been identified can be one of the considerations for the development strategy and the revitalization of the region of city.

In 1960, Kevin Lynch, Professor at M.I.T., published a book *The Image of the City*, the results of a five-year long research project examining the most important elements in a city as perceived by the residents of the area.

His goal was to identify what features of the built environment were important to the people of the city. Lynch's core concept was the idea of the "legibility" of the built environment. That is, how easy can the parts of the cityscape be organized into a recognizable pattern. He conducted case studies in three U.S. cities: Boston, Los Angeles, and Jersey City.

He used two primary methodologies. First, he conducted extensive fieldwork observing the physical layout of the city. Then, in-depth

interviews with city residents were conducted to better understand the mental-image people have of their built environment. Lynch identified five key elements that make up an individual's perception of their city: paths, edges, districts, nodes, and landmarks.

Paths
Paths consists of the "channels along which the observer customarily, occasionally, or potentially moves" [1]. These can include streets, paths, transit routes, or any other defined path of movement. It is important to note that the paths an individual identifies may not correspond to a traditional street network. These are often the most predominant items in an individual's mental-map as this is main mechanism for how they experience their city.

Edges
Edges provide the boundaries that separate one region from another, the seams that join two regions together, or the barriers that close one region from another. They are linear elements, but are not the paths along with the individual experiences the built environment. They can be physical edges such as shorelines, walls, railroad cuts, or edges of development, or they can be less well-defined edges that the individual perceives as a barrier.

Districts
Districts are "medium-to-large sections of the city" [1]. They are typically two-dimensional features, often held together by some commonality. The individual often enters into or passes through these districts. According to Lynch, most people use the concept of districts to define the broader structure of their city.

Nodes
Nodes are points within the city, strategically located, into which the individual enters (and which is often the main focal point to which she or he is traveling to or from). There are often junctions – a crossing or converging of paths. They often have a physical element such as a popular hangout for the individual or a plaza area. In many cases, the nodes are the centers of the district that they are in.

Landmarks
Landmarks are also a point-reference (similar to nodes). However, unlike nodes, which the individual enters during his or her travels, landmarks remain external features to the individual. They are often physical structures such

as a building, sign, or geographic features (e.g. mountain). The range of landmarks is extensive, but the commonality is that there are used by the individual to better understand and navigate the built environment.

IV. MENTAL-MAPPING THE URBAN-IMAGE OF SEMARANG OLD CITY

The authors have conducted a survey from 80 respondents, all of them are Architecture students, by collecting their answers from a questionnaire being set up previously, to understand the perception of respondents regarding their mental-mapping of Semarang Old City Area.

The reason of choosing students majoring in Architecture disciplines is to simplify the survey being held, since most of the Architecture students were highly aware of those five elements; paths, edges, districts, nodes, and landmarks. Another research is needed to strengthen the understanding of the phenomenon, by using another type of respondents, such as inhabitants, tourists, local people, etc.

The result of this specific respondents shows us, that the respondents actually recognize the five elements of an urban-image within the Semarang Old City Heritage Area.

a. Path

The result from questionnaires collected, shows that from all of the the existing road network, only a few lines are identified by respondents as a Path/ Paths in their cognition. Generally, those Paths/ Lines are common routes that traversed, when the respondent had to cross the Semarang Old City area, or when the respondent had to reach a certain goal in the Old City area.

Figure 1. Pathway Analysis of Semarang Old City area
Source: Personal documentation, 2015

Main pathways in Semarang Old city area which is perceived as a Path/ Strip by respondents are:

1. Path of Jl. Empu Tantular - Jl. Tawang – Jl. Pengapon,
2. Path of Jl. Empu Tantular - Jl. Tawang-Jl.Cendrawasih – Jl. Letjen. Suprapto,
3. Path of Jl.Empu Tantular – Jl. Merak – Jl. Cendrawasih – Jl. Letjen. Suprapto,
4. Path of Bubakan – Jl. Cendrawasih – Jl. Letjen Suprapto.

The most dominant track which is perceived as a Path/ main line in the Semarang Old City area is Jl. Letjen.Suprapto. It is understandable, since most of the landmarks and important activities in the Old City are concentrated along this path.

This path is where the night activities still going until midnight, or almost twenty four hours. The potential benefit from this path could be an example of how to revitalized most of the paths which lacks of activities, during the day and especially during the night.

b. Node

The majority of the respondents were only recognize certain nodes of some nodes located in Semarang Old City Area, namely Node of Bridges Berok, Node of Tawang Area, Node of Jl. Letjen.Suprapto, Node of Bubakan, Node of Blenduk Church and Srigunting Open Space.

Figure 2. Nodes Analysis of Semarang Old City area
Source : Personal documentation, 2015

There is one interesting thing that can be identified from the tendency of the node-recognition by the respondents. Of five nodes that are identified by the respondents, four of them is an area landmarks, which are Bridge of

Berok, Polder Tawang Station, Bubakan roundabout (traffic circle position is located at the outer edge of the old town area-southeast), and the Church Blenduk with its Srigunting Park.

There is one node that almost without landmarks around it, which is intersection between Letjen.Suprapto - Jl. Cendrawasih. More research is needed to determine further the correlation between the presences of the landmarks that define the observer's perception node around landmarks.

Among those nodes, the Node of Polder Tawang and Node of Blenduk Church and Srigunting Park are the most recognized nodes. It can be concluded that the presence of Tawang Railway Station and Blenduk Church have significant effects toward those nodes.

c. Edge

Semarang Old City area, formerly is a fortress city with boundaries-fortress shape. The remains of the fortress boundary's suspected edge is relatively easy to be recognized nowadays. The shape of the solid mass of the building, with a set-back to zero (almost without a set-back) from the edge of the road and drainage in front of it could be a strong indicator of the location of the edge of the fortress' remains.

After the fort was dismantled, the mass of the building looks like a fortress-edge forms an imaginative fortress surrounds the Semarang Old City area. The choosen location of NIS Semarang Tawang Station which considering the grid of the Old-City, makes the station Building (built years later after the dismantle of the fortress) became an integral part of the Old City area (Prabowo, 2002)

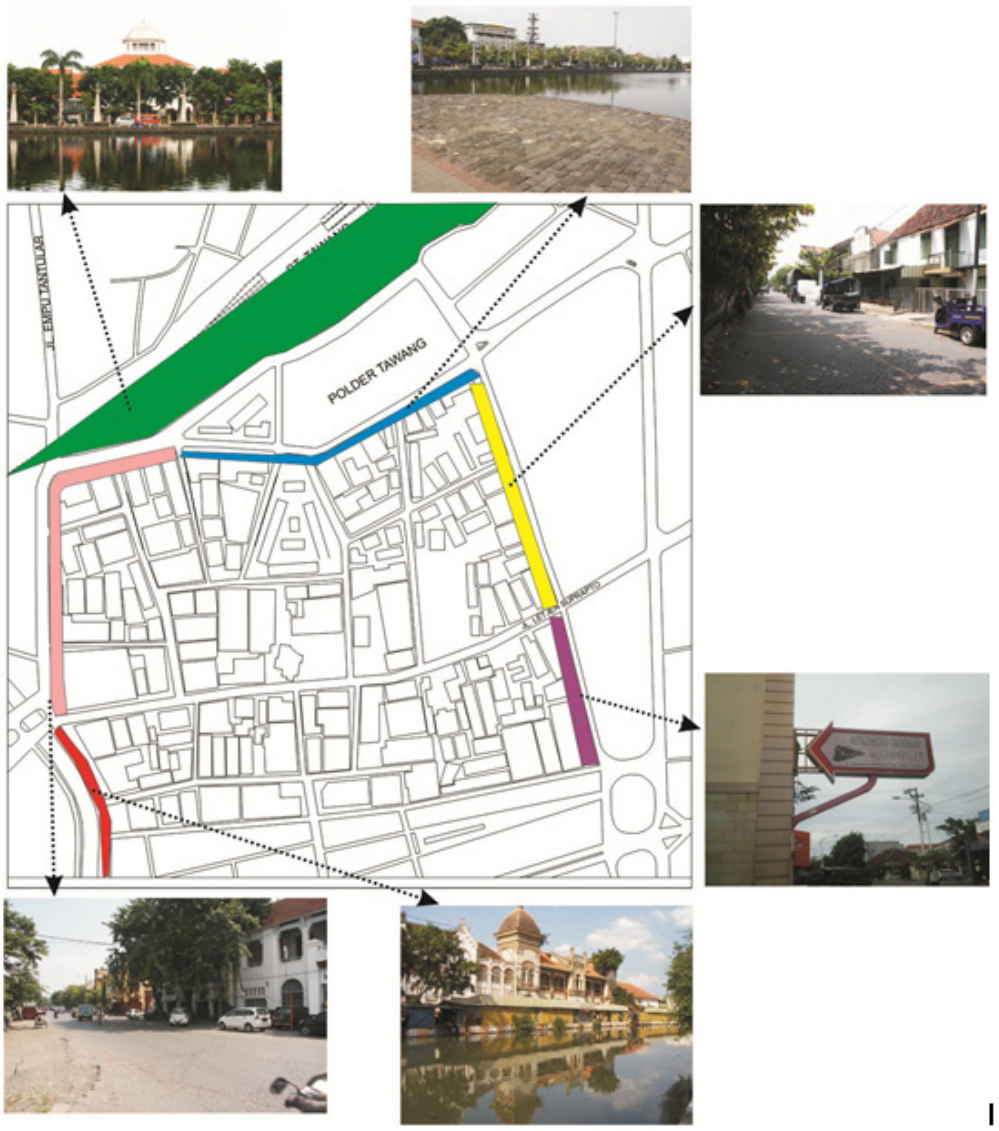


Figure 3. Edge Analysis of Semarang Old City area
Source : Personal documentation, 2015

On the South side of the fortress, lies a river (Kali Semarang) which is become a transportation path from the sea at that time, as well as a moat fort on the south side. Building owned by state-owned companies-Rajawali Nusindo dominate the edge in southern part of the Old City area. There are anomalous elements of Edge in South-East side of the Old City, which is in the region of Jurnatan/ Bubakan. Jurnatan region was the

central node land freight transport, particularly buses, rickshaws, carts, public transport, and Jurnatan Train Station.

After the tearing down of Jurnatan station area, this area changed into commerce and shopping area, with the opening of Jurnatan shopping complex. As a result, the face of a fort and colonial buildings had not seen again. It might be the cause that this area is no longer perceived by observers as the edge of Semarang Old City.

d. District

Naturally, the Semarang old city area has several grouping activities, which are Tourism and Cultural District, Offices District, and Warehousing district. The rest of the area is used for stores, settlement, and some of them are left empty.

Figure 4. District Analysis of Semarang Old City area
Source : Personal documentation, 2015

Respondents are aware of the sense of each district, because those each

district has different activities and different type of buildings.

Further research is needed to collect data of land ownership. It might also the cause of missed-use on the land use that has been set by the Government of the city, through the regulation of Semarang No. 16 of 2003 on Building Management Plan and Environmental (RTBL) Old City area.

e. Landmark

The result of the questionnaire obtained through the identification of mental-mapping observer, which clearly states the 5 (five) objects perceived as Landmark / Landmarks.

Sequentially, the object which are mentioned: (1) The Church of Blenduk, (2) Tawang Station, (3) Polder Tawang, (4) Bridge Berok, and (5) Srigunting Park / Parade Plein.

Figure 5. Landmark Analysis of Semarang Old City area
Source : Personal documentation, 2015

One thing that is interesting is the phenomenon of Polder Tawang, which newly built in the early 2000s. This area was once an open field, which is then converted into Polder (pool) as Flood control in the Old City area of Semarang Tawang Station and the entire Old City area.

Interestingly, Polder Tawang is then perceived by the observer and the respondents as one of the landmarks of the Old City of Semarang, defeating several historic buildings in the Old Town area as Marba Building and Building Insurance Jiwasraya, for example.

It shows that, with a proper treatment, an object that is not a genuine remains of the Netherlands Colonial era could be perceived as Landmarks in the area where surrounds by a lot of colonial buildings.

The same thing happened to park Srigunting which ranks fifth in the questionnaire that's been distributed. In the past, the name is not known as Srigunting Park. In the area which is nowadays known as Srigunting park formerly a field next to a church that became a gathering place for residents of the city and venue for official ceremonies and celebrations citizens. It was well known as Parade Plein (Parade Square).

Further research and continued efforts is needed to create new landmark in the Semarang Old City area, neither is the revitalization of historic buildings, or new objects that can be processed nor adapted to become another landmark of the Semarang Old City area.

V. CONCLUSION

Revitalization of the Semarang Old City can be done in various ways. Focus study also related to various aspects, whether economic, social, cultural and technical aspects. In this paper, the author focuses on urban planning and urban design aspects by using the viewpoint of the five elements of the city's image as the basis theory to create a mental-map of the Old City area of Semarang.

The Mapping of Urban image need to be taken, to enhance the experience of enjoying the city, particularly Semarang Old City. It will guides and navigates the visitor movement properly, and needed to be part of the strategic planning, including: conservation strategy, tourism, parking planning, activity planning, priority planning, etc. The mapping will also give the visitor the safe-feeling of not being-lost inside the Old City Area.

The mental-maps can also be used as a reference for the development plan of the old city of Semarang. Determination of the five elements town located in the old town area of Semarang can be a starting point of development. One of these landmarks and nodes that can be developed as a generator by presenting the various functions of the activities inside it. However, this paper is limited to mapping, there needs to be further research related to the quality of each element of the city in order to be able to contribute the maximum to revive the old town area of Semarang.

REFERENCES

[1] Lynch, Kevin, The Image of the City, MIT Press, Cambridge MA 1960
[2] Shirvani, Hamid, Urban Design Process, Van Nostrand Reinhold, New York, 1985.
[3] Cullen, Gordon, The Concise Townscape, Architectural Press, 1971
[4] Purwanto, Edi, Pendekatan Pemahaman Citra Lingkungan Perkotaan (melalui kemampuan peta mental pengamat), Dimensi, Journal of Architecture and Built Environment, Vol 29, No.1, 2001
[5] Budihardjo, Eko, Arsitektur dan Kota di Indonesia, Alumni, Bandung, 1991
[6] Prabowo, Bintang Noor, Studi Karakter Perancangan Kota di Kawasan Stasiun Kereta Api Sebagai Bagian Dari Konfigurasi Kota Lama (Kasus: Stasiun Tawang Dan Stasiun Jakarta Kota)., Program Pascasarjana Universitas Diponegoro, 2002

REDUCING CAUSES OF WOMEN'S FEAR OF CRIME IN UNDERGROUND STATION: THE IMPORTANCE OF GOOD SURVEILLANCE AND WAYFINDING

Elita Nuraeny[1]*, Enira Arvanda[2]*

[12]Department of Architecture, Faculty of Engineering
Universitas Indonesia
*elitanuraeni@gmail.com, **enira28@gmail.com

Abstract
In big city, crime has become a major problem for its citizens, especially women. The fear of crime among women is affected by their minor physicality and the possibilities of being harassed. The unpredictable actions of strangers—such as homeless people, delinquents and drug addicts—are keys in igniting the fear of crime and thus hinder women to travel alone, especially in the underground transportation stations. Surveillance or presence of other people is believe to reduce women's fear of crime in public space as well as clear signage and way finding in providing clear escape routes during emergency situations.

This paper will try to understand how to decrease the fear of crime in underground stations through three steps: understanding the safety and security in public space (dwelling), the fear of crime among women (surveillance and way finding) and comparing the design of underground transit of Jakarta's Mass Rapid Transport (MRT) with benchmark from other existing underground stations to achieve sustainable design for the future of Jakarta's transportation facilities.

Keywords: safety and comfort, underground station, surveillance, wayfindings

INTERIORITY, DWELLING AND THE FEAR OF CRIME

Interiority, Dwelling and Basic Human Needs

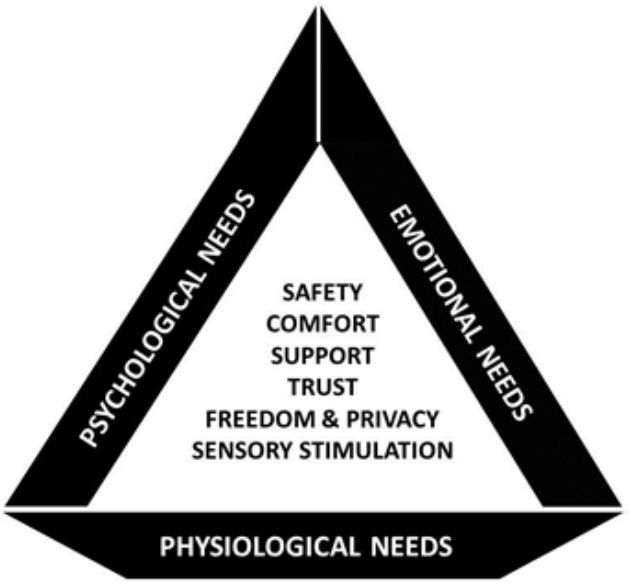


Figure 1. Triangle of human needs
Source: S.Caan, 2011

Interiority is the first step in understanding the basic of human needs. It involves both the tangible and intangible of space. Figure 1 shows the correlation between the intangible and tangible aspects towards human needs and the peace of mind. Safety, comfort, support, trust, freedom and privacy, as well as sensory stimulation are the important factors to achieve in designing interior.

Safety and Comfort in Underground Transit Station

Safety and comfort are two of basic human needs. However, most people feels insecure in urban environment and the most common place is the transport nodes. As explain by Uittenbogaard and Ceccato, transportation nodes becomes a crime generators as well as crime attractors because it concentrate heavy flows of people. This situation may attract offenders to commit crimes (Uittenbogaard, *et al.*, 2013).

Feeling secure and fear of crime are highly affected by the environment of the transportation nodes. There are two types of environment: the

condition inside shelter and social environment in the surrounding areas (Uittenbogaard, *et al.*, 2013). The importance of a conducive area is clearly stated in the research of Wilson and Kelling entitled "Broken Windows: The Police and Neighbourhood Safety" (1982). They stated that criminal actions happen when disorder comes in an ordered society. If this continues, control in society will decrease and change the neighbourhood. This situation, where criminal activities become a daily routine and custom in society—also called as 'urban decay' (*Wilson, et al.*, 1982)—will hinder people from using public transportation or being outside and thus reducing the surveillance number in the street (*Cozens, et al.*, 2004).

The physical condition and location of the transportation nodes also plays a role in attracting offenders and increasing opportunities of crime. Underground transit station is one of them, because it usually provides poor conditions for formal and informal social control which can lead to more crime and disorder (*Uittenbogaard, et al.*, 2013).

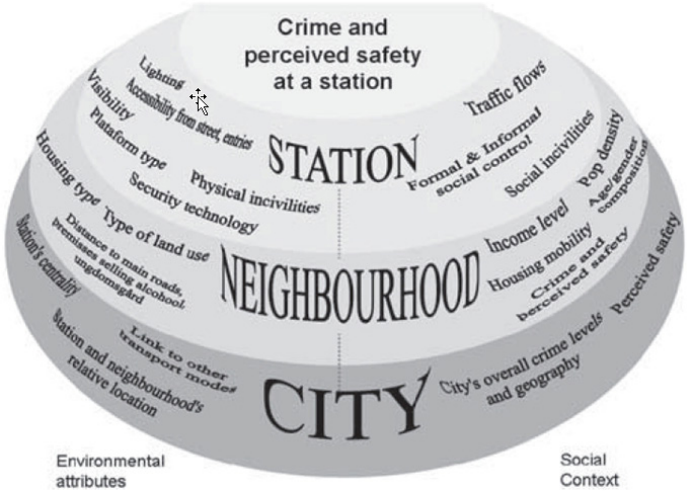


Figure 2. A conceptual framework for security in underground stations
Source: V. Ceccato et al, 2013

Formal social control such as the police patrols and CCTV cameras as well as the informal control of other passengers or shops nearby can provide a sense of security. A controlled public space can reduce criminal actions, because the presence of other people will discourage crime to take action. However, based on research of Ceccato and Haining (2004), crowded transportation sites are often lack of either formal and

informal social control or the 'capable guardians' (Ceccato, et al., 2013). Therefore, increasing number of potential guardians or surveillance to provide security can be achieved by enhancing the environmental attributes in underground stations.

WOMEN AND THE FEAR OF CRIME IN UNDERGROUND TRANSIT

Fear of Crime in Public Space

The fear of being victimized in public space is a product of poor condition in surrounding environment. Since public space commonly seen as more masculine space—based on the different cultural view in gender interaction is affecting human's concept of space, perception and behaviour (Rendell, 2004)—the fear of crime and insecurity will increase among women. Experience, memories and interaction between human and their environment are the key ingredients of creating fear of crime, especially towards women (Loukaitou-sideris, 2014). Hannah Scott (2003), in her research concluded that woman has two types of fear: concrete fear (afraid of an actual criminal actions) and formless fear (afraid of more common criminal issues). These types are strongly affected with age differences (Scott, 2003; Loukaitou-sideris, 2014) and affecting women's daily routines to avoid the possibilities of harassments or being targeted by criminals.

The preventive actions will make a huge impact on how women chose their traveling options in the city and initially transform women's urban experience. Many women avoid going out after dark or chose a spesific transportation stations to be comfortable and secure (Loukaitou-sideris, 2014). However, women's fear of crime heightens during their journey from/to and waiting in stations, especially in enclose and secluded space with minimum access (Loukaitou-sideris, 2014; Valentine, 1990) like underground stations.

Fear of Crime in Underground Stations

In designing underground stations, there are three important aspects. They are:

1. Funtional aspect (connectivity between spaces, movement efficiency in space)
2. Psychological aspect (spatial experience, safety and comfort)
3. Structural aspect (the building quality and sustainability)

The functional and structural aspects (physical aspects) can be break down into several factors such as, accessibility and condition of neighbourhood, orientation and wayfinding, space proportion, connectivity between underground space and the surface, natural and artificial lights, material and colour, noise level and air control (Durmisevic, 2002). When underground stations incorporated these factors into the designs, safety and comfort will be achieved.

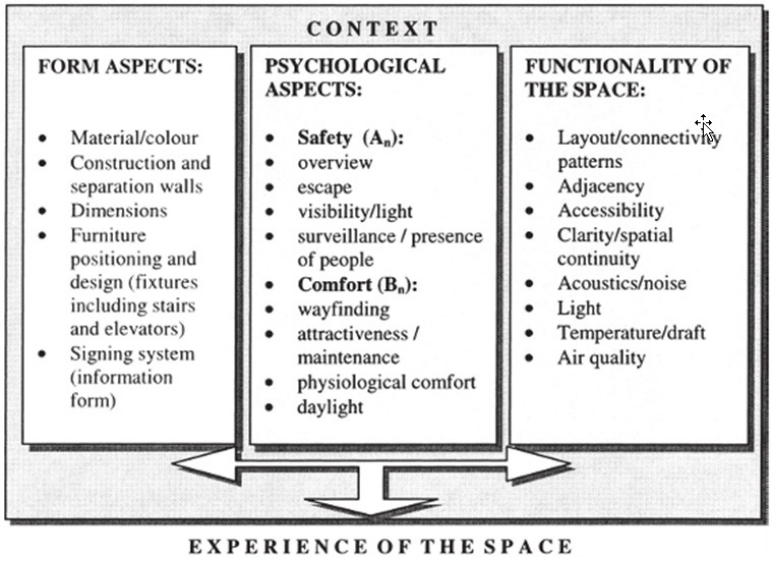


Figure 3. Important aspects in designing underground space and reducing fear of crime
Source: Durmisevic and Sariyildiz, 2001

Those factors are beneficial in increasing the physical or environment aspects in underground stations, and also increaseing the psychological effect on users, especially women. With good environment, people will be attracted to come and use the underground stations thus providing stations with informal surveillance. However, if there is no control of whoever can enter the station, the positive impact will turn into negative. An uncontrolled underground stations can become a crime nest with overcrowding (can attract more crime to take action) and promote vandalism (decreasing the building quality and attractivesness). The solution to this problem is by restricting and limiting access to some area in stations. Reducing the platform length also can be a solution in preventing crime (Loukaitou-sideris, 2014), because women often afraid of the dark corner in every long platform has. Also, an empty and long platform can attract homeless.

Since women's spatial cognition is different from men, they often struggling to read a map and find a location. Women usually miss peripheral informations, unless there are informations about specific landmark to guide them (Kim, et al., 2007). Therefore, to increase awareness of safety and security, a clear wayfinding and signage are very important in underground stations. A good signage can inform women to find direction in station as effective and efficient as possible. Also, clear signages can help women in determining which direction to a safe location in station and locating the exit during emergency or as an escape route.

In conclusion, there are many aspects to considered to achieve safety and comfort for users in underground stations. But, from the physical aspect to psychological aspect, there are two prominent needs that stood out: surveillance and wayfinding.

UNDERGROUND SPACE AND JAKARTA'S MRT

Planning of Jakarta MRT System

The Jakarta MRT is designed to be the most reliable public and mass transport in Jakarta. It is created to be the backbone of all the transportation modes and system in Jakarta (the TransJakarta bus, public bus, taxi, etc), as well as the catalyst of urban planning. Therefore, urban planning in Jakarta can be focusing on developing the environment around the MRT system (Transit Oriented Development—TOD) (PT. Lapi ITB, 2010). The main purpose of this project is to reduce air polution and traffic congestion in Jakarta by encouraging citizens to use public transportation. This project will be the first beginning of new urbanism of Jakarta, where it will focusing on to be the pedestrian-friendly city.

Therefore, to achieve the goals of reducing traffic congestion and promoting the public transportation, many MRT stations are located in bussiest areas in Jakarta. The planning of MRT also considered to place their station in areas which has important roles in connecting the journey between the sattelite cities (Bogor, Depok, Tangerang and Bekasi) to Jakarta. With this deliberation, the MRT will be able to connect and reducing the travelling time accros cities.

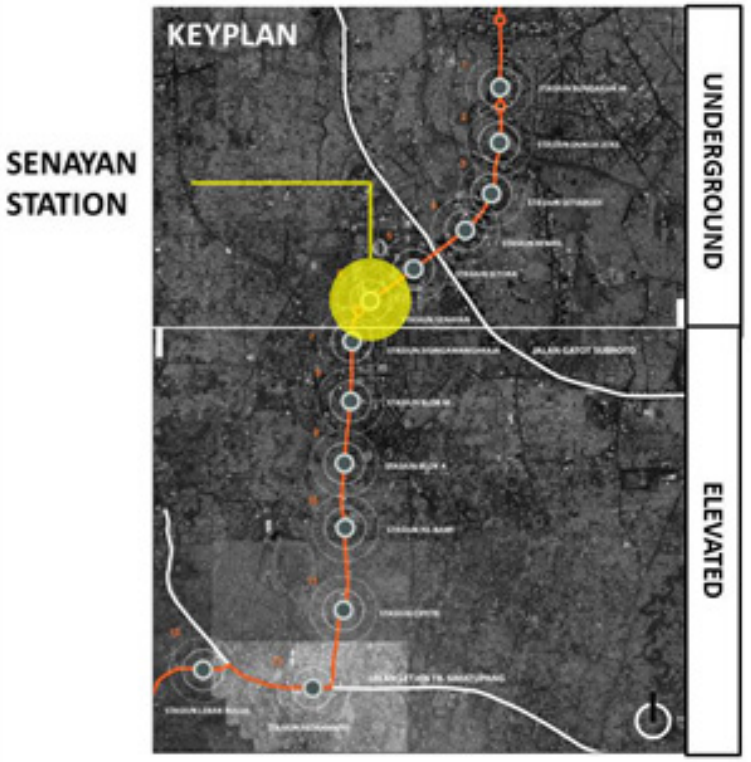


Figure 4. Keyplan for Jakarta MRT system planning
Source: PT. Lapi ITB, 2010

However, to be able to stimulate the will of Jakarta's citizens to convert from private vehicles to public transports is not easy. An elaborative research of human comfort and safety in public space is needed to strengthen the design of Jakarta MRT system. And since the government also planning to have some stations to be build underground, it is very important to reduce fear of crime—especially towards women—while concepting the design.

Planning of Underground Station (Case Study: Design Concept for Senayan Underground Station)

The Jakarta MRT project is seperated into two terms and the first term consisted of thirteen stations, including Senayan Station—coded as CP104—as the fourth station of the MRT system. It will be located alongside Sudirman Street and surrounded by Ratu Plaza Building, Summit Mas Building and Ministry of Education and Culture (MRT Jakarta, 2014). The Senayan Station will be the 8th station in the first MRT lane in Jakarta. Also,

the station will be the transition from elevated to underground station of MRT Jakarta, range from Lebak Bulus to Bundaran HI.
The design of this station has been thought thoroughly to be sustainable and functional. Every single material use in designing the station can be recycled to suppress cost of construction and maintenance. Another principal design for this station is to provide safety, security and comfort for users (MRT Jakarta, 2014).

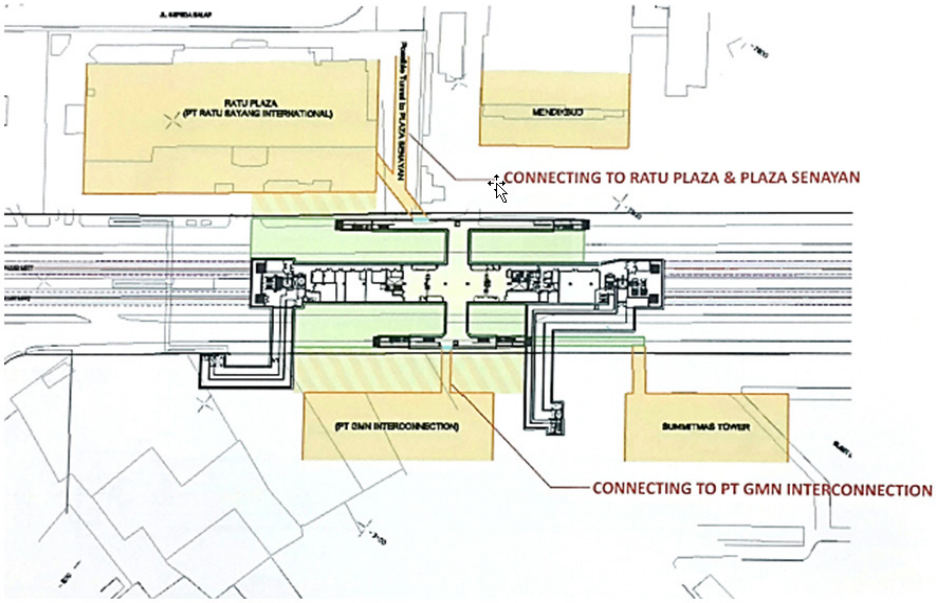


Figure 5. Connectivity of Senayan Station with the other buildings and its environments
Source: MRT Jakarta, 2014

From the perspective of fear of crime in public space, this connection between station and other buildings surely will increase the number of surveillance. Moreover, most connecting lines are leading from the station to crowded area and thus increasing the possibilities of the informal surveillance and reducing the fear of crime in this station.

However, besides the connecting lines which has direct entry to various bussiness centers and buildings around the stations, there are other entry/exits which has direction straight from the underground station to the kerb of Sudirman Street and to the bus stop near Ratu Plaza. To understand the safety and comfort in reducing the fear of crime for women, the analysis will be focusing on the surveillance and wayfinding of the Senayan Station.

Exit and Entrance

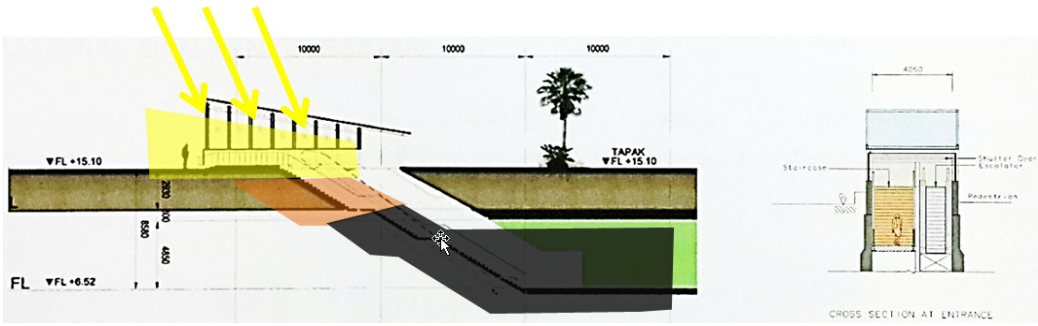


Figure 6. Entrance and exit for underground station
Source: MRT Jakarta, 2014

The design of underground entrances are designed similar to each other for an easy identification and can be very useful in reducing fear of crime, because it will be easier—especially women—to identified the entrance/exit and avoiding the possibilites of being attack. If the entrance/exit is not clear, women will spend more time to find the station and therefore increasing the possibilities of crime, especially during the night and if the station is located in bad neighbourhood. Moreover, the glass material will be very useful for women to identified any stange behaviour or dangerous figures waiting for them at the end of the entrance/exit. The transparent walls also providing maximum surveillance. If something bad happen inside the station, people around it will know and act as soon as possible.

However, with the purposed material of aluminium strips, which is not translucent, it will reduce the capacity of natural light to enter the lower base of the entrance/exit (shown with yellow to dark color). Besides the unfulfilled sustainable factor, this condition can also become a threat to passengers' safety and comfort. The dark corner on the lower base will make women unable to see clearly and thus bad for the wayfinding and can cause accidents; unless, artificial lighting will play a significant role to anticipate it. In emergency situation, it will be dangerous for passangers because their sight will be limited and the negative perception of descending to a darker room can cause panic, because it gives impression of being cut-off so suddenly from the street level.

The condition of bad lighting will also intrigued the fear of crime among women. Since women's spatial recognition (understanding map, signs and direction) is not as good as men, the minimum illumination in the lower base of the entrance surely will make women hard to determine the

direction. Moreover, the darkness will hinder women to enter the station because the underground area is enclosed and dark; it makes women perceieved there is danger lurking within the darkness.

Figure 7. (left) Platform and entrance/exit in Frederiksberg Station, Denmark; (right) entrance/exit in Fukuoka Station, Japan.
Source: dev.ihdcstore.org, transportation (2009, last access June 6th, 2015)

Figure 7 shows a good example of entrance/exit to underground station. Both Frederiksberg Station and Fukuoka Station provide passangers with lots of natural lighting, which can be beneficial for sustainable energy and reducing fear of crime. With lots of natural light sources (ex. Skylight and wide opening), the lower base of free concourse and exit/entrance area will be illuminated enough for women to see and therefore able to predict or avoid any dangerous encounters. The Senayan Station can go with either way: adding a skylight like Frederiksberg Station or maximising the material use for its exit/entrance door with translucent and reflective material such as glass and artificial lighting.

Public Circulation, Layout and Wayfinding

Increasing safety and comfort of women in underground space can be achieved by maximize the layout design and public circulation, which can improve the number of positive surveillance is essential. As mentioned by Ceccato et al (2013), most crime happens on platforms, escalators and access stairways where station design lacks of good surveillance (Ceccato, et al, 2013). Another speculation on circulation is to separate the public flows to make less chaotic and crowded situations where thievery usually take action (Uittenbogaard, et al., 2013). With this type of environment, passengers will be more aware and alert towards strange behaviour such as walking against the flow and also to organise behaviour of Indonesians in public space to be more obedient to rules.

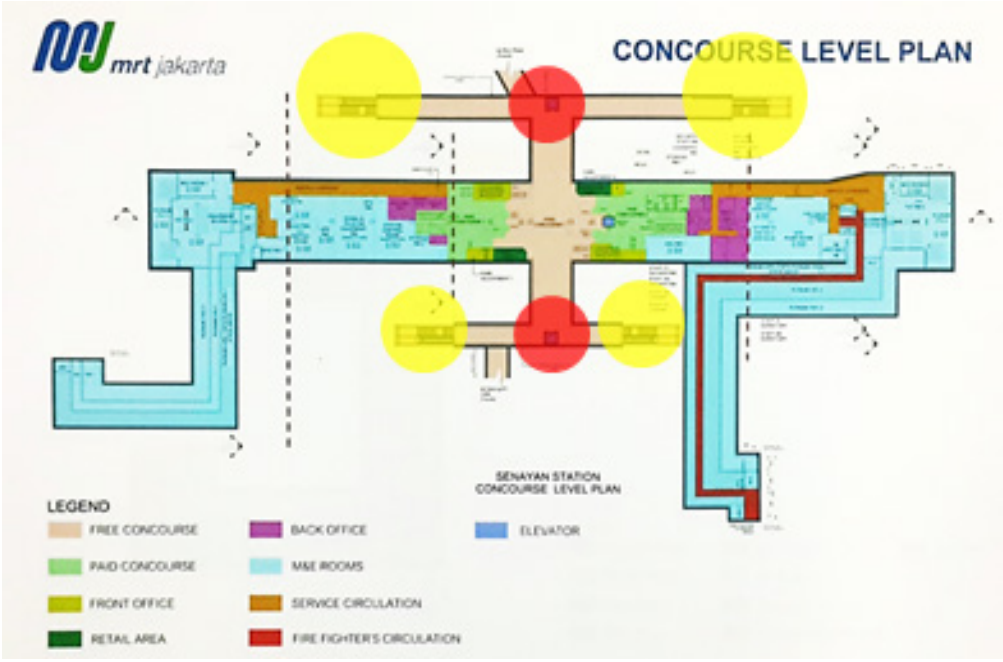


Figure 8. The concourse level plan of Senayan Station
Source: MRT Jakarta, 2014

In figure 8, there are two public access into the undeground station: access with elevators and stairways and escalators. The elevators are reserved for the diffable and elders with wheelchairs, while the other access (stairways and escalators) for other passangers (yellow circles). The elevators area (red circles) are located face-to-face with paid concourse area or ticket gates and can be easily located when passengers exit the gates.

However, in the layout of Senayan Station, the other access to the stairways and escalators are not visible from the ticket gate. This situation will make passengers unconscious the whereabout of other public access besides the elevators and eventually will reduce surveillance number around the other exit/entrance. When many passengers will use the elevators—which intended for the diffables and elders—crowding will happen around the area. Without a clear flow seperation between the exiting and entering passengers, it will make the junction evenmore crowded. This situation will increase the possibilities of crime and fear of crime, especially during rush hours. And since the entrance/exit area other than elevator is separated from the ticket area with T-junctions, it will be very difficult to women to find it. Fear of crime will increase due to this condition because women can not find the escape routes easily during emergency situation.

This situation can be avoided by providing a clear signage pointing towards other accesible exit/entrance for passangers or relocating the elevator and escalator/stairs close to each other. Shown in the figure 9 is an example made in Fukuoka Station where the elevator and stairs are at close proximity for an easy access. Relocating these two entrance/exit lanes can increase amount of positive surveillance and at the same time reducing women's fear of crime.

Figure 9. Station entrance/exit in Fukuoka both has the stair and escalator side-by-side.
Source: dev.ihdcstore.org, transportation (2009, last access June 6th, 2015)

Another problem is shown by the layout design of this station. The free concourse area (light brown) is separated from the paid concourse area (light green). This condition is not suitable in providing the good surveillance. Free concourse area means everyone can enter the area even though they are not intended to use the transportations. Therefore, the strangers mention in the broken window theory can also be in this area and might also taken this particular area as temporary shelter during rain or as a permanent shelter for homeless people. Although there is retail areas (dark green) not far from the free concourse area, the shopkeepers or other passengers nearby will unable to watch the area from crime because there is a sharp corner between the free concourse and retail area.

Minimalizing the existing of corners has become a great asset in reducing fear of crime. With less corner, the ability of being seen and seen by other will increase awareness towards crime (surveillance). Corner also can provide concealment and therefore increasing fear of criminal hiding behind it (Durmisevic, 2012, refering to Nasar and Jones, 1997). In the

layout of Senayan Station, the free concourse and paid concourse area is connected with corners. With minimum surveillance, the free concourse surely will increase passengers fear of crime.

The connection between Senayan Station and the other office towers as well ass some shopping districts surely will increase the number of surveillance. However, Senayan Station as the first underground station after series of 7 elevated stations will affect passengers spatial orientation and constraint the capability in spatial cognition, especially for women. The transition will force their spatial mapping to adapt; from being able to see the surrounding area which the train will pass to dark underground tunnel. This situation will disoriented passengers, especially women, in an enclose space such as underground stations. Moreover, the idea of building an underground station is new and never before presented in Jakarta. To finally interact with an underground station, the citizen of Jakarta will need some time to reorganise their spatial cognition as well as mind map of the entire Jakarta. This situation can lead to criminal action which exploit the confusion in underground station and easily targeting the women, since their spatial mapping is not as good as men (Kim, et al., 2007).

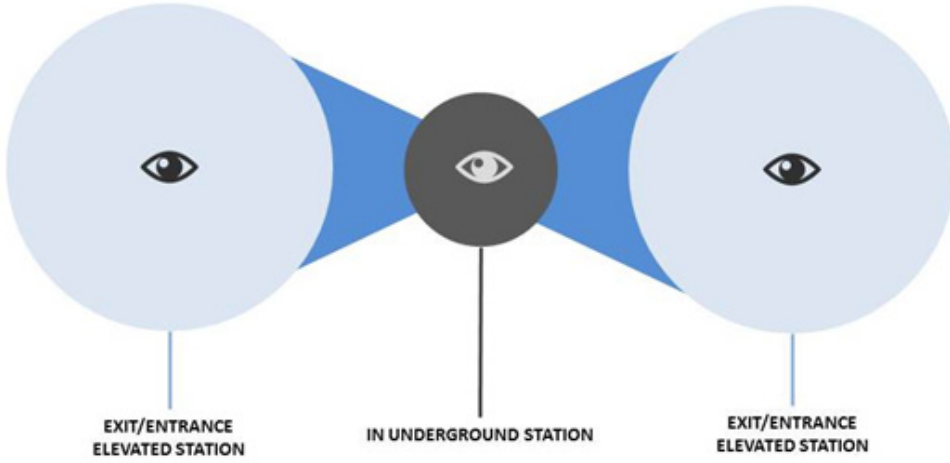


Figure 10. Constraint in spatial cognition between the exit/entrance and elevated station to underground station
Source: Personal, 2015

Thus, it is necessary for Senayan Station to accommodate an easy navigation and orientation for the passangers, especially during the rush hour. Moreover, clear wayfinding will certainly reduce the fear of crime among women, especially when it leads them to safe place or exit/

entrance. For example, every underground train stations in Tokyo, Japan, are not only directing the passangers to the exit, but also mentioning the nearest buildings or landmark within the area of that particular exit (Shuffield, 2002).

Figure 11. Each stations are identified by different colors, names in English, Japanese and unique symbol which related to the surrounding of each stations (left). Another maps showing the neighbourhood helps passangers to find their way.
Source: dev.ihdcstore.org, transportation (2009, last access June 6th, 2015)

With this method, women will be able to connect the relationship between the underground space and the street surface. Thus helping women in creating the new spatial mapping with the MRT as the baselines for the future Jakarta. With this new spatial mapping, it will be easier for women to determine which station, exit and entrance they should take to avoid criminals and dangerous neighbourhood. A better wayfinding also will provide enough information for women to the nearest safety area with high surveillance numbers or shortening the time consumption to reach their destination from underground station.

CONCLUSION

The MRT is a big improvement from the government of Jakarta to support healtier city, since planning for each MRT stations will be the backbone of all transportation modes existing in Jakarta, as well as a baseline for Jakarta city planning in the near future (PT. Lapi ITB, 2010). When the MRT is

finally open for public, it will not only change transportation in Jakarta, but it also change people's perception of the old Jakarta they already knew.

Since some stations of MRT Jakarta will be located underground, providing and promoting underground space as a comfortable and safe place is crucial, because underground space mostly receives bad reputation and perceived negatively by people. If this negative view towards underground space is not yet reduce, it will lead to excessive fear of crime, especially women. By giving more attention to women's needs to reduce fear of crime in underground public space, safety and comfort can be achieved for all (Arvanda, et al, 2014).

Some preventive measures can be done, for example a clear symbolic language such as an iconic exit/entrance to differentiate underground stations with other buildings; it makes wayfinding easier in urban scale. Good lighting, broad visibility as well as clear signage are helping women to increase awareness and identify the condition of neighbourhood where the station is located; is it safe or is it unsafe? Therefore, women will feel safe inside and outside the underground stations. It also helps women to plan out their journey in Jakarta, thus making them more calm and comfortable to take journey across the city.

The comparison with other stations in Japan and Denmark could be a positive inputs for the construction of MRT Jakarta; from maximising wayfinding and relocating or redefining the entrance/exit of every stations. However, the MRT project is still underconstruction and every data provided in this paper is the initial design guidelines for underground stations. There are many aspects that must be addressed once the MRT is open and used by public and further research will be needed.

REFERENCES

Arvanda, E., Kusuma, N.R., Suryantini, R. (2014). Kajian Ruang Transit Transportasi Bawah Tanah: Pengaruh Kualitas Ruang Terhadap Rasa Nyaman dan Aman Pengguna Wanita. Unpublish manuscript (Direktorat Riset dan Pengabdian Masyarakat, Universitas Indonesia). Universitas Indonesia.

Caan, S. (2011). Rethinking Design and Interiors: Human Beings in The Built Environment. London, UK: Laurence King Publishing Ltd.

Cozens, P., Neale, R., Hillier, D., Whitaker, J. (2004). Tackling Crime and Fear of Crime While Waiting at Britain's Railway Stations. Journal of Public Transportation Vol. 7 No. 3.

Durmisevic, S. (2002). Perception Aspects in Underground Spaces using

Intelligent Knowledge Modeling. Doctoral Disserttation, Delft University of Technology, p. 1-167. Netherlands.
Kim, B., Lee, S., Lee, J. (2007). Gender Differences in Spatial Navigation. World Academy of Science, Engineering and Technology. Downloaded in January 20th 2012 from http://www.waset.org/journals/waset/v31/v31-53.pdf
Loukaitou-sideris, A. (2004). Is It Safe to Walk Here? Design and Policy Responses to Women's Fear of Victimization in Public Places. Research on Women's Issues in Transportation proceeding Vol. 2. LA, USA: University of California. Downloaded in January 25th 2014 from http://onlinepubs.trb.org/onlinepubs/conf/CP35v2.pdf
MRT Jakarta (2014). Konsep Desain Arsitektural Stasiun Senayan: Construction of Jakarta Mass Rapid Transit Project, Underground Section CP104.
PT. Lapi ITB. (2010). Panduan Rancang Kota: Pengembangan Koridor MRT Jakarta.
Scott, H. (2003). Stranger Danger: Explaining Women's Fear of Crime. Western Criminology Review. USA.
Shuffield, J. (2002). The Subway as Intermediary Public Space. Unpublish manuscript (Department of Urban Planning, Columbia University). Online. Available http://www.urbanresidue.com/theory/subway.html
Uittenbogaard, A., Ceccato, V. (2013). Safety in Stockholm's Underground Stations: An Agenda for Action. Springer Science+Business Media Dordrecht.
Uittenbogaard, A., Ceccato, V., Bamzar, R. (2013). Security in Stockholm's Underground Stations: The Importance of Environmental Attributes and Context. Security Journal Vol. 26, 1, p. 33-59. Macmillan Publishers Ltd.
Valentine, G. (2002). Women's Fear and the Design of Public Space. Alexandrine Press.
Wilson, J.Q., Kelling, G.L. (1982). Broken Windows: The Police and Neighbuorhood Safety.

Websites

Institute for Human Centered Design. (2009). Project Facts: Nanakuma Line, Fukuoka, Kyushu, Japan. Retrieved from http://dev.ihcdstore.org/?q=node/121. Last access on June 6th 2015.
Institute for Human Centered Design. (2009). Project Facts: The Copenhagen Metro, Copenhagen, Denmark. Retrieved from http://dev.ihcdstore.org/?q=node/142. Last access on Junes 6th 2015.

IN DWELLING : THE TRADITION OF EATING ACTIVITIES ON URBAN MINANGNESE

Vania Dwi Amanda Surya[1]*, Rossa Turpuk G.[2]**

[12]Department of Architecture, Faculty of Engineering
Universitas Indonesia
*vania.dwi16@gmail.com, **ro.saturpuk.gabe@gmail.com

ABSTRACT
The Minangnese is one of the local people of Indonesia which have a strong tradition and religion. One of the activities as a part of the tradition is eating shown both in their everyday life and ritual ceremony. Eating activity is a part of human-cycle which is contained human ecologies such as eco-cultural and eco-social. Both of them are apparently in eating activity of The Minangnese. Eating activity and space where the activity occurs are inseparable. Dwelling is being settled and keeping settled which is continous activity and formed the habit as a part of tradition. Eating activities could be the way to see dwelling in Minangnese This paper aims to determine the journey of dwelling in eating activities by seeing the effect of traditional eating activities of Minangnese who live in urban areas, on space occupancy. The method used is comparing the tradition of eating activities on indigenous Minangnese and urban people of Minangkabau. Minangnese eating activities is affected by the space used for eating activities which has been defined in the house of Minangnese on urban areas and the tradition of eating activity. The process of dwelling in eating activities on urban Minangnese is the strategies which are used by urban Minangnese to utilize the space which has existed to apply the tradition in their new house on urban area.

Keywords: Dwelling, Space, Eating, Tradition, Minangnese

INTRODUCTION

Minangnese is one of original inhabitants from Indonesia, lived in West Sumatera province, which has strong custom. Minangnese custom is still preserved its authencity and unique compared to other inhabitans traditions. Eating activities is one of the activities which have strong tradition and custom in Minangnese and also could be seen until now. This people have a series of custom and rules in eating activities both of in daily life and in ritual ceremony.

In addition, Minangnese has a well-known traditional food in Indonesia which is Rendang and this ocacasion is proved that food has been formed culture. Food is not only things to fulfil human daily needs but also etiquettes in eating activities from each area (Education and Culture Department, 1997).

John Newman (2009) stated the meaning of eating activities in Typical Social or culture defined the relevant social aspect and important culture of eating activities that eating is important and pleasure activity for human. It is a foundation in many social activities even it can change physical condition and psychological a certain person. Eating is no longer as human daily needs. Furthermore, it is also as a pleasure and as a medium for social interaction. Now, eating could be done both of at home and at outside such as in a café and in a restaurant.

Generally, People of Minangkabau is also famous because they leave their hometown to find a better life in other places. This tradition of eating activities is also brought to their new destination city, although this tradition is not exactly same as in the original place. There are changes and adaptations as a result of culture in modern city. On the other hand, Peter King said in his book that, "*Dwelling is the act of settling and keeping settled, and this is reiterative, circular, it occurs again and again and it is always going on and on*". This definition could mean that eating activities is a part of dwelling which is continuously performed and inertia that becomes habitude. These activities move in and also keep settled with the tradition and include in daily activities which are a part of dwelling.

On the other hand, space is a part of dwelling itself where the dwelling happened. Space is created not directly as a relationship between people with the existing building but the most important matter is the relationship betwwen people and other people (Lawson, 2001). He also said that, "*We rely upon space to create places appropriate to certain*

kinds of behaviour and to tell us what they are". Space could be defined by people behaviour to do an activity as an extension of body (Forty, 2000) and the relationship between people and other people included in this activity.

The method is used to discuss this paper by comparing Minangnese tradition of eating activities between the original place and the urban area where the Minangnese inhabitants move there. The purpose of this paper is to see the process of dwelling in Minangnese eating activities between indigenous Minangnese and urban Minangnese by the tradition in eating daily activities and the space where the activities is held.

THE TRADITION OF EATING ACTIVITIES ON ORIGINAL MINANGNESE

Minangnese custom, originated from The Philosophy of Minangkabau tradition, "*Alam Takambang Jadi Guru*", which based on, "*Adat Basandi Syarak, Syarak Basandi Khitabullah*", has meaning that everything from nature become knowledge for life that is shown by Allah SWT from Islam religion in Al-Quran (Yulfian Azrial, 2008). This based of custom is a foundation in all of Minangnese habits, involved in their dwelling, especially eating activity (it will be discussed deeply later).

In addition, Minangnese kinship system is according to mother's descent line called '*matrilineal or matriakhat*'. Parsudi Suparlan (1982) wrote in his book that relation system governs the group of peoples in a decent line from their levels based on rights and obligations to differ them with other lines. Here are the things that became an overview of the kinship matrilineal system.

a. Passed down through the mother's tribe
b. The estate is owned by the mother as collateral security of women
c. The oldest woman in a family, Limpapeh or Ambun Puruik as symbol of maternal power which is internal authority, dominates all of the estate in their familiy.
d. The oldest man, Tungganai, has a duty as "*Mamak Kapalo Warih*" that has external power.
e. The familiy heritage and and the inheritance title are revealed between niniak to mamak and mamak to kemenakan.
f. The position of daughters are special.

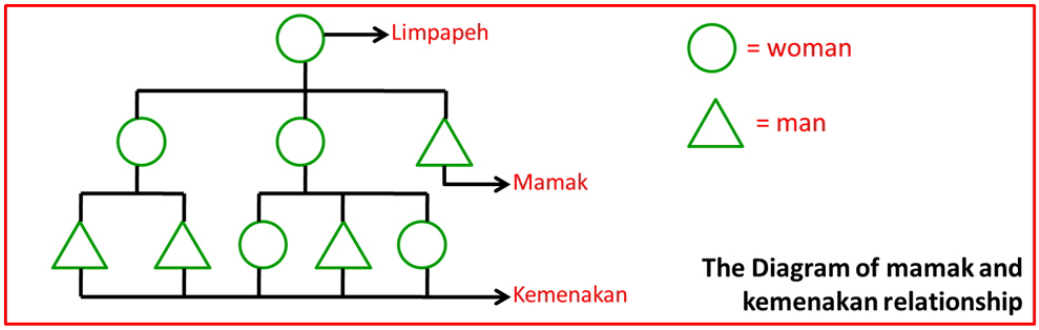


Figure 1. The Diagram of Minangnese Kinship System
Source: The Book of Minangnese Culture and Nature

In general, woman has the highest position as an owner of Minangnese wealth, whilst man organizes it. This descent line becomes the foundation of the space arrangement in traditional house of Minangnese which influence eating tradition.

The Traditional House Of Minangnese

Traditional house of Minangnese is '*Rumah Gadang*' or '*Rumah Besar*' or '*Rumah Buranjang*' named Enormous House in English. Departemen of Education and Culture (1991) stated that this name is called enormous cause of the big dimension and the function for huge family consisted of some nuclear families which are in a mother's descent line.

'Rumah Gadang' has open space within several coloums to support the building. This house has rectangle shape that the longest and the shortness dimension are divided into some '*lanjar*' and '*didieh*' respectively. In several houses have space in the west and east of the house for a room called '*anjuang*'. *Lanjars* separate into four parts which is in the backside of house is used to be bedrooms named '*biliek*'. The numbers of bedroom is determined by the quantities of woman who live there or how large *lanjar* itself. These bedrooms, each bedroom for a nuclear family, are generally small that accommodate Minangnese with a double bed, a cupboard and a little space for movement.

The second *lanjar* is area for a particular event of the room owner, such as places for eating and for sleeping. The third lanjar is called the middle lanjar in three lanjar house which has a function as the waiting room for guests and it is also a place to serve meals for the guests. The outer lanjar is lanjar tepi located in the first row of Rumah Gadang, is a noble lanjar for

providing male guests (Education and Culture Departemen, 1991).

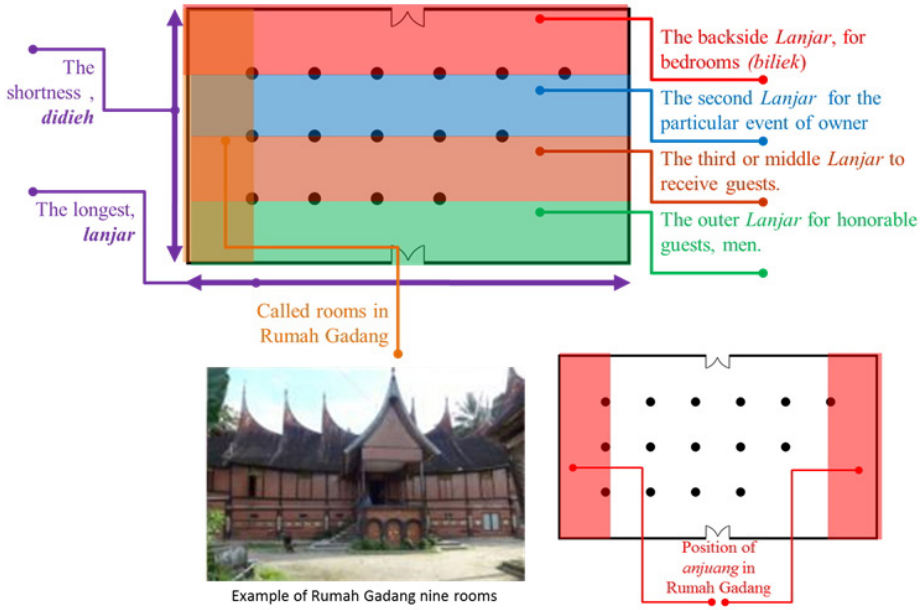


Figure 2. The basic principle of Rumah Gadang
Source: Personal processed based on Arsitektur Tradisional Daerah Sumatera Barat, as a result from interviewed and personal documentation

The result of interviews with Mrs. Ana who is the guide of Rumah Gadang located in Taman Mini Indonesia Indah, are two division types of space element in Rumah Gadang. The first space elemenet is based on Minangnese ethnic group and the second is based on how many rooms in the house that the number of rooms is usually odd and this is shown in this table below.

Table 1. The table of space element divisio

The Types Of Space Elements	The Division	The Differences
Based on Minangnese Ethnic Group	1. Body Chaniago	Does not have anjuang
	2. Koto Piliang	Has anjuang
	3 Rajo Babandiang	Has the asymmetry levels in anjuang
	4. Kerajaan is called Kingdom (Pagaruyung Palace)	Has the asymmetry levels in anjuang Has two storeys

Based on the number of rooms	1. Three rooms	Stairs is located in southeast of the house
	2. Five rooms	Stairs is located in southeast of the house
	3. Seven rooms	Stairs is located in south of the house
	4. Nine rooms	Stairs is located in south of the house

Source: Personal processed as a result from interviewed

Minangnese Eating Tradition

Priyono Endi Rekarti (2003) in his written, Hiper-Realitas Pada Rumah Makan Padang, stated a prophecy in Minangnese about eating tradition, "*Bicara Selepas Haus, Berunding Sesudah Makan*". He also said that eating activities are an important activity as a part of culture and tradition shown by their daily activities.

Eating activities in tradition are either eating together with all of the members in several nuclear family or just a nuclear family. It is clear that from this prophecy that eating activities not only as a daily necessaries but also as facility to communicate between *ninik-mamak* and *kemenakan* to discuss about the issues of life. Togetherness is an important part in Minangnese eating tradition and the following diagram shows the intensity of eating together.

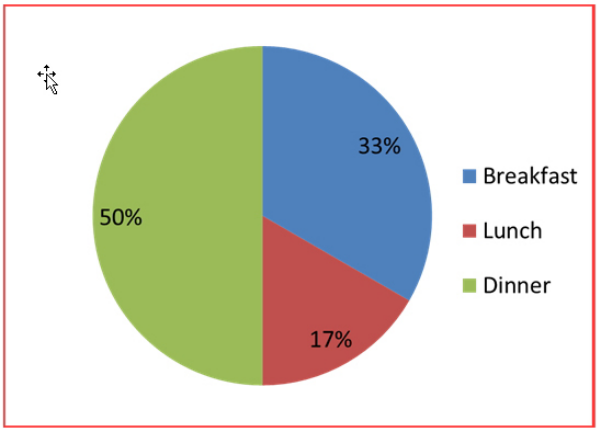


Figure 3. The Table of the intensity eating together in Minangnese
Source: Personal processed as a result of interviewed

The diagram shows the intensity of eating together in a three different times per day of a week. The activity of eating together is more often done at night either weekday or weekend, while they are less likely to eat together at noon because each member of family is busy as a result of working and studying. Minangnese is quite often to eat together at morning to go to school and working place.

Minangnese eating activities, from preparing the food, when eating to after eating, are a part of tradition. Preparing food or cooking is done by Minangnese woman either mother or daughter to transfer cooking knowledge up to the next generation. There are two ways to prepare the food affected by kithen that there is only one.

1. Cooking is done by each family for their own consumption and stored in front of *biliek*.
2. Each family takes turns to cook for the entire family and stored in front of *biliek*.

Both of them is usualy done by Minangnese. In addition, there are some food stored in the kitchen that should be preheated to prevent damage, such as gulai and rendang which is contained coconut milk as the ingredient.

Minangnese do their eating activity in open space of Rumah Gadang rather than in a particular room. This habit are going to affect eating activities of urban Minangnese in their dwelling that there is not specific room for each activity (picture 4) and space are going to change their function in compliance with the activity.

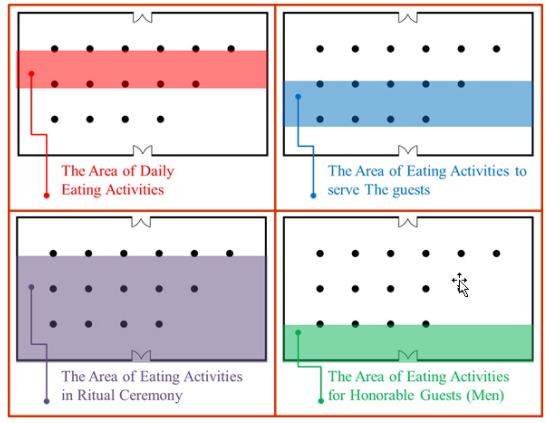


Figure 4. The area of eating activities in different conditions
Source: Direct observation

Minangnese usually eat by sitting on the floor and using hand. The floor covers with mat and they use special fabric, sepra, to layer the mat when important events or celebrations held. Either a nuclear family or the entire family should obey several rules in eating activities to respect the eldest or people who has higher position such as *sumando*, husbands from a huge family. These are some obligations that apply.

1. Seating arrangements need when Minangnese eating together either in a nuclear family or in the huge family. The elder people sit in the eastern of Rumah Gadang which is the eldest room in the *biliek*, additionally, there is a seperation area between man and woman. At the same time, fathers sits near the bedroom. (picture 5)

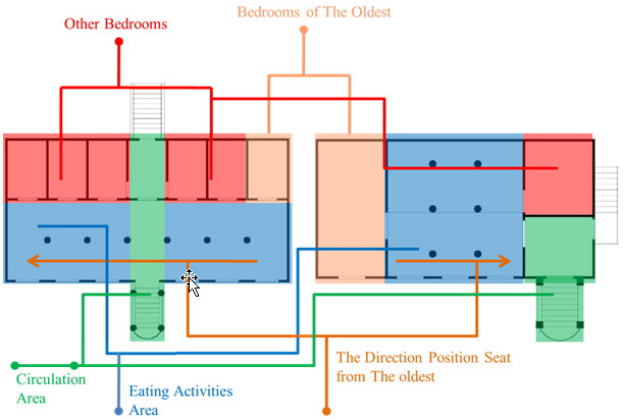


Figure 5. Seating arrangements in Minangnese eating activities
Source: Direct observation

2. The etiquette in Minangnese eating activities is accentuating the eldest or people who have higher position in this kinship like *sumando* who will be served first. There is also a difference way to serve food between man and woman that man will be main priority to be served. It is suitable with Islam religion that woman should consider their husband ahead themselves which is a base of Minangnese custom as mentioned before.

Basically, these rules also apply for certain event, ceremony, and when receiving guests but guests will sit in the front of lanjar. However, guests will take a food later after householder for etiquette and manner.

Figure 6. The example of eating activities in Minangnese
Source: Personal Documentation

THE TRADITION OF EATING ACTIVITIES IN URBAN MINANGNESE

The tradition of eating activities which will be discussed is the tradition in daily eating activities. To discuss it, the selected case studies are three houses of Minangnese who have migrated to Jakarta and the surrounding areas. Since, Jakarta, the capital city of Indonesia, is a favourite destination to migrate and also the city that could be seen the changes of traditions and habits in Indonesia.

The selection of houses for case studies will be divided into several types. Firstly, a house is designed by the owner or others and a architect. Secondly, a house that the space arrangement design is already done and built, could be lived by the owner. Thirdly, a house is in housing estate that the design is typically same with others.

All of the types have purpose to see the adaptation methods applied by the owner to fulfil their necessaries in eating activities appropriate with the changes dwelling in urban society whilst the third type also to know how the owner to maximize the existing space function in eating activities. The diversity of the house types have goals to know the owners habits to adapt their tradition in eating activities in present and find the variabels which influence the eating activities etiquette. The following is a general description of the three case studies.

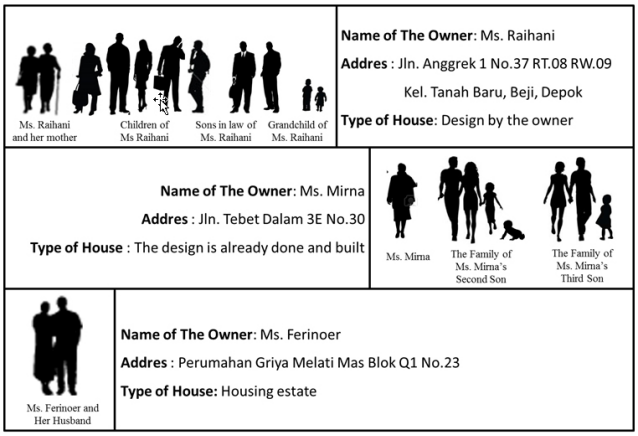


Figure 7. General Desciptions About The Study Cases
Source: Personal Ilustration from interviewed

Case Study 1 : Ms. Raihani's House

The first house design by the owner is Ms. Rani's House which is two storeys house. The ground floor has living room, family room, dining room, kitchen, bedrooms, restrooms, garage, swimming pool, and garden, meanwhile the second floor is just consist of bedrooms. This paper discusses only only the ground floor will be discussed because all the joint activities do on this floor. In addition, this floor has many open spaces shown on this picture below.

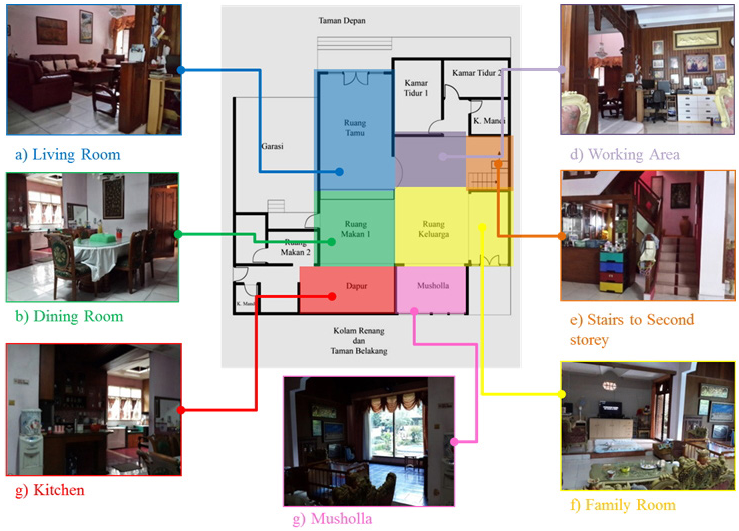


Figure 8. The layout of Ms. Raihani's house
Source: Personal Ilustration and Documentation

Rooms in this house are connected to each others and the walls is not many used jus for private rooms such as bedrooms and bathrooms. As the main topic, dining room is limited by furnitures such as a cupboard (figure 9). This diagrams below show the meaning of eating activities in Ms. Raihani house and how their family interpret the Minangnese eating tradition to their habits in urban area.

Figure 9. Dining room position in Ms. Raihani's house
Source: Personal Ilustration based on survey

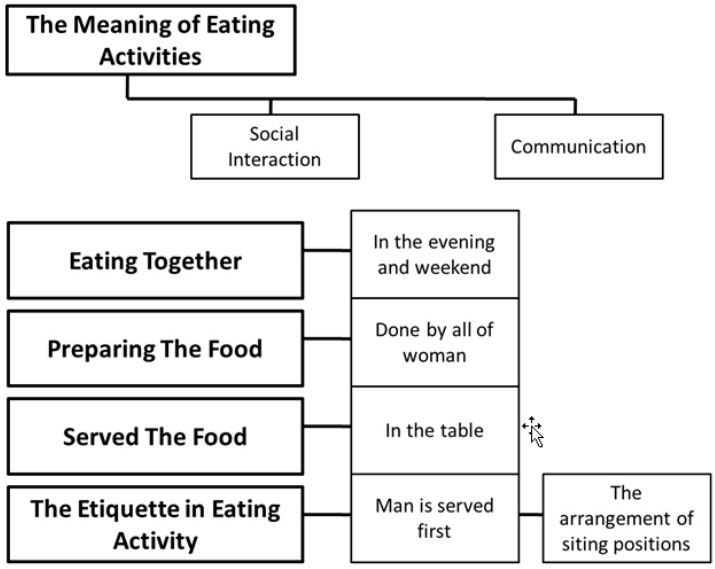


Figure 10. The meaning and the tradition of eating activities
Source: Personal Ilustration based on survey

This family place a set of dining table to support their eating activities. Actually, this is different habits with the original eating activities which do not use furniture to eat. Even so, this family had a arrangement of sitting positions when the head of this family was still alive. The arrangement enacts the eldest to sit at the end of dining table to honour them. On the other hand, there is a habit to place the guests sitting backs the kitchen to prevent guests aware the kitchen condition, and also Ms. Raihani prefers to held an event outside her house by using tent.

Figure 11. The arrangement of dining table and siting position of eating activities in Ms. Raihani's house
Source: Personal Documentation and Ilustration based on survey

The area of eating activity process started from preparing, storing the food, and serving it to eat are situated in close space where people can do each of activity easily. These diagrams below show the sirculation of eating activity process, the arrangements of sitting position in eating activity, the tendecy of sitting selection and the arrangement of sitting position when serving the guests (figure 12).

Figure 12. a) Sirculation of eating activity process, b) the arrangements of sitting position in eating activity, c) The tendecy of sitting selection, d) The arrangement of sitting position when serving the guests in Ms. Raihani's house. Source: Ilustration based on survey

Case Study 2 : Ms. Mirna's House

The Second Minangnese house which is not a part of housing estate build by developer is Ms. Mirna house that could be directly lived by them. This house also has two storeys but the main analysisis performed on the ground floor same as the first house.

In the beginning, Ms. Mirna placed the dining room near the acces to garage and then she have placed it to area near the kitchen. As the result for effectiveness and effeciency to serve the food. This shceme below show the arrangement of dining room in Ms. Mirna's house.

Figure 13. The layout and the dining room position of Ms. Raihani's house
Source: Personal Ilustration and Documentation

Overall, this house has almost the same arrangement as the first case study which is open spaces and connected each others without many walls, except kitchen, bathroom, and bedroom. In addition, the boundaries from a room to others is bordered by the difference of the height level.

This diagrams below show the meaning of eating activities in Ms. Mirna's house and how their family interpret the Minangnese eating tradition to their habits in urban area.

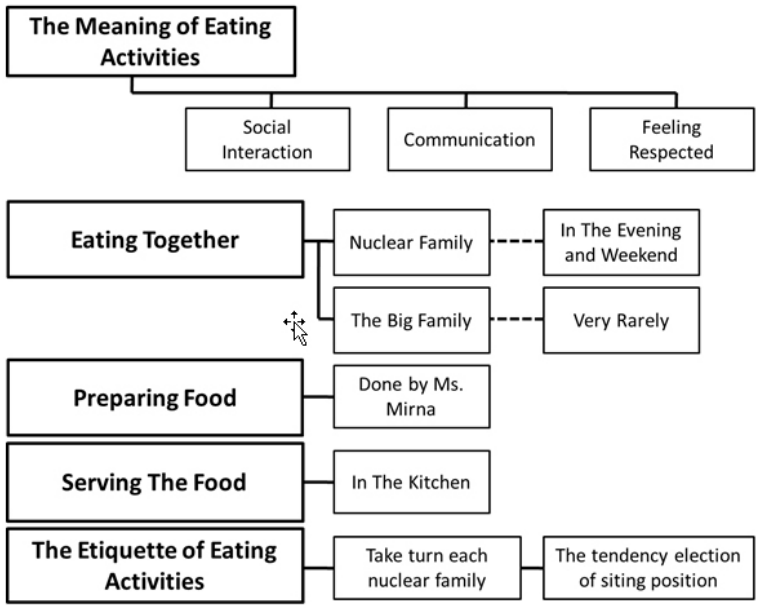
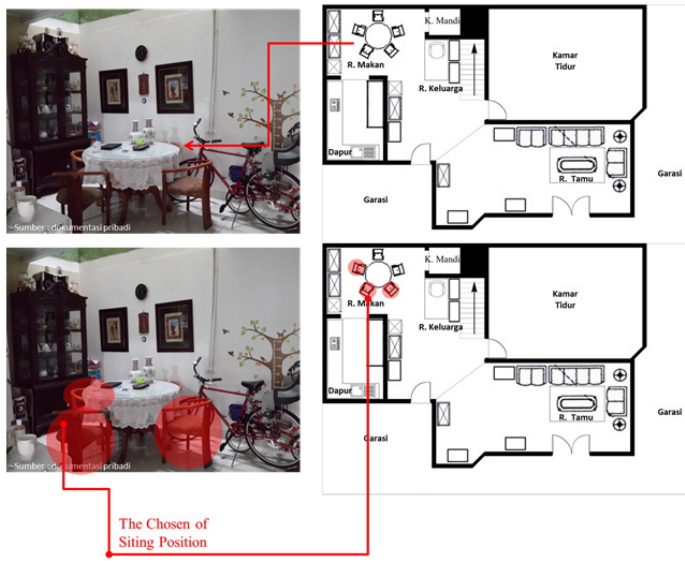


Figure 14. The meaning and the tradition of eating activities in Ms. Mirna's house
Source: Personal Ilustration based on survey

Ms. Mirna family also has a set dining table place in her dining room even the furniture is quite different with the previous case. However, there is no the arrangement of sitting position but there is a tendency to choose a place to eat near the kitchen because Ms. Mirna store the food in there.



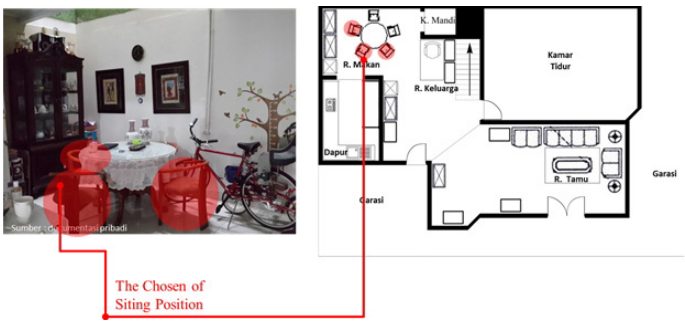


Figure 15. The layout of the dining room and the arrangement position of Ms. Mirna's house
Source: Personal Ilustration and Documentation

In this house, all of eating activities process are located in close area (figure 16 a). A tendency of sitting selection exists in order to move easily from kitchen and from family room to dining room (figure 16 b). On the other hand, the tendency of sitting position when serving guests is same as eating activity without guests, and there will be expansion of eating area to living room when they are served many guests (figure 17).

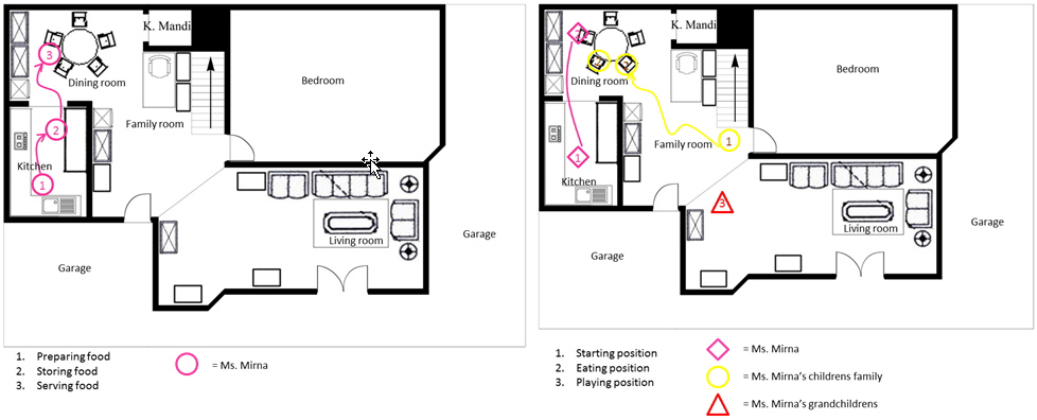


Figure 16 a) Sirculation of eating activity process (left), b) the tendency of sitting position in daily eating activity (right)
Source: Ilustration based on survey

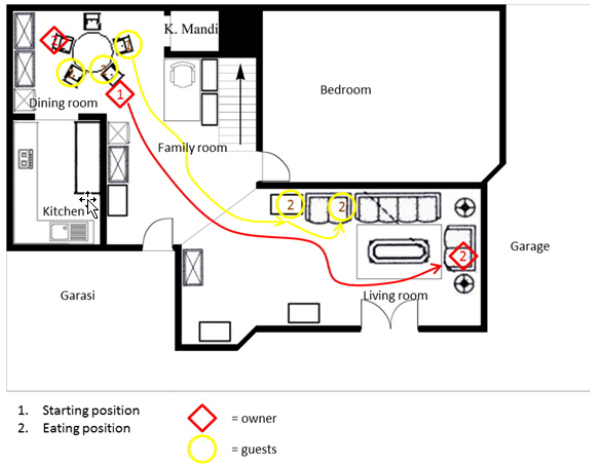
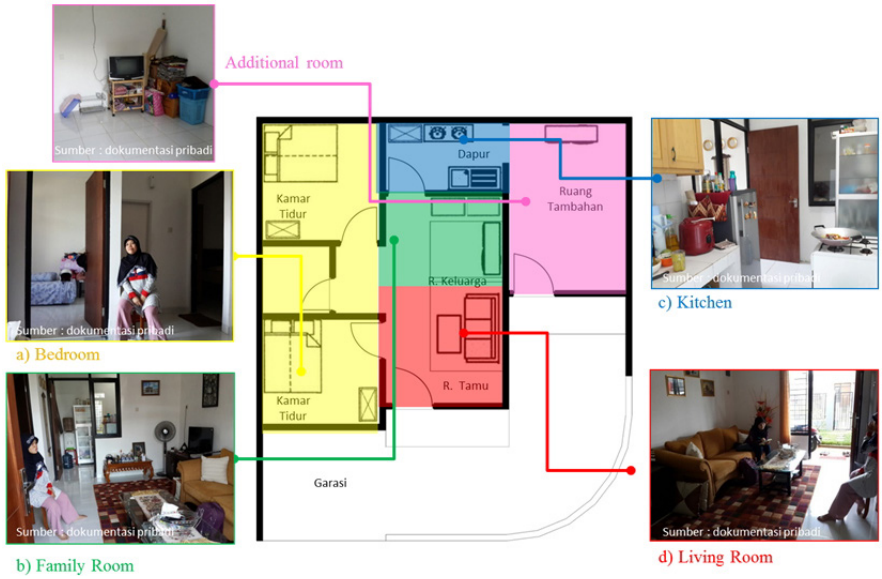


Figure 17. The expansion of sitting position when serving the guests in Ms. Mirna's house
Source: Ilustration based on survey

Case Study 3 : Ms. Ferinur's House

The third house, one-storey house in housing estate, is Ms. Ferinur's house. The design of this house came from the developer which is contain of 2 bedrooms, an enough big space, a bathroom and open kithcen behind the house. This house has been renovated in the kithcen and also there is an additional room located on the eastern of the house.



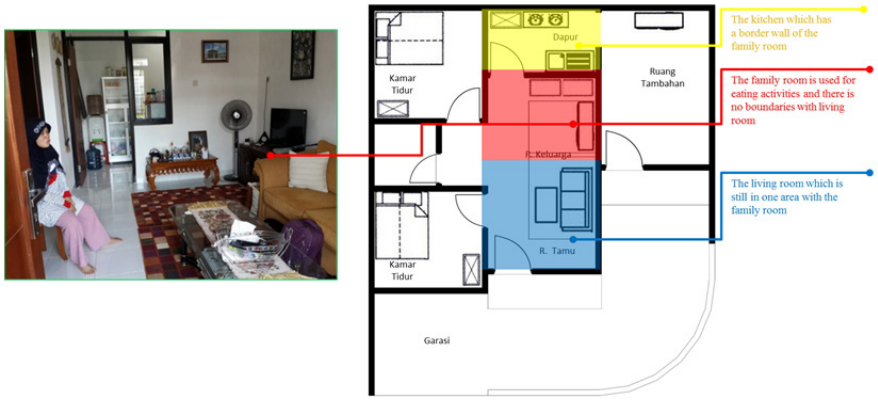


Figure 18. The layout and the dining room position of Ms. Ferinur's house
Source: Personal Ilustration and Documentation

This house owns different arrangement of spaces with the first and second houses which has more wall borders and limited open space connected each others. Also, there is no special room for eating activities and the owner uses living room as eating activities area, while Ms. Ferinur has unique habit in the arrangement of sitting that she would placed her husband on the right side of her.

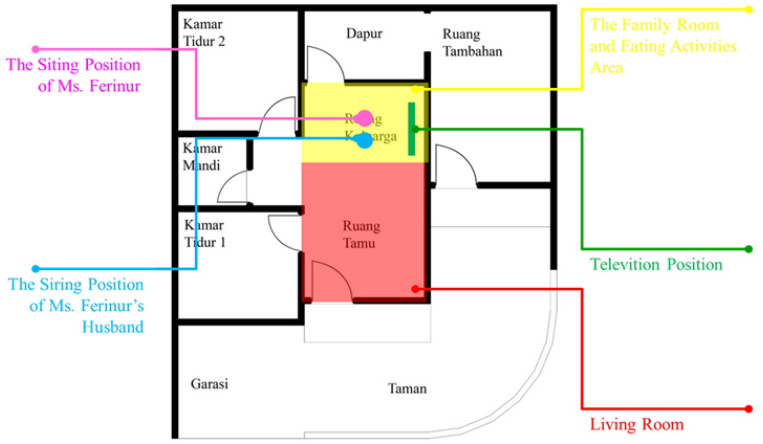


Figure 19. The arrangement position of eating activities in Ms. Mirna's house
Source: Personal Ilustration and Documentation

All of eating activity process are held in close area same as other houses (figure 20 a). A tendency of sitting position is not only as a part of tradition but as a sirculation that close with kitchen also (figure 20 b). There is also

expansion area to living room and others room beside the kitchen when serving the guests (figure 20 c).

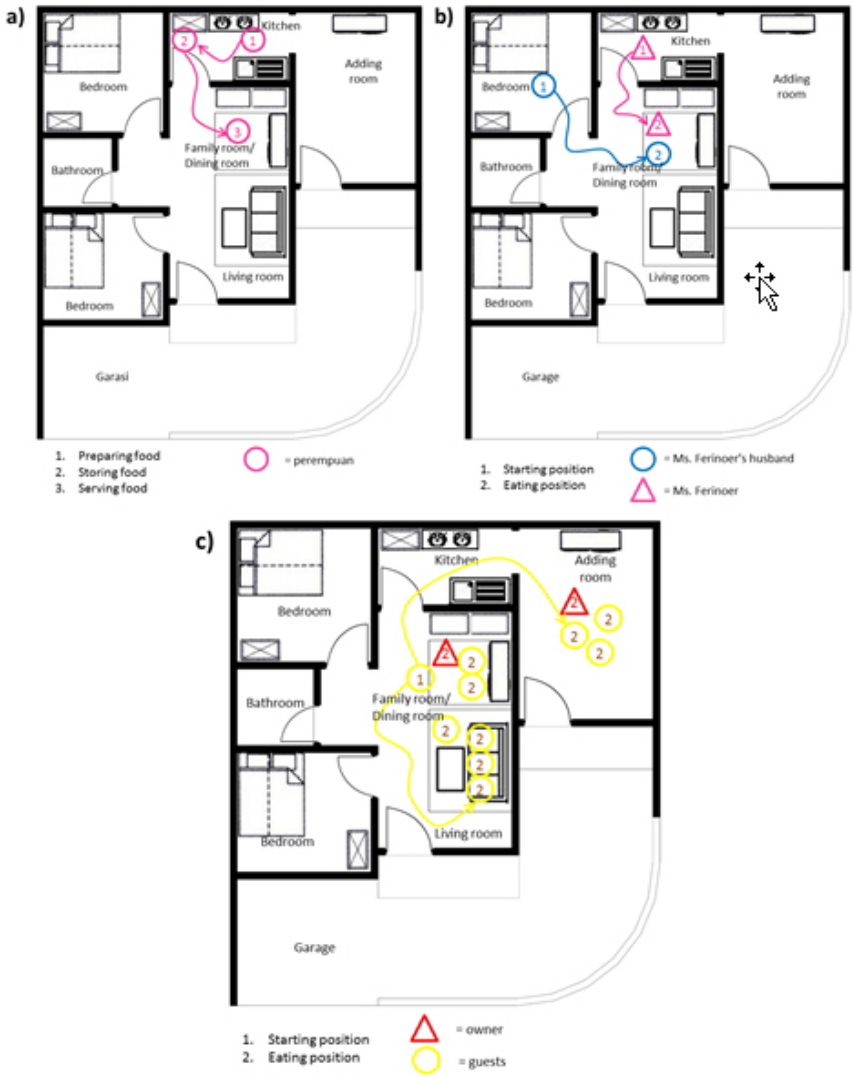


Figure 20. The arrangement position of eating activities in Ms. Mirna's house
Source: Personal Ilustration and Documentation

The differences of house types affect the arrangement of spaces and influence not only the place for dining but also the tradition of eating activities. This tabel shows the analysis about the comparison eating activities between traditional house of Minangnese and case studies.

Table 2. The comparison of Minagnese eating activities in traditional house and urban area

	Tradition of Minangnese	Case Study 1	Case Study 2	Case Study 3
The Type of House	The Traditional House of Minangnese	Minangnese House is design by the owner	Minangnese house had built after that it buy	Minangnese live at housing estate
The Meaning of Eating Activities	It is part of interaction, communication and togetherness	It is part of interaction, communication and togetherness	It is part of interaction, communication and appreciation	It is part of responsibility, interaction, communication and togetherness
The time of Eating Together	Morning and afternoon	Morning and afternoon	It is rarely to eat together	Everyday
The Area for Dining Space	No specific area to eat, do somewhere which is possible (both daily eating and eat together in ceremonies)	At dining room (both daily eating and serving the guests) and hold a tent outside when even held	At dining room (both daily eating and serving the guests) and at living room when an event	At family room (both daily eating and serving the guests)
The etiquette of eating activities in Manganese	Sit on the floor called lesehan in Indonesia	Sit on the chair and use dinning table	Sit on the chair and use dinning table	Sit on the floor called lesehan in Indonesia
Sit on the floor called lesehan in Indonesia	The eldest man sit on the end of house (both of daily eating and eat together in ceremonies) and the guests sit in the front of the lanjar	Parent sit on the end of dining table (daily eating) and the guests is placed on the backside of kitchen	Siting incline closer to kitchen and living room (both daily eating and serving the guests)	Husband sit on the right of the wife (daily eating). Men place to sit is first priority rather than women (serving the guests)

Source: Personal Analysis

CONCLUSION

Eating activities for Minangnese have more important meaning rather than as a subsistence, including culture and tradition that have strong influences on the eating activities. Furthermore, it is also involved in interaction and communication for tradition and custom when discussion and decision are decided and the most important in eating actvities for Minangnese is the togetherness.

Eating tradition in Minangnese creates from the togetherness of people participated on this activity. Eating area for Minangnese is defined by the activities itself such as the togetherness. This means that eating area for eating is not specified by Minangnese, but it is created as a result of eating activities itself (Lawson, 2001) and as a extemsion of body (Forty, 2000). Other elements, created eating area, are coloums in open space where eating area is held, and sepra as a thick layer to serve food. In addition, this fabric is also a border for Minangnese eating area.

Today, the process of Minangnese dwelling have changed from the original area to urban area. This changing happens because of the clear definition of room function, especially dining room that causes of the using of element interior furniture in there. The using of element interior is also changed the wy to do the tradition of eating activities on urban Minangnese. Furthermore, The differences of house types also affect the arrangement of space in the house and the tradition of eating activities also get impacts from them. The house which designed by the owner, they can arrange the function of each room fitted in their tradition, but for the other house types they cannot do that. The process of dwelling in eating activities on urban Minangnese is the strategies which are used by urban Minangnese to utilize the space which has existed to apply the tradition in their new house on urban area.

REFERENCES

Ana. (2014). Tradisi Kegiatan Makan Di Rumah Gadang. Anjungan Rumah Gadang Taman Mini Indonesia. Wawancara Pribadi

Anggraeni, Y. (2014). Tradisi Kegiatan Makan Di Rumah Gadang. Wawancara Pribadi

Azrial, Y. (n.d.). Budaya alam Minangkabau (1st ed.). Padang: Angkasa Raya.

Erdawati. (2014). Tradisi Kegiatan Makan Di Rumah Gadang. Wawancara Pribadi

King, P. (2008): In dwelling : implacability, exclusion and acceptance. -(Design and the built environment series). Ashgate Publishing Company
Forty, A. (2000). Words and buildings (1st ed.). New York: Thames & Hudson.
Lawson, Bryan (2001). The language of space. Great Britain: Architectural Press
Mintosih, S., & Widiyanto, Y. (1996). Tradisi dan kebiasaan makan pada masyarakat tradisional di Kalimantan Barat (1st ed.). Jakarta: Proyek Pengkajian dan Pembinaan Nilai-Nilai Budaya Pusat, Direktorat Sejarah dan Nilai Tradisional, Direktorat Jenderal Kebudayaan, Departemen Pendidikan dan Kebudayaan.
Newman, J. (2009). The linguistics of eating and drinking (1st ed.). Amsterdam: John Benjamins Pub. Co.
Pertiwi, W. (1997). Tradisi dan kebiasaan makan pada masyarakat tradisional di Jawa Tengah (1st ed.). Jakarta: Departemen Pendidikan dan Kebudayaan, RI.
Rekarti, E. (2003). HIPER-REALITAS PADA RUMAH MAKAN PADANG Kecendrungan konsumen tidak lagi memperhatikan keaslian suatu produk.

DEVELOPMENT OF SEA DWELLING: BAJAU TRIBE

Ade Amelia[1]*, Albertus Bobby Widagdo[2]**

[12]Department of Architecture, Faculty of Engineering,
Universitas Indonesia
*ameadelia@gmail.com, **albertusbobby@yahoo.com

ABSTRACT
Building is often associated with constructing materials on the land. It is unlikely to live on the sea. However, Indonesia is an archipelago country, that 2/3 part of it covered by sea water. Bajau, a nomad tribe, lives in the World Coral Triangle which includes some Indonesian territory. Thus, they have a strong connection to the marine life. Bajau tribe willing to do anything to keep their tradition, living in the sea. This sea-wanderer tribe developed their dwelling over the time. The authors interested to see how they keep living on the sea and how they developed their dwelling forms, from a houseboat to the "coral-column-house". The purpose of this paper is to describe the development of Bajau's dwelling type and to study about Bajau's connection to the sea as the important part of their life cycle.

Keywords: sea, dwelling, settlement, nomad, type

INTRODUCTION

Indonesia is inhabited by people from thousands of ethnics. Surprisingly, on the other side of these various people inhabits the islands, there is a tribe who actually prefer to stay on the ocean. Bajau tribe lives and has the living depend on the sea, scattered across the archipelago. Basically, the existence of Bajau spreads in the "world coral triangle", including the sea of Indonesia, Sabah (Malaysia), the Philippines, and the Pacific Islands. Bajau tribe relies heavily on the existence of coral, because in these places fishes are easily found as their primary source of food commodities. Currently, Bajau has already covered 21 provinces in Indonesia. Bajau

main settlements are found in Sulawesi and Nusa Tenggara (Priantono in Uniawati, 2007). The significant number of its distribution pattern proofs the existence of the tribe.

Nowadays, most of Bajau community has chosen to leave their past nomadic lifestyle. The development of their settlement is also based on government's purposes to improve the public services. Sopher (1977) revealed that their efforts to "settle" Bajau have started since the Dutch East Indies civilization (1820 to 1920), which is still continued until now. The various intervention of government programs, also affects the Bajau community life both in terms of physical settlement and traditional values.

On the other hand, the establishment of Bajau settlements as an ethnic community is strongly influenced by their sea traditions. Bajau's "culture of constructing" is inseparable from their everyday life, life cycle of various age groups, and social roles. In a strong society tradition like Bajau, the "culture of constructing" means a self-declaration (Tjahjono, 2013). Although there are differences with the inland communities, their culture which related to the sea produce a form of living culture that can not be separated from the elements of vernacular architecture.

The collaboration between government's influences in resettling the Bajau community with their traditional values, produce spatial life patterns as a character of each Bajau settlement. This heterogeneous nature allows the connection between life on the sea and on the land. Their variant responses to the problems experienced according to their villages, where the situation is also different (Zacot, 2002). If we look at the Sama Bahari village's conditions, there has been a various interventions affected the pattern of people's daily life in the settlement

IDENTITY OF BAJAU TRIBE AS THE SEA DWELLERS

Bajau tribe also known as sea people. That predicate pinned to community groups who sustainably living inside the boat and wandering on the sea. Meanwhile, foreign writers used to call them by Sea Nomads, Sea Gypsies, Sea Peoples, Peoples Boat, Boat Nomads, Nomadic Peoples Boat, etc. (Sembiring in Koentjaraningrat, et al, 1993).

They preserve the pattern of nomadic life from their inheritance. Based on historical records and ethnographic at the end of Srivijaya period (around 14th century) according to Chou Chu Fei, sea nomads have been known since 1178. But according to Chia Tan, it was already happened since

the year 800 (Wolters, 1975; Hall, 1960) . Meanwhile, Magellan noted the Bajau have lived as the sea people since the beginning of the 16th century (Ahimsa, 1995). According to the description of Ir. Abdul Manan, M.sc, as President of the Kerukunan Keluarga Bajau Indonesia and District Head of Planning Agency. Wakatobi, Bajau tribe is the sea people with many versions of stories and myths about their origin. Bajau tribe or Sama tribe, has similar life patterns and language, eventhough their settlements are scattered. Bajau tribe is also famous for their openness to the outside influences.

Fig. 1 World Coral Triangle Where Bajau Tribe Lives
Source: Ekskursi Arsitektur FTUI, 2013

Bajau tribe conceived the sea as a liaison in life. The sea connecting Bajau people who are separated from each other across archipelago. Dependence on nature to support themselves and their families, caused Bajau people who were born, lived, and died at sea to equip themselves with the ability to read the weather and the movement of fish based on experience.

> *"Orang Bajo, terutama yang hidupnya paling sederhana, benar-benar gelisah dan jengkel bila mereka tak mempunyai perahu,*

yang merupakan satu-satunya alat pengangkutan. Mereka tak dapat dipisahkan dari perahu. Perahu merupakan satu-satunya harta yang berusaha mereka dapatkan mati-matian." (Zacot, 2002)

Bajau's daily life also inseparable from the boat. Boat is interpreted as their own feet. 'Feet' that created their existence on the sea as their homeland. Boat naturally used as both of a transportation media and living place. Initially, Bajau tribe was not settled in the form of village. They are scattered across the sea.

TRACING THE DWELLING DEVELOPMENT

Researching for traditional residential development is often faced with obstacles. Usually it is caused by a lack of oral and written information. Difficulties were also encountered when the authors arrived at the Bajau settlement in the Sama Bahari village, Wakatobi. Our findings showed that occupancy has been already developed with the influences of land settlement. Eventhough the house form in this settlement is similarly same, there are some significant differences between house material usage.

There are various ways to trace the dwelling development. The authors try to study the type of Bajau's dwelling, focusing on the usage of building materials and spatial functions to determine the phases of their dwelling development. Argan (1963) in Nesbitt (1996) argues:

> "Aldo Rossi and Rafael Moneo investigated Quatremere de Quincy's definition of type: "the idea of an element which should itself serve as a rule for the model." Moneo interpret it as the inherent structural and formal order that allows architectural objects to be grouped together, distinguished, and repeated."

Typology is the knowledge of the type study for tracing the development of architecture product (Argan in Nesbitt, 1996). The search for meaning in the type study can generate continuity within history, in which in the context of traditional settlements such data is lost.

The aims for typing the material is to find patterns that appear on the settlement. Alexander (1964: 5) explains that various environmental variables in a complex society are interconnected with each other. In this case, the relation between the environment and society context is seen as a reference to reveal the forming elements of dwelling area. Individuals

in the community group have the same pattern in the construction of shelter and settlement (Alexander, 1977: x). Each pattern is believed to be a description of each form of events that occur repeatedly.

> "What is most important about this sequence, is that it is based on the connections between the patterns. Each pattern is connected to certain "larger pattern" which come above it in the language; and to certain "smaller" patterns which come below it in the language." (Alexander, 1977 : xii)

Type does not present so much an image of something to be copied or imitated exactly as the idea of an element which should itself serve as a rule for the model (Argan, 1967).

> "The birth of a "type" is therefore dependent on the existence of a series of buildings having between them an obvious formal and functional analogy. In other words, when a "type" is determined in the practice or theory of architecture, it already has an existence as an answer to a complex of ideological, religious, or practical demands wich arise in a given historical condition of whatever culture." (Argan, 1963)

Type study is related to the process of comparing and superimposing individual forms so as to determine the "type", by eliminating characteristics of particular individual building and compile those common remaining characteristics (Argan, 1963). Thus, type's formative process is not just a classifying or statistical process. The type-series can not only be seen in their physical functions, but also by their spatial configuration. He also argued that:

> "Formal architectural typologies will always fall into three main categories; the first concerned with a complete configuration of buildings, the second with major structural elements and the third with decorative elements." (Argan, 1963)

Type-study can be seen as an instrument of cultural memory and architectural meaning (Colquhoun, 1967). The usage of this study is useful for tracing the dwelling development.

> "Colquhoun sees the transformation of past solutions (i.e., using typology as design method) as a means of acknowledging the role of precedent in design." (Nesbitt, 1996)

In addition to the effect of government programs intervention, there are various elements of Bajau itself which is upholding their tradition in shaping their dwelling environment. Waterson (1990: xv) states that the whole culture represented in their inhabited space, construction, and the use of space in everyday life. Thus, the habitable living space is not neutral but rather consisting of the cultural construction composition.

> "Buildings, as all human endeavors, obey varied and often contradictory and conflicting impulses which interfere with the simple and orderly diagrams, models, and classifications we love to construct." (Rapoport, 1969: 11)

Rapoport (1969) said that although technology may evolved, but architecture should not do so. Building, in this case dwelling, is formed as a result of collision between diverse elements. Those diversity are often have the opposite effect, due to the interference of the dwelling form. Rapoport (1969: 18) described an alternative theory of settlement formation which included elements such as climate in its relation to the need for shelter, materials-technology, site conditions, and socio-cultural.

> "Shelter is of supreme importance to man, it is the prime factor in his constant struggle for survival. In his efforts to shelter himself against the extremes of weather and climate he has, over the ages, evolved many types of dwellings, one of which is the court house." (Schoenauer and Seeman, 1962 : 3, in Rapoport, 1969 : 19)

Materials, construction process, and technology in fact tend to be judged as a Rapoport's theory of modification factor, not as a determining factor of vernacular settlement form. Because it is not directly affects the house form, but rather to determine the limits of spatial organization. The dwelling's identity and character can be seen from its constituent materials. Most modern theories emphasizes functionality to determine the building construction technology. However, the process of vernacular settlement formation considered that symbolism are more important than utility. Many examples of the technology roles taken over by social values in the vernacular settlement situations (Rapoport, 1969: 25). The irrational structural system can also arise from their belief that can be found in their construction techniques and materials usage. Thus, vernacular architecture reflected by the natural conditions of shelter site, the influence of tradition, culture, and other external factors.

SEA DWELLING DEVELOPMENT OF BAJAU TRIBE IN SAMA BAHARI, WAKATOBI

Sama Bahari village is divided into four administrative "dusun". Those dusuns are Dusun Sampela, Dusun Dikatutuang, Dusun Wanda, and Dusun Pagana. According to Mr. Suhaele, the village is divided not by central axis, but by form of lines created by the passing boats among the building's masses in the village and formalized around 1997. This proved that knowledge of the sea path are ingrained into people's mind, reflected into their current spatial arrangement of the village.

Fig. 2 Sama Bahari Village Location
Source: Google Earth, 2014

Fig. 3 Dusuns' Boundary and Territory
Source: author, 2014

According to Mr. Jabira (interviewed on July 2013), the initial growth of the village originated from the south (now Dusun Sampela) to the north (now Dusun Dikatutuang). Growth continues to the west up to the point of stopping because it reached deeper sea floor, making it difficult for house construction. After that, the development began to spread to the eastern part of the settlement (now Dusun Pagana and Dusun Wanda), into relatively shallower water which became land when the tide reach lower level (meti). Later, development has been influenced by the main connecting road (see Fig. 3). There are several building masses (houses) sharing a large enough coral pile as their base. These conditions form a cluster of coral pile, which includes several houses and creating shared yard. This coral pile clusters affect the density between the mass of the building, therefore affecting social behavior among them.

Bajau community as the main actor in the settlement has an important role in shaping spatial patterns. Their daily practice consists of various physical and non-physical aspects. The everyday life in vernacular houses produce a house as a place of value through the creation of liveliness (Oliver, 1987). Bajau tribe itself as one of the indigenous groups that still hold the traditions, see nature as their living space. They try to meet daily needs according to their religious believes. Sea is the inevitable aspect to Bajau as the basis of their beliefs as the Sea People.

Over the past years, the government obligated the entire population to create permanent houses in order to facilitate the community empowerment programs. Materials and construction used indicated

there was various houses in the Sama Bahari village.

There are patterns of repetition in the use of roofing materials, walls, and base foundations. Therefore, we conclude there are 3 major types of houses in the Sama Bahari village. These types imply a more modern and permanent Bajau residential development. The results set out in this diagram mapping (Fig. 4).

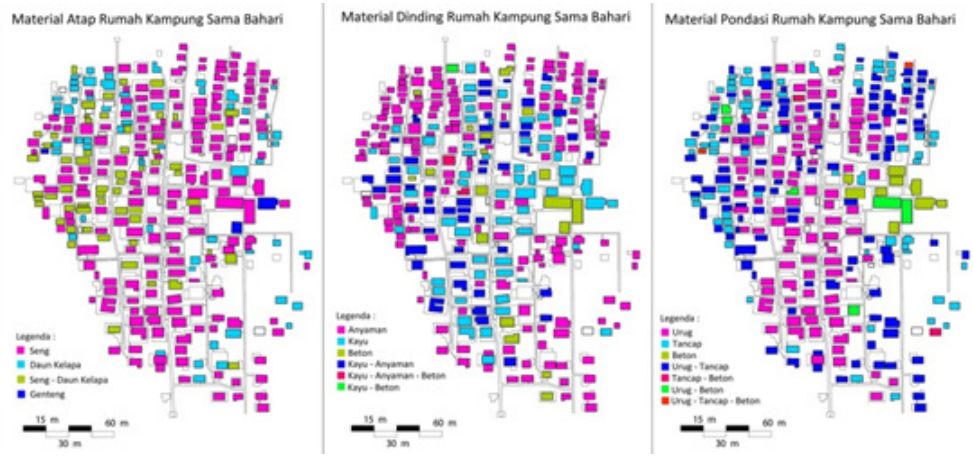


Fig. 4 Type-Study by Material Mapping of The Houses
Source: author, 2014

Given the formation of Sama Bahari settlement in terms of the physical aspects of the building, we did a study based on the type of building and construction materials. This study was conducted to see the development phases of Bajau's dwelling; from the soppe (nomadic boat) to the more modern dwelling. Studies were conducted (in July 2013) by mapping the type and construction materials which are classified by the use of roof, walls, and base foundations in every building in the Sama Bahari village.

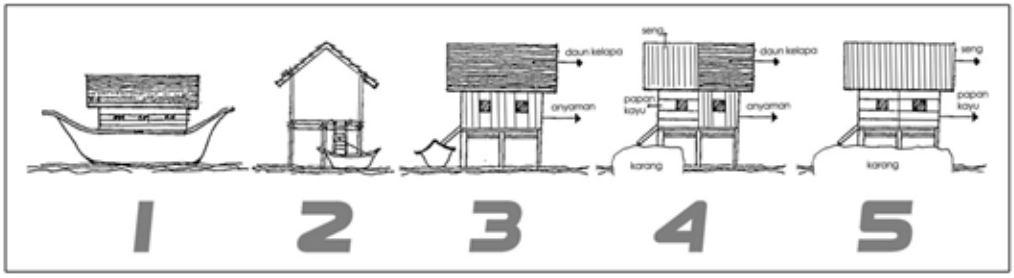


Fig. 5 Dwelling Development Stages of Bajau Tribe In Sama Bahari
Source: author, 2014

This material study is one of author's methods to identify residential development of Bajau tribe. With the source material and mapping studies, we can see overall perspective on how Bajau adapting to their environment. Adaptation is certainly lead to the system life cycle and the life they have. Indeed we can not see it only by physical of building. These developments should also be seen from the environmental aspect. Rapoport said that:

> "It became obvious that one had really to look at vernacular urban design,vernacular landscape design; one had to look at a whole environmental system, not just at architecture because people do not live in buildings but they live in systems of settings.So, we cannot understand one without looking at the other." (Rapoport, 1979)

The Bajau tribe also live in a system that is very close to the sea . In this case , they are not tied to a physical building , but it could be seen as a process of cause and effect of their daily lives.

"Soppe" as The Origin of Bajau's Houseboat

Bajau tribe also known as the Sea People, lives nomadic on boat and hunts the fishes as their main commodities for personal consumption or market. However, the Bajau has developed their way of life from nomadic to sedentary. Initially, they lived on a boat called *soppe*. They did all the daily activities, either sleeping, eating, fishing, defecating, etc. on *soppe*. But in his book about Bajau's life in Torosiaje, Zacot (2002) explained that the houseboat used for dwelling is called *leppa*. A family group usually lived in one *leppa*. However, *soppe* is no longer used, and thus extinct because people often get caught by foreign governments while fishing and encroaching the sovereign territory (Mr. Jabira, April 2014).

Besides living as nomad, Bajau tribe also has known the construction of temporary shelter. In the beginning of time, this temporary dwelling was built to wait for the beginning of the next fishing season, which was named *Sapao*. It was formed by simply plugging 4 piles of mangrove wood into the shallow sea floor, which was usually in the bay near the coast. Easy-to-find coconut leaves were used as roofing materials. There were no walls in *Sapao*. A ladder was added to ease the access from boat to *Sapao*. They moored soppe and stayed a while in *Sapao*. While taking care of *soppe* by patching or drying to evaporate the water and remove mold from the pores of the wood, they also visited the land to buy/swap daily needs.

"Mereka biasanya berhenti di tempat-tempat persinggahan yang tetap, dipilih sesuai perubahan musim dan arah angin. Persinggahan dipilih karena letaknya baik, teduh, terlindung dari ombak dan badai, seperti teluk. Di sana mereka melego jangkar untuk menambatkan sampan, berlabuh mendirikan gubuk (sapao) sebagai tempat tinggal sementara." (Sembiring dalam Koentjaraningrat, dkk, 1993)

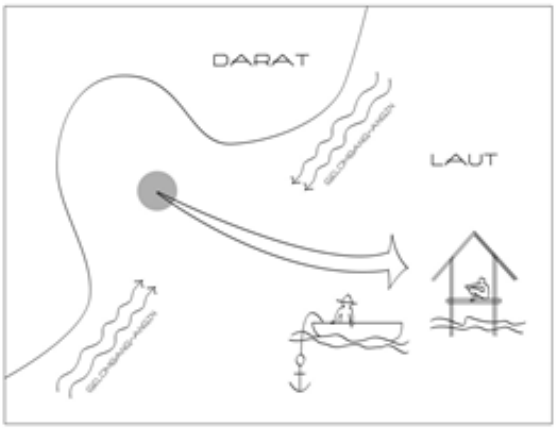


Fig. 6 Location Criteria For Erecting Sapao
Source: individual illustration, 2014

At first, the family group decided to anchor and set up temporary living shelter. There are two different reasons for doing so; when the ongoing season is not possible to look for the catch or they need to repair their boat. Sembiring (1993) also mentions that after the boat is continuously used for three to four months, it needs to be raised at the drydock for drying and patching process. This drying process is needed to evaporate water from the pores of their boat's wood.

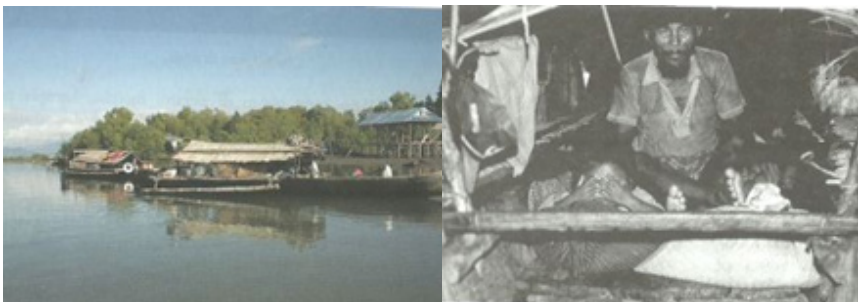


Fig. 7 – Fig. 8 Bajau's Houseboat and Its Narrow Space Inside
Source: author, 2014

At this stage, the Bajau has established Sapao as a temporary shelter, when their boats are waiting for repaired or season's change. Sapao is just a shack with a simple construction and materials. The construction required that the location are in the shallow water and close to the coast. But they have to do it not so close to the coast, so that in the low tide conditions they are still able to use their boat. Sapao will abandoned when Bajau people go back to their boat in the next season.

Rumah Tancap

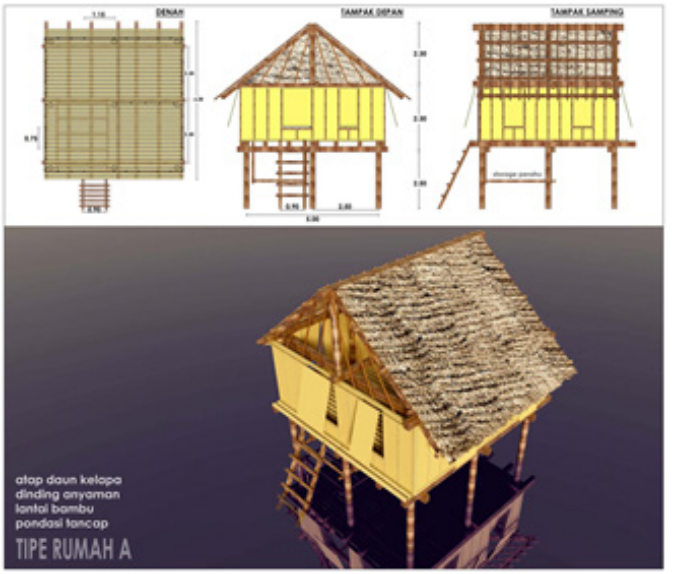


Fig. 9 Schematic Drawings of Rumah Tancap
Source: author, 2014

Rumah Tancap (Fig. 9) is a house with a roof made of coconut leaves, woven bamboo walls, and stake foundation. The size of this house type are relatively small, consisting of a 3x3 column made by wooden stake. This house type usually occupied by small or poor families, because of the small dimensions of the house with inexpensive and easily obtainable materials. Mangrove woods historically used for poles due to its resistance to sea water. However, with the prohibition of mangrove wood exploitation, Bajau people had to use another wood from land to build their house. This house type is only lasted for a few years (2-3 years depending on the resilience of the wood) and required replacement of wooden stakes. Usually there is a boat in the storage under the house so that the boat is not submerged in sea water continuously, while some others simply moored their boat tied at the house's stake.

Rumah Karang

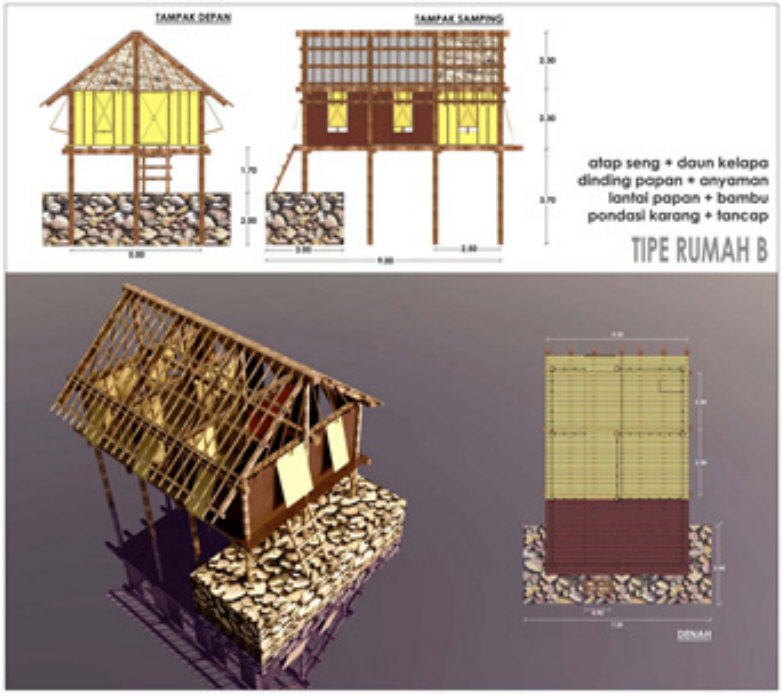


Fig. 10 Schematic Drawings of Rumah Karang
Source: author, 2014

This house (Fig. 10) shows the community's effort to obtain a more durable and permanent housing. *Rumah Karang* is a house with the combination of zincalume and coconut leaves roofs, woven bamboos and wooden boards walls, and wooden stake-coral pile foundations. They began to stockpile on dead coral pieces to create a foundation and form a courtyard in front of their house which can be used as a communal space. Typically, coral pieces are taken home after fishing. Coral pieces accumulation process can takes a long time, years even decades. Their local wisdom in guarding the nature can be seen by how they stockpiled only about 10 pieces of died coral in a day.

Rumah Gantung

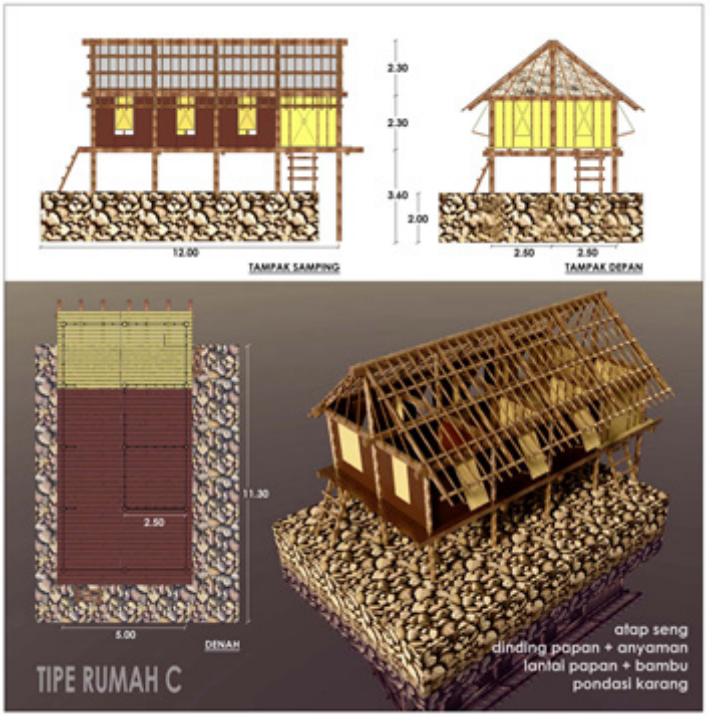


Fig. 11 Schematic Drawings of Rumah Gantung
Source: author, 2014

The third type, called as *Rumah Gantung* (Fig. 11), is a house with zincalume roofs, wooden boards and woven bamboos walls, and the coral pieces foundation. Initially, the zincalume roof was introduced by the government through public housing assistance programs that considered previous house types were not up to their standards. Zincalume roof is considered more modern and durable than palm leaves, which are considered filthy by some people. They prefer the practicality of buying zincalume, even though its application raised the temperature in the house during the day. Wooden boards is choosed to dominate the walls and maintain woven bamboo for the rear wall which used as the kitchen area. Usually coral pieces foundation is already covered the whole plots, but many occupants are letting the back of their house (kitchen) still stick to the wooden stake foundation in the seabed. The kitchen area used bamboo flooring in order to obtain a larger gap to dispose kitchen waste directly to the sea. This house type using knock-down system construction and often identified as the Buton house (island near Wakatobi who supplies wood).

Rumah Gantung is considered as a hanging house, not in contact with the sea. Therefore, under this house type is often used by people to store equipment, machinery, and boat. Sometimes the front yard and under the house area are also used for socializing with neighbours.

Originally people used coral pieces as a medium for the house foundation. The wooden columns was erected on top of it so they were not directly affected by seawater. The effort is intended to slow down the process of weathering and retaining the wood from mold and mildew. When Sama Bahari's community needs and activities are growing, they required more connectivities with the land (Kaledupa Island) to buy fresh water and basic needs in the market. Spatial needs to store the growing list of daily life supporting tools, such as water jerry cans, firewood, boat engines began to emerge the needs of dwelling space extension. Thus, they need to stockpile coral pieces in order to get additional spaces in front of or under the house.

Comparison of Interior Spaces

Fig. 12 Interior Plan of Bajau Houses Type
Source: author, 2013

Arrangement of space in the house is influenced by many things. The fundamental thing is the addition of a family member as well as the activities that take place in it. It also affected the influence of material selection in space and activity that occurs as a result of the material use. The house this step is the simplest form of home Bajau. The house is usually

filled by 2-4 members of family. The house only has a 1 bedroom which is sealed with a kitchen and directly integrated with the family room. The material to be replaced in a quick span of time is one of the advantages of this house. Usually, this house owned by a family who still sail and nomad. When they have to move and sail for a long time, they just left it without hesitation. This type of house often found at the outermost of the village and rarely connected with bridge. The residents are Bajau people who still depend on their boat as their first house.

Fig. 11 and Fig.12 Section-Activities View of Rumah Tancap and Rumah Karang Types
Source: author, 2013

In terms of interior space configuration, Rumah Karang is filled with more inhabitants than Rumah Tancap. This also affects the life of the house that requires them to stay longer. Sleeping area expanded and the development of more complex furniture is the result of a life of Bajau tribe began to settle.

Fig. 13 Section-Activities View of Rumah Gantung Type
Source: author, 2013

Configuration space at "Rumah Gantung" is more complex when compared to "Rumah Tancap and Rumah Karang". One of the residents of Rumah Gantung even have moved in more than 30 years. The furniture in the house even has a similar with houses on land in general. Usually they have two bedrooms, with a fairly complete kitchen and family room as well as guest chair. They also take advantage of existing coral heap under their home for boat storage, a place to dry clothes, even for selling and shopping.

CONCLUDING REMARK

Based on material mapping dwelling Bajau tribe in the village of Sama Bahari, there are some types that describe the development of Bajau's dwelling. Bajau tribe, which lived in the oceans, has received numerous interventions. It became a causal occupancy changes and life in the village Bajau Sama Bahari. Observations will shelter materials and the way they protect the house to be able to settle and last longer, giving them a new space to be able to interact and socialize. On the other hand, the material changes also give environmental impact. However, with a variety of intervention and development, they still bear to not change the environment where they live, which is in the middle of the sea.

REFERENCES

Ahimsa, Heddy Shri. 1995. Levis-Strauss di Kalangan Suku Bajo: Analisis Struktural dan Makna Cerita Suku Bajo. Yogyakarta: Kalam.

Alexander, Christopher. 1977. A Pattern Language. Berkeley: Oxford University Press.

Amelia, Ade and Widagdo, A. Bobby. 2013. Ekskursi Wakatobi 2013: "Tanah Airku, Air Tanahku" Sebuah Rekaman Perjalanan Mahasiswa Arsitektur Universitas Indonesia. Depok: Ikatan Mahasiswa Arsitektur FTUI.

Argan, Giulio Carlo. 1963. On The Typology of Architecture, in Kate Nesbitt, ed., Theorizing A New Agenda For Architecture An Anthology of Architectural Theory 1965-1995. New York: Princeton Architectural Press.

Colquhoun, Alan. 1967. Typology and Design Method, in Kate Nesbitt, ed., Theorizing A New Agenda For Architecture An Anthology of Architectural Theory 1965-1995. New York: Princeton Architectural Press.

M.B.T.U. Journal of the Faculty of Architecture volume 5, number 2, Juli 1979 : An Interview of Amos Rapoport on Vernacular Architecture.

Oliver, P. (1997). Encyclopaedia of Vernacular Architecture of the World, Cambridge University Press, UK.
Rapoport, Amos. 1965. House, Form, Culture. Prentice Hall, Englewood Cliffs NJ.
Tjahjono, Gunawan. 2013. Kuliah Umum Pameran Ekskursi Wakatobi: Arsitektur Vernakular Terkait Etnik. Jakarta.
Uniawati. 2007. Tesis: Mantra Melaut Suku Bajo: Interpretasi Semiotik Riffaterre. Semarang: Universitas Diponegoro.
Waterson, Roxana. 1990. The Living House: An Anthropology of Architecture in South-East Asia. New York: Oxford University Press.
Widagdo, A. Bobby. 2013. Skripsi: Intervensi Pemerintah Terhadap Suku Bajau Melalui Pola Permukiman Studi Kasus: Desa Sama Bahari. Depok: Universitas Indonesia.
Zacot, Francois-Robert. 2002. Orang Bajo Suku Pengembara Laut: Pengalaman Seorang Antropolog. Jakarta: Kepustakaan Populer Gramedia

TRADITIONAL ARCHITECTURE LOCAL WISDOM CASE STUDY: PENGLIPURAN VILLAGE , BALI

Ima Rachima[1]*, Maulina Dian P.[2]**

[12]Program Studi Teknik Arsitektur,
Institut Sains dan Teknologi Nasional (ISTN)

*imanazir@yahoo.com, **dee_237@yahoo.co.id

ABSTRACT

Local wisdom is a set of conventions in society, which regulates the life setting profane and especially sacred, local wisdom which cannot be separated from the traditional process that are hereditary, passed down from generation to generation. The term of 'local wisdom' has the meaning as: forms of wisdom or policy that comes from the region or regions 'local' in order to answer the problem of socio-cultural, socio-economic and socio-ecological that aroused from the developing society , In our study the history of development of traditional architecture in the archipelago, then we will recognize which various matters closely related to the values of 'local wisdom' on the layout system of the building to the surrounding ecological environment area. Local wisdom is a process recognizes which is potential and has natural properties to the sustainability of community tradition, especially in architecture. From conception it can be seen the reciprocal relationship between nature-community-tradition.

Bali's traditional architecture is one of the traditional architecture in the archipelago. Balinese community is still adhere to tradition and culture and still maintain and protect the local wisdom inherited from the ancestors hundreds of years ago. Through several observations and descriptive analytical methods the Penglipuran Village will be analyzed, to determine the extent of local knowledge on the village still preserved despite being set into a tourist village. The result, although the age is constantly changing and it has become a tourist village, but the customs and culture of Bali is still maintained. Local wisdom in the Penglipuran

Village is still maintained and preserved.

Keywords: Local wisdom, architecture, Bali

INTRODUCTION

The original traditional architecture of the region in the archipelago as part of the original culture of local communities is one of the very strong potential cultural, both in terms of culture, art and traditional ethics. Traditional architecture that came from local tradition that continues passed from generation to generation, its formation is influenced by elements of the cosmos and the myths which are then assessed as architecture that have local wisdom. Each region in the archipelago has a different concept of culture to demonstrate the value of their local wisdom in community life for generations, and this is a form of wisdom on the environment that exists in their social life. According to Putu Oka Ngakan in Suhartini, local wisdom is the values or behavior of local people in their interaction with the environment in which they live wisely. Thus the local wisdom is not the same at different places and times and different tribes.

In some areas of archipelago has been a lot of local wisdom to be an example to understand of the value of nature, settlement patterns, the structure system, up to the symbolic elements contained therein.

Bali is one island in Indonesia which has natural beauty, culture and way of life of the community and have the characteristic of the building that is oriented towards religion, which is influenced a lot by elements of the cosmos and myths. Penglipuran Village Is one of the traditional village which considered special because it has a pattern of Bali Aga village (indigenous people of Bali). Although it has been a change of age/ era/ time, and has become a tourist village, but it still can be said that Penglipuran Village is still met with the high values of traditional architecture also its community is well maintained, especially in applying this local wisdom. This paper will examine how strong local wisdom in Penglipuran village applied in the values and behavior of the community in interacting with the environment in which they live wisely.

METHODOLOGY

This research is considered descriptive analysis, the data collection method is using the direct observation method. Primary data was obtained from

direct observation in 2013 by doing the shooting conditions and the building of settlements and conduct interviews. Results of the photo shoot and interviews were analyzed and described as the source of information sought in accordance with the purpose of research. Secondary data were obtained from the results of previous studies, as well as from library's related literature.

LOCAL WISDOM

Local wisdom (local wisdom, local knowledge, local genious) in Diem, translated as intelligence / local knowledge or views of life and science as well as a variety of strategies in the form of life activities of local community customs, religion, science, economics, technology, social organization , language and communication, as well as the arts) in responding to the various issues to maintain, improve, develop elements of their needs, by observing the ecosystem as well as human resources contained on their own citizens. Local wisdom has been becoming the physical and cultural traditions, and inherited for generations and be the basis for forming the building and its environment, which is embodied in a cultural heritage.

In the context of a traditional home, the local wisdom that accompanies the process of construction of the house has been arranged harmony between the needs of technology, building materials, design, layout, with natural ability. The harmonization achieved by traditional communities by first knows and understand well the environmental conditions. Traditional societies mastered the ecology concept in which they live. They know all too well about the interaction between living things biotic and a biotic environment, so as to create a balanced life, and in harmony (Diem,).

TYPE OF LOCAL WISDOM

Local wisdom types include governance (how to organize to manage), traditional values, and ordinances and procedures, including the use of living space (communal land).

Goverance

In every region in general there is a social system that regulates the social structure and linkages between existing community groups, such as Banjar in Bali. In addition, there is also the division of tasks and functions within an indigenous group, for example Kepatihan (duke), Kauman (students) in the villages around the palace/ kingdom in Java. Authority in

the structure of the social hierarchy also be part of the governance, such as the authority of traditional leaders in decision-making, and the rules of social sanctions and fines for violators of certain regulatory and customary law.

System Value (Philosophy of life)

Values of life / philosophy of life is the values of life that was developed by a community of traditional society ethics regulate the assessment of good-bad and right or wrong. For example, in Bali, there is a value system of Tri Hita Karana which associate with the values of community life in relationship with God, the universe, and man. The provision is set up custom things that must be adhered to, about where is the good or bad, which should be done and what not to do, that if it is breached, then there will be the customary sanctions that ruled them.

Procedures

Some local customs/ traditional rules have provisions on the right time for planting and a traditional calendar system that can estimate the suitability of the season for a variety of agricultural activities, such as: Pranoto Mongso (timetable and conditions of the time fished by traditional Javanese calendar) in the Java community or Subak system in Bali.

Special provisions (a sensitive area, Holy/ sacred, Building)
Regarding the preservation and protection of sensitive areas, as it pertains related to forest management, particularly in the village's bamboo forests

FORMS OF LOCAL WISDOM

Forms of local wisdom can be categorized into two aspects, namely the local wisdom that real tangible (tangible) and intangible (intangible).

LOCAL WISDOM OF THE INTANGIBLE REAL (TANGIBLE)

Forms of local wisdom that real tangible includes the following aspects:

Textural

Some kind of local knowledge as a value system, the procedures, the specific provisions outlined in the form of written records such as those

encountered in the traditional horoscope book, calendar and Prasi (culture write on a piece of palm leaves).

Figure 1. Example of Prasi-Catur Veda Sirah (left) and Lontar Usada (right) (source:www.ngarayana.web.ugm.ac.id dan www.kaskus.us)

Building / Architectural

Many traditional buildings are a reflection of the form of local knowledge, such as building houses of the people in Bengkulu. This is a folk house building residential buildings were built and used by a large part of society with reference to the head of the customs house. This vernacular building has unique because the development process that follows the ancestors, both in terms of knowledge and methods (Triyadi et al, 2010).

Objects of Cultural / Traditional (Artwork)

Many objects of cultural heritage, which is one form of local wisdom, for example, kris

LOCAL WISDOM OF THE INTANGIBLE (INTANGIBLE)

In addition to the tangible form of local wisdom, there is also a form of local wisdom that intangibles such advice is delivered verbally and hereditary which may include songs and songs which contains the values of traditional teaching. Through advice or other forms of local wisdom Other intangible, social value delivered orally / verbally from generation to generation.

TRADITIONAL ARCHITECTURE

The traditional architecture is one of the cultural products owned by the

Indonesian people in the form of a building with the shape, structure, function, decoration and how to make it inherited from generation to generation and can be used to perform the activities of life as well - good. The tradition of erection a building realized or not is an architectural tradition that has been carried out by tribes that exist in Indonesia since the days of the ancestors. Purwestri in Pattipeilohy, wrote that the architecture of a tribe is always in touch with the Religion, local climatic and natural conditions as well as their livelihood.

Traditional Architecture of Bali

Bali is one island in Indonesia which has a very strong cultural potential, both in terms of customs systems, culture and arts. According to the Public Works Department of Bali Province 1986 (Artha, 2010), traditional Balinese architecture is a reflection of the mindset, the attitude of a whole community living as well as various aspects of traditional life in general, so the traditional Balinese architecture contains elements of the value system and the procedures in place themselves against the environment. Besides that the spiritual aspect also underlies traditional Balinese architectural in a variety of functions to facilitate the activities of human beings. Focused on this, Bali is a traditional architectural element that unify between humans and the natural environment.

Philosophy and Conceptual

Philosophy embodiment of traditional Balinese architecture make it built environment that is harmonious and harmony between man, nature and God.

- Tri Hita Karana: three poles that make a life on earth; man, nature, and architecture is accepted as a life after going through a process of ritual and their birth.
- Panca Maha Bula: three elements that make a life: human, natural and harmonious environment for the same constituent elements. Architectural keep their balance.
- Nawa Sanga: nine tracks that each positioned in a particular direction; animated, inhabited, colored by certain forces to the space arrangement and time each in the form of architecture. Condition for the existence of an indigenous village is full application of Tri Hita Karana.

Philosophy of traditional Balinese architecture then applied to in the form of conception as the foundation of traditional architectural embodiment

in Bali. The basic concept based on the norms of universal religion, which is based on the design concept of the place, time, circumstances, form and function peruntuknnya. Among the expressions of conception are applied, generally used:

- Triangga: as an expression of values of life
- Catuspatha: as the expression patterns of space
- Sangga Mandala: an expression system placement

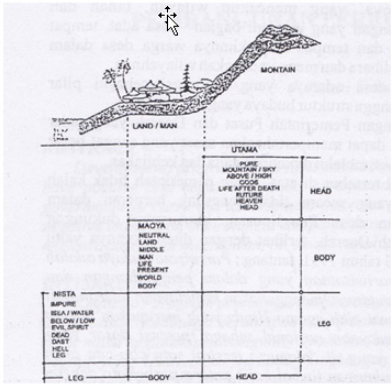


Figure 2. Distribution of the earth (Bali) according to the rules of the Tri Kita Karana

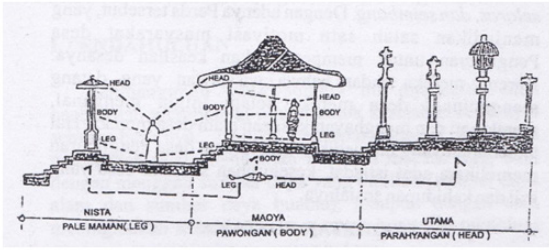


Figure 3. Distribution of land use according to the rules of the Tri Kita Karana

Conditions of Penglipuran Village.

Topographically Penglipuran village situated at an altitude of 500-600 m above sea level which is at the back of Mount Batur. Conditions of arable land due to the result of weathering of volcanic rocks. Residential area located in the middle of a bamboo forest. with total area of 14 hectares of the total area of approximately 112 rural Ha, the rest is a field of bamboo and plantations.

Demographically Penglipuran village the villagers living within 76 traditional existing homes. One uninhabitable home 1 s / d 4 KK as long as one of kinship. And according to the customs regulations, that the village's residents are not allowed to practice polygamy. If there are people who are polygamous will be thrown out village named Coral unite the south of the village.

Architectural conditions of residential buildings in the village in a traditional coral Penglipuran still preserved as the original although there have been some changes. The pattern of building mass (yard, corals) that maintains

custom homes (Bale Sakanem and Paon) with the structure of the building materials and ornaments are still maintained its authenticity. The uniqueness of this Penglipuran environment is that they occupy the house from the beginning until now still functioned. Each placement mass of the building is based on the concept of Nawa Sanga. The village's buildings are still using materials that are still original, such as the roof and walls with bamboo, wood columns and floors from the ground. Besides, there is a fence and angkul-angkul along the north-selatar axles.

Traditional building in the village's limited to a simple building because Penglipuran a masyarakatna village consists of caste sudra. For this reason also the buildings in the village's tend to be simple, without much use of ornaments.

Physical Structures and Village Patterns.

Penglipuran This includes the type of pre-Hindu village of Bali or Bali Aga, which is the most prominent feature of the north as the south begins in the north in the form of Pura Puseh and Penataran ended with Pura Dalem in the south.

Physical structure and pattern of the village's different villages in Bali more become attractive. Linear pattern of north-south access road that forms the environment is in the middle into open space for the local community, so it will be found that a typical residential neighborhood of the village of Bali Mountain (Bali Aga Village). So if there will be development of residential areas, should increase in the direction of the horizontal, not allowed to add vertical direction. Linear structure that is reinforced with a fence equipped with angkul-angkul (gate) whose majority is made of soil and bamboo so that adds to the beauty of the village's environment.

In the layout of the settlement, Penglipuran consists of three zones (mandala) on the north-south direction, namely;

- Mandala Majesty: a sanctuary located on the north side of the village (higher ground), here placed Pura Desa
- Madya Mandala: a place in the middle of life, here are housing residents
- Nista Mandala: as a dirty / low, is on the south side of the village, here is a cemetery area .

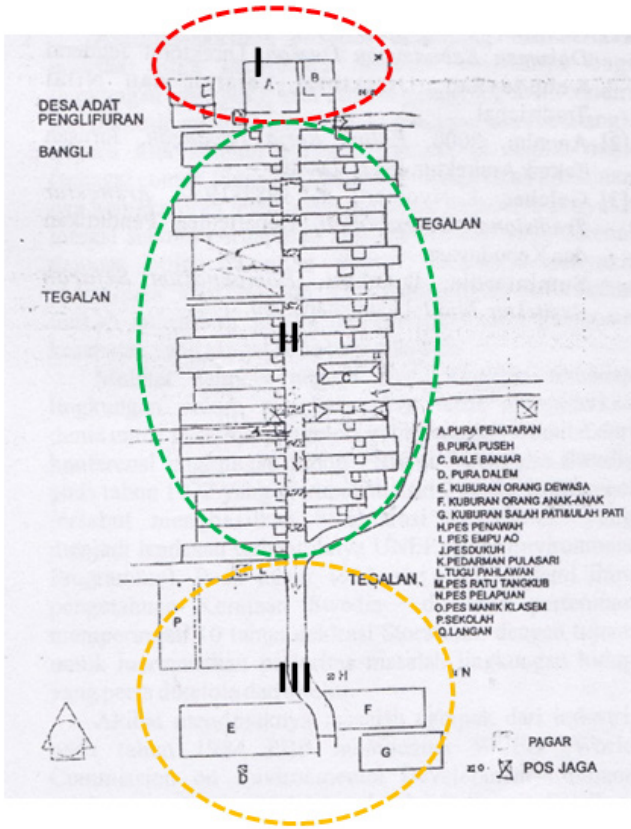


Figure4. Village pattern:
I. Utama Mandala (Pura)
II. Madya Mandala (Rumah Tinggal)
III. Nista Mandala (Makam)

Figure 5. The physical structure seen from the Mandala Utama area (Pura)

Figure 6. The physical structure seen from the Nista Mandala area (Cemetery)

Traditional village is a unit of the area where the villagers together jointly conceptualize and activate ceremonies and various cultural activities are organized by a particular cultural system, as well as the activities of Panglipuran village residents, more leads all activities on tasks that are sacred , as well as organizing religious ceremonies, coaching and repair places of worship in the village.

In terms of community, village's residents have a relatively distinct from the uniqueness of Balinese society in general. As part of the Bali Aga type of society they are generally more egalitarian and less stratified. Thus the social system is not as complex as the people of Bali lowland. As farming communities, they tend agrarian orientation. Religious ceremonies mostly are linked the life of farms and ranches. Agriculture is a prominent holtikutura.

Penglipuran Village surrounded by bamboo forests that provide rural air cool and fresh with the sound of a bamboo tree unique friction when in contact with each other at the time the wind blows (Anonymous, 2012). This forest is owned by the village and partly owned by local residents with an area of 45 hectares is used for the purposes of population to build houses and handicrafts in addition to the customary ceremonial purposes. Besides, this forest also serves as a water reservoir when rain and provider of clean water in the dry season for the villages that are below (Anonymous, 2012).

Bamboo forests are located in the region Penglipuran environment is very beneficial for the natural ecology. The bamboo trees can strengthen the cliffs on the North and West side of the village from erosion, store water content, as well as soil fertility due to weathering leaves. Bamboo forest sustainability is maintained as well as provide livelihood protection has been recognized by the society because of the bamboo can be used as building materials, household appliances and tools ceremony. In addition Preserve the forests managed by indigenous villages Penglipuran not be separated because of the role of traditional authorities who led forest management based on the values of local wisdom local indigenous village.

Despite of achievment in comunity status as " a Tourism Village " makes no moral decadence village's people to remain in the original traditional ethics and culture. Here the village's social culture is still very strong by doing various kinds of religious activities and the corresponding original ethics

However, the local community did not mind if the shrine (commonly called "Pura") in the tourist area is also used as attraction as far as they meet or comply with regulations (known as "awig-awig") applies.

Local communities actually did not expect money or donations on maketh them as tourist performances during religious ceremonies berlangsung. Tetapi if there are tourists who want to donate, the donation is entered or accepted by indigenous elders. The social life of local citizens going well and there are no indications of conflicts of interest of citizens (Juniarta, 2012).

Figure 7. Bamboo Forest

LOCAL WISDOM IN PANGLIPURAN VILLAGE.

Local wisdom in the village Penglipuranmasih still maintained and preserved until today. This can be seen from:

Governance

In every region in general there is a social system that regulates the social structure and linkages between existing community groups, in addition to the authority in the structure of the social hierarchy also be part of the governance, such as the authority of traditional leaders in decision-making, and the rules of social sanctions and fines for violators of certain regulatory and customary law.

With an area of 1.12 km2 village reach stretched from north to south, the village inhabited more than 200 head of this family was divided and separated by appropriate road boundary arrangements form part kangin house located in the eastern part and Kauh home located in the western part, the majority of the village's community work as farm laborers and craftsmen. Not far from the villages of bamboo forest are used for craft and home building materials.

Entering the village's neighborhood far from modernity, but governance local village with elements of beauty is also very true cleanliness is maintained, in every house entrance there is a gate, if entered into the house looks spatial arrangement of the building, part of space as in general there is a bale-bale / aula balle (meeting room or waiting room), there is also a bedroom and kitchen space, the unique all these houses are built using bamboo. The use of bamboo which makes Penglipuran awarded the Kalpataru.

Judging from the village zoning according to local custom agreement, the village is divided into three areas by division palemahan area or foot area of the village, pawongan area or village bodies, the last area parahyangan village head and village head is the part that is considered sacred to the Panglipuran villager.

Figure 8. Bamboo wall

System Values of life

Values are the values system that was developed by a community of traditional society ethics governing the assessment of good-bad and right or wrong. In Bali, the system used is the value of Tri Hita Karana which relate to the values of public life in relationship with God, the universe, and man. The provision is set up custom things that must be adhered to, as to what is good or bad, which one may do and what not to do, that if it is breached, then there will be the customary sanctions that govern them.

Village's community collectively has a Hindu village's layout is typical with Trimandala concept is divided into three different spaces in the function and level of purity, which is the primary, middle and contemptible. The third layout of this space stretching from the north (mountain) to the south (sea), with the village road straight staircase as a central axis, separates

the intermediate space into two parts. The most northerly on the main zone or "space on god", standing sacred building places of worship temple named Upgrading the villagers. As for the intermediate zones or "space man" contained 76 plot the yard and the house where the residents lived is divided into two ranks, ie western 38 and 38. The road east village as a separator is maintained free of four-wheeled vehicles and do not use asphalt but paving blocks and stones brush .Part southernmost is contemptible mandala or "space for people who have died" in the form of the burial place of the villagers.

In addition to the uniformity of the shape of the building, there is a tradition in this village is the mixing yard. This yard is vacant land reserved for indigenous villagers Penglipuran exiled for a foul customary form of remarriage / polygamy. Village's community adopts monogamous, so that every act of polygamy is a violation of the customs and the perpetrators must be sequestered in the yard fuse located in the South of the village / bottom. And for the people who practice polygamy along with its offspring will be exiled and provided grounds and if need be awakened by the customs house to stay, but they should not be entering the traditional village and should not follow the traditional ceremony. Until now no one has dared to violate the customs rules and the yard is empty and the villagers considered as coral leteh (dirty areas).

The uniqueness of the traditional village Penglipuran is although Hindu society has Penglipuran village cemetery. Cremation ceremony is performed only to deliver the spirit of the deceased to the creator. The village cemetery to the ground with no signs / tombstone and is divided into 3 parts, namely for children under 12 years, for people who died ordinary (ill) and cemetery for people who died unnaturally, usually caused by an accident, killed and others.

It is very significant that can be seen on the social and cultural life of the community is the similarity Penglipuran housing arrangements that are traversed by the "Rurung" (road) that divides the housing on the "tempekkangin" (east side) and "tempekkauh" (west side). "Angkul-angkul" (gate/ entrance) which has similarities between a house with other houses facing each other, the layout of the building in a residential area where every home has a "bale adat" required and "dapur adat" that form and function is the same on every home. In addition harmony is also seen from the shortcut that connects the house to the other house, this signifies that the community Penglipuran is a social community that can not be separated from the other community

Procedures

Some local customs rules have provisions on the right time for planting and a traditional calendar system that can estimate the suitability of the season for a variety of agricultural activities, the rules regarding the use of indigenous space including territorial boundary area, residential placement, storage logistics, rules of use of water for paddy or agriculture to other forms of traditional house.

Building / Architectural

Entering the Village area Penglipuran, we are already faced with the concept of environmentally friendly settlements. Penglipuran community region does not allow cars and other motor vehicles entering the area. The whole of motor vehicles can only reach the parking lot is provided in front of the region.

The main road continues to climb, with steps-steps and in the end there is pura.Jalan-road in a residential neighborhood made of natural stone that decorated the grass along the right and left jalan.The rows of frangipani trees bring out the nuances of modern Balinese.

Uniformity gate commonly called angkul-angkul it has its own charm. This uniformity tradition is a symbol of togetherness that has been instilled long ago by the ancestors of the people Penglipuran. In the order form and location of the house in their families, communities Penglipuran still stick to it.

According to the actual layout, a traditional Balinese house consists of three main parts. "Building houses is generally the same as other areas, still using Asta Kosala Kosali, there is a sacred place in the north, then the kitchen, then there Dangin and bale bale Dauh or logy," said I Wayan Supat, the village head Penglipuran.

Home made almost the same design, which uses the concept of traditional Balinese house or custom house Bali. Each house has parts built detached house. Consists of several buildings that stand alone, even though it is located not far apart. Each house consists of a main house building, bale-bale, kitchen, jineng for the granary, and the sacred place to worship. There is also a concept / grip that must be adhered to. For example about the direction and the location of each building. Special, every house there is certainly a place of worship in the form of puramini.

Figure 9. The road environment with natural stone

Figure 10. Uniformity gate

With local wisdom possessed, they can preserve the relationship between soil, water, climate, and bamboo forests. Bamboo and soil in its management will have an impact on water and climate according to the scale at the local case (also caused by the impact of the surrounding area). When bamboo felled there will be erosion, sediment, and soil fertility loss. Then when the land is sold or changed function, there will be changes in the ecosystem that would later influence the outcome of thought patterns, behavior and others in humans. The main potential does not shift the ownership of land is at the same function as their togetherness concept and the absence of thought Penglipuran individuals in residential areas. All the land from the yard of the house, fields, fields, forests, and others are owned by the village, known as the land of temples profit, or land outside the temple area as a result of wealth for all purposes temple, the land belongs to "padruwen" indigenous villages, coral Kerti or yard, or village ayahan land known as AYDS (Awig-awig Penglipuran, Palette 5, PAOs 25, paragraph 2, 1989: 8).

Bamboo forests are located in the region Penglipuran environment is very beneficial for the natural ecology, in addition to strengthening the cliffs on the northern and western side of the village from erosion, store water content, as well as soil fertility due to weathering leaves, bamboo Penglipuran community also useful as ingredients buildings, household appliances, and tools ceremony. Subsequent developments bamboo is also used as an economic buffer as manifested one community leader.

Through bamboo, Penglipuran be recognized at the national level by the government as the Kalpataru award recipients in 1995 ago. The existence

of the four potential natural resources such as arable land, water resources, favorable climate, as well as the bamboo forest, making Penglipuran as a community still exist to this day along with the change of time without having to change to four potential ecological chain mentioned above.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results and discussion that has been described previously, then some things can be concluded, that is.

1. Village Penglipuran have local knowledge covering governance, traditional values, and ordinances and procedures, including the use of space (communal land).
2. The local wisdom in the village Penglipuran still awake because it has values, which regulates the ethics of good-bad ratings as well as right or wrong, through the Tri Hita Karana value system that associates with the values of community life in relationship with God, the universe, and human.
3. The customary rules and regulations on the preservation and protection of rural areas Penglipuran the basis of the preservation of local wisdom in the village Penglipuran.
4. The conservation of the forest in the village of Penglipuran conducted by the local community as well as the contribution of the government. Communities conserve forests based on local wisdom through the concept of "forest due", as well as the implementation of Tri Hita Karana. The village's forest preservation is still maintained thanks to the preservation efforts of both the local community and interference from the government.
5. In the context of a traditional home, the local wisdom that accompany the process of construction of the house has been arranged harmony between the needs of technology, building materials, design, layout, with natural ability. Traditional societies mastered the concept of ecology in which they live. They know all too well the interaction between living things and the environment, so as to create a balanced life, and in harmony.

Development of tourism in the tourist village Penglipuran affected no negative impact result on the environment and land quality degradation or agricultural land land any other fields. The preservation of the forest is still well maintained. Community with the same mindset agree to preserve the forest and without dependence on the forest. Basically the local community has been aware of the need for forest conservation, forest area is considered as a water reservoir area that could be used for the benefit of life and other living creatures as well as agricultural purposes.

REFERENCES

Hakim, R, ((2003), Komponen Perancangan Arsitektur Lansekap Prinsip-prinsip dan aplikasi desain, Bumi Aksara, Jakarta.

Juniarta, Pande Putu (2012), Aplikasi Pariwisata Berkelanjutan di Desa Wisata Penglipuran, Fakultas Pariwisata, Universitas Udaya, Denpasar

Tjahjono, Gunawan. (2002). Indonesian Heritage, Arsitektur. Jakarta: Buku Antara Bangsa

Prijotomo, Josef. (2004). Arsitektur Nusantara Menuju Keniscayaan. Surabaya: Wastu Lanas Grafika

Prayogi , Putu Agus (2011), Dampak Perkembangan Pariwisata di Objek Wisata Penglipuran, Program Studi Pariwisata Stipar Triatma Jaya, Jurnal Perhotelan dan Pariwisata, Agustus 2011, Vol.1 no.1

Syamsidar, B.A. (1991). Arsitektur Tradisional Daerah Sumatra Barat. Jakarta: Departemen Pendidikan dan Kebudayaan

Unwin, Simon.(1997). Analysing Architecture. London: Routlegde

Nasbahry Couto, (2011) Morfologi Bentuk Bangunan Tradisi Minangkabau Sebagai Refleksi Budaya

Yeang, Kenneth. (1994), Bioclimatic Skyscrapers , Artemis London Limited

PLACE-IDENTITY OF DENPASAR IN A RAPIDLY DEVELOPING URBAN ENVIRONMENT

I Nyoman Gede Maha Putra[1]*

[1]Department of Planning, Oxford Brookes University
*13079818@brookes.ac.uk

ABSTRACT
It has been argued that having a place-identity can support a positive attitude in individuals towards their environment because they feel 'at home' there. Living in an environment that is familiar is also said to increase social cohesion among its dwellers, and to enhance the sense of belonging. This in turn serves to improve the liveability of that environment and, in general, enhance the quality of life of its residents. This study focuses on the island of Bali as a place-identity and on how changes in this environment have impacted upon the people who live there. Bali was once colonised by the Dutch in the beginning of the 20th century. During the short span of occupation, the Colonial Government developed the landscape in 'the Dutch way' introduced new ways of development which did not make reference to local building tradition. One of the towns developed by the Dutch was Denpasar, which in this century, has become a thriving capital of Bali Province. Denpasar attracts many people from other regions and Bali's neighbouring islands who come to find jobs, with the result that the city has now become the most populated region within the island. This research investigates the changing patterns of Denpasar from its formative period to date. Utilizing an urban morphology approach, the evolving meaning of the dwelling as located in Denpasar, how such dwellings are constructed and have been reconstructed repeatedly by their dwellers, will be examined. Initial findings of this study show that while the city grows from a traditional small town, with a long history of a distinctive character, it transforms in a way that is seen as undesirable by some dwellers. The study reports on extensive physical developments which have contributed to the evolving form and meaning of changes

which have impacted on the identity of the place under study.

Keywords: place, place identity, urban morphology, sense of place

INTRODUCTION

This paper is situated within the debate around the issue of 'place' in urban design: it examines the changing forms of a city, and their impact on the concept of sense of place in that environment. Focusing on Denpasar in Bali, this paper traces the changing patterns of the city and addresses the formation of the concept of identity within that city from its formative period to its current state. Dwelling is not an artefact but is in constant change, being created and recreated by its actors. Therefore, this study also explores roles and interest of key actors and their development strategies in the transformation processes.

The concept of place and place identity has long been discussed in many fields from geography to urban design and architecture. Relph (1976) defines that the study of place has two significance points in our life. The first is for its own right as a fundamental expression of man's involvement in the world. Secondly, it will contribute to the maintenance and manipulation of existing place and the creation of new places. Creswell (2004) claims that the study of place can also be used as tool to understand the world.

As a total phenomenon, a place cannot be explained by reducing its components into single pieces. Rather, it is said to be a total environment involving tangible and intangible properties, understood only through use and experience (Heidegger in Sharr, Adam, 2007). To understand a place, thus, means one should experience it through sensing its physical elements by wandering around, understanding its activities, observing the way people using it in everyday uses. A place can also be understood by exploring the way people percept and imagine and how people attach meaning to it. Some critics claim that it is the meaning of place that is important in the definition of place (Hough 1990; Agnew, 1987; Lynch, 1981; Tuan, 1974; Butina Watson and Bentley, 2007).

A city is one particular kind of place, one which is useful to conceive not so much as a final product but as a process. That is, it has a start, from which it has developed via several processes but not necessarily any recognisable end. As a complex and dynamic system, a city comprises many dimensions and elements, each linked to the other. These processes render the city as a locus of constant change, affected by community

life, and economic, social and culture influences which alter the physical characteristics of the city, resulting in changes in the city's image. Because the components are in a constant change, so too is the identity of the place.

To study the forms of the city means to understand the whole process of the city from its initial development to its current form. The term that has been widely used in studying the development of a city is urban morphology. Urban morphology studies seek to capture the historico-geographical structure of the cultural landscape. Along its life span, there are patterns that structure and express the histories of the various parts of the landscape. To understand these geographical patterns, it is necessary to appreciate how the various urban landscape components relate to both the underlying agencies and activities and to one another (Whitehand, 2009; Kropf, 2009).

The social actors within a city will develop a sense of possession, of what is 'ours', within the process of the creation and modification of the city. The study of urban morphology supports the definition of the concept of place identity by establishing a sense of continuity and change in the place, which reflects the dynamics of the community. Creation and re-creation of forms occurs on various scales, from the smallest units, the larger scales, to regional scales.

Urban morphology study will be used to discuss the dynamic meaning of sense of place within the context of Denpasar. The development of the city in various time frames and its dynamic patterns will be discussed.

METHODOLOGY AND APPROACHES

In order to understand the transformation of Denpasar, qualitative approaches are used in this study. Beginning with an investigation of the characteristics of a Balinese traditional settlement, the study moves on to data collection with use of interviews to gather key information from local people as well as experts in traditional architecture. A field survey was carried out to examine certain artefacts that would exemplify the understanding of traditional settlement. Information from various literature and previous paper works from several writers have been analysed.

The results from this initial data collection served as the first step in analysing the morphological history of Denpasar. At this stage, the history of Denpasar was studied more in depth by means of interviews, as well

as data gathered from policy papers and previous research papers. This second stage led to further findings on morphological periods of Denpasar. Once these morphological periods had been revealed, the next step undertaken was to analyse periods of continuity and change in Denpasar, using maps, historical images and archives of old sketches to assist the process of analysis. Since the availability of maps, particularly maps from 1906 to 1980, was limited, a current map obtained from the City Planning Body, *Bappeda Kota Denpasar*, was used to reconstruct past topographies. The pattern of continuity and changes can be seen by analysing physical development of the city in order to define the meaning of this transformation.

Finally, the meaning of urban transformation, defined as the identity of the place as sensed by locals, was formulated by discussing and consulting participants living in the city centre of Denpasar.

BALI AND DENPASAR IN BRIEF

Bali is an island located in the southern part of Indonesian Archipelago, between the most populous Java Island to the west and Lombok Island to the east. Physically, the island is divided into two distinct parts by mountains that stretch from the eastern to the western part.

The Balinese believe that mountains, particularly the highest Mount Agung, are places inhabited by the gods while the oceans are the dwellings of evil spirits (Waterson, 1997). This reflects a value system whereby higher places are seen as more sacred than lower. *Kaja* is the word which defines the upward direction to the mountains and *kelod* defines the downward direction to the sea. Because the mountains are located in the middle of the island, the directions toward the sea and toward the mountain in the northern part of the island and in the southern part are different. So the sacred directions as defined by the people in the northern part differ from those of the people in the southern part (Covarrubias, 1932; Sularto, 1987; Waterson, 1997).

The direction of the sun also plays an important role in the value system of the Balinese. The direction where the sun rises is seen as more sacred than where it sets, since this symbolises death (Gelebet, 1983; Waterson, 1997; Sulistyawati, 2013). The superimposition of these two value systems has resulted in a nine-fold division of values, known as *nawasanga*. Each area in the nawasanga embodies a different value.

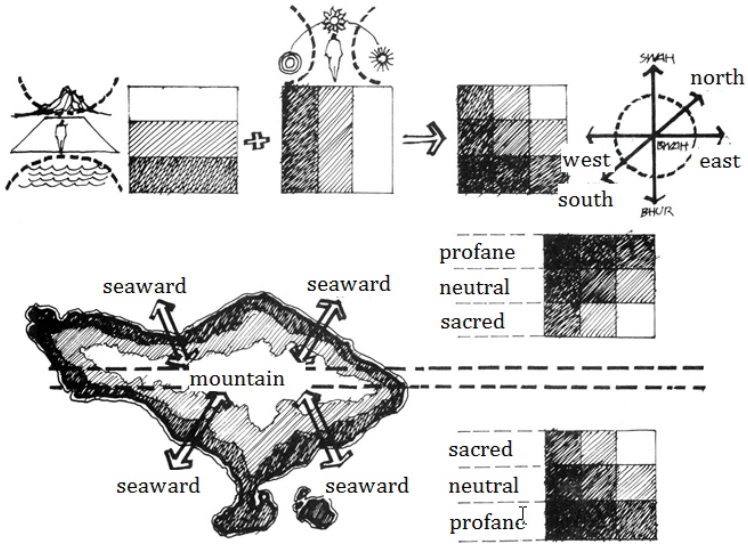


Figure 1. Cosmological ideas which is resulted from physical characteristics of the island and local traditional beliefs
Source: Sularto, 1987

The central area of the nawasanga has neutral value while the north-eastern area holds the highest value. To the opposite, the south-western is seen as the lowest value area. This cosmological idea has been implemented in various levels of arrangement, from village structures to house level. On an urban scale, this value system has been popularly used in the arrangement of city centres of various kingdoms in Bali with some variations (Putra, 2009).

Denpasar was once the capital of Badung Kingdom in the southern part of Bali Island. Located in the south eastern part, neither mountain nor lake can be found in the area. However, the mountains can be seen in a clear sunny day while the ocean can be found to the east and to the south of the area.

MORPHOLOGICAL ANALYS OF DENPASAR URBAN FORM

Denpasar at the End of the 19th Century

Denpasar Palace was built in 1788, and became the centre of the Badung Kingdom until 1906. However, before this the centre of the Badung Kingdom was the Ksatrya Palace, located 300 meters north of

the Denpasar Palace. The location of Denpasar Palace was formerly a royal garden, where the king used to entertain his colleagues and royal guests. In the 19th century, the area of the city centre was surrounded by extensive agriculture lands. Rivers irrigated these fertile lands all year, yielding cultures of rice and other plants.

The main temple, *Pura Desa*, located in the middle of the kingdom, is close to the biggest river, *Tukad Badung*, from where the holy water is gathered during the ceremonies. Two cemeteries are located in the southernmost of the settlements. One cemetery is arranged for the royal family while the other is arranged for common people. Scattered within this area, traditional settlements are located in several groups known as *banjar*.

The size of a *banjar* ranges from 50 to 200 families, headed by a community leader called *kelihan banjar*. Each group has its own community hall, *bale banjar*, which functions as the centre of social and cultural activities. This hall is also utilised to perform local entertainments: traditional dances, gamelan orchestras, puppet shadow shows and theatre plays. Some vendors sell food in this community hall during the performances.

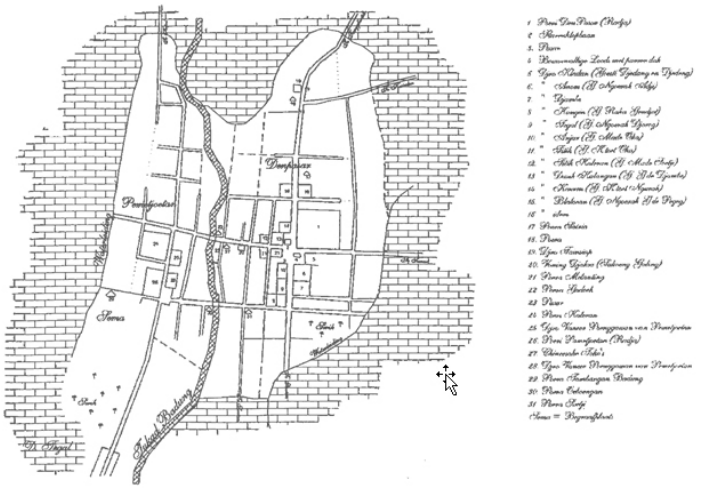


Figure 2. Early map of Denpasar showing several important sites and plots
Source: Gegevens, 1906

The centre of Badung Kingdom was traditionally arranged around a crossroads known as *catuspatha* (Putra, 2013). In this pattern, two main roads, with a north to south axis and an east to west axis, crossed at a central point and divided the area into four distinct plots. Some other

smaller roads were also dominated by north to south or east to west axes, creating grids and characteristic urban blocks.

The palace was situated to the north-east of the *catuspatha* centre point, symbolising the highest value in the *sanga mandala* conception. This location represented the position of the king as descendant of the god, a belief adopted from Shivaism and commonplace in many kingdoms around South East Asia until 19th century (see Lansing, 1983). Some houses of king's men were situated around the palace.

A traditional market was located to the southwest of the centre of the *catuspatha* located under a big sacred banyan tree. Together with two other markets, one to west and another one to the south, located in different settlements, these three markets formed a market association and each market would be open in different days in turns. To support local needs some Chinese shops selling kitchen utensils, clothes, and other imported products, were located west of the market. While traditional market was an open air, Chinese stores were more permanent in four walled buildings lined the edge of the street. A small temple for Goddess Sri, worshipped by the vendors, divided the traditional and Chinese stores.

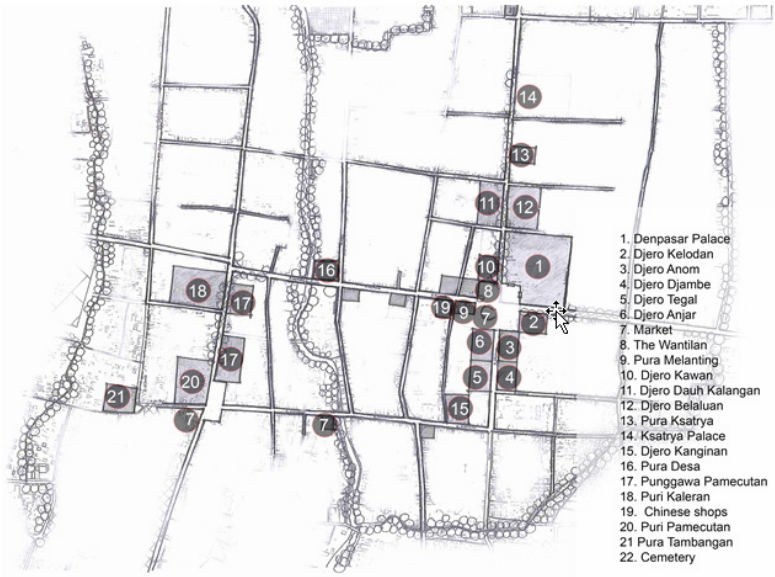


Figure 3. Maps of Denpasar in the Kingdom of Badung era
Source: constructed from various sources

West of the palace was a big open pavilion with three-layered roof, the

wantilan. This pavilion was used as an arena of cockfighting, one of the most popular games at the time. It was also used to stage traditional performances.

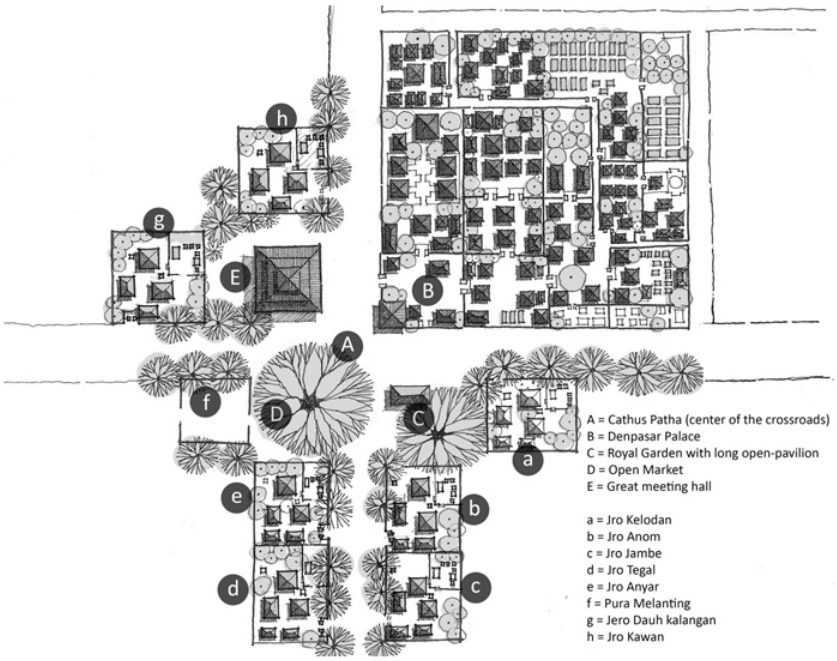


Figure 4. Situation around Denpasar palace before the invasion in 1906
Source: constructed from various sources

The centre of the crossroads, as the centre of the kingdom, was the site of most socio-cultural and economic activities within the area. This crossroads was believed to be the axis linking three different layers of the world. As a religious and magical point, this centre was normally left empty, although annually, a ceremony known as *tawur kesanga* was conducted to maintain harmonious relationships between the three layers of the world.

Colonial Interlude 1906 - 1942

In September 1906, Colonial troops invaded the Kingdom of Denpasar. This invasion was triggered by a dispute between the king and the colonial government over a shipwreck on Sanur Beach. This led to a tragic war, *Puputan Badung* where the king of Badung and thousands of his followers were dead.

A new government body was established to take over the political power from king. In order to manage the area of Bali and Lombok, a government

body, *Afdeeling Bali Lombok*, was formed. Despite the new government system, the Dutch maintained a role for the kings in certain fields, particularly in religious and local customary affairs. To accommodate these affairs, a council for the kings from all over Bali named *Raad van Kertha* was formed.

The colonial government aimed to build a stronger economic base of the city by carrying out a number of changes to the city's infrastructure. Roads were widened, repaired and reinforced to improve the distribution of goods and to support trading. Sea ports, Benoa, Kuta and Sanur were renovated and Chinese traders were invited to become involved in developing local economy (Nordholt, 2000).

After the war, the Denpasar Palace was demolished by the Dutch to make way for new development. All kings' men houses, the *wantilan* and the market had been demolished also to make way for new facilities supporting the new colonial government development. The market and its temple were removed and transferred to a new location next to the river in the western part of the city. A tall footed-clock was placed in the centre of the crossroads, thus changing its function as a symbolic representation linking the three layers of the world. Consequently, the function of this *catuspatha* as the point of religious and physical orientation of the city vanished.

In a newly developed city centre, alarge open space, the *alun-alun*, was created as the centre of orientation. This large open space was made by demolishing some buildings and houses located across the former palace to the south and serves not only as the centre of orientation but also as a place of military shows.

An office for the Department of Public Work, BOW, was also built within this plot. An office building for resident assistant of South Bali was built in the former palace, oriented south and facing the *alun-alun*. In the same plot, some houses for colonial government officer were built in the north eastern part.

The new location of the market, next to Badung River, was extensively developed. The street where Chinese shop-houses located grew rapidly owing to its strategic position linking the *alun-alun* and the new market. In front of the new market, Arabic traders set up some clothing and fabric-related businesses following the success of their fellow Chinese traders. These Chinese and Arabic quarters soon became the centre of modern

life in the city, where modern clothes, goods, kitchen utensils and other modern products could be found.

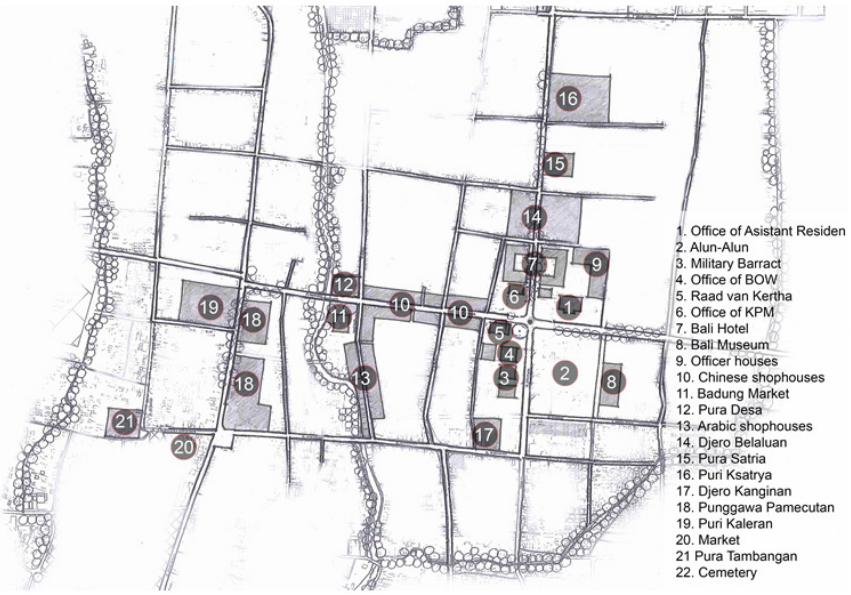


Figure 5. Maps of Denpasar during the colonial government
Source: constructed from various sources and fieldwork 2014

One of the colonial government strategies for boosting economic development was to promote Bali as a tourist destination. To support this strategy, a hotel consisting of two wings was built in Denpasar, the east wing occupied part of former palace plot facing west while next to it, across the street, the other wing was built facing east. This hotel might have been the first tourist accommodation built on the island.

Since that time, Bali has been continuously promoted for its beautiful landscape and rich Hindu-Buddhist culture. In order to protect Balinese culture from western culture infiltration a new socio-cultural strategy called *Baliseering* was established by the government. Within the *Baliseering*, all Balinese youngsters were told to maintain their own culture, speak their own language, dance traditional dances, and so on. In 1932, within the framework of *Baliseering*, a new museum was inaugurated, designed to combine the forms of a traditional temple and palace. It stored and exhibited ancient relics and artefacts.

Figure 6. The Chinese shop-houses, now Jalan gajah Mada, in the colonial era
Source: Tropenmuseum of the Royal Tropical Institute (KIT) [CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0)], via Wikimedia Commons

While the Dutch colonial Government colonised Bali in a relatively short period of time, Japanese troops forced them to evacuate the island in 1942. The Japanese troops took over the island until 1945 when the Japan surrendered to allied forces. After this brief Japanese occupation, a Dutch Colonial military force once again took over the island, under The State of East Indonesia.

After the Independence 1945- today

Indonesia proclaimed its independence on the 17th of August 1945. But it was not until a year later that Bali was freed from the Dutch to become part of the Republic of Indonesia led by Sukarno. The new government continued developing Bali as tourist destination with three major projects carried out in Bali at the end of 1960's by the Government of Indonesia. These were the development of international airport to be utilised as a new gate for international tourists, a huge Bali Beach Hotel in Sanur, and a research project carried out by French international consultant SCETO, to develop tourism sector in Bali. Several other projects, mostly privately led, have also been carried out since with the support from government by providing tax incentive to boost tourism sector development.

While tourism was developing at Sanur and other beaches, the city centre and its surroundings were also being extensively developed. *Badung* Market came into existence as the magnet for regional economic

development, while surrounding areas of the market were transformed and merged to form a central business district. From a traditional and relatively small market, this place has become a major distribution centre of goods in South Bali.

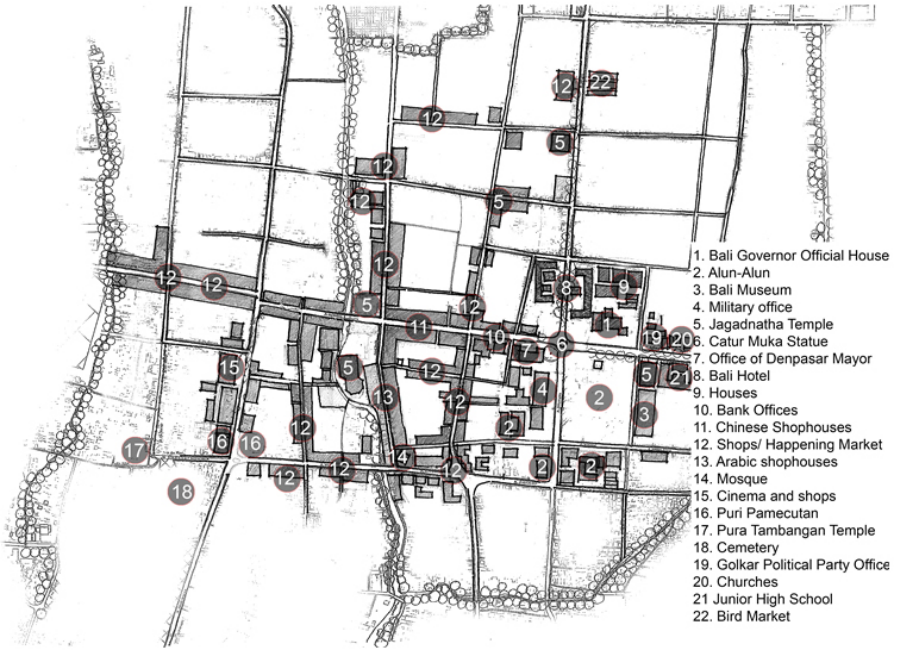


Figure 7. Current situation within the city centre of Denpasar
Source: Fieldwork in 2014

Other areas around this market have been impacted by the growing economic activities of the market. Chinese traders build more shop houses along several more streets around the area, as did a growing number of Arabic traders.

Figure 8. Left image showing the catuspatha with gigantic statue while image on the right showing some shop houses.
Source: Fieldwork, 2014

The new government of Bali built an official house in the former resident assistant office north of alun-alun. A temple, Pura Jagatnatha, which is worshiped by the Balinese Hindu, have been built in 1953 located north east of the *alun-alun* next to Bali Museum. In the centre of the *catuspatha*, a gigantic statue replaced the tall footed clock. This statue, erected in 1973 by a renowned local artist I Gusti Nyoman Lempad, symbolised Brahma, believed to be the creator of the universe, with a gigantic body and a head with four faces pointing to the four directions.

DISCUSSION: CONTINUITY AND CHANGES OF URBAN FORMS

The physical development of Denpasar shows that the old cosmological-based urban pattern was transformed by a new formal colonial approach even before the new economically oriented development of modern Denpasar took over. The overall changes in the Denpasar landscape indicate that the city is intensively growing.

Major changes in the landscape configuration can be seen as follows:

- agricultural lands no longer exist around the city centre;
- the *alun-alun* and the market are the centre of people activities, where social and cultural activities are now performed at several stages in the *alun alun*. The market maintains its role as the centre of economic activities, however, its position has moved from its former position;
- the role of the *catuspatha* and existence of roads that crossed have been eroded since the north and south axis as well as east and west axis are no longer as strong as in the kingdom era in defining the crossroads pattern. ;
- as a consequence of economic development around the market, traditional houses around the city centre, particularly around the market and several blocks around it, are walled by lines of shops and shop-houses;

It could be argued that the economic development of the city offers greater opportunities for employment which in turn increases the welfare of the citizens. The prospect of more jobs draws in business and more people from outside are attracted to working in the city, increasing available manpower. The downside however is that the majority of public spaces are now occupied by businesses, making them less accessible and less comfortable for public use and leisure. Moreover, many community halls, which in the past might have been favourite places to socialize, may be rented out for profit. Some drawbacks as defined by locals and to be found in the field are as follows:

- shops dominate road sides makes many houses are left less-accessible from the main roads. Consequently, some of their their occupants leave them to find other locations to build new houses. These houses are now only utilised as a 'mother house' where they would only be visited by the owners during the ceremony to worship in the family shrine.
- not only becoming denser the city is also expanding and getting bigger which makes it less walkable and not pedestrian friendly. The facilities are spreading to any directions and less compact compare to the old city centre where facilities are centred in close proximity;
- The majority of public spaces are now occupied by businesses makes it less-accessible for public uses and less comfort. Moreover, many community halls, where in the past are favourite places to socialize, are being rented for profit reasons.

In such conditions, it may well seem to some citizens that the city has become a place where the quality of life is worsening. This seems certainly to be the case in Denpasar, where uncontrolled urbanisation, profit oriented development and weak policy implementation in controlling physical development have negatively impacted on the environment.

CONCLUSION

Cities are in constant state of change led by human agency. Without involvement of its actors, a city would remain unchanged and might become a dead city. Denpasar development, on the other hand, shows how a traditional city can transform physically through different actions by different actors and in different economic and political situation. As a place, Denpasar, particularly the city centre, is not only characterised by its physical forms but also by its vitalities and images. Economic development and political changes influence the forms of cities which in turn produce and reproduce dynamic images of the city.

From its formative period to current situation, the transformation of Denpasar has been led by many factors. At least three different approaches can be seen to have been applied by different actors in different political situation. The first approach, highly influenced by local belief was based on the cosmological ideas which were translated into the concept of *catuspatha*. The implementation of this concept resonated with a city design where all facilities were oriented to the centre of the *catuspatha.*

The second approach was developed by the Dutch Colonial Government.

Focusing on stabilising a new political system and developing local economic growth, they completely rearranged the former traditional belief-led pattern of the city. Ignoring all reference to the cosmological ideas embedded in local beliefs, the city was transformed into a formal urban block. Political, military and cultural facilities were designed to meet each other in a large open space which then became the centre of orientation of the city. The market, as economic engine of the city, was moved to another location.

After the independence, the physical development of the city moved forward in the third appeoach, which demonstrated a synthesis of cosmological-led and colonial economic-led approaches. To bring back the *catuspatha* as the centre of orientation, a huge statue has been erected. This statue is now used as the zero point of the city. However roles of the *alun-alun* as the centre of social and cultural event have been maintained. Since the colonial era, *Tawur kesanga* ceremony has taken place in the *alun-alun* replacing the *catuspatha*. The market, as the centre of economic activities, has grown significantly.

It is an economically based development which is now championed as influencing and forming the pattern of the city. Traditional settlements have been covered with blocks of shops; pedestrian ways are occupied by street vendors. Nowadays, neither religious and traditionally rooted pattern nor formal pattern developed by colonial could be recognised as dominant elements of place identity of the city. The identity of Denpasar today is a mix of old cosmological based settlement and a newly economic based organic pattern.

REFERENCES

Alsayyad, N. (2014). Traditions: The "Real", the Hyper, and the Virtual in the Built Environment. London, United Kingdom: Routledge

Asquith L., Vellinga, M (2006). Vernacular Architecture in the 21st Century: Theory, Education and Practice. London: Taylor and Francis

Bourdier, J.P., AlSayyad, N. (1989) Dwellings settlements and tradition cross-cultural perspectives, Lanham : University Press of America ; Berkeley, CA : International Association for the Study of Traditional Environments

Butina-Watson, G., Bentley, I. (2007). Identity by Design, London: Routledge

Covarrubias, M. (1986). Island of Bali. First published in 1937. London. KPI

limited
Sulistyawati (2012). A Principles and Concepts of Balinese Traditional Architecture and Cultural Values. In Suartika, I G. A.M. (2012). Sustainable Cultural Landscape. Denpasar: Udayana University Press
Creswell, T. (2004). Place: a Short Introduction (first edition). Malden, Oxford, Victoria: Wiley Blackwell
Geertz, C. (1959). Form and Variation in Balinese Village Structures. American Anthropologist, New Series, Vol. 61, No. 6 (Dec., 1959), pp. 991-1012
Gegevens. (1906). Gegevens betreffende de zelfstandige rijkjes op Bali. Batavia.
Hanna, W.A. (2004). Bali Chronicles: Fascinating People and Events in Balinese History. Singapore: Periplus Editions
Kropf, KS .(1993). 'An enquiry into the definition of built form in urban morphology'. unpublished PhD thesis, University of Birmingham
Lansing, J.S. (1983). The "Indianization" of Bali. Journal of Southeast Asian Studies, Vol. 14, No. 2 (Sep., 1983), pp. 409-421. Cambridge University Press. Accessed: 28/02/2014 08:30
Lynch, K. (1961). The Image of the City, 1st edition. Massachusetts: The MIT Press
Norberg-Schulz, C. (1984). Genius Loci: Towards a Phenomenology of Architecture. New York: Rizzoli
Nordholt, H. S. (2000).Localizing Modernity in Colonial Bali during the 1930s, Journal of South East Asian Studies, Vol.31, No 1 (March 2000) pp. 101-114
Oliver, P. (2007). Dwellings: the Vernacular House Worldwide. Phaidon Press Ltd; New edition
Picard, M. (2008). Balinese Identity as Tourist Attraction: from `Cultural Tourism' (PariwisataBudaya) to `Bali erect' (AjegBali). Tourist Studies. 2008 8: 155
Putra, I G.M. (2009) Perubahan Ekspresi Catuspatha Dalam Tata Ruang Pusat Pemerintahan Di Kota Denpasar : Perspektif Kajian Budaya. Disertasi pada Program Doktor, Program Studi Kajian Budaya, Program Pascasarjana, Universitas Udayana
Rapoport, A. (1969). House Form and Culture, 1st Edition, Prentice Hall
Relph, E. (1976). Place and Placelesness. Pion Ltd
Sharr, A. (2007). Heidegger for Architects. Oxon: Routledge
Sularto, R. (1987). A Brief Introduction Traditional Architecture of Bali: Some Basic Norms. Aga Khan Architecture Awards Speech
Tuan, Y. F. (2001). Space and Place: The Perspective of Experience, Reprint edition. Minnesota: University of Minnesota Press
Vickers, A. (1994). Travelling to Bali: Four Hundred Years of Journeys. New

York: Oxford University Press
Waterson, R. (1997). Living House: An Anthropology of Architecture in South-East Asia. Singapore: Tuttle Publishing
Whitehand, J.W.R., Morton, N.J. (2004). 'Urban Morphology and Planning: the Case of Fringe Belts', Cities 21, 275-289

WHERE IS HOUSE? URBAN DWELLING, DWELLING IN URBAN?

Sri Wulandari1*, Annisa Dienfitriah2**

[12]Department of Architecture, Faculty of Engineering,
Universitas Indonesia
*sriwulandari.arsui2010@gmail.com,
**annisa.dienfitriah@gmail.com

ABSTRACT
Jakarta, as a capital city has inefficiency time of commute due to imbalances between its population and its transportation infrastructures. Some citizen of Jakarta's satellite cities spend almost of all their daily life not in house, but on the street, on the train, and on the other public transportations. They also take any time in office, school, and shopping or food centers. They enjoy the commuter life by reading books, watching television in car, or surfing internet through their gadgets. Quality of time in commuting becomes so worth in the middle of traffic. Because of its quality time, people get pleasure by perceiving their routinity. Thus, the routine of those activities made a rhythm composing the new culture and changing behaviours of people dwelling. By that situations, people do not eat in their dining room, do not play on the backyard, and do not teach their children at home. They have no time for interaction in living room, take a bath in house bathroom, or even sleep in private room anymore.

So what is house? Would people find any new concept of dwelling without house? So how is sustainability of human cycle pattern in the future? This paper aims to highlight and present the possibilities of new culture and dwelling concept based on present phenomena that people experience in Jakarta. By analyzing situations and literating other sources method, this paper also try to describe situating dwelling in the future and open to any chance improvement for following research.

Keywords:architecture, situating, commute, routine, dwell

INTRODUCTION

Several last years, the population in some big cities in Indonesia rose significantly and no exception for Jakarta as the capital city of Indonesia (BPS, Indonesian Statistic Center Institution, data). BPS temporary projection stated that in 2010, the amount of Jakarta citizen was 9.61 million people and in 2013 it became 10.09 million people increase. Jakarta with 664 km2 area, has different citizen amount in day and night. In night, it is around 10.09 million people, but in day the amount is around 11.2 million people (BPS data). "*Results survey of Commuter Jabodetabek 2014 showed that from 9.2 million DKI Jakarta citizen that are 5 years old and above, are commuter citizens for 14.09 per cent and 85.91 remains are non commuter citizen.*" (BPS data, 2015). Based on the data, it could be imagined how dense the mobilization is in Jakarta because of the private cars or the public transportations. Not surprisingly there are many traffics happened in Jakarta everyday.

Traffic problems happened in Jakarta are not only caused by the population increase as explained before, but also caused by the lack quality of infrastructure that could not supporting the citizens needs. For example the fact that the time range to wait commuter line arrives at station in Jakarta nowadays is around 5-10 minutes once. It takes much times and less efficiency because it makes queue accumulation of passengers mainly in rush hours. Moreover, the train intensity travel also makes a traffic problem because of crossing trajectory with road vehicle. Based on this phenomena we know that Jakarta and its surrounding citizens have high population and mobility activity, but actually this condition is not conduct Jakarta in a dense condition yet. It is coherent with what Adi Wibowo, one of practitioner that is dabbling in architecture field, stated: "*Actually, Jakarta is not dense yet, but its citizen is already spread out to the perimeter of Jakarta. It happen because of Jakarta's environment itself is not welfare to stay in. It just gives chances for business.*"

Through days and years, the same condition is always happened and repeated. Traffic, duration of commute and waiting public transportation, mileage, and expensive cost of transportation from one place to another place prove that there is not any significant infrastructure quality enhancement yet. Despite of inadquate infrastructure, citizens of Jakarta's satellite cities have to keep doing their activities in Jakarta because of life demand. Along with that life demand, the citizens will keep trying to run their virtually as human being for dwelling. Dwell itself has some meanings as described on Building, Thinking, Dwelling (Heidegger, 1951), which

are: *"...when to dwell means merely that we take shelter in them."*, *"... to remain, to stay in a place."*, and *"To be a human being means to be on earth as a mortal. It means to dwell."* From the description, it could be seen that dwell constitutes habituation when we sheltered in a certain place.

Generally, house is a kind of area that usually used for human to dwell. House becomes zero point for people in their life growth process. House creates memories by connecting past, present, and future. It also unite the dweller's life phase difference (Tessenow in Allen, 2005). Many activities is done at house by every dweller, like sleep, breakfast, dine, play, talk, gather, or take a bath. For some citizens of Jakarta's satellite cities that are commute, several activites as a kind of dwelling which usually done at house, nowadays should be done while commute because of mileage problem that need its time allocation, and it makes the times to do activities in house sacrificed. Based on this situation, some citizens of Jakarta's satellite cities make a deal between activities that should be done with the times needed, by doing some activities while commute, like eat, read books, watch television, surf the internet by gadget, and socialize. In some cases, take a bath also not be done in occupied area, but instead in a work area. It is also related to the spatial interaction that Encyclopedia of Geographic Information Science stated :

> *"...spatial interaction models are now used routinely in traffic forecasting and planning as well as site location in the commercial sector, where they are linked to travel activity analysis in which many stage interactions and time travel budgets are considered" (Batty, 2012)*.

From this statement, it could be assumed that people consider with the budget and time when they travel or in mobile condition. Then, whenever possible they should use the time effectively, doing some dwell activity while commute. This habituation changes encourages mindset changes that an occupied area may not be needed anymore. So what is house? Would people find any new concept of dwelling without house? So how is sustainability of human cycle pattern in the future?

RETHINKING: HOW WE COULD DWELL THERE

Dwell, House, and Home

Every human being always doing their daily activities as habituation. Gradually, the habituation of their activities makes memories and

formalizes concept of home in their mind. Some people may feel like home in a place, eventhough they are not in dwelling area, nor in house.

> *"Home is located in space, but it is not necessarily a fixed space. It does not need bricks and mortar, it can be a wagon, a caravan, a boat, or a tent. It need not be a large space, but space there must be, for home starts by bringing some space under control. Having shelter is not having a home, nor is having a house, nor is home the same as household." (Douglas, 1991).*

People that lives in Jakarta's satellite cities could feel home while they commute. But, in this case, it does not mean they dwell, as Heidegger said "...to dwell means merely that we take shelter in them."

Many people dwell in their own house, the other one dwell in a rental house, apartment, dormitory, flat, or mansion. It seems that every people dwell by stay in a place, like what Heidegger (1951) stated before. However, there are also some people who still live in nomadic, and actually they also dwelling for their life because in other definition, dwell also means live in earth: *"To be a human being means to be on earth as a mortal. It means to dwell"* (Heidegger, 1951). Based on the situation, it could be said that people will always dwell as long as they live. People could dwell in a house, but house is not the only place for people dwell. While dwell, people could feel home, but when people feel home, it does not mean they dwell. People could feel home in a house, but sometimes home is not a house and house is not a home. Dwell, home, and house could be related, but they do not have absolute correlation to each other, as drawn on the following diagram:

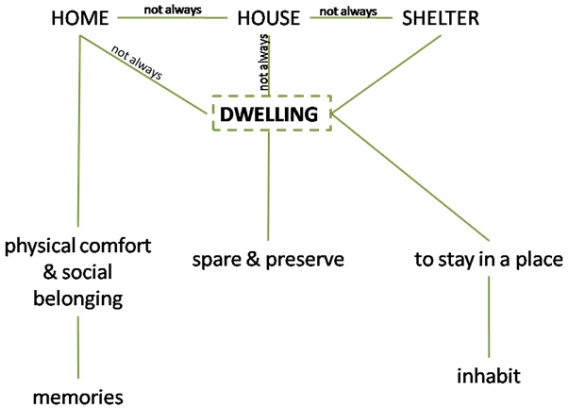


Figure 1. Dwelling Understanding Diagram
Source: Personal Illustration

Jakarta Condition Related to Mileage and Time

Jakarta is surrounded by some satellite cities: Bogor and Depok (in the south), Tangerang (in the west), and Bekasi (in the east). Everyday, some citizens of Bogor, Depok, Tangerang, and Bekasi commute to Jakarta or to another satellite cities. When the citizens commute from one satellite city to another satellite city, they should passing through Jakarta as a near route, except Bogor-Depok. It maybe happen because the location of all Jakarta's satellite cities are mostly opposite.

Based on direct observation, not of all Jakarta's satellite cities and Jakarta itself has complete facilities and infrastucture. If there is one, usually it does not has equivalent quality between one facility and other facilities. This situation makes the intensity of mobilization flow risen because of fulfillment to go to the activity center such as work area, school, administration, shopping, business, fitness, and amusement center.

To reach the activities center, surrounded Jakarta's citizens or Jakarta's citizens itself need to spend more effort in energy and time. The mileage to one area that is far enough also causes the duration of commute time, therefore modes of transportation are still needed for reach out those area. Unfortunately, transportation modes used in Jakarta and its surrounded are not used efficiently yet, either implemented by private vehicles or public transportations, as seen in train station, there are still some queue of passengers that are accumulate in peron area. The queue could be happen in a long time because the intensity of fleets that come are still slightly, which is about 5-10 minutes. The mobilization that related to mileage and time could be illustrated as the following figure:

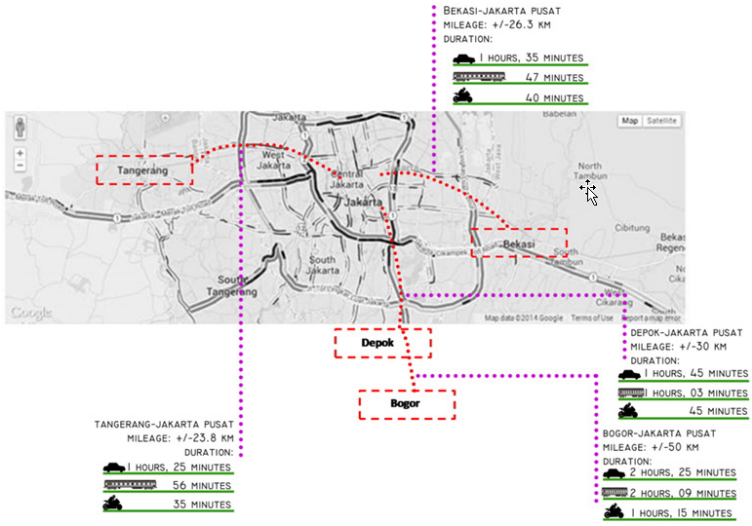


Figure 2. Duration of Commute Time Prediction Source: http://id.techinasia.com/, accessed in 27/03/2015 (had modified)

Moreover, the activitiy centers in Jakarta also seems too spread out. For example, to fulfill a need of shopping, some citizens should go to another part of Jakarta. In some cases, the citizen of Jakarta's satellite citizens should go to Jakarta for working because the office is located in the central district. Another case also shows that the citizens of Jakarta's satellite cities should go to another Jakarta's satellite cities for study because the good education institution is located in other Jakarta's satellite cities. As the figure 4 shows the spread out of industry in Jakarta.

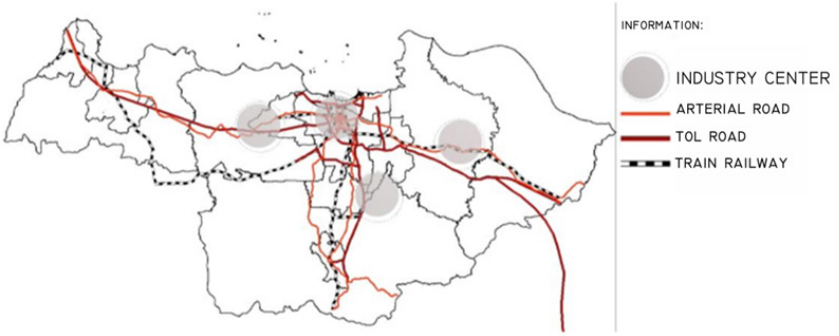


Figure 3. Jakarta Spread Out Center Industry
Source: http://sappk.itb.ac.id/, accessed in 27/03/2015

Sustainability in Jakarta Dwelling

Jakarta's Ecology

The high of mobilization happened in Jakarta could affect the ecology life in Jakarta itself. The number of motor vehicles used as connector between one area to another area may increase the carbon emition in the air. Indirectly, this situation also could affect sustainability of citizen's dwell in Jakarta. The longer traffic in an area, the more carbon emition is released. Besides the traffic that is not welfare to the efficiency, polution from the traffic also could decrease the quality of dwell in Jakarta.

Nowadays, there are many dwell areas are built in Jakarta's satellite cities. The dwell areas are generally more cheap, liveable, and welfare for the citizens. It is not infrequently that some people who lived in Jakarta gradually move to Jakarta's satellite cities for better dwell environment. However, some citizens who move to Jakarta's satellite cities still work in Jakarta. It is based on vary motivations, but one of the reason is economy. From the facts, we may conclude that the growth of Jakarta changes how people dwell.

Citizen's Life Style

Changes of living condition in Jakarta also affect citizens life style of Jakarta and its satellite cities. For some citizen who choose work in Jakarta and commute for long-distance everyday, there are citizens that try to spend their time in traffic by doing activity like socialize in virtual world. There are also who like to spend their time in commute by breakfast or lunch in orther when they arrive at work area, they are ready for work. There are also people who drop by for breakfast or dinner because the commute distance is still far and they are already hungry. Meanwhile, there are also who like to take a bath in office because they do not have any time for taking a bath at living area. Those vary conditions and habituations actually could affect how long a person stay in a house or living area and how many rooms and spaces still used in that house or living area.

Dwelling & House Itself

Based on now high rate mobilization in Jakarta and its satellite cities people condition, they might not dwell in house anymore, but instead in apartment, rental house / room, or in a flat. This situation form an understanding and assumption that dwell is no need to be large because it is so rarely used by the occupants. But, do people still need dwell area? If all citizen finally wonder to reach effectiveness and efficiency without accompanied by infrastructure and economy improvement, it could be that house become something that not important anymore. But, in other side, if it truely happens, what about people who already married and had children? Is the dwelling area will no longer there anymore? Then, how is the sustainability of dwelling? For more away it is need to be proved through observation of study case, therefore it will be clear which part is really change and what about the sustainability of dwelling as human being to survive.

CASE STUDY

House would change occupant's lifestyle if its function as a zero point of human growth space were changed. Shifting in function and wide area needed in the house is formed of occupant's deal due to inside and outside house activities conflict during growth process. For an example, Mr. S's house, a household which is consist of a father (Mr. S, 51 yo/2015), a mother, and two daughters (8 years gap of age) who live in Bekasi. Mr. S's family have high mobile intensity outside house to fullfill the life activities demand, represent almost of Jabodetabek family

household type nowadays. Mr. S's house was build appropriately to all of family members' spatial needs with additional rooms in case of guests. But sometimes, because of low intensity use, the guest area adaptably changing become the rooms used to casual activities.

The changes of used area are suitably with occupant's needs & growing process. In Mr. S's house, when the second daughter was a teenager, the whole area in the house was used well & optimal. Almost all of area in the house were used with equal intensity because the occupants still had much time to spent in the house for doing activities inside.

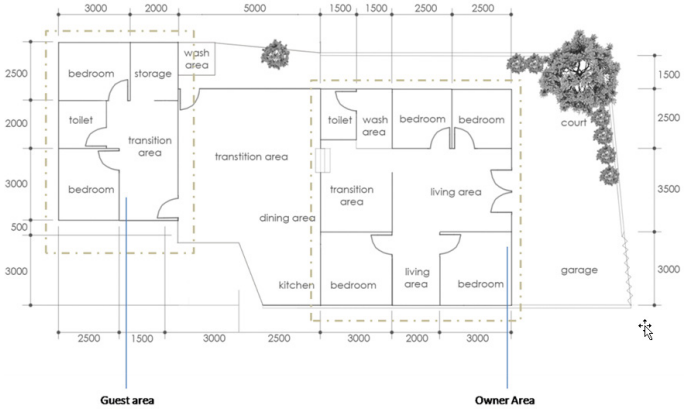


Figure 4. Mr. S's House Division - Source: Personal Illustration

Time/activities	father	mother	daughter 1	daughter 2
06.00	Leave to work (garage)	Tiding up (a whole house)	Goes to Campus (garage)	Goes to School (garage)
07.00		Washing up (WA)		
08.00				
09.00				
10.00				Study in School
11.00				
12.00	work			
13.00		Praying (R)	Study in Campus	Praying (R)
14.00		Lunch (DR)		Lunch (DR)
15.00		Cooking (K)		Assist Cooking (K)
16.00		Take a Bath (T)		
17.00		Gathering Family (LR)	Take a Bath (T)	Take a Bath (T)
18.00	Praying (R)	Praying (R)	Praying (R)	Praying (R)
19.00	Have a dine (DR)	Have a dine (DR)	Have a dine (DR)	Have a dine (DR)
20.00	chit-chat (LR)	Chit-Chat (LR)	chit-chat (LR)	chit-chat (LR)
21.00	Watching TV (LR)	Watching TV (LR)	Watching TV (LR)	Watching TV (LR)
22.00			Studying (BR)	Studying (BR)
23.00				
24.00			Take a Sleep (BR)	Take a Sleep (BR)
01.00	Take a Sleep (BR)	Take a Sleep (BR)		
02.00				
03.00				
04.00		Cooking (K)		
05.00	Take a Bath (T) Breakfast (DR)	Take a Bath (T) Breakfast (DR)	Take a Bath (T) Breakfast (DR)	Take a Bath (T) Breakfast (DR)

Information:
R: Room
DR: Dining Room
LR: Living Room
BR: Bed Room
T: Toilet
K: Kitchen
WA: Washing Area

Figure 5. Mr. S's Family Time/Activities Daily Schedule
Source: Personal Illustration

The ratio of occupants's activities inside and outside the house was still equal. Mr. S, father, start working at 06.00 o'clock until 17.00 o'clock outside, his time remains were spent inside the house with the family. Mr. S's wife, was a household wife who was automatically spent all of her time inside the house with numbers of activities. Mr. S's first daughter also spent almost all of her time inside the house but went to campus from 06.00 o'clock until 15.00 o'clock or until 19.00 o'clock longest, so she still used her evening time in the house. And Mr. S's second daughter, at that time, was still in the elementary school, almost a whole of her time was also spent in the house. She just went to school from 06.30 o'clock until 12.00 o'clock. The much time they have, the much activities they do, the much space they use.

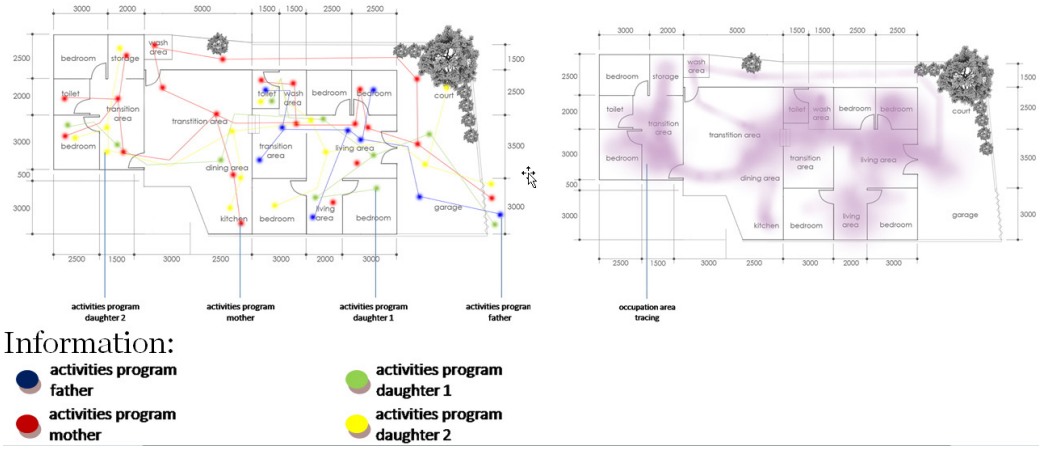


Figure 6. Mr. S's Family Spatial Mapping (left) & Mr. S's Family Spatial Map Intensity Tracing (right)
Source: Personal Illustration

Based on diagram above, regular activities did everyday in the house have becomes a habit for inhabitants. It presented the existence and identifying features of dwelling which is affirm by its occupant selves. All of area where needed by occupants are fully used. The room remains is in the guest area which is fulfilled only when the guest comes. But, that condition will change along with growing and changing of occupants' life cycle phase.

Response to life cycling changing phase, When Mr. S's second daughter was being a young adult, she has mobility demand for education in Depok. She should commute everyday from Bekasi to Depok. At the end, this phenomena change the used area in the house because of new occupants' activities. The change is caused by demands of

arrived schedule contrast with the mobility condition in the road, so the occupants need to allocate their time for balancing the conditions, as the action to deal with that realities requirement. For an example, Mr. S's second daughter goes to campus on Monday with demand to arrive in campus before 08.00 o'clock, the distance of Bekasi to Depok is 35km and velocity of public transportation is 40km/hour, so she has 52 minutes and 30 seconds time to commute. But, with the fact that Jakarta's mobility condition is quite traffic, so it may be take assumption that the velocity of public transportation is 15km/hours. In that specific condition, the commute activity from Bekasi to Depok will take 2 hours and 20 minutes time to commute. If Mr. S's second daughter must be arrived in Depok at 07.30, so she should to depart at 05.10 from the house. It means that she should make a deal with her regular activities after 05.10 o'clock in order to do not do in house.

Refers to time/activities schedule of Mr. S's family, the activities that Mr. S's second daughter usually do, the next deal is a selection of what dwelling activities that can do in the house and what that can't. If in regular day she has family breakfast at 05.30 o'clock, now she should bring her breakfast and eat it after arrived in campus. Along with the increasing of technology and communication development, chit-chat activities not only can be done when everyone gathering, but also by social media through gadget in the commute time.

Along with mobility of some activities in or to some places (some people even have same schedule with another but with different destination), a rush would be happened and made traffic in the rush hours every days. After study in campus, Mr. S's second daughter will go back from Depok at 16.00 o'clock and arrived at 18.30 o'clock. The consequence is such as prayer activity that usually did at home should be done in another place with the same time.

Time by time, the activities and the pattern of dwell changes because of the family member growth. For example, by the passing time, Mr. S's fist daughter have changing status from single to married, bringing the new occupant with his own dwelling program, Mr. S's son in law. He work in Central Jakarta. Before married he lived in Depok, but after married he lives in Bekasi. Before married he had a breakfast in the house and went to work at 06.00 o'clock, now he should goes to work at 05.10 o'clock and take a breakfast in office to avoid the late due to traffic.

The Changing of dwelling pattern will changes the room used in the house.

Because of so many activities outside the house, family member have a new habitual and new room use mapping based on their activities in short time inside the house. If there were some areas that usually used before, now it will be used rarely or even never. In Mr. S's family case, the consequence of arrive at home after dinner is family member will gathering in the living room to built a quality time with chatting each other until fall asleep. Finally, the bedroom is only used as personal storage or clothes changing area after take a bath, short frequency used. In the same time, now, living room is not only used as gathering area, but also used for another new dwelling programs and activities. That phenomenon makes some transition area spontaneously, and the best spontaneous transition area chosen is the larger which can retain a lot of activities of all members. The point is, there is a room hierarchy that can fill occupants needs based on intensity of used caused by time limit to stay in house. In this phase, the need of dwelling area becomes smaller and more flexible, but more specific to basic needs.

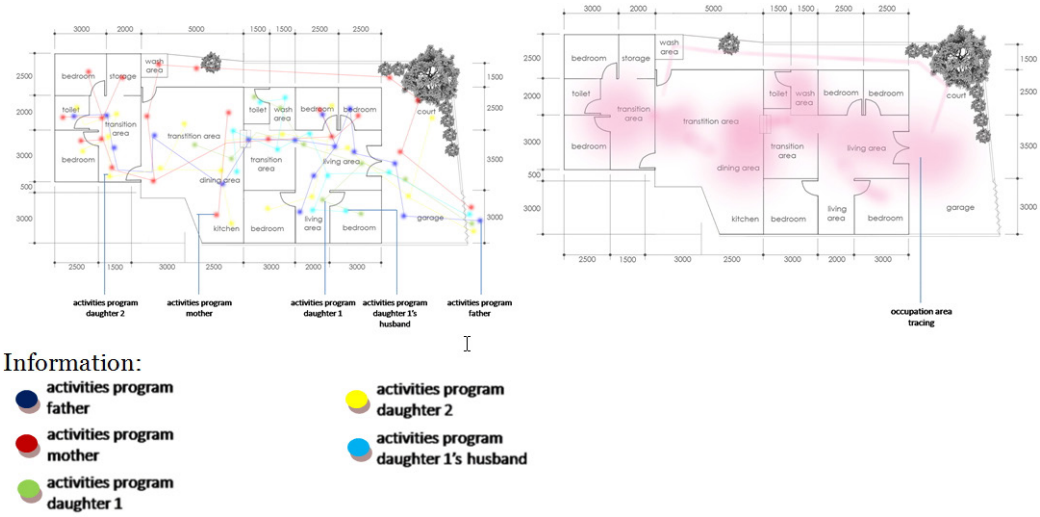


Figure 7. Change of Mr. S's Family Spatial Mapping based on Growth Factor (left) & Change of Mr. S's Family Spatial Map Intensity Tracing (right)
Source: Personal Illustration

Mr. S case study explains that dwelling activities depends on the occupants growth process. People growing and their life phase changes their needs of spaces. In Jakarta context, people will make a deal with activities, spaces, and times they have to fill the needs of dwelling. In the long future, young people will have a lot of activities in many places caused the house might be used rarely or even not needed anymore. The less activities did, the less rooms needed.

The development of knowledge, mindset, and technology has a significant role to make activities dispersed in many places. There are changes in pattern and lifestyle society from generation to generation, so it is possible if people becomes so mobile, so many times than now, until they have no activities should did in the space called house. Learn from Mr. S's family, kind of jobs and marriage status become a significant factor that change the needs of occupants dwelling activities. For that reason, the next explanation will present a new participant who have different status, pattern, and life style with Mr. S's family but still represent an urban commute people around Jakarta.

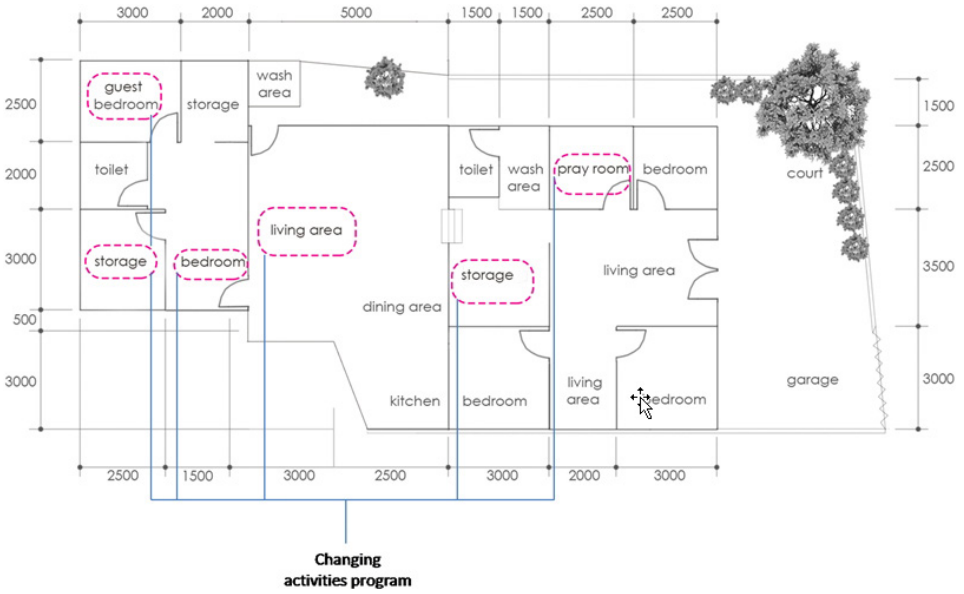


Figure 8. Mr. S's Family Changing Spatial Program
Source: Personal Illustratio

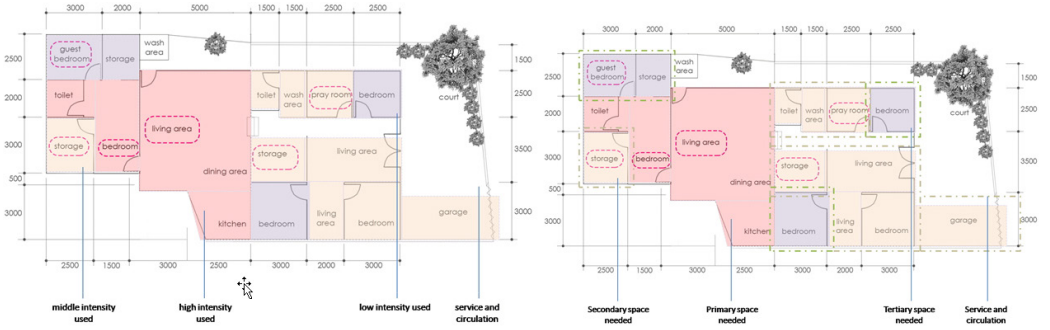


Figure 9. Mr. S's Family Changing Spatial Program based on Intensity Used (left) & Mr. S's Family Changing Spatial Program based on Intensity Used (right)
Source: Personal Illustration

Kind of Jobs

Working is one of activities that fill more than a third human life time, that's why working activities will influence human life style. In this context, kind of jobs is also interfere human pattern of dwelling, just because working activities depends on kind of job did. For example, Mr. S, a father who lives in Bekasi and works in industrial block in Cibitung, will have a different mobility and dwelling pattern with Mr. RJ who is a single man lives in Bogor and works in Cilandak, South Jakarta.

To commute from house to office, Mr. S needs 45 minutes but Mr. RJ needs 1 hour and 15 minutes. Both of them are engineer, they start working at 08.00 o'clock and finish at 17.00 o'clock every day, but sometimes they should give their weekend for overtime work. Mr. RJ has more additional job than Mr. S, he also should check and make a framework for his worker every days. So many jobs to do but limited time to work make the time is so precious for him. It is very reasonable if he decide to rent a room near the office to solve his inefficiency commutes time. Based on that explanation, there is a comparison between two conditions of dwelling shifting pattern that happen to commute people around Jakarta. The validity statement of dwelling shifting pattern is everyday repeating condition that made people built a new perception of their surrounding spaces. They will have become accustomed by that places and that new perception will obscure the public private boundaries. The dining area or other main activites are not placed in the house but in the office.

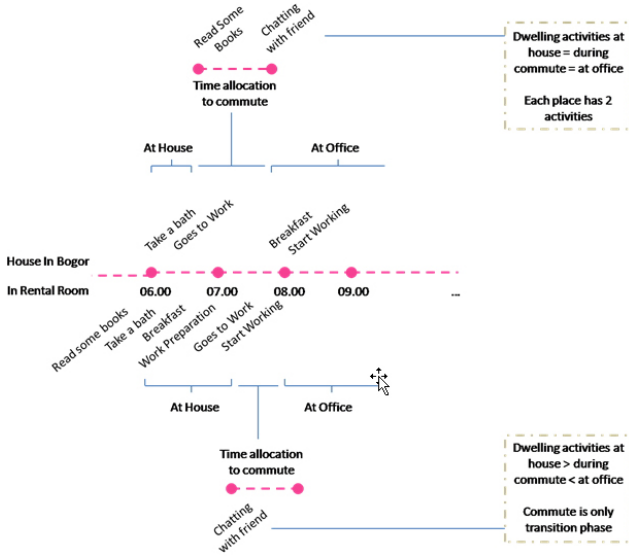


Figure 10. Differences Dwell Activities and Space of Mr. RJ
Source: Personal Illustration

Beside that, the decision to rent a room near the office has made Mr. RJ perception of spacial needs changing. By the reason his rent room is only used to stay after work, with notabene only a short time live there, Mr. RJ just need a little space to do less activities in his limited time inside house. Indirectly, it make Mr. RJ dwelling activities not placed inside his room only but also dispersed in many places.

This shifting dwelling activities phenomena is also happen significantly to Mr. BS, husband of Mr. S's first daughter, a man who works in Sudirman, Central Jakarta, and lives in Bekasi. Mr. BS works as field engineer supervisor of a telecomunication company based in Jakarta. His jobs require a high carefulness to maintain the signal transmitter that usually take long times. Because he does not decide to rent a house near with office, Mr. BS should do some of his dwelling activities not in house. In some cases, because of jobs demand, he decide to stay all night long in office with already prepared the clothes, sleeping outfit, sanitary equipment, and food supply in his cubical before. This action states that Mr. BS has ready and prepared about doing dwelling activities not only in the sspacial surrounding called house, but also in another spaces that can fulfill all the everyday needs.

Based on those cases, both of them have similar mobility problem to fulfill life needs by working in far place. On the other hand, both of them have their own strategy to deal with their conditions. It also could be summerised that both of them are representation of Jakarta's commuter population whose experience a mindset shifting ended with spaces needs shifitng to dwelling. Here, we know that comprehention of occupation nowadays are influenced by epochal demands. Specifically, as long as mobility problems is not solved yet, public & private concept to did dwelling activities will be grey and can be did in anyplaces.

More over, despite both of them has a similar factor as an actor of commuter population in Jakarta, Mr. RJ and Mr. BS have a significant difference to did dwelling activities in their routine, that is marriage status. Mr. RJ is a single man but Mr. BS is a married man. This status, at the end, will affect decision making process of these men to make a strategies dealing with their dwelling condition and reality as an urban commute people.

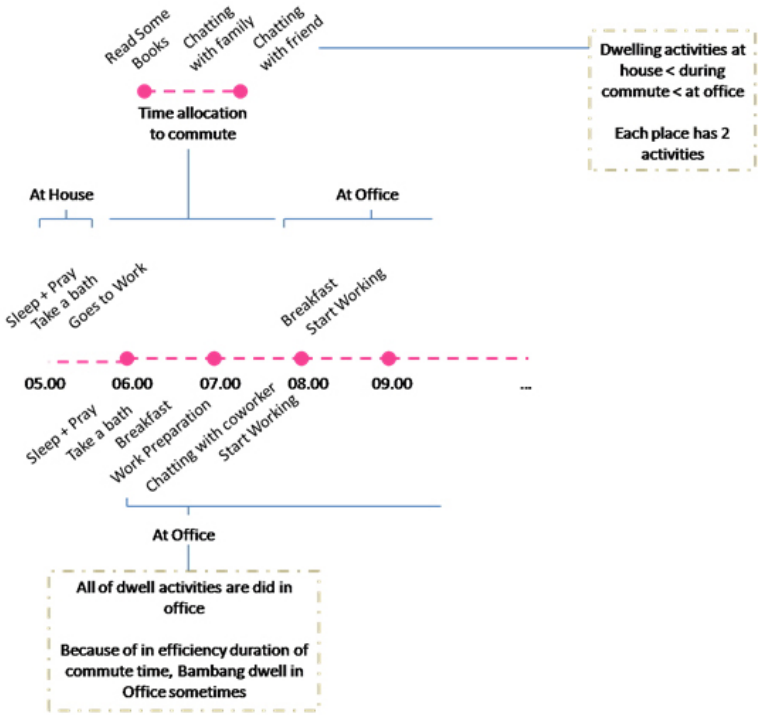


Figure 11. Differences Dwell Activities and Space of Mr. BS
Source: Personal Illustration

Marriage Status

Marriage status becomes the special one of several factors that affects decision making process because of other people existence. Instinctively, human will choose to live with people who they loved the most by mutual caring and accompanying each other. Because of this case context is about the possibility of dwelling activities which is not stayed in one place, the status of marriage becomes importance. It is also important because marriage status unite the emotional factor which is could not translated into special context clearly and easily.

Mr. BS stated that sometimes he chooses half day working, do activities in the house, and go back to office in the evening just to maintain his quality time with family beside weekend days off. He also stated that he does not choose to rent a house near the office just because the condition is not suitable for family living there. On the other hand, Mr. RJ just allocates his weekend days off to do a quality time with his family. So, there is no reason for him to stay longer in the house because there is no emotional

relationship affects his decision with other people to stay. Here, we know that both of them have different dwelling shifting rhythm. The rhythm for married people is more rigid, depends on someone/something but for single people is more flexible, depends on their routine needs.

Based on those two variables, we know that dwelling activity is easy to change, shift, and disperse, for people whose high intensity to commute. On the other hand, dwelling pattern which they have also depends on kind of job and marriage status and makes them have their own value to decide something. For kind of dwelling in the commute condition like this, issues of life demands, marriage status, kind of job, direction and destination, distance, velocity, and how long the time took are really important to affect human succession to respond their special surroundings. House might be not exist anymore, but everyone still need the zero point in special form to unite their past, present, and future meeting all of phase of their life.

CONCLUSION

People survive for their viability by keep doing their activities. People as human being will always dwell, as long as they live whether in a house, apartment, rental house, rental room, flat, mansion, or dormitory because by remain having their own dwelling area, people sometimes could do their private activities freely and also could form their memories about home in their mind.

Meanwhile, in the future time, if the infrastuctures are still inadquate, the numbers of population continue to rise, and the fulfillment of activities must be passed by far mileage and long duration of commute time, the dwell area maybe no longer used optimally. People start making strategy as a tactic to keep doing their dwelling activities that could not be done in dwell area because of the limited time. The strategy conducted by some dwelling activities while they are commute. Slowly, it will minimize the area of dwelling space and make it used optimally.

Formerly, dwelling area was large enough because many dwell activities done in dwelling area, like breakfast together with all family members, play something together with siblings, talk with neighbourhood in the afternoon with a cup of tea, or read a book under a tree in front of house. But nowadays, when people are not too often stay in the dwelling area and dwell activities could be done outside dwell area, therefore the space needed for dwelling is may not be so large anymore.

However the dwelling area is rarely used, it does not mean someday it will be disappear. Despite people rarely use dwelling area for doing activities, the dwelling area is always needed, either for single person, or for people who live with family, eventhough the dwelling area is not a house and not a home or in the reduced size space.

Then, what is house? House is a place where people could dwell. Would people find any new concept of dwelling without house? Yes, it is possible for people to not dwell in the house anymore. People may dwell in a house or not. Someday, it is possible that house is not exist anymore, but it could not apply for dwell. So how is sustainability of human cycle pattern in the future? Based on the explanations before, in the future, people may no need a house, but they still need a place to dwell. Not only a house, it could be another place but of course a place that is different with the working place. Later on, a house could be extinct "for living", but dwelling would be exist wherever the people are.

REFERENCES

Allen, Matthew David. (2005). Towards a Nomadic Theory of Architecture: Shelter, Dwelling, and Their Alternatives in Architecture of Homelessness. Washington: University of Washington Comparative, History of Ideas program.

Batty, Michael. (2012). "Spatial Interaction", Encyclopedia of Geographic Information Science. Ed. Thousand Oaks, CA SAGE: 2007. 417-19: SAGE Reference Online, Web.

Douglas, Mary. (1991). The Idea of Home: A Kind of Space. New School for Social Research: Social Research, Vol. 58, No. 1.

Heidegger, Martin. (1971). Building Thinking Dwelling (in Poetry, Language, Thought). New York, USA: Harper Colophon Books.

Viantari, Dimitra. (2012). Gejala Dekonsentrasi Perkotaan Menurut Perspektif Industri di Wilayah Jakarta dan Sekitarnya. Jurnal Perencanaan Wilayah dan Kota A SAPPK V1N1, 231-240. http://sappk.itb.ac.id/jpwk1/wp-content/uploads/2014/04/231-240.pdf, accessed in 27/03/2015.

ATTACHMENT TO PLACE AS THE MEANS OF DWELLING: A CASE STUDY OF VICTORIA PARK, HONG KONG

Ivan Nasution[1]*

[1]Centre for Sustainable Asian Cities, National University of Singapore
*ivan.nasution@gmail.com

ABSTRACT
Dwelling is attained only by means of building. The problem arises when "building" is becoming difficult to be achieved by individuals in big cities. Cities are built by compensating the rapid process with proximity to the economy and social relation. As consequences, cities were not constructed by its dwellers. With the rapid pace of immigration and urbanisation, the process of dwelling through building becomes impossible. If "building" cannot be the basis of dwelling in the city, then do the city dwellers dwell in the city? Moreover, what is the basis for "dwelling" in the city?

This paper argues that "dwelling" in the city is related to people's attachment to public space. The means of attachment is by redefining one's identity in the space. Urban appropriation often occurs in the process. The statement will be argued by series of phenomenological observations conducted in two case studies in Hong Kong. The cases will illustrate the act of associating oneself with public space by appropriating it has similar quality or attributes of the act of dwelling.

Key Words: dwelling the public space, attachment to place, appropriation of space

INTRODUCTION

In "Building Dwelling Thinking", Heidegger (1971) emphasise the

inseparable relationship of "building" and "dwelling". He claimed that "only if we are capable of dwelling, only then can we build" (p. 160). Today, in the metropolitan cities, however, the major challenge for dwelling is the chance of building. As we know most of the cities we know today was planned and built by the city planners and developers, not by the people who live in it. Moreover, the buildings for people to dwell are often mass produced, thus, no significant distinction between one building to another. In that argument, people are not immediately related to the process of building and the actual buildings themselves. If so, do people dwell in the city?

As people desire a proximity to the economy and social relation, the city becomes denser with people and activities, and, in consequences, space becomes a precious commodity (Uytenhaak, 2008). Cities are filled with the commodification of space, whether formal, e.g. developer builds as dense as possible to gain profit from high land price or informal, e.g. people squat the public space in order to survive. Specifically for informal commodification, it grows over time that the space occupied often associated with the people who squat it. For example, Victoria Park in Hong Kong is often associated with a group of Indonesian domestic workers that squat it regularly on Sunday. In this case, can we say that this group of domestic workers has a *place* in the city, and thus, they "dwell" in the city by the means of attaching themselves to the public space?

This paper will argue that attachment to place shapes the process of dwelling in the city. The means of attaching oneself to a place is by having control over a space or an "authority" to rearrange it. Thus, the main question is whether an act of appropriation of public space, for example, the street vendors can be called an act of "dwelling" by the means of public space? If we assume that, however, will the instability and temporality of dwelling a public space be contradicting with the meaning of dwelling itself where one "have a *place*"? This argument will be narrated by empirical studies of urban appropriation in Hong Kong.

THEORETICAL DISCUSSION

Heidegger (1971) argues that dwelling is neither equal to shelter nor building; dwelling is making a "place" where one *feels at home*. As he illustrated, residential buildings may provide shelter, yet do not necessarily ensure that people will dwell in them. On the other hand, people may not take shelter in a building but they have a "place" there, for example, truck driver on the highway, working woman in mills, or engineer in the

power station (pp. 143-144). A thing, for example, highway or bridges, can gathers, so called, the fourfold (sky, earth, people and a sense of spiritual reverence) that allows a location comes into being, and subsequently, the existence of a location allows a space comes into being (pp. 151-152). Buildings or things allow locations to evolve into a space. Moreover, space, in turns, will provide a "place" for a man.

In the field of geography, Yi-Fu Tuan is one of the leading scholars that discuss thoroughly in the relation of "space" and "place". He argues that understanding the idea of "place" is needed to define the meaning of "space" (Tuan, 1977). A space is generic and abstract, infinite, bounded, open and empty. On the other hand, a place is "immediate, concrete, particular, bounded, finite, and unique" (Walter 1988 in Ryden, 1993, pp. 37). Tuan (1979) argues that place is a space with a meaning given by people, as such, "space provides the context for places but derives its meaning from particular places" (Relph, 1976, pp.8). Even then it should not be misunderstood that space is merely a container for a place. Rather space and place is a dialectical relationship that unfolds the understanding of the former defined by the latter, and in turn the latter derives its meaning from the former. For the purpose of this paper, the discussion implies that a "place" is the consequences of "space", although, not every space can be a place.

As we understand the dialectical relationship between space and place, the same relationship may occur between place and man, as such, when man gives a meaning to a space (and evolves into place), in return, the place will give him a meaning. Relph argues that to understand a place, one needs to identify its three components, (1) the physical setting of the place (i.e. spatial conditions), (2) the activities, situations and events, and (3) the individual and group meanings to it (Relph, 1976 in Seamon and Sowers, 2008). Relph suggested that the tripartite related to the "identity" of a man *of* and *with* the place. The strongest sense of place is formed when one has a "deep, unself-conscious immersion in place and the experience most people know when they are at home in their community and region" or also called "existential insideness" (pp. 45). Relph defines insideness as the level of attachment, engagement and concern of a group or a person towards a particular place. The stronger one's identity to a place, one can feel the "insideness" of the place. Thus, one will feel safe, enclosed and ease. It implies that one will give meaning and relate themselves to a place if they feel at home, which resonance with the concept we discussed earlier of "having a place". What is the nature of this relationship?

Heidegger also mentioned that dwelling is the relation between man and space. Men only can experience spaces by persisting in them (pp. 155). It is to say that we can only go through spaces by being conscious of locating ourselves in it and being aware of the things in the surrounding. In sociology, place refers to one's position in society while, in geography, it refers to a spatial location (Tuan, 1979). However, some scholars find convincing to the clarity of the first definition than the abstract meaning of the second ones (for example, Greene, 1968 in Tuan, 1979), while others argue that spatial location derived from one's position in society rather than the opposite (for example, Sorokin, 1964). In short, a place is where one found a meaning in a space; one found themselves in a place. Therefore, the relationship between man and space (and place) is somewhat dialectical and dependent, i.e. man gives a space meaning to evolve into a place, and in turn the place defines the identity man. However, coming back to the essential questions, how spaces are produced in the first place and what are the reasons for this production?

Space production is a way of imposing an identity of a group of people into a space. Spatial pattern is not neutral and innocent (Tunas, 2013). Space and its patterns are socially produced, which involves discrimination, injustice and cultural and political superiority of a race, gender or nationality towards others (Soja, 2010).

In fact, according to Lefebvre (1974), among the three-fold of space, the perceived space (i.e. spatial practice) and lived space (i.e. representational space) are produced in relation to the everydayness of the people. The former represents a space as an act of production and reproduction of a society within particular location; the latter refers to a mental construction on how actually the space directly lived through its complex associated meaning, images and symbols (p. 39). Thus, a production of space is more than just a manifestation of an economic or survival acts. Moreover, we can argue that the relationship between man and space is not merely an economical.

In fact, a space contains traces of the mental space of its inhabitants in their everydayness (van Schaik, 2008). He proposed that architecture (and its spatial implication) be a product of a product of mental space. Individual constructs his/her spatial history from memories of his/her spatial experiences, and thus, spatial history constructs an individual mental space. Although, mapping individual mental space is a difficult task, yet, the traces are evident in the space that he/she produced. Moreover, the position of human and space are equal, i.e. human produce spaces and the spaces

reproduce human and continue. Thus, accumulation and juxtaposition of layers of spaces and mental spaces are continuously reshaping and refining the space itself. Thus, cities are the traces of tangible manifestation of the mental space of the citizens (p.59). Buildings and public spaces are superimposed in layers by a generation after a generation. Even then, cities are far more complex than just a representation of a mental space. However, on a scale of a neighborhood (for example, a size of a street or community park) the manifestation of a shared mental space by a group of people can be more apparent. It also means that these spaces represent a certain way of life (lifestyle) or characteristics of its inhabitants.

As we know, people defined a place by giving a meaning to a space, however, "people are defined first by their position in society: their characteristic and lifestyle follow" (Tuan, 1979, pp. 409). To discuss character and lifestyle of a group of people, it is appropriate to bring "Habitus" into the discussion. Habitus is a systematic distinction that is chosen consciously, which makes a unity of behaviour of a person or a group of people – *lifestyle* (Bourdieu, 2005, pp. 44). In other words, habitus is *non-natural* acquired characteristics generated by social experiences and education. However, habitus is not merely a repetition, instead a generative grammar that allows inventions and improvisations within given boundary (pp. 46). However, only when people are misfits and confronted with the existing structures, then innovations may appear to challenge the consensus (pp. 47). It means that the struggle is the central aspect of the invention. Bourdieu (1990 in Hillier and Rooksby, 2005) introduced the term "field" for socially constructed space that is filled with conflicts, competition and struggle of an actor to play "games" to achieve his/her objectives. Thus, the concept is crucial to understand relationship of one's behaviours to their action in a given space in relation to available resources, their view of the space, their ideological viewpoints, and their perception (pp. 23).

Habraken (2000, p. 8) argues that control is the "central operational relationship between humans and all matter that is stuff of built environment". Control is not equal to ownership (p. 19). Controlling a space means the ability to defend and repel the unwanted intrusion into a defined space. Thus, defining a territory is the very act of inhabiting the space, and the ability to rearrange things within the defined territory is an act of claiming one's territory in space (p. 127). Habraken further argues that the act of occupation marks the extent of the claim. For example, in a corridor of an apartment building, one may place furniture, potted plants or a parasol to identify his/her territorial claims. In fact, the

manifestation of territorial claims is the ability to control the configuration of space. Furthermore, the smallest scale of controlling configuration of space is merely by one's presence in a space. Even in public space that is communally shared, one's presence and interacting or using a certain thing or an area in public space is already marking the "instant territorial configuration" of a space (p. 160). Thus, as configurations do not appear in a vacuum, the act of temporarily occupying or appropriating the space, for example, public space, suggests a territorial presence.

Therefore, as occupation and appropriation of space in daily life suggested control and territorial presence; and by claiming territorial presence suggested man found their life style and identity in a place; and to define one's identity in a place, he/she have to feel at home; and thus, it suggests that man's attachment to a place inherits similar attributes the act of dwelling.

METHODOLOGY

To unfold the people's behaviour in dwelling a "place", it is appropriate to use phenomenology as a central methodology of this research. Phenomenology does not take the obvious things for granted. Instead, it questions the attitudes and assumptions in daily life experience, as well as the realm of conceptual perspectives and explanations (Seamon and Sowers, 2008). As argued by Seamon (2000), in environmental design, phenomenology might cultivate both intellectual and emotional sensibilities in seeing the environment behaviour. As such, one's understanding may be more holistic. It relies on the interpretation of human experience in a certain situation. It aims "to examine and clarify human situations, events, meanings, and experiences" (p. 157) in daily life to describe rigorously the human life as "as it is lived and reflected upon in all of its first-person concreteness, urgency, and ambiguity" (Pollio, Henley, & Thompson, 1996, p. 5).

However, as suggested by Seamon (2000), there are two major assumptions to take in adopting this method, namely, **person and world as intimately part and parcel** and **a radical empiricism**. The first assumption emphasises on the relationship of man existence with their world. It develops the argument of *intentionality* that suggests "human experience and consciousness necessarily involve some aspect of the world as their object, which, reciprocally, provides the context for the meaning of experience and consciousness" (p. 161). Furthermore, the central notion of this assumption is the *lifeworld* – the daily life context –

and the place, which we have discussed earlier. The second assumption deals with the means and attitude of studying the first assumption. The researcher pursues to be exposed to the phenomenon to allow it to reveal its complexity through researcher's involvement and understanding. Thus, to claim this radical empiricism, the researcher must: (1) have direct contact with the phenomenon, (2) assume that he/she does not know the phenomenon but wish to know it, and (3) depicts human experience in experiential terms.

Due to mainly relying on the subjectivity of the researcher, *trustworthiness* is the main limitations of this method. *Interpretive appropriateness* is the major doubt, how one can ensure the accuracy of placing the knowledge synthesised from experience into an appropriate theory (Seamon, 2000). However, several scholars have proposed criteria to validate the trustworthiness of phenomenological interpretation. For example, Polkinghorne (1983, p. 46) suggested four criteria, namely, vividness (sense of reality and honesty), accuracy (the believability of the phenomenon), richness (aesthetic depth and quality), and elegance (sharpness of the revelation).

To stage the phenomenology in the more objective view, however, further elaboration of the context of the phenomenon is necessary. Thus, in the description, observation of the built environment will be elaborated as through as possible. The lifeworld or context will be elaborated explicitly using the analysis of the physical structure of the built environment developed by John Habraken (2000). The analysis will include *live configuration, levels, equilibrium, the identity of the agents, dominance and dependence,* and *control distribution. Live configuration* means an arrangement that is actively controlled and reconfigured by a single agent (p. 18). The domain of the configuration is called *levels*. Good configurations require *equilibrium*, a situation that structured to ensure stability and prevent imbalance while allowing continuous transformation (p.27). *Agents* play a role in arranging the configurations. Some agents have more resources than the others. Thus, negotiation and consensus are needed to maintain the equilibrium of the built environment. However, levels inherited the "asymmetrical relationship between live configurations", i.e. a *domination* and *dependence*. A "higher-level configuration dominates the lower-level, and the latter is dependent on the former" (p. 32). Given such conditions, control distribution exists in different levels. Single level distribution is called *horizontal* control, while if involves number of levels of distribution are called *vertical* control.

CASE STUDY OBSERVATIONS

Phenomenological observations were conducted within the population of domestic workers in high-density and high-intensity environments of Hong Kong. The observations focused on the phenomenon of the appropriation of space that later gives an attachment to place in the case of *Victoria Park*. The cases put forward an act appropriation as a means of attachment to public space. The observation will identify the six components of the physical structure of built environment, namely, live configurations, levels, equilibrium, agents, dominance and dependence, and control distribution. However, such components will be elaborated implicitly or explicitly within the narrative of the case studies.

The narrative mainly comprises of four main aspects: existing spatial conditions as the domain of the appropriation, the description of the live configuration (i.e. architectural/spatial elements used to produce new conditions of space) arranged by agents, certain dominancy and dependence of the appropriation, and various activities or usage of space within a particular timeframe as results. Often, the surrounding context becomes the point of the departures of a particular phenomenon. The analyses of these case studies are also accompanied by the insights from the review on secondary sources and in-depth interview with different actors.

Introduction: Precariousness of the domestic workers

According to ethnographic research conducted by Moira Zoitl (2008), the domestic workers are living in precarious conditions in Hong Kong. They are voluntarily displacing themselves from the familiar setting called "home" in their origin country to strive for a better living in another environment. In the "new home", they occupied very limited space within the employers' house; some even sleep in the common room or share a bedroom with an elderly. Their employment status is uncertain; often their contracts are temporary, without any assurance to be extended. Being alienated and suppressed by the dynamics of the city and the cultural identity of the majority of the population, the migrant domestic workers lost their sense of home and identity. With such precariousness, these domestic workers developed minimal association and participation in the way of life of the locals (French, 1986). Thus, in order to regain their identity, they have to start a new process of dwelling. However with the limitations and restrictions, they have minimal chance to dwell in the living spaces of their daily life.

Being economic, socially, and culturally marginalized by the daily life in the new place, they try to redefine their identity and place in society. They strengthen the relationship and network within the own ethnic group who share same values and aspirations. However, this network requires defining a territory to claim their existence. The only available options in the city that often vacant and without ownership are the public spaces. Moreover, the means to attach by having a control over them is by occupying and appropriating them.

Sunday is the official holiday for around 300,000 plus domestic workers in Hong Kong. Filipinos and Indonesian domestic workers gather and express themselves in the public place, and often appropriating it. In the past, such activities are neglected by the larger public due to the inconvenience caused by this act of appropriation. These 'invasion' are slowly accepted after the government ensures the safety and hygiene in the public areas affected by these activities (Singh, 2013). Such small adjustment on the policy accommodates the need for the domestic workers without sacrificing the convenience of other stakeholders that use the public space.

Victoria Park

Victoria Park is known as the largest park in Hong Kong with an area of 17 hectares. It is equipped with different program and facilities, such as outdoor swimming pool, sports facilities, children playground and even a mini zoo. In contrast to the dense urban fabric, Victoria Park can be seen as an exception in the city. However, strangely enough, the Park is often occupied not by the local inhabitants of the city, but Indonesian domestic workers.

Hundreds of workers filled the Park on Sunday morning. They often crowd the surrounding area and the streets leading to the Park and express their identity in various ways. Identity here can be defined as *lifestyle* that these workers adopt, especially in the way they dress and various productive activities that they do. These workers often imitate the way the local inhabitants dressed to be accepted in the daily life of the city. However, with the native touch of the domestic workers, the style has become something else. The various mix-and-match way of dressing can be found in the Park. It feels like an open air theater. It is difficult to distinguish between performers and spectators (fig. 1). The massive presence of the domestic workers in the Park signifies the "instant territorial configuration" as one of the keys of the territorial claims, to have control over a space.

Figure 1. Sunday morning in Victoria Park as an "instant territorial configuration."
Source: Ivan Nasution, 2013

The reason behind the productive activities is also not simple. The uncertainty of the employment status forced them to train new skills to prepare for the worst. Thus, the park is not only a creative expression of one's identity but also one's struggle to be productive in order to sustain her life. In one corner, one can found a group of women with hijab practicing tambourine and singing qasida (fig. 2), while in other corners a group of domestic workers are sitting in circle and reciting Qur'an (fig. 3). In other parts of the Park, other groups are practicing make-up skills, photography or traditional dance, such as Jaipong dance or Kuda Lumping. Such conditions are vividly captured in a movie titled "Minggu Pagi di Victoria Park" (2010).

Figure 2. Qasida group practicing in Victoria Park
Source: Ivan Nasution, 2013

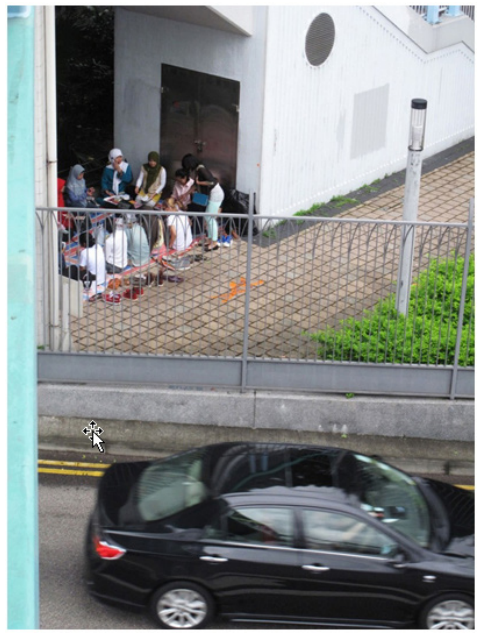


Figure 3. Reciting Quran
Source: Ivan Nasution, 2013

The park is a place to reconnect network of friends from the similar ethnic group (fig. 4). The Park is a safe haven for these workers to retreat from their daily life. Both in reality and the movie portrays the struggles of Indonesian domestic workers in Hong Kong in the daily life. Some domestic workers even deal with physical and sexual abuse or other injustices. In the movie, one of the protagonist-antagonist, Sekar, who was an innocent country girl, are forced to become a prostitute to pay her debt to a credit company. Due to precarious condition and the debt, she doubts her identity and slowly tries to wipe it to become invisible. By doing so, she can 'walks' around unnoticeable in order to survive the city. However, at the end of the movie, the main protagonist, Sekar's sister, Mayang helps Sekar to reconcile her memories and identities. One of the means to do that is by bringing Sekar back to Victoria Park to regain her identity by reuniting with her friends. She feel safe and has a place back in the community in the Park.

The Park is a symbol to struggle for freedom and democracy, to have a voice in talks about the injustice. The workers often use the Park to protest on the employment law that inflict them, to defend their fellow workers that physically or sexually abused to have justice, or to have a say about their home country president candidate. By having physical territory in the

Park, the domestic workers are regaining and becoming politically aware of their identity as a mass. By doing so, the local inhabitants starting to acknowledge the existence of these workers. Thus, the Park helps these workers to reconnect themselves to the daily life of the city. Moreover, thus, they have a place in the society.

Figure 4. Reconnect friends from similar ethnic group
Source: Ivan Nasution, 2013

CONCLUSION

Built environment comprises of both physical settings and the actors who create and act in it. Due to its ever-changing nature, built environment resembles "an organism more than an artefact" (pp. 6). However, certain values are represented in the built environment, including public spaces and passed on to generations. In fact, the only way that built an environment can thrive is when people find it worth to actively involved in "renewing, altering and expanding it" (pp. 7).

As shown in the case study observed, the displaced population that have lost their "home" and identity, attempt to find their identity place in the public spaces of the city. They reconcile and redefine their identity first by reconnecting themselves to other people from the same origins. The struggle in the daily life, these workers brings its expression in public space. Moreover, thus, it brings a common symbolical value to the space. Place as the locus of this identity reconciliation. Through the means of temporarily occupying and appropriating public space by having a massive presence in a park, the workers give a meaning to the public space. A recreational space (the Park) are turned into a place where social, political and economical activities can take place. Time and events are the only things that separate it. In times, the place gives an identity to them. Moreover, in order to sustain their identity, the domestic workers developed a common understanding to resist the alienation by the city or the lack of privacy in their employers' house,

and work collectively to achieve a common goal. Thus, only if we capable of appropriating, then we can dwell.

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REFERENCES

Bourdieu, P. (2005). Habitus in Hillier, J. and Rooksby, E. (Eds.) (2005). Habitus: a Sense of Place Second Edition. Hants: Ashgate Publishing Limited.

Habraken, N.J. (2000). The Structure of The Ordinary, Form and Control in The Built Environment. London: MIT Press.

Heidegger, Martin (1971). Building Dwelling Thinking. As it appeared in Poetry, Language, Thought trans. Alfred Hofstadter. New York: Harper and Row.

Hillier, J. and Rooksby, E. (Eds.) (2005) Habitus: a Sense of Place Second Edition. Hants: Ashgate Publishing Limited.

Lefebvre, H. (2007). The Production of Space. Blackwell Publishing, Australia.

Seamon, D., and Sowers, J., (2008). Edward Relph: Place and Placelessness. In P. Hubbard, R. Kitchin and G. Valentine (Eds.) (2008) Key Texts in Human Geography. SAGE

Relph, E. (1976). Place and placelessness. London: Pion.

Ryden, Kent C. (1993). Mapping the Invisible Landscape: Folklore, Writing, and the Sense of Place, Iowa City: University of Iowa Press.

Seamon D. (2000). A Way of Seeing People and Place: Phenomenology in Environment-Behavior Research. In Wapner, S., Demick J., Yamamoto,T., and Minami H. (Eds.) (2000). Theoretical Perspectives in Environment-Behavior Research (pp. 157-78). New York: Plenum,.

Soja, E. W. (2010) Seeking Spatial Justice. Minneapolis: University of Minnesota Press.

Singh,, J.T. (2013) Sunday in the Park: Domestic workers and public space in Hong Kong. Cities of Migration [Online] 29 July 2013. Available at: http://citiesofmigration.ca/good_idea/sunday-in-the-park/

Tuan, Yi-Fu (1975). Place: An Experiential Perspective, Geographical Review, 65 (2), pp. 151-165

Tuan, Yi-Fu (1977). Space and Place: The Perspective of Experience, Minneapolis: University of Minnesota Press.

Tunas, D. (2013) Spatial injustice: Life Chances in Urban Informal Settlement, Paper presented at Spatial Justice in Asian Cities – The case of Jakarta, Jakarta.

Uytenhaak, R. (2008) Cities Full of Space: Qualities of Density. Rotterdam: 010 Publisher.
Van Schaik, L. (2008) Spatial Intelligence. Great Britain: John Wiley & Sons Ltd.
Zoitl, Moira (2008) Exchange Square. Berlin: Jovis Verlag GmBH.

TEMPORARY INHABITATION AS A STRATEGY TO ALLEVIATE NEGATIVE PERCEPTION OF UNDERGROUND TRANSIT SPACES

Enira Arvanda[1], Nevine Rafa Kusuma[2], Rini Suryantini[3]

[12]Department of Architecture, Faculty of Engineering
Universitas Indonesia
*enira28@gmail.com, **nevinerafa@gmail.com,
**rinisuryantini@gmail.com

ABSTRACT
This paper questioned about underground transit space and its future role in the city, especially Jakarta with its upcoming underground transit scheme. The common notion of transit space as non-space due to its utilitarian and lack of identity environment seems to overshadowing the space, creating certain negative perceptions and insecurities especially in underground setting. This paper will explore possibilities for dwelling in motion, creating underground transit spaces as viable public space and temporary habitable space, where people aren't always in flux, but also able to maintain their sense of selves and wellbeing. Research method used is qualitative, by literature reviews and direct observations. Case studies for this paper are existing underground transit space in Jakarta (pedestrian crossings) and proposed design for MRT Jakarta stations. Findings show that most of the spaces in our case study are conceived at utilitarian level, although one case shows interesting possibility to be further developed into livable public space. Other notable finding from the study is about how architectural/interior elements play significant role in creating atmosphere that alleviate negative perceptions and encourage temporary inhabitation to happen.

Keywords: underground, transit space, temporary inhabitation, negative perceptions

INTRODUCTION

Utilization of underground spaces can be seen in cities all over the world – mainly for mobility purposes, where it acts as transit space, a passage which connect movement from point to point in the city. Underground space as transportation facility were first built in London in 1863 (Martin, 2012), followed by Paris in early 1900. From 2014 the city of Jakarta has finally begun to build its first underground mass transportation system, where the first corridor (Lebak Bulus-Bundaran HI) is expected to operate by 2018 (PT. MRT Jakarta, 2014).

The need to develop underground space as the site of mass transportation facilities is incredibly urgent, as Jakarta might face total gridlock by 2020 (JICA,2004) due to its heavy traffic, inefficient public transportation, insufficient road growth, and scarcity of land for transportation use. Therefore, public anticipation of Jakarta MRT project is really high, many Jakartans who have gotten tired of being stuck for hours in traffic are willing to switch their private cars to a more efficient transportation mode. MRT Jakarta have the opportunity to change residents' mindset about public transportation. For a city which is based on automobility, the challenge would be to alter residents' mode of transportation from private cars to public transport voluntarily, for as we all know, public transportation have certain conflicting image, especially for women (Ceccato, 2012; Loukaitou-Sideris, Bornstein, Fink, Samuels, & Gerami, 2009; Valentine, 1990), while the use of underground space itself also bear some negative perceptions (Carmody & Sterling, 1987; Durmišević, 2002). As a consequence,to successfully make MRT Jakarta as the backbone of future transportation in the city, stakeholders need to evaluate issues related to public transportation which place in underground space and it's important to comprehend the changing paradigm of public transportation space as not only space for systems,flows and circulation in the city, but also as a site of interaction, lived space of the everyday life where actual mobility takes place (Jensen, 2008).

Thus, a careful planning needs to be done with many considerations not only on the functional and technological aspects but also on the understanding of social and human factors aspect in the design of underground transit space.

The paper will highlight findings from authors' previous research on spatial qualities of underground transit space and its effect on perception of safety and comfort of women passengers, and bridge it with strategies

needed to change daily mobility inside transit spaces into a meaningful experience for people, providing engagement with the transit environment and resulting temporary inhabitation at the in-between space.

The objective of this study is an exploration on the idea and possibilities of underground transit space as public space that are inclusive and safe, a supportive environment for positive social interactions that enrich experience and maintain people's wellbeing while practicing daily mobility.

This paper is organised into five sections. In section two, after the introduction, theoritical view on mobility and transit space will be presented. In here we will also discuss the changing paradigm of transportation space in the city. In section three, Issues related with underground transit space and strategies for achieving safety, comfort and maintaining wellbeing in underground transit space through environmental design will be shown. In section four, we will compare theoritical findings from section two and three with our findings from field survey done in several underground transit spaces that existed in Jakarta and here we will also look at several drawings from MRT Jakarta project. This section will provide a basic understanding of spatial practice at Jakarta's underground transit space and trajectory for future development. Section five will conclude this paper.

Mobility, Transit Space And The City : Theory

Mobility is not merely movement. Movement is understood as displacement of object from A to B, involves a passage of time and , simultaneously, a traversal of space (Cresswell, 2006). According to Cresswell, mobility is a socially produced motion, it is a way of being in the world because it is practiced, experienced and it is embodied. Jensen notes that people not only observe the city whilst moving through it, rather they constitute the city by practising mobility. The meaning of places in the city is constituted by the movement as much as by their morphological properties (Jensen, 2014).

Theory of mobility relates closely with the notion of space and place. In traditional (humanist and phenomenological) concept of space and place, relation between people and place are seen as static and stable in nature (Cresswell, 2004). For example, according to Tuan, dwelling and inhabitation occur within a secure geographical location,resulting sense of place, rootedness and identity (Tuan, 1977). But in the world of growing communication,technology and changing mobility where everything

is always on flux, the concept of rootedness to certain geographical location as a prerequisite of dwelling, has to be reconsidered.

Transportation facilities are space of movement, its primary goal is to facilitate flows as smooth and efficient as possible. These facilities are transitory space, it act as nodes that connect modes of transportation, hubs that mediate and control passenger circulation in-between places. Most importantly, they facilitate the exchange from individual mobility (pedestrian and automobile access) to public modes of movement (Cruceru, 2010). Transit spaces are often critiqued for being generic, "all the same", utilitarian, designed only for efficiency, a place of weak and distended sensations (Koolhaas, 1995). French scholar Marc Auge also defined transit space as non-place,merely a place but a space defined by movement, where its characteristics are mostly typical, without atmosphere,where individuals move within but without meaningful experience and interactions (Augé, 1995). Transit space experience is seen by many as alienating experience. As stated by Sennett, urban space that becomes a mere function of motion becomes less stimulating, desensitized the space and resulting disembodied experience (Sennett,1994 in Jensen,2008). These rather pessimistic views on transit space, that illustrate mobility as disadvantageous to urban public space are somewhat contradictory with the definitions of mobility above, that it is actually produced socially and generetes culture and meaning. Thus, can transit space means more than just mere flow channels? Can non place become place for temporal inhabitation?

If we take a closer look at the precedent of transit spaces today, somehow the opinions on transit space as generic, utilitarian machine-like efficiency environment where system rules, are quite true. The design language of these spaces are all about containment and movement, array of signs and symbols with universal meanings, suggesting that these places are belonging to a placeless, universal culture (Cruceru, 2010). The universal language, where everything is globalised and standardized create expression of 'sameness' that cause displaceness, a non place for passengers who are going through these spaces. The rigid system of flows, of entries and exits also create particular longing to be 'outside' and going back to reality, it clearly shows how a transit space as connectors,are actually disconnected from the city.

To change the paradigm, Jensen suggested that by understanding the city as not consists of 'enclaves' alone (fixed and bounded sites,e.g. home) but also to understand its dynamic part, the 'armatures' (infrastructure

channels and transit spaces),we will come to realize that both are actually interdependent, because our life happens inside the static enclaves and the in-between places (Jensen, 2009). In other words, transit spaces are part of urban fabrics and have the potential to become a public realm. Being on the move is in fact an embodied experience, thus we actually dwell-in motion (Urry, 2007). In accordance to Urry's notion, Jensen also explored the idea of mobile sense-making, as a way to experience meaningful engagement with the space of mobility and the pleasure in inhabiting armatures of the city (Jensen, 2009). Even the space is temporarily inhabited; there are needs to create a more meaningful mobile experience.

Underground Transit Station as Site for Temporary Inhabitation

> Travel can be a positive experience; we need not consider it pure cost … Travel can be a pleasure, if we pay attention to the human experience: the visual sequences, the opportunities to learn or to meet other people (Lynch, 1984).

As a much preferred space for transportation site, underground spaces have become interlaced with the city surface as part of urban fabrics. Despite of their ubiquitous presence in the city, the relationship between city dwellers and underground spaces, unfortunately, are not always pleasant. Underground space is still thought of as unnatural setting for human activities and its characteristics might cause undesirable effects for human psychology and physiology, thus the use of this space is still suffer from certain negative perceptions from its users (Carmody & Sterling, 1987; Durmišević, 2002; Whyte, 2009),as summarized in table 1. Hence, when functioned as transit station, the space is double-challenged. The first challenge would be to alleviate negative perceptions of underground space, while the second challenge is to enchance transit environment from 'non-place' to place of meaningful experience and encouraging temporary inhabitation.

Table 1. Reasons for Negative Perceptions of Underground Space & Transit Station

Underground Space	Transit Station
Feeling 'cut off' from the above city settings	Being in close proximities with strangers – crowding
Lack of natural light	Transport nodes are often called crime generators and crime attractors as they concentrate large flows of people and are social spaces, which make it easier for offenders to commit crime.
Lack of exterior view, inward orientation	
Claustrophobia	
Fear of structural collapse	
Fears related to safety concern	
Cultural assocation of underground spaces with death and burial	
Lack of fresh air and indoor air pollution	
Past negative experience with underground environment	

Source : (Carmody & Sterling, 1987; Ceccato, 2012; Durmisevic & Sariyildiz, 2001)

Negative perceptions of underground transit stations can create hesitation for citizens to use public transport and will influence ridership for this mode of transportation. Being inside train station is also perceived as having more risks and induce anxieties that will eventually lead to fear of crime. Fear of crime refers to the fear of being a victim of crime as opposed to the actual probability of being a victim of crime (Hale 1996; Farrall et al. 2007 in Ceccato,2012). Our perception of risk may be partly determined by the physical characteristics of a setting (Ceccato, 2012) as shown in table 2.

Table 2. Environmental conditions that give "Cues to Danger"

Conditions	Cited from
• Lack of familiarity with an environment • Darkness • Presence of certain individuals	(Warr 1990)
• Enclosed spaces with limited exit opportunities (underground passages,subway stations) • Anonymous deserted open spaces (empty public parks,etc)	Gil Valentine (1990)

• Desolation • Lack of people and activity, no one will help if a crime occurs	Loukaitou-Sideris (1999)
• Less visibility, many hiding places • 'negative' land use (liquor stores,bars,etc) • unkempt and littered settings • Grafitti/vandalism • Deteriorating buildings	Loukaitou-Sideris (2012)

Source : (Ceccato, 2012; Loukaitou-sideris, 2012)

As an important part of the larger urban fabric which also serves as public space, it is important to think of issues related to underground transit station, particularly those that are connected with physical environment and surroundings. From the previous section, we've learned that the 'de-sensing' of transit environment that lead to the notion of non-place, are caused by the physical environment of transit stations that are designed and built with only functionality in mind without much considering of human factors and further understanding of mobility as an embodied, as well as collective experience.

To make transit space works as a place with meaning where people dwell within, the planning of transit space needs to consider the relationship between body,mind and space, or the interiority of a space. Inhabitation could only occur when the inner self is able to identify itself and feels at 'ease' and intimate with a place (Perolini, 2013). As stated by Gehl, pleasantness of a place depends on protection from danger and physical harm, primarily protection from insecurity due to fear of crime (Gehl, 2011) thus, meaningful engangement with transit space, might not happen if negative perceptions and fear of crime is still associated with the space. Inhabitation suggested in this paper happens temporarily or occuring only while people are moving within or in between movements , as the characteristic of transit space itself. It is also closely linked with the notion of place-making. Temporary inhabitation could be in the form of simple basic activities such as walking leisurely,standing,sitting,seeing,hearing and talking, all of which could be developed into more complex activities. These activities only happen when people find that space could facilitate them and pleasant enough to do so. Some scholars have also remarked about the potential of underground transit space to work as public space and the importance of integrating underground transit stations to its urban context (Bernard, 1995; Cruceru, 2010; Orum & Neal, 2009). Some initiatives were done to make underground stations more humane, for example, SubArt movement by the San Francisco Bay Area Subways that

tries to re-imagine utilitarian transit corridors as vibrant public space and enchancing the experience of passengers through infusion of art inside stations (SubArt, 2015).

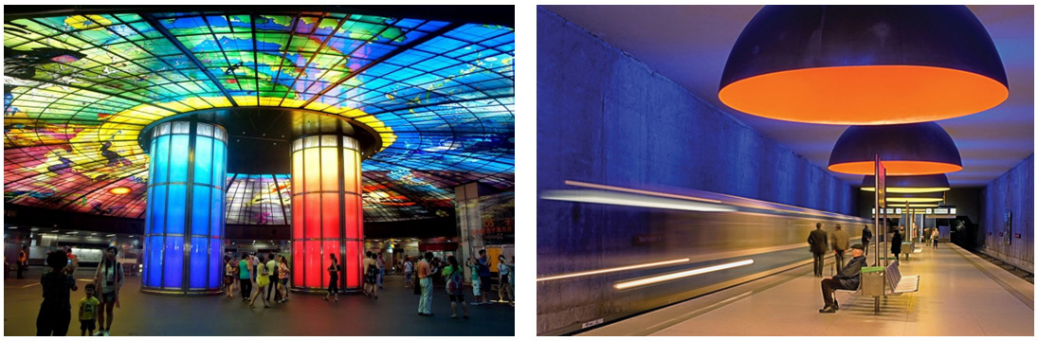


Figure 1. Stations Design that are encoraging temporary inhabitation
Source : www.subartsf.org , www.spur.org (accessed 06-01-2015)

To encourage inhabitation within underground transit space, Carmody & Sterling identify design strategies as a way to alleviate negative perceptions of underground space (Carmody & Sterling, 1987). While Durmisevic & Sariyldiz, focus on the quality measurement of space in underground stations,which are determined by *functional aspects* (connections,efficiencyofmovement),*psychologicalaspects*(publicsafety and comfort) and *form aspects* (interior elements,color,materiality,sign systems,etc).

Table 3. Key design aspects of underground transit stations to alleviate negative perceptions and encourage temporary inhabitation

Key Design Aspects		
Design Aspects	Safety Aspects	Comfort Aspects
1. Acess-Entrance/Exit (first impression, transition from inside-outside) 2. Sense of Space (view and orientation) 3. Daylighting 4. Interior Elements (creating atmosphere) 5. Mechanical Electrical System	1. Overview (good visibility,non blocking elements, reduce possible hiding places) 2. Escape (possibility to escape during emergency situations) 3. Visibility/ Light (aspects that heighten good visibility) 4. Surveillance/ Presence of people (formal and informal surveillance)	1. Wayfinding and Orientation 2. Attractiveness and Maintenance 3. Physiological Comfort (acoustic,noise level,lighting,temperature, air ventilation)

Source : (Carmody & Sterling, 1987; Durmisevic & Sariyildiz, 2001)

Case Study : Underground transit space in Jakarta

Underground space for transportation transit purposes haven't been utilized a lot in Jakarta. But during our research, we've identified several locations and analyzed those spaces. For this paper, we will discuss two underground space that function as underground passage which connect two different modes of transportation. Thus, eventhough they're not underground stations, both contexts are within transportation facilities and share some similar characteristics and issues with underground stations. Field observations were carried out for one month, data collected were tangible and intangible aspects of the space and its surroundings, analysis are made based on aspects and strategies as suggested in table 3. Objective of this case study is to compare theories from literature with the actual condition of underground transit spaces. The findings from this study will become a basis for suggestions and trajectories for the improvement of underground stations.

1. Underground Pass in Blok M Bus Terminal

Blok M terminal is one of the busiest bus terminal in Jakarta. It's strategically located in downtown and surrounded by commercial and business facilities. In 2018, Blok M will become one transit node of MRT Jakarta's first line.

The underground passage is located beneath the bus terminal, connecting different platforms of the terminal and also with the adjacent underground shopping arcade (Blok M mall), while also serve as alternative exit for passengers heading to the commercial district of Blok M.

In general, the condition of this underground passage is moderately maintained. Despite its straight functionality and stark atmosphere, there are very little signs of vandalism and deterioration of space. Formal surveillance is done by placing guard/security officers next to each exit/entrance access. While informal surveillance depends on the presence of others, which is quite a lot because the adjacent shopping mall is always full of people.

Access to and from the passage is quite problematic, especially entrances from the terminal which are difficult to recognise (see figure 2). There's no unique interior or architectural feature that could act as signifier for entrance/exit from afar. The only clue is from signage that is placed on the entrance/exit gate. This condition might disorientate and confuse

users, especially for first timer. Meanwhile, from underground pass to mall entrance, the access is quite bold, because it also acts as the shopping mall's main entrance. But to reach the access, one have to pass through the mall which layout is quite chaotic and directional signage is at war with commercial signs and displayed objects (see fig.3).This condition would possibly cause confusion and feeling of disorientation.

Figure 2. Access from terminal to underground passage
Source : Arvanda et al.,2015

Figure 3. Access from underground mall to outside
Source : Arvanda et al.,2015

Inside the passage, the ambiance is vary according to different zones. Area nearby access to terminal is rather 'flat' (bare walls,solid materials,monotone color scheme) but the mall area is lively, well-lit and clean. The high ceiling, plenty of daylight,and the use of materials that reflects light could supress the feeling of being shut and enclosed. Some rather unpleasant condition of this space is the chaotic ambiance caused by disorganised selllers' layout, and the disarray of objects and

signs. Although for some, the chaotic situation might act as spectacle during circulating movement, and thus enjoyable. The presence of various sellers also encourage users to use this passage as meeting point, or just to stroll around and pass some time. Temporary inhabitation do happen, but unfortunately the space is not actually designed as potential public space.

In conclusion, Blok M underground passage is unique because it's not solely utilitarian,the program combines functional transit space with commercial uses.Thus, activities that happen inside the passage are quite vary, resulting a lively ambience and encourage temporary inhabitation by users. Although, the spatial quality of inside and outside (the surrounding)has not integrated yet, this space is highly accessible and thus it has potential as public realm.

2. Underground Pass in Jakarta Kota Train Station
This underground passage is located in Kota, a historical area of Jakarta. It functions as pedestrian crossing that connect Jakarta Kota train station with Transjakarta station. The passage is short and has no program other than circulating users.

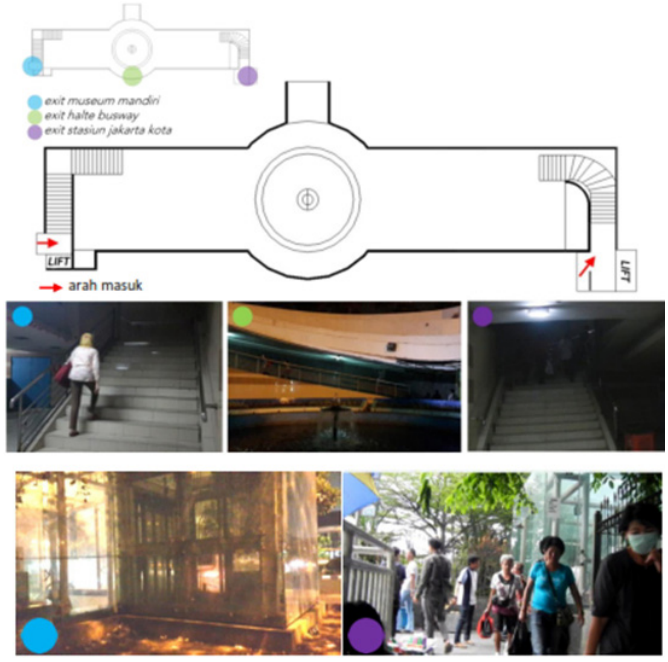


Figure 4. Access to Jakarta Kota Train underground passage and its surroundings
Source : Arvanda et al.,2015

This passage is difficult to locate from inside the station, because it's positioned at the front yard, thus one have to go outside and passing through pedestrian path alongside the station to find the entrance/exit gate. Signage system is very poor, no clear indication from both inside the station and outside the passage, although inside the passage there are adequate amount of signage. When it was first opened in 2008, the entrance became a landmark for the area because of its contemporary design and the use of materials that are contrast (steel and glass) with its surroundings. Today, the iconic entrance has become desolated due to non-proper maintenance from its operator. Interior elements inside the passage has also shown signs of deterioration : ceiling panels hanging down,broken elevator, littered floors, vandalized walls,and non functioning stair lighting. There's no presence of formal surveillance,no guard nor CCTV cameras around. In some areas of the passage,mainly the area nearby Transjakarta station's exit, are occupied by certain groups of people (homeless,street gangs,and street vendors). Those conditions contribute to the feeling of insecurities, especially for women.

The spatial quality inside this passage could actually be pleasant, the glass entrance provides ample of daylight in, and at the other side of the passage, there's a round fountain that acts as focal point (fig.5), and lead us to open space. The interplay of inside and outside is well thought of, giving the sense of balance betwen enclosed and open. Unfortunately, the space isn't maintained properly. Due to its monofunctionality, the main activity inside the passage is solely to circulate. Although, nearby the fountain we could find quite a lot of people use the surface around it to sit down,wait for someone or to gather with friends. These activities could potentially form a public life within the space, where people are encouraged to stay awhile and enjoying themselves.

Figure 5. Fountain area at the end of the passage
Source : http://chisaholic.blogspot.com/ (accessed 04-09-2015), Arvanda et al.,2015

Case Study : MRT Jakarta Underground Stations

MRT Jakarta goes by the tagline 'Increasing mobility, improving life quality'. But apparently, from their official website, the project is emphasized on the functionality, effectivity, technical and technological aspects (PT. MRT Jakarta, 2014). Their plan to increase mobility by providing efficient transportation system is clearly indicated, though, it is still unclear how the project will improve life quality in terms of social, cultural and human factors aspects.

By looking at the proposed underground station design (PT. MRT Jakarta, 2014), the basic requirements for function,efficiency,safety and comfort, as mentioned in table 3, have been applied in the design. However, there are several aspects that need to be improved in the design, to avoid the station be generic,utilitarian and machine like environment which will potentially become another non-place in the city. Based on design criterias on table 3, we can see that aspects such as quality of interior space could be developed to enchance users' experience and evoking their senses (various type of lighting-not just functional, color as signifier of place,presence of interesting architectural/interior elements as spatial landmarks, creative array of material and textures, aesthetic elements for visual pleasure). The layout also shows that the facilities provided are strictly utilitarian for the purpose of efficient flows, there are no presence of space for users to maintain their wellbeing while travelling, for example to rest awhile,to wait, nor facility for moslem praying and breastfeeding room.

Figure 6. MRT Jakarta proposed interior, concourse and platform level (rendering)
Source : http://www.jakartamrt.com/,PT MRT Jakarta

In figure 7, we can see that the entrance is very straightforward, it takes you directly to underground from pedestrian level. The design itself looks

generic, no architectural elements specific to its surrounding context, resulting resemblance to other stations in other country (see fig.7,below picture). The entrance doesn't show sensitivity to Jakarta's climate, with its heavy rainy season. Also,the landscaping around its entrance isn't targeted to stimulate senses, rather just to provide greeneries.

Figure 7. MRT Jakarta proposed entrance design (above), MRT singapore entrance design (below)
Source : PT MRT Jakarta, www.flickr.com (accessed 04-09-2015)

To summarize, the design of MRT Jakarta underground stations seem to only meet the specifications for functionality,safety,security and functional level of comfort but hasn't showed further attempts to make it as a potential public space through design elements that would encourage passengers' activities other than just transiting and circulating. Integration of underground stations with its surrounding context need also to be planned, so access to underground stations won't be secluded from public life above and alienated from its surroundings.

CONCLUSION

From the literature review in section one, it's very clear that 21st century mobility isn't just about movement and efficient flows. There's urgency to rethink about mobility space (armature) as integral part of urban fabric, and explore its potentials to create a more meaningful mobile experience and pleasure in inhabiting the space,even if it's just temporarily. To dwell-in motion. If transit space environment can be humanized, the experience of travelling in the city can be celebrated, rather than just senseless act of arrivals and departures.
From the case study section, we can see that underground transit spaces

doi:10.1080/17450100802658002
Koolhaas, R. (1995). Generic Cities. In S,M,L,XL (p. 1376). Monacelli Press.
Loukaitou-sideris, A. (2012). Safe on the Move: The Importance of the Built Environment. In V. Ceccato (Ed.), The Urban Fabric of Crime and Fear. Springer.
Loukaitou-Sideris, A., Bornstein, A., Fink, C., Samuels, L., & Gerami, S. (2009). How to Ease Women ' s Fear of Transportation Environments: Case Studies and Best Practices. San José, CA.
Lynch, K. (1984). Good City Form (p. 514). MIT Press.
Martin, A. (2012). Underground Overground: A Passenger's History of the Tube. London: Profile Books Ltd.
Orum, A. M., & Neal, Z. P. (2009). Common Ground? Readings and Reflections on Public Space (Taylor & F.). Routledge.
Perolini, P. (2013). Interior Environments: The Space of Interiority On interiority. Zoontechnica, (03), 1–5. Retrieved from http://zoontechnica.com/occ_web/issue_03/issue_03_essay.Interior_Environments.html#pg_issue_03_essay.Interior_Environments.html
PT. MRT Jakarta. (2014). About MRT Jakarta. Retrieved from http://www.jakartamrt.com/informasi-mrt/tentang-mrt/
SubArt. (2015). SubArt. Retrieved June 04, 2015, from http://subartsf.org/
Tuan, Y.-F. (1977). Space and Place The Perspective of Experience (8th,2001 ed., p. 246). Minneapolis, MN: University of Minnesota Press.
Urry, J. (2007). Mobilities. Polity.
Valentine, G. (1990). Women ' s and the Design Fear of Public Space. Built Environment, 16(4), 288–303.
Whyte, W. H. (2009). City: Rediscovering the Center. Philadelphia: University of Pennsylvania Press.

in Jakarta are mostly conceived at utilitarian level with monofunction. Although some places have shown possibility to be developed as public realm, there are problems with facility maintenance and safety issues that might lead to the feeling of insecurities and fear of crime for its users.

It seems like MRT Jakarta project hasn't yet seen the potentials of underground stations as a new typology of public space. Thus, in the future it might need addition to its planning and design, and to collaborate more with stakeholders involved to further develop the project into successful public space.

REFERENCE

Augé, M. (1995). Non-Places Introduction to an Anthropology of Supermodernity Cultural Studies 1995. New York: Verso.

Bernard, D. (1995). A View of Paris Meteor Project: Forging a New Relationship between City and Metro. Planning and Development, 10(3), 343–352.

Carmody, J. C., & Sterling, R. L. (1987). Design Strategies to Alleviate Negative Psychological and Physiological Effects in Underground Space, 2(I), 59–67.

Ceccato, V. (2012). The Urban Fabric of Crime and Fear. (V. Ceccato, Ed.) (p. 351). Springer. doi:10.1007/978-94-007-4210-9 Springer

Cresswell, T. (2004). Place: a Short Introduction. Blackwell.

Cresswell, T. (2006). On The Move: Mobility in the Modern Western World. New York: Routledge.

Cruceru, A. (2010). Urban Form, Transit Space, And The Public Realm. University of Guelph.

Durmišević, S. (2002). Perception Aspects in Underground Spaces using Intelligent Knowledge Modeling. Delft University of Technology.

Durmisevic, S., & Sariyildiz, S. (2001). A systematic quality assessment of underground spaces – public transport stations. Cities, 18(1), 13–23.

Gehl, J. (2011). Life Between Buildings: Using Public Space. Island Press.

Jensen, O. B. (2008). European Metroscapes - The production of lived mobilities within the socio-technical Metro. Copenhagen. Retrieved from vbn.aau.dk

Jensen, O. B. (2009). Flows of Meaning, Cultures of Movements – Urban Mobility as Meaningful Everyday Life Practice. Mobilities, 4(1), 139–158. doi:10.1080/17450100802658002

Jensen, O. B. (2014). Flows of Meaning, Cultures of Movements – Urban Mobility as Meaningful Everyday Life Practice, (June), 37–41.

CITY PARK AS SUSTAINABLE URBAN OPEN SPACE BY CONSIDERING COMMUNITY BASED ANALYSIS

Bambang Soemardiono[1]*, Achmad Maksumi[2], Defry Agatha Ardianta[3]***, Raden Winton Danardi[4]****, Setyo Nugroho[5]*****, Diah Kusuma Ningrum[6]******

[123456]Department of Architecture,
Institut Teknologi Sepuluh Nopember (ITS)
*bamsoem03@yahoo.com, **cak5um@ymail.com,
***agathadefry@yahoo.co.id, ****wintondanardi@gmail.com,
*****nuguroho@yahoo.com, ******diahkusuma.archit@yahoo.com

ABSTRACT
Urban open space is defined as city's outdoor space that based on vegetation as its main element. The form of urban open space could be a plaza, water landscape, or city park. City Park was created to improve the quality of urban space. Yet, during its development process most of the City Park faced problems related to physical and non-physical aspect. Physical problems commonly concerned to the lack of vegetation diversity, and human scale. Meanwhile, non-physical problems focused on land availability, funding, and people participation. One of the themes of City Park in 21th century is sustainability. The key issue of sustainability is the people participation in place making process. Hence, this paper discusses the model of City Park as sustainable urban open space by involving the communities as stakeholders. The methodology applies community based analysis by generating semi-structured interview from the stakeholders to obtain the appropriate criteria and model of recommended City Park. Based on the criteria of good City Park from theoretical review and people's perception, the result shows the most recommended of New City Park is located in Jalan Jemursari with children playground, social space, and amenities as public facility.

Keywords: City Park, Community based issue, Sustainable, Urban open space

INTRODUCTION

City Park was introduced in early 19th century in order to improve the quality of urban neighbourhood. Common City Park shows some characteristics such as lots of walkway, connected space, and a statue as landmark. New paradigm of urban landscape has recently been emerging. This new perspective goes to the non-physical aspect in which social process should entwine with ecosystem (Anderson, 2006).In other words, it is appropriate to the theme of City Park in 21st century which focused on sustainability, environment, and landscape recovery. Moreover, community involvement is also being the major criteria for good City Park on how involve the people in management and/or development (Green Flag Award, 2015). These new broader views are the solution for problems appeared in urban areas such as high land price and lack of space, so that the reclamation is often happened (Triquel, 2012). Problems in funding and people participation have also been a significant issue in planning a City Park (Regulation of Ministry of Public Work No.5, 2008). Soesilo (2006) stated that City Park's nowadays are facing some problems such as the lacking of people participation, not appropriate to human scale, and lacking of type of vegetation.

The quantity of City Park in Surabaya as city case study has been emerging started from 2010 when the new City Major of Surabaya prefer to improve the green open space through constructing a City Park. There are more than 25 City Parks and 6 Urban Forest which play important roles for communities. In fact, there is no community involvement during the planning development process. People did not get any opportunity to disseminate their ideas about what kind of City Park should be, or how the City Park can accommodate their activities, or what the most significant criteria will be. Assessment of the success of Parks depends on sensorial, emotional and mental relationships between the users and the environment; therefore, people's perceptions are considerably important in this assessment (Ter, 2011).

As the references have mentioned above, people participation is the aspect that should be addressed. According to the phenomena, this paper aims to develop the model of City Park as sustainable urban open space by considering people participation.

THEORETICAL REVIEW

The presence of City Park aims to give aesthetic impression, reduce air

and noise pollution, improve micro climate, increase water catchment area, support living organism, and provide comfortable zone. It could be stated that City Park is essential for City to achieve a balance between psychology and human physical, habitat, and ecosystem (Purnomohadi, 2006). Some criteria from both of literature review and people's perception should be possessed for achieving a City Park as sustainable urban open space. By referring to this consideration, a City Park could be more optimal as public open space and play positive role for community as user.

Open Space

Open space can be defined as land and water in an urban area that is not covered by cars or buildings, or as any undeveloped land in an urban area (Woolley, 2003). Open space has also been described from a user's point of view as being an arena that allows for different types of activities encompassing necessary, optional and social activities (Woolley, 2003). These activities are thus very dependent upon the external environment and the quality of that environment Social activities are considered to be an evolution from necessary and optional activities. Open spaces can, of course, be defined physically by their legal ownership and boundaries but the perception of who owns a space is also important Some open spaces are exclusively used by one person or a few individuals, while other spaces are shared with more people.

Open space can be private, public, or blending both of them. Private open space is possibly the easiest to understand and includes individual gardens to homes. Public open space can be identified as spaces such as parks and plazas. Meanwhile semi-private open spaces include those where a limited number of people use the space but where the ordinary public would generally not be welcomed. Such open spaces might include courtyards to houses or flats and communal gardens and play spaces. Semi-public open spaces might include spaces with limited opening times to the public or be generally accessed and used by particular groups within society—spaces such as school playgrounds.

City Park and Sustainable Urban Open Space

City Park is one of manifestations of seven typologies of open space whose primary function is for informal relaxation, social and community purposes such as events and festivals, or horticultural/arboricultural displays (Campbell, 2001). Meanwhile Al-Hagla (2008) stated that City Park or Urban Park is areas of land, normally enclosed, designed, constructed,

managed and maintained as a public park or garden. They often incorporate other types of greenspace, such as children's play areas and sports facilities, but their primary function is for informal activity or relaxation, social and community purposes, and horticultural or arboricultural displays. According to Al-Hagla (2008), there are dual role of open space in urban neighbourhood. The first is 'social': that come out of understanding the neighbourhood as a 'community'. The second is 'ecological': that see the 'ecological perspective' is much more appropriate to be applied to a neighbourhood regarding its unique site qualities.

The term of sustainable stands on social, economical and ecological as integrated perspective which are called as sustainable communities that the Egan Review stated (2004). It emphasizes as those which "meet the diverse needs of existing and future residents, their children and other users, contribute to a high quality of life and provide opportunity and choice. They achieve this in ways that make effective use of natural resources, enhance the environment, promote social cohesion and inclusion and strengthen economic prosperity (Review, 2004). The role of open space in achieving sustainable neighbourhood is formulated in three key issues: space management, space function (circulation of people and permeability), and the role of objects within the space (sustainable landscape) (Al-Hagla; 2008).

Basically, planning a sustainable urban open space is to maintain allocation of spatial use for three main functions: as ecological function (physical, chemical, and biological process in order to maintain natural balance); economic function (all related to productivity to support the realization of economic growth and prosperity); and socio-cultural function (all related to an attempt to create equality, sense of community, sense of place, and people's participation in urban development). There are some points in the form of planning an ecological city:

a. Understanding the urban roles and functions in the context of ecosystem,
b. Conserving ecologically sensitive areas,
c. Providing man-made space to support ecological function (reservoir, drainage, seawall),
d. Providing waste management to protect ecological function,
e. Optimazing built environment (compact city, mix landuse, vertical construction, infill development, mass transportation, pedestrian ways).

Community Based Analysis

Government is like a private company, because they have to serve public to 'produce' environmental, social, and economical services (ICLEI, 1996). The issues of sustainable development need a local economic development to support community life by utilizing their talent and resources of local resident. Community based planning will be used to involve local residents and other users. In the level of sustainable development, it needs servant and program (ICLEI, 1996). Activities of community involvement for built environment will be better, if they actively involve (Socrates, 2009). The roles of community as stakeholder are very significant for implementing a concept of sustainable city, because the power and authority is the key of coordination. Community involvement should be conducted since the beginning of the planning process including design and implementation. The principle of Community Based Analysis must fulfill these following points (ICLEI, 1996):

a. Providing an opportunity for stakeholder to develop more detail analysis on key issues related to the community's vision. Through this analysis, it will be able to obtain some options for actionplan.
b. Sharing the experience, reviewing and participating in technical assesment, preparing priority planning and developing options for action.
c. Conducting in-depth dialogue among communities, and between communities and technical experts.
d. Focusing on planning which is interest, based on needs, and urgent of community.
e. Informing to stakeholders about technical aspects of the problems to be solved by involving them in the process of data collection and analysis.
f. Preventing less critical asessment from the experts (often external experts).
g. Developing a well-informed constituency of residents to work on sustainable manner.

Benefits of community involvement are enables local people to understand and appreciate the aim of the development project; rewarding way to get to know the community, their ideas, wants and needs; it also prevents future conflicts, which are not only costly, but also are an outcome of a dissatisfied community; can provide accurate and more detailed and information, which otherwise might be difficult to obtain (Kaur, 2007).

Criteria for Site Selection

Criteria for City Park are divided into two categories (see Table 1). The first criteria dedicate to the site selection, while the second criteria are

applied for designing the City Park. A good City Park should possess some criteria (Herawati, 2012) such as: located in strategic area, easy to access by all communities; own an ecological-social-economical function to improve public health; and provide aesthetic value and amenities for all communities including benches, playground area, jogging track, lighting, parking area, and vegetation. Planting vegetation is very important in structuring a City Park in the context of urban landscape (Purnomohadi, 2006). Location should be easy to access from public transportation and private-owned transportation. As shown in Figure 1, the location of City Parkmust be able to reach at maximum 32 km (20 mil) from other City Parks and located in the center of community and secure zone (Simonds and Strake, 2008).

Table 1. Criteria for site selection

Criteria for Site Selection		Criteria for City Park Design
Herawati,2012	Strategic location, Easy access,	Should improve public health, Amenities, Aesthetic value.
Kent,1998	Easy access, Safe and clean,	Attractive, Amenities, Social activities.
Purnomohadi,2006	n/a	Type and vary vegetation.
Simonds and Strake,2008	Easy access.	n/a
Katz,2011	Strategic location,	Look and feel public, Simple, not overdesigned, Can see and walk.
Project for Public Space,2015	n/a	Amenities, Attract people to come, Identity and image.
Terr,2011 n/a = not available	Easy access,	Clear signage , Social activities, Popular activities Source: Literature, 2015

Source: Literature, 2015

Other criteria for creating a good City Park are: should be in the centre of a neighbourhood; should look and feel truly public; should be simple and not overdesigned; should allow the people to both see and walk through it (Katz, 2011). In addition, City Park should satisfy some points such as: easy access; has a clear signage; should attract people; should provide an opportunity for social activities; should include popular activities (recreation, entertainment); elements of attraction should be created in activity areas; and should have the opportunity to use every area of the park and make contact with other users (Ter, 2011).

METHODOLOGY

Stage of Research

Primary data have been collected through observation and semi-structured interview to the respondent. Respondents participating in the research were coming from different background, including government and visitors of City Parks (randomly selected). The interview form was semi-structured interview, so that the interviewer should fill the perception of respondent or stakeholders to the answer sheet. It is conducted two times: at the beginning of research for gaining criteria based on respondent's perception; and before the final result for disseminating a model of City Park to the respondents (see Figure 1).

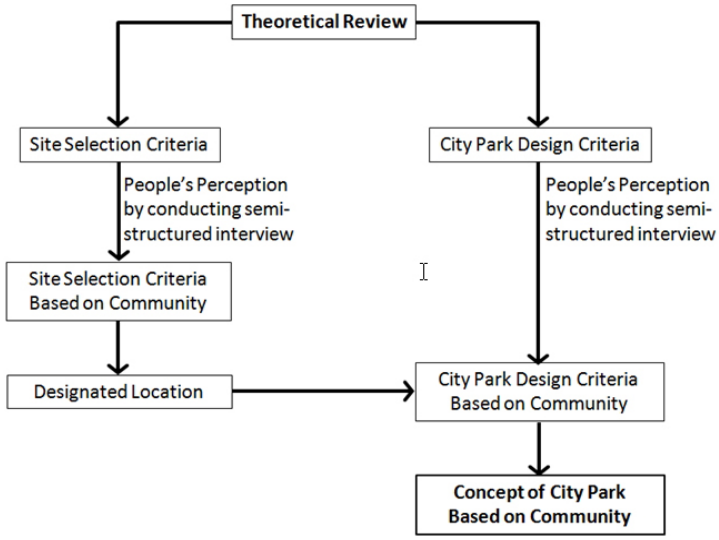


Figure 1. Methodology for constructing concept of City Park
Source: Author, 2015

At the first stage, respondents were randomly selected 9 people among the visitors of the City Parks. The questionnaire addressed a broad range of issues such as: how people understand about City Parks, what should be possessed by City Park, and what kind of the requirements that should be fulfilled by City Parks. After obtaining the criteria of City Parks based on respondent's perception, site selection was addressed by authors. Authors decided one the most recommended City Park by applying selected criteria.

After acquiring one recommended site, developing a model of City Park was addressed by providing two or three alternative design models. The

major interest of the research was to analyze people's thoughts and perceptions in a qualitative way.

Proposed Location of City Park

Based on the phenomena and the distribution of City Park in Surabaya, author and team have decided three proposed City Park which are located in the sub City centre. There are three recommended locations as prospective City Park (Figure 2).

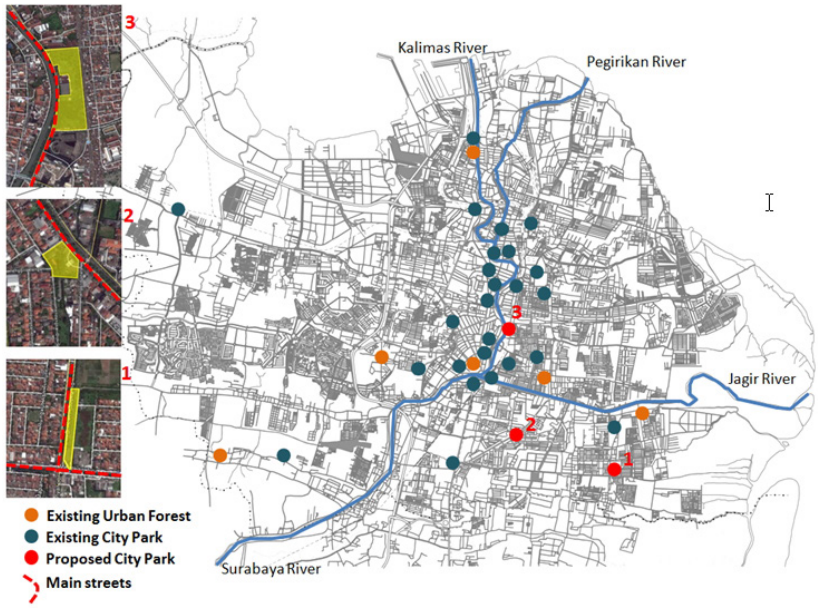


Figure 2. Proposed location and its distribution of existing City Park and Urban Forest in Surabaya City
Source: Google earth, 2015 and Bappeko, 2010 (Surabaya City Planning and Development Authority)

The first spot is located in Jalan Sukarno with south and west as site orientation. The site form is rectangular with currently function as vacant land owned by City government. The second spot is located in Jalan Jemursari with north-east as site orientation. The site form tends to be square or trapezoidal with currently function as petrol station. The last spot is located in Jalan Ngagel at the riverbank of Kalimas River. All prospective City Parks are in main street corridor of the City with different characteristic of form and function around the sites.

MODEL OF CITY PARK

Criteria of Site Selection Based on Community

The result shows that understandings of City Park by respondents are vary. Some respondents explained that City Park is urban open space which own lots of vegetation as pollution's reduction. Other respondents argued that City Park is an open space for various activities such as gathering, playing, resting, and relaxing supported by amenities. It indicates that people's perception on City Park is green open space with amenities which can be used actively by community. Therefore, those active City Park can create urban public space.

People's perception on criteria of site selection for City Park should fulfill some points, as shown in Figure 3. The highest point as the most significant criteria for respondents is safety. Most respondents prefer to the City Park located in safety zone. Other following points are accessibility, near public facility, and site form. Though some respondents consider that site form is not the significant points to be assessed, other respondents evaluate that square shaped or circle site are preferable. They also explained that circle or square shaped site would be easy in planning, design, circulation, and maintenance.

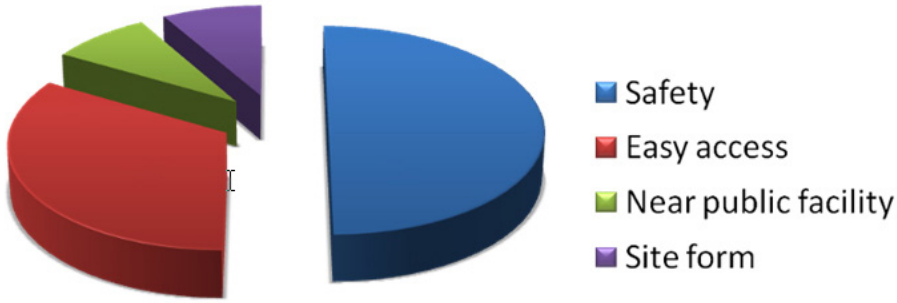


Figure 3. Criteria of site selection from respondents
Source: Interview, 2015

Final criteria are obtained by synthesizing criteria from theoretical review and people's perception, as shown in Table 2. Some criteria are same, and there are also additional criteria from respondents. Similar criteria include easy access and safety. It means that the location of City Park should be reached by all people via walking or vehicles. The site should also locate in safety zone. Strategic location is related to the location close to public facility such as terminal, station, residential, shopping area, hospital, etc.

Additional criteria for site selection which come from people's perception is site form.

Tabel 2. Synthesis of Criteria Based on Community

Criteria for Site Selection		
Theoretical review	People's perception	Synthesis
Strategic location	Near public facility	Strategic means near public facility (terminal, residential, shopping area, hospital, etc).
Easy access	Easy access	Easily accessed by pedestrians and vehicles.
Safe and clean	Safety	Located in safe zone.
n/a	Site form	Respondents prefer to square form.

n/a = not available

Source: Synthesis, 2015

Site Selection Based on Synthesis

Assessment of site selection is applied based on synthesis of criteria. Each criterion is described as detail as possible, especially for point of "strategic location" and "easy access/ accessibility". Strategic location is seen from the integration between location of City Park and residential or urban public facility. In accessibility, the major aspect is telling about how visitors reach the location by public and/ or private transport, and also the availability of pedestrian ways. The assessment is applied by using Likert scale with range from 1 to 4. Scale 1 is the lowest value, while scale 4 possesses the highest value of potency in site location. The assessment can be seen on Table 3.

Table 3. Site Selection of Prospective City Park

Criteria	Site 1				Site 2				Site 3			
	1	2	3	4	1	2	3	4	1	2	3	4
Strategic location:												
Formal settlement				√	√						√	
Nonformal settlement				√				√				√
Health facilities			√					√	√			
Transportation facilities		√						√	√			
Education facilities				√				√			√	
Commercial activities			√				√			√		
Public service and trade			√					√			√	
Accessibility:												
Bus	√							√	√			
Minibus			√					√				√
Nonformal public transport				√		√				√		
Motorcycle				√				√				√
Private cars				√				√				√
Pedestrian ways		√			√					√		
Safe zone			√					√		√		
Site form	√							√	√			

1=very poor, 2=poor, 3=good, 4=excellent
Source: Author, 2015

The result of assessment in the point of strategic location between site 1 and site 2 are similar. Site 3 has the lowest value in strategic location because it is not close to health and transportation facility. As well as the value of strategic location, the value of accessibility between site 1 and site 2 are identic. Site 2 dominates in the point of site form. Because the site form tends to be square, it is preferable for community.

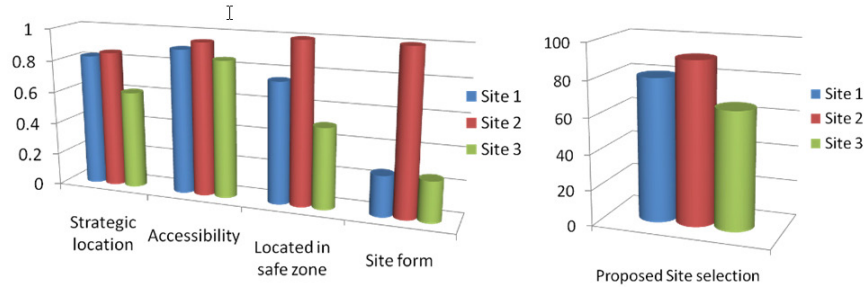


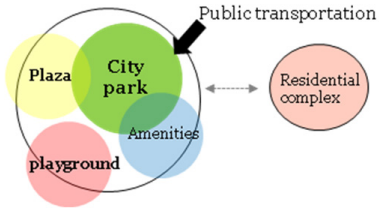
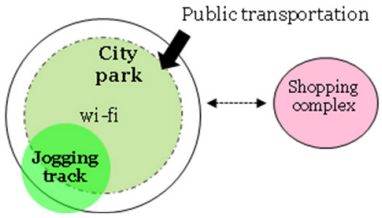
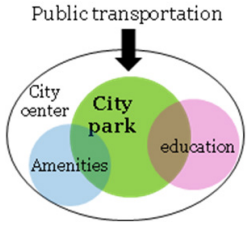
Figure 4. Results of assessment of prospective City Park
Source: Author, 2015

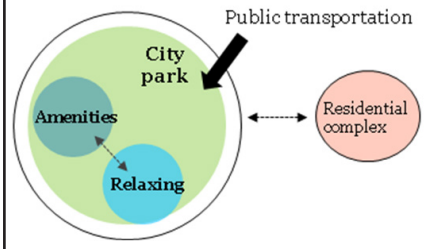
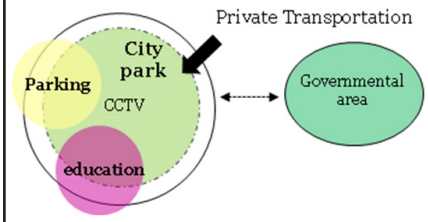
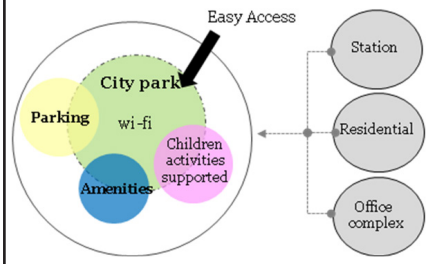
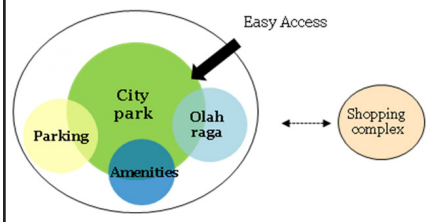
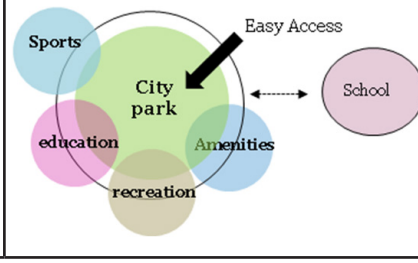
The assessment shows that the most potential site to be a City Park based on decided criteria is site 2 which is located in *Jalan Jemursari*. Further stage of research is construction of design criteria based on people's preference on what City Park should be.

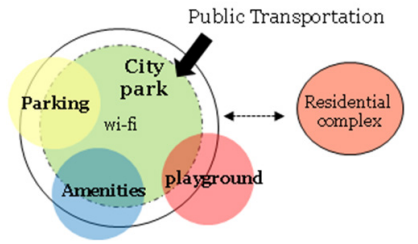
Design Criteria for City Park Based On Community

Table 4 shows the People's Perception in City Park Design Criteria. Each respondent is described by the preferences of facilities, amenities, vegetation, activity, accessibility and location. After obtaining the aspects of criteria above, the diagrammatic model is constructed in order to simplify the reading process of people's perception.

Table 4. People's Perception in City Park Design Criteria

	Facilities, Amenities	Vege-tation	Activities	Accessibility, Location	Diagrammatic Model
	Toilet, children play-ground, praying room	Trees	Sport, play, gather-ing	Near residential complex, easy access for public transport	
	Wi-Fi	Trees, deco-rative plants	Jogging track	Near shopping complex, easy access for public transport	
	Toilet, jan-itors and security guards	Trees	Educa-tion	In city center, near main street, easy access for public transport	

	Facilities, Amenities	Vege-tation	Activities	Accessibility, Location	Diagrammatic Model
	Benches	Trees, deco-rative plants	Relaxing	Near residential complex, easy access for public transport	
	Safe, parking lot	Trees, deco-rative plants	Educa-tion	Near gov-ernmental area, easy access for private transport	
	Toilet, Wi-Fi, bench-es, mini library, parking lot	Trees	Play for children	Easy ac-cess for all people, near station residential and office complex	
	Children play-ground, relaxing pool	Trees	Sport and exercise, social space	In city center, near main street, easy access for public transport	
	Toilet, play-ground	Flow-ering trees	Sport, edu-cation, social space	Near public school, easy access for public trans-port	

	Benches, children play-ground, Wi-Fi, parking lot, gaze-bos	Trees	Social space	Near residential complex, easy access for public transport	

Source: Analysis based on interviews, 2015

Respondent number 1, 4, 6 and 9 prefer City Park that close to residential complex and easy access for public transportation. It aims to accommodate social space for residents in the residential complex and visitor who are passing by the street. While respondent number 2 and 7 prefer City Park located near shopping area. Other respondents are considering City Park that close to school and governmental area. In outline, respondents choose and prefer City Park with easy mobility, accessibility, safety and security provision for the user of City Park. According to most of respondents, activities must be accommodated by City Park such as social interaction, children playground, sports and exercise, relaxing and education. Most of respondents prioritize safety zoning of children playground, social space, and jogging track as sports activities. Trees are also the influential aspect for respondents. One of them prefers flowering trees to provide an aesthetic impression of City Park. Table 4 also shows the facilities and amenities in City Park such as: benches, gazebos, relaxing pool, playground, Wi-Fi connection, toilet, parking lot, mini library, and praying room which all are located near entrance of the Park.

City Park planning and design must fulfill some requirements covering physical and non-physical needs. Those are supporting each other, for instance: the availability of street furniture as physical equipment can accommodate activities and create social space as non-physical aspects. According to respondents from the physical needs, a City Park should have lots of well-planted vegetation and shading. City Park must also promote comfort, safety, and cleanliness through space and furniture arrangement. Comfort for visitors can be manifested by providing amenities such as public rest room, bench for sitting, children playground area, sport facility, parking lots, and security post. Along with the emerging technology, respondents also argued that they prefer City Park which have the availability of Wi-Fi connection.

Besides physical needs, non-physical needs must be addressed such as: City Park should accommodate social activities for community. Furthermore City Park should be accessed by all community in different age and social status. All non-physical are manifested through physical planning by applying the synthesis of design criteria as shown in Table 5.

Table 5. Synthesis of Design Criteria

Criteria for Designing City Park		
Theoretical review	People's perception	People's perception
Should improve public health	Sport Facility: jogging track or plaza for daily exercise	Should improve public health by providing jogging track or plaza for daily exercise
Amenities	Amenities for visitor: bench, rest room, childern playground, security post, parking area.	Should accommodate visitors through amenities
Aesthetic value: simple and not overdesigned, attractive.	n/a	Should plan and design with aesthetic value
Type and vary vegetation	Should own green space, lots of well-planted vegetation	Should own vary and well-planted vegetation
Look and feel public	n/a	Should look and feel public
Can see and walk	Footpath around the Park	Should be able to walk and see through the footpath
Identity and image	n/a	Should posses an identity and image of City Park
Clear signage	n/a	Should provide clear signage
Social and popular activities	Social space, relaxing space	Should accommodate activities inside the Park
n/a	Wi-Fi connection	Should provide facilities appropriate to emerging technology.
n/a	Accessible for all people (different age and social status)	Accessible for all people (different age and social status)

n/a = not available

Source: Synthesis, 2015

According to people's perception, design criteria including aesthetic; identity and image; signage; and space which feel public are not the major criteria in planning and designing City Park. It shows that those criteria are considered as minor or insignificant criteria. Criterion such as the needs of Wi-Fi connection for visitors in City Park becomes an unexpected aspect because it is not analyzed in theoretical review.

Recommended Model of City Park

Site selection and design criteria are combined to compose a model of City Park based on people's perception. The recommended model help respondents or people to evaluate the City Park that is suitable for their preferences and needs. According to the resulted design criteria by community, they prefer safety social space for children and leisure, and the amenities may locate near the entrance area. Safety means the location are not close to main streets or entrance so that the children and visitor can satisfy spending their time in City Park. From this description, the site is divided into two zones with different function. Social space zone is placed on the southern and western side since the location is not directly facing to main street corridor. Meanwhile amenities will be accommodated on the eastern side. Wi-Fi connections are provided in all zones of designated City Park. People can connect the Wi-Fi while sitting in a bench or concrete stone at the plaza. In the center of the Park, there is relaxing space by providing water feature to make relaxing soul of visitors. Element of water is believed to be able to soften the surrounding area which are majority built in concrete and stone. Water feature in the center also creates dynamic and attractive impression for visitors.

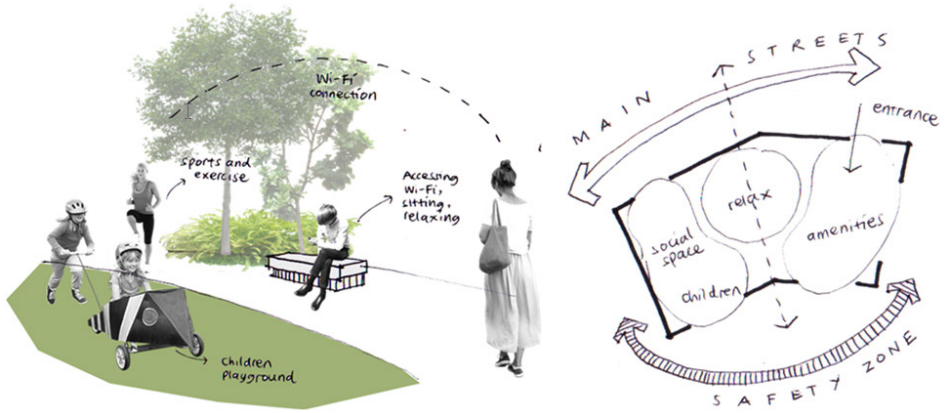


Figure 5. Raw sketch of City Park
Source: Author, 2015

Zone of Social space 2 is used as children playground area. Social space 1 can accommodate as leisure space where parents are also able to look after their children. Concept of walk-able creates clear circulation, and integrates all spaces in the Park through jogging track and footpath as shown in Figure 6.

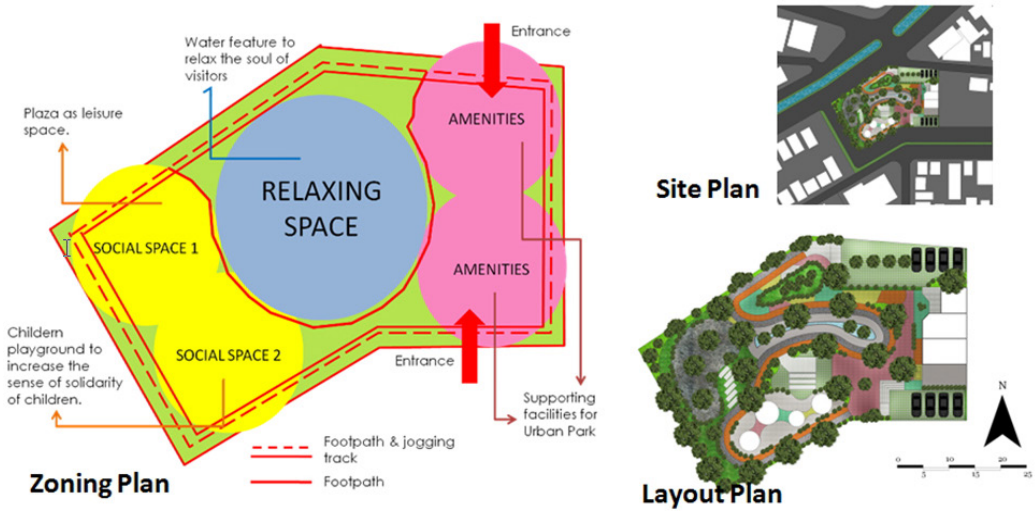


Figure 6. Recommended model of City Park
Source: Author, 2015

CONCLUSION

City Park as sustainable urban open space by considering community based analysis results 4 criteria of site selection and 10 criteria of City Park design. Criteria from respondents are quite different from theoretical review. In site selection, respondents prefer to the square-shaped site; located in safety zone; strategic place from public facility; and easy access. In design criteria, the major criteria for City Park design are the availability of Wi-Fi connection and inclusive Park design. Most of respondents prefer a provision of safety children playground area. According to respondents, the main purpose of visitors going to City Park is to fulfil their children's needs in leisure and refreshing time. After obtaining the model of City Park based on people's perception, it is recommended to do evaluation process in the further stage of research. The evaluation process of this model must involve the stakeholders including government, academics, and local inhabitants as user of City Park.

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REFERENCES

Al-Hagla, Khalid (2008). Towards a Sustainable Neighborhood: The Role of Open Spaces. Archnet-IJAR, International Journal of Architectural Research - Volume 2 - Issue 2 - July 2008. Pp. 162-177.

Anderson, E. (2006). Urban Landscapes and Sustainable cities. Ecology and Society 11(1): 34. [online] URL:http://www.ecologyandsociety.org/vol11/iss1/art34/ .

Campbell, K. (2001). Rethinking Open Space, Open space Provision and Management: A Way Forward, Report presented by Scottish Executive Central Research Unit, Edinburgh, Scotland, UK.

Green Flag Award. (2015). Judging Criteria http://www.greenflagaward.org.uk/ awards/application accessed on March 1, 2015.

Herawati, Herlinda. (2012). Kriteria Taman. Source: http://id.scribd.com/doc/8492 3766/kriteria-taman#scribd. Published on March 11,2012. Accessed on January 14, 2015.

ICLEI (International Council for Local Environment Initiatives). (1996). The Local Agenda 21 Planning Guide, an Introduction to Sustainable Development Planning. International Council for Local Environment Initiatives (ICLEI) and International Development Research Centre (IDRC).

Katz, Peter. (2011). What makes a good urban park: City parks have been endangered by suburban flight, privatization and design overkill. Here's a short list of basics for planning true public spaces.http://bettercities.net/news-opinion/blogs/peter-katz/15519/what-makes-good-urban-park accessed on March 3, 2015.

Kaur, Guneet. (2007). Participatory Approach/ Community Involvement in Planning. 43rd ISOCARP Congress 2007.

Kent, Fred. (1998).Creating Great Urban Parks - a publication on an Urban Parks Institute regional workshop. http://www.pps.org/reference/creating-great-urban-parks/ accessed on March 3, 2015.

Project for Public Space. (2015). Signature Places: Great Parks we can Learn Fromhttp://www.pps.org/reference/six-parks-we-can-all-learn-from/accessed on March 3, 2015.

Purnomohadi, Ning. (2006). Ruang Terbuka Hijau Sebagai Unsur Utama Tata Ruang Kota. Direktorat Jenderal Penataan Ruang

Regulation of Ministry of Public Work No.5. (2008). Pedoman Penyediaan dan Pemanfaatan Ruang Terbuka Hijau di Kawasan Perkotaan.
Simonds, John Ormsbee; Starke, Barry W. (2008). Landscape Architecture, 'A Manual of Environmental Planning and Design' fourth edition. McGraw Hill.
Socrates. (2009). Community Engagement Strategies. http://socrates.berkeley.edu/ ~pbd/pdfs/Community_Engagement_Strategies.pdf , accessed on March 2015.
Ter, Ümmügülsüm. (2011). Quality criteria of urban parks: The case of Alaaddın Hill (Konya-Turkey). African Journal of Agricultural Research Vol. 6(23), pp. 5367-5376.
Triquel, Artana Lieonart. (2012). Urban Landscape. Loft Publications.
Woolley, Helen (2003). Urban Open Space. London: Spon Press

THE POTENTIAL OF TRADITIONAL MODULAR PREFABRICATED HOUSING FOR INDONESIAN DWELLING CULTURE

Rossa Turpuk Gabe[1]*, Gregorius Gegana[2]**

[12]Department of Architecture, Faculty of Engineering
Universitas Indonesia
*ro_saturpuk_gabe@yahoo.com, **lonelanrete@gmail.com

ABSTRACT
Rapoport in House Form and Culture concluded that forms of urban housing usually conforms to the norms of the local cultural tradition. Indonesian tends to grow their big family with the married children living together with their parents under the same roof or located in close proximity to one another. This house-form represents traditional lifestyle in Indonesia which also represents the cohesion of the extended family system. The extended-family housing phenomenon happens in rural and urban area. On the other hand, traditional prefabricated modules allow people to develop and assemble/ disassemble the house based on the development of their family, as we found in Thai traditional house. This paper discusses the potential of traditional modular prefabricated housing system to cope with society lifestyle of extended-family housing based on case study of Indonesian and Thailand traditional houses. To achieve this objective, we did literature review and analyzed three case studies as the examples how traditional prefab house fits the extended family system. Finally, we also examined our society capability to develop the industry of prefabricated houses based on traditional system like in Woloan village,Minahasa. The findings of this study suggest the potential of traditional modular prefabricated housing confirms the needs of extended family dwelling culture and also preserves the ability of local people to build their houses.

Keywords: housing, traditional, modular, prefabricated, dwelling

INTRODUCTION

Many researchers have examined how dwelling reflects culture. Dwelling is phenomena, the creation by the individual consciousness out of its rootedness in culture, time and place (Heidegger, 1951). Sharing household space with extended family members is common way of Indonesian dwelling culture, as well as in Southeast Asia region. People tend to grow their big family with the married children living together with their parents under the same roof or located in close proximity to one another.

On the other hand, dwelling culture not only defined the living culture of people but also decided the house form and the wisdom system of built. House construction, which is part of house form, tells about how or why these structures were built and who built them (Stevanovic, 1997). One of the construction systems is modular prefab system. While it is not relatively new, modular prefab system could give the ability to customize a well-designed home rather than settle for the generic as it allows assembly and disassembly as well as alternate arrangements of the building parts(Nadim & Goulding, 2011).

OBJECTIVES

In this digital era, prefab construction system is getting more popularity, especially after the invention of 3D printing for rapid production of building materials. There are many studies that reveal the potential of prefab construction in terms of construction time or cost in mass production point of view. Nevertheless, for the purpose of architectural study, there is a need to look its potential judged from people's dwelling culture. The objective of this paper is to identify the potential of modular prefabricated house that conform the extended family dwelling culture.

Scope and Methodology

While prefabrication housing is commonly considered with modern technology, the origins of modular prefabricated housing rooted in traditional craftsmanship. Therefore, we limit the prefab system to the traditional prefabricated house. Since the benefits in cost and material aspects of prefab system have been uncovered in other studies and the craftsmanship involves the work of art, we also do not include cost and material aspects in this study.

The main method of this research is based on literature review and case

studies. Firstly, we look at the literature of extended family dwelling culture, especially in Indonesia. We also review the literature of prefabricated house.

Secondly, we look at three cases studies of traditional prefabrication house in Thailand and Indonesia. The traditional houses of these countries have been selected because their similarities of dwelling culture and house build system. Discussion of cases studies are not to be compared. The Thai's traditional house and Jim Thompson's house discuss a prefabricated build system and the modifications to meet the needs of space. Moreover, the Woloan's traditional house discusses a development chance of local industry.

Thai traditional house look as a case study of traditional prefab house that is resulted from the needs of extended family culture. The case study of Jim Thompson's house is also presented to show the utmost modification of Thai traditional house to adapt owner's western dwelling culture. In these two case studies, we also visited the houses and informally gathered information from associated persons. Lastly, we look at Woloan village in Minahasa as an example in Indonesia that shows how people make traditional prefab house as a community based industry. From the literature reviews and case studies, we discuss how the capability of modular prefabricated housing fits into society's extended family culture.

EXTENDED FAMILY DWELLING CULTURE

Defining Dwelling Culture

Dwelling has been a coherence of living habits and cultural boundaries. It is formed as a result of large scale socio-cultural values (Rapoport, 1969). It takes inside, being covered with cultural, social and psychological meanings (Karadag, et al., 2012). Dwelling plays an important contribution in identification of behavior and ways of dweller's life. It is inseparable from the social, economic, cultural and politic development of man (Jiboye & Ogunshakin, 2010).

Culture is defined as the ideas, values and way of the people's life. Rapoport suggest that the built environment reflects many socio-cultural forces, including religious beliefs, family and clan structure, social organization, ways of gaining a livelihood and social interactions between individuals (Rapoport, 1969). Geertz defined culture as a relatively organized system of shared meanings. It is a system of inherited conceptions expressed in

symbolic forms, by which people communicate, perpetuate and develop their knowledge and attitudes toward life. Furthermore, culture influences the way in which space is shaped and used in everyday life (Geertz, 1973).

The resultant of dwelling and culture is dwelling culture which is a knowledge embedded in the process of living phenomenon for a particular society with a relationship of cultural and socio-economic involvements (Mosha, 2012). The people have a way of shaping their dwelling which will lead their lives. Dwelling culture represents the quality of human interaction in the space they have produced.

Dwelling culture variables may be construed as one set of determinants of house form which is reflective the lifestyle of its people. The dwelling form is the setting for everyday manifestation of the homeowner's living culture. This form is the physical characteristics of the dwelling depend on the surrounding environment, available building materials, technological know-how, and some cultural determinants like the social and economic status of the dwellers (Jiboye & Ogunshakin, 2010). Erdinc also observed that house form meets the society's physical, social and psychological needs, and it is shaped by belief systems, status symbols, privacy and safety, economy, material resources, technology and climate conditions (Karadag, et al., 2012).

Living with Extended Family in Indonesia

Extended family housing can be described in terms of share a living space which is common in Indonesia, whether in rural or in urban area. In urban setting, living with extended family provides many benefits as well. It also has long-range benefit for wealth accumulation and stability. People who live with extended family are more likely to make the transition to home ownership.

Extended family Housing can be described in terms of share a living space which common in Indonesia, whether in rural or in urban area. This is a symbol of social and family recognition. The extended family housing is where a generation of families expresses its existence the identity of lineage (Awotona, et al., 1994).

The extended family housing represents an extension of the family over space as the family grows.The growth of the family was paralleled by a physical expansion of the house. The house usually incrementally develops into a several dwelling units for extended family. Spatial arrangement of

house should be easily adapted to accommodate the changes of family composition as well as each member's needs.

TRADITIONAL PREFABRICATED HOUSING SYSTEM

Rapoport classifies system of dwelling settings into three types: non-fixed-features, semi fixed-features and fixed-features. Non-fixed-features are non-environmental that communicate the social identity and status of dwellers, such as clothing, language and activities. Meanwhile semi fixed-features are described as anything from the type and arrangement which may change fairly quickly and easily.

As in modular prefabricated housing, fixed fixtures are defined as features that are basically fixed or those that change rarely and slowly (Rapoport, 1981). Fixed features reflect social, organizational, cultural and institutional meanings (Ahrentzen, 2002). In other words, they reflect the way in which people live.

The term modular prefab system is a construction methods ranging from completely off-site and completely on-site (Nadim & Goulding, 2011). Offsite fabrication is the practice of assembling components of a structure in a factory and transporting complete assemblies to the construction site where the building is to be located. Hence, prefabrication means there was a body of work that occurred before the actual onsite assembly (Smith, 2010).

The benefits of system are flexibility and customizability of the housing. Modular prefab housing is faster, more sustainable and more affordable to build.The uptake of modular prefabricated housing innovations is likely to be influenced not only by the characteristic of the product, but also the people, technology and business processes surrounding it (Nadim & Goulding, 2011).

While prefabrication housing is commonly related with modern technology, it is not entirely new technique.The origins of modular prefabricated housing rooted in traditional craftsmanship and has been used by traditional people since long time. It is constructed by skilled-craftsmen. Traditional modular prefabricated housing integrates the understanding of Indonesian dwelling culture, local people's skills and knowledge.

THAI TRADITIONAL HOUSE

Figure 1. A compound of Thai hard-wood traditional house
Source: (author's documentation)

Thai hard-wood traditional house, like most traditional houses in Southeast Asia, is a wooden house with gable roof, raised up from the ground on post. As depicted in ancient relic, such as engraved bronze drum unearthed in Vietnam and Indonesia, this form dates back to the region's prehistoric period (Boonjub, 2009).There are differences in style and details between north, central, and south region. However, the style considered to be the classic one is that of central plains, where Thailand's kingdoms of Ayutthaya, Sukhothai, and Bangkok are located and therefore where Thais reached the height of their culture and power (Jotisalikorn, et al, 2013).

The house consists of different separated living units that are connected by one terrace platform in the middle. There are many configurations of these living units, from single family house to a cluster house. A single family house consists of one bedroom (often with veranda in front of it) and one kitchen, while the larger house can have multiple bedrooms and other function rooms as can be seen on Figure 3 below.

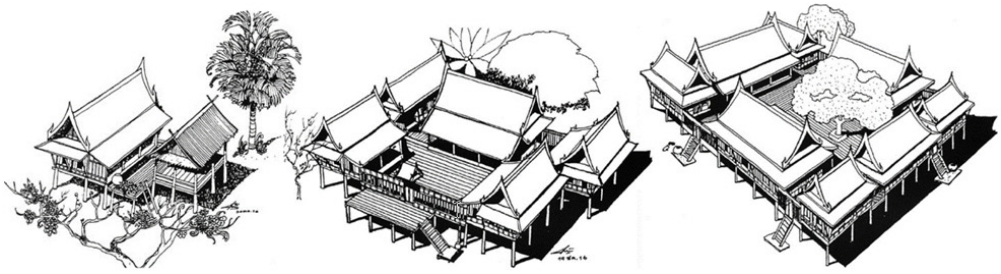


Figure 2. Various compound arrangements of the Thai house: single-family house (left), larger-family clustered house (middle), and wealthy family compound (right).
Source:(Ramasoot, 2013)

Just like most society in Southeast Asia, Thai people follow extended family system. Therefore, there are needs to relocate and repurpose the architecture, in particular to serve house expansion for family's changing situations and requirements (Ramasoot, 2013). As a result, Thai traditional house is known for its flexible structures and configurations that allow modifications to comply with the family expansion, relocation, and changing conditions.

The house adaptable nature is enabled by five key attributes: 1) the prefabricated structure, 2) the modularity and neutrality of house units, 3) the central terrace, 4) the use of a single room for a single function, and, 5) potential spaces available for infill and modifications (Ramasoot, 2013)

Figure 3. House panels in carpentry (top) and assembly on site (bottom)
Source: (Nongnit's Treasures, 2011)

The word traditionally used in Thai for house building is *prung*, meaning 'assemble' (Jotisalikorn, et al., 2013). All panels for walls, roof, floors, and decorations are carpentered in builder's workshop before they are transported to the site. Each regionhas its own carpentry style as well as its famous industry village, such as in Ayutthaya in central or Phraein the north. On site, the main wooden posts with wooden bases are raised one by one, going in clock-wise direction. Next, comes the construction of the roof, walls, and floors. The posts and the walls are built slightly inward-reclined, adding structural strength with natural self-weight interlocking and creating the illusion of height.

All wooden structures and building panels are connected using various interlocking joints and fitted with wooden pegs. Originally, the joints are not even nailed. Due to its prefabricated system, construction on site just takes few days with a dozen workers to complete, depends on the size of the house (Sathāpitānon & Mertens, 2012).

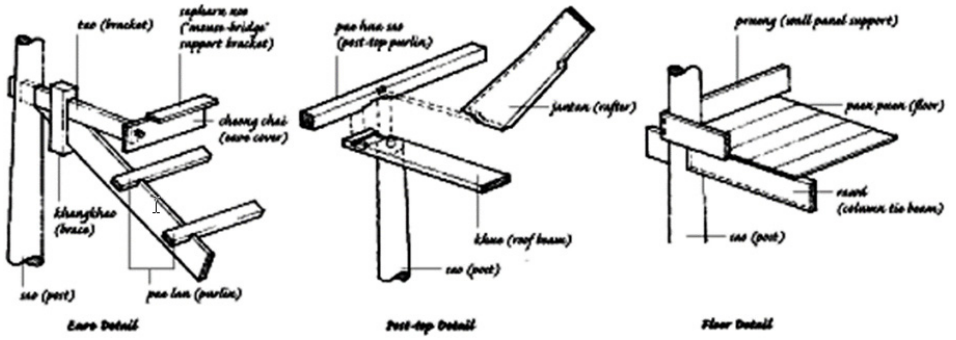


Figure 4. Knockdown joints in Thai traditional house
Source: (Sathāpitānon & Mertens, 2012)

Bearing in mind that all panels are prefabricated with certain dimensions, the structures also has modular system that resembles the units of building panels. Each living unit has different module as can be seen on Figure 6 below. The common modules are: bedrooms or other mainrooms have 2x3 bays, the veranda in front of it has 1x3 bays, and kitchen/ supporting unit has 1x2 bays.

Figure 5. Main floor plan of Thai house shows modularity of house units.
Source: (Ramasoot, 2013)

Bearing in mind that all panels are prefabricated with certain dimensions, the structures also has modular system that resembles the units of building panels. Each living unit has different module as can be seen on Figure 6 below. The common modules are: bedrooms or other mainrooms have 2x3 bays, the veranda in front of it has 1x3 bays, and kitchen/ supporting unit has 1x2 bays.

Due to different function of separated living units, each living unit is self-sustaining rather than dependent on another, both functionally and structurally. In traditional extended family system in old Siam, additional bedrooms were added as the family size increased. Traditionally, the groom left his family home to join the bride's family, so often he would remove his room from his parents' house and take it with him to add to his new bride's home(Jotisalikorn, et al., 2013).Furthermore, increasing usable spaces for similar functions can be executed by multiplying house units (Ramasoot, 2013).

Figure 6. The use of veranda (left) and ground floor (right) to add living units
Source: (Ramasoot, 2013)

In contrast to most buildings that were originally designed to be as inclusive as possible, there are blank versatile areas at various parts of the Thai house, namely: the veranda, the terrace, and the ground floor area (Ramasoot, 2013). These open spaces can be easily enclosed or partitioned based on structural grids, presenting opportunities to add living units within existing structures.

Having usually 2-2.5m height, the ground floor area originally were used to add protection from wild animals and seasonal changes, store agricultural

tools, livestock, and function as informal workspace for Thai women. An elevation of the entire house structure may be required to increase the headroom of ground floor area, depending on its height and function to add.

Jim Thompson's House

Jim Thompson was an American entrepreneur and the founder of the world renowned Jim Thompson Thai Silk Company. He came to Thailand during World War II and turned his attention to Thai silk after dismantle his military position. He lived in Thailand for about 25 years before mysteriously disappeared during his vacation in Cameron Highland, Malaysia in 1967. His Thai teak house that he had designed and built in 1959, now stands as a famous museum and tourist destination, home to his extraordinary collection.

Figure 7. Original sketches of the house by Jim Thompson in 1959
Source: (Warren et al., 1999), (The James H.W. Thompson Foundation, 2003)

Jim Thompson's house is one of earlynotableexamples of modification to Thai traditional house layout as well as re-use of different house modules, done by a foreigner. Jim Thompson originally bought the panels from 6 separate 100- years-old houses from 3 different locations in central Thailand, disassembled them, and brought the panels to the new location in Bangkok. The panels were reassembled into completely new configuration rather than following the conventional layout of Thai traditional house, as can be seen on Figure 9 below.

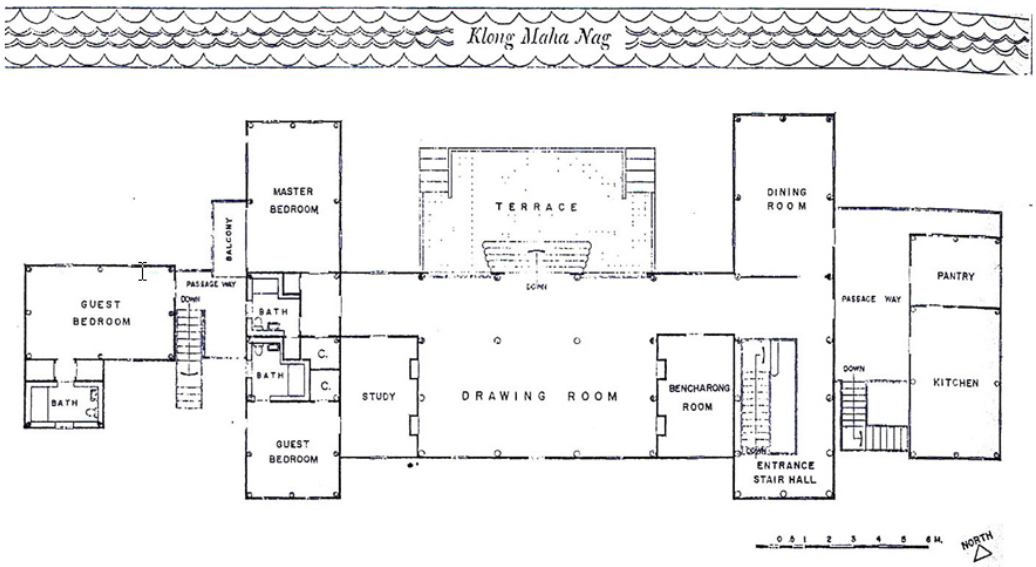


Figure 8. Floor plan of Jim Thompson's House
Source: (Warren et al., 1999)

Due to his western culture, he mainly brought most activities to the interior rather than do it in terrace like Thai people. He also added some functionality according to his need such as bathroom, drawing room. On the ground floor, he added galleries and silk workshop. The terrace does not have function as circulation between units anymore since the units is now adjacent directly each other and connected by internal corridor and doors. Furthermore, the terrace was made permanent by stones and bricks.

Despite of entirely new configuration, the module for each living unit still can be recognized. The numbers of bays for each room, however, do not always follow the traditional rule. In bigger rooms, such as drawing room, we still can distinguish the original houses modules based on its bays and panel's crafting style. For the most other parts, it is difficult to distinguish it.

Figure 9. Jim Thompson's house: exterior (top), front stone terrace (middle left), drawing room (middle right), upper guest room gallery (bottom-left), indoor ground floor/ entrance gallery (bottom-right)
Source: (author's documentation)

WOLOAN VILLAGE, MINAHASA

Although it is not as dispersed as in Thailand, prefabricated traditional house also presents in Indonesia. The Woloan village is located in Minahasa, it is about 3 km from Tomohon and 28 km from Manado. The Minahasan traditional house has known as *Wale* or *Bale* which means a place for family activities.

The characteristic of *Wale* is stilts house with 16 to 18 wooden pillars. A few centuries ago, this traditional house could be occupied by six to nine of households according to spatial needs of family composition. Knock-down system of this wooden house speed up the build processes and easy to be assembled or disassembled. While modern society builds a stone-house, the *Wale* house is no longer become the main house in Woloan village. The existence of the *Wale* house just became an additional room which can be assembled to increase the stone house. This dwelling form shows the *Wale* house, which a knockdown wooden house, has a potential to accommodate the changes of spatial needs of family composition.

Now, Woloan Village is famous for its knockdown wooden house production. Until 1980s, the market was limited to Minahasa, but now the orders come from all over the world.

Figure 10. Woloan wooden house variations
Source: (CV. Woloan Permai, 2012)

There are several basic designs and buyers can even customize them. The samples are lying along Woloan streets. The height is about 3 meters above the ground and the space underneath can be used for various purposes, such as a parking space. Unlike Thai house that has separated living units connected by exterior terrace, the rooms inside Woloan house are directly adjacent each other. The original Minahasan house does not include kitchen nor bathroom.However, the customers can still order to have these spaces.

All Minahasan traditional houses are made of three types of wood. The main support beams are from iron wood, walls from cempaka/ frangipani wood and ceiling is made of nanthu wood. The panel modules have more variations with curved panel. The 112m2-type housepanels are usually built by 8 carpenters and takes 2 months to complete (Rumteh, 2004). It takes 1-2 days to dismantle it for shipping and 1-2 weeks to build it on the owner's property by 5-6 workers (Khalid, 2013).

The business is a lucrative trade. At the first, only Minahasan bought the house. Nowadays, buyers comes from national such as: Jakarta, Bandung, Surabaya, Yogyakarta, Medan, Bali, Nusa Tenggara Barat, Papua and others, as well as international such as Argentina, Japan, Poland, South Korea, Philippines, United States, Netherlands, Sweden, Finland, Denmark, Singapore, Malaysia, China, South Korea, Japan and Australia. Some countries, such as Argentina, even have been regular customers since 1990s (Dewangga, 2014).

The increasing demand for the traditional houses encouraged locals, who learned their house-construction skills from their ancestors, to take the business seriously. In 2014, there were 10 companies constituting the Woloan house exporters in Woloan alone. There are also several individuals who are producing this traditional house independently. There are about 500 workers are involved in this project and they are mostly local residents (Dewangga, 2014). In a year, one company can create 20 prefab houses (Rumteh, 2004).

TRADITIONAL PREFAB HOUSE FOR EXTENDED FAMILY SYSTEM

From Thai traditional house and the case of Jim Thompson's house, we can see that traditional prefab house is easy to assemble and disassemble, adjusting the needs of the owner. In fact, the development of prefab construction in this traditional house is a result of the needs of extended family. Ready to assemble elements, modular aspect, non-permanent

joints, as well as functional and structural independence of each space are important to make the house adaptable to changes. Finally, in extended family dwelling culture, where the family keeps growing bigger in a house, such as in Indonesia, traditional prefab house fits the development of family members and their needs as the house's parts can be easily added or relocated.

Traditional prefab housing also encourages community based or local industry, as we can see in Woloan village, since the technology context and the skill is based on traditional. Contrary to modern prefabrication that emphasize advanced mechanical technology and mass production in global scale, the development of traditional prefab emphasize labor-intensive and mass production in local scale. Although, it does not close the possibility of local industry to expand internationally. Furthermore, this industry can encourage local people to study more and develop their cultural heritage. In the end, traditional prefab housing industry can trigger community empowerment as well as cultural preservation in accordance of government program and our society needs.

CONCLUSION AND SUGGESTION

This paper has presented how traditional prefab house can conform the needs of extended family dwelling culture from two case studies in neighboring country. The third case study in Minahasa also reveals the potential of local people empowerment from this traditional prefab house.

Discussions of prefab construction often revolve around the point of view of efficiency in production and construction management as well as advanced technology. This research is one attempt to look prefab construction from dwelling culture point of view and traditional people empowerment. However, this research is limited and does not review the cost and material aspect to conform extended family dwelling culture, especially in Indonesia. More extensive study is needed to look those aspects as well. Therefore, the comprehensive analysis of using traditional prefab house to correspond Indonesian extended family dwelling culture can be formulated.

REFERENCES

Ahrentzen, S. (2002). Socio-behavioral Qualities of the Built Environment. In R. Dunlap, & W. Michelson, Handbook of Environmental Sociology. Westport: Greenwood Press.

Awotona, A., Ogunshakin, L., & Mills-Tettey, R. (1994). Multi-Habitation and Cultural Structures. Experiences from Nigeria. Newcastle: Book of Readings. Dept of Architecture Obafemi Awolowo University.
Boonjub, W. (2009). The Study of Thai Traditional Architecture as a Resource for Contemporary Building Design in Thailand. Bangkok: Graduate School Silapakorn University.
CV. Woloan Permai. (2012). Sejarah Rumah Panggung Kayu Manado. Retrieved from CV. Woloan Permai: http://www.rumahkayumanado.com
Dewangga, K. (2014, January 21). North Sulawesi's Woloan House Goes International. Retrieved from tnol.asia: Indonesia's Global Portal: http://www.tnol.asia/arts-culture/19861-north-sulawesis-woloan-house-goes-international.html
Geertz, C. (1973). The Interpretation of Cultures: Selected Essays. New York: Basic Books.
Heidegger, M. (1951). Building, Dwelling, Thinking. London: Routledge.
Jiboye, A. D., & Ogunshakin, L. (2010). The Place of the Family House in Contemporary Oyo Town, Nigeria. Journal of Sustainable Development, 117-128.
Jotisalikorn, C., Di Crocco, V., Bhumadhon, P., & Tettoni, L. (2013). Classic Thai: Designs* Interiors* Architecture. Singapore: Tuttle Publishing.
Karadag, A. A., Koral, M., & Aydin, S. (2012). A study on determination of the factors affecting dwelling choice: Duzce Toki housing area, Turkey . International Journay of Physical Sciences, 2867-2875.
Khalid, K. (2013, April 12). How much is that knock-down house. New Straits Times, p. 4.
Mosha, L. H. (2012). Imposition of architectural and spatial planning concepts into local dwelling culture. Prime Journal of Business Administration and Management (BAM, 2251-1261.
Nadim, W., & Goulding, J. S. (2011). Offsite production: a model for building down barriers: A European construction industry perspective. Engineering, Construction and Architectural Management, 82-101.
Nongnit's Treasures. (2011). Traditional Sala Thai & Houses. Retrieved from Nongnit's Treasures: http://www.nongnit.net/thaihouse.html#
Ramasoot, S. (2013). Sustainability via Adaptability: Learning from the Traditional Thai House's Built-for-Change Architecture. Journal of Architectural/Planning Research and Studies, 10(1), 57-70.
Rapoport, A. (1969). House Form and Culture. New York: Prentice-Hall.
Rapoport, A. (1981). Identity and environment: A cross-cultural perspective. In J. Duncan, Housing and Identity: Cross-cultural

perspectives (pp. 6-35). London: Croom Helm.
Rumteh, J. (2004, August 29). Minahasa's Traditional House Travels Well. Retrieved from The Jakarta Post: http://www.thejakartapost.com/news/2004/08/29/minahasa039s-traditional-house-travels-well.html
Sathāpitānon, N., & Mertens, B. (2012). Architecture of Thailand: A Guide to Traditional and Contemporary Forms. Bangkok: Editions Didier Millet.
Smith, R. (2010). Prefab Architecture: A Guide to Modular Design and Construction. New Jersey: John Wiley & Sons, Inc.
Stevanovic, M. (1997). The age of day: the social dynamics of house destruction. Journal of Anthropological Archaeology, 334-395.
The James H.W. Thompson Foundation. (2003). The Jim Thompson Legacy: The House that was the Talk of the Town. Retrieved from The Jim Thompson House: http://www.jimthompsonhouse.com/museum/index.asp
Warren, W., Beurdeley, J.-M., & Tettoni, L. I. (1999). Jim Thompson: The House on the Klong. Singapore: Archipelago Press.
Williams, P. (1987). Constituting class and gender: a social history of the home. In N. Thrift, & P. Williams, Class and Space: The Making of Urban Society (pp. 154-204). London: Routledge & Kegan Paul.

MODEL OF EMBODIED ENERGY CALCULATION FOR LOW COST HOUSING IN INDONESIA

Yuni Sri Wahyuni[1]*, Dewi Larasati Z. R.[2], Siswanti Zuraida[3]**

[1]Graduate School of Architecture,
Institut Teknologi Bandung,
[23]School of Architecture, Planning and Policy Development,
Institut Teknologi Bandung
*yuni.cip@gmail.com, **dewizr_ar@yahoo.com

ABSTRACT
Due to the large of housing demand in Indonesia, it causes the large of construction material demand as well. The usage large amount of material for construction which has certain embodied energy (EE) will impact to the amount of EE for whole construction process. EE is an issue of green building that refers energy released in building lifecycle and shows the potential impact of energy consumption for cost and environment.

There are so many ways to calculate EE material usage and each research can be different. This paper describes formula to calculate EE for construction material usage in low cost housing in Indonesia. The formula that developed is based on Bill of Quantity analysis for material construction. The data input for EE material list base on inventory data sources which are collected in this study. Furthermore, the aim of this study is to find the amount of EE on low cost housing, then provide the opportunity to calculate EE based on substitute material in order to meet the optimal embodied energy of building construction material usage.

Keywords: embodied energy, EE calculation, construction material, low cost housing

INTRODUCTION

Housing has function to comply one of human basic need. Housing has a strategic role to moral family education. People need housing which are healthy, affordable, low cost and safe for physics and spiritualism to reach mutual life (Arifuddin, 2010). Housing and environment will create social life, living habits, physics requirement and humanism (Sepang, 2013).

Indonesia government through RPJMN 2010-2014 have mandated to develop affordable housing about 1.618.180 unit by 2014. It's divided into 1.370.000 low cost housing for landed house, 88.180 unit of rented flats and 160.000 unit of owned flats (Bappenas, 2010).

Due to the large of housing demand in Indonesia, it causes the large of material demand as well. The usage of material for construction has certain embodied energy that impacted to the amount of embodied energy (EE) for whole construction process. It is necessary to consider EE as awarness to energy efficient usage.

Government as regulator could make intervention in physics development regulation. Developers as housing provider have to follow the rules that lead to energy-efficient building materials usage. Consumers have to educated by awareness to criticsm energy efficient of housing construction. When it is run consistently and continuously, there will be a energy saving culture. Consumers will be educated from the beginning in terms of energy-saving habits or inhabit. People will pay attention to environmental impacts (Sukendar, 2012)

Energy efficient awareness still act as campaign slogan but not in fact term. People agree that energy-saving is very important thing but the habit showed the different things. One of causes is the different energy calculation which is showed energy efficient values. The values have not force to make good policy and implementation. Stakeholder need same references, valid, and easy to use. The references should show energy efficient value that agreed by all stakeholder. The specific energy efficient value which could indicate the level of energy saving and direct the thing that have done (Rakhmanto, 2011).

This research conducts in order to find out how much energy usage which needed in construction process by material usage. It offer energy usage calculation system base on material preference. it describe material building energy usage and refer to material building by EE material. In

other hand, it can be practised as calculation process. Calculation model is developed for low cost housing only, because it become the biggest housing type requirement in Indonesia.

The aim of the research will give an easy way for EE material calculation and make people have awarness for material building usage efficiently.

METHOD OF EMBODIED ENERGY OF BUILDING MATERIAL CALCULATION SYSTEM

EE have definition as energy that embedded in total lifecycle building (Treloar 2012; Treloar, 1997). EE as indicator how much carbon emission will be found in each phase in total lifecycle building (Dixit, 2013). It necessery to count the EE in building lifecycle. One of phases is construction.

There are so many way to calculate EE. Every country, region, building or case have their own way for the embodied energy measurement (Dixit et al, 2012). There are 10 parameter identification why EE measurement can be different from each other. There are caused by ; geography, social, culture, etc (Dixit et al, 2010).

Every researcher could develop the calculate system according to they need. EE measurement have relative references in state the input, output, calculation purpose, building or project phase, regard to the country which make calculation, etc (Treloar, 2012; Treloar, 1997).

The main requirement in embodied energy is boundary system. Every case have to state which boundary system that will used. The boundary system will guide the calculation and analyze that will created.(Dixit, 2012; Treloar, 2012).

Some EE system that used is Lifecycle Assessment (LCA) and it is too generic system and not cover the system that needed. Then reseacher develop the hybrid system to special system which develop for the spesific case (Wahyuni, 2015; Sposto; 2012; Chang, 2010).

Method

The EE calculation can be created by input-process-output system (Dixit, 2012; Treloar, 2012). The input system development create the inventory data of material and its EE. This research develops an EE calculation system by divided material from the object and collect EE data from

some sources.

The process system development create a calculation formula to count EE by each material, component or sum of all material unit. It is very subtance system and suitable for varian calculation usage. In the process, material inventory data and its EE will re-arrange in a new complete list base on spesific objects that choosed.

The output of system development as a result of EE material calculation. It can be used to count the EE for analyze the composition and comparison material. The EE could be created as basic system to develop carbon emission and costing calculation system.

DEVELOPMENT OF EMBODIED ENERGY CALCULATION METHOD FOR LOW COST HOUSING IN INDONESIA

Construction industry in Indonesia known about 3 aspects in development, there are labour, equipment and material. Material is a static aspect and the other as dynamic aspects. It cover all phase in total lifecycle of building, including the distribution of the pre-construction, construction and post-construction (Kim, 2002).

The research will develop EE calculation method with material building as a main aspect and low cost housing as spesific object to analyze. Work Unit Price Analysis or *Analisis Harga Satuan Pekerjaan* (AHSP) is a method of calculation. AHSP has been commonly used in the calculation of development planning. So it is known well by development community. AHSP could be the basic of the specific system development such as special calculations material to be developed. AHSP has become a standard calculation of all projects, both large and small project. So AHSP can be used for the calculation of low cost housing in this research also (Tim BSN, 2010).

AHSP that used in this research just refer to low cost housing as object. These types ; 21, 36, and 45 unit. The type of housing units are created as general shape of low cost housing types, it is formed from the results of several design units studied object for each type. Low cost housing build in large and massal scale project which needed a large material availability and it could count for its EE material building. Furthermore, the result EE calculation could be a consideration for material building usage by environment impact.

The research create frame work for EE calculation method that describes in figure 1.

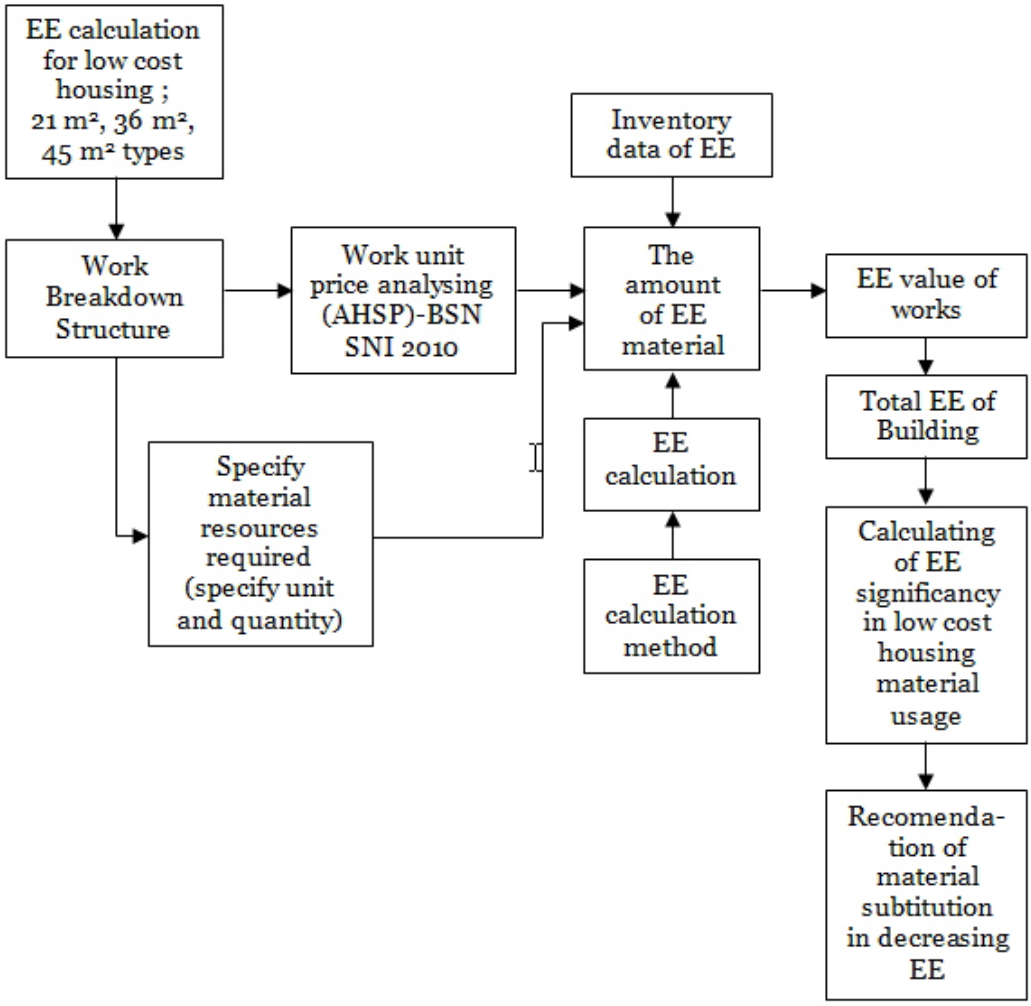


Figure 1. Frame work for embodied energy calculation method

Embodied energy calculation analyze concept

The research create the new formula of EE calculation based on AHSP from Standarisasi Nasional Indonesia (SNI 2010) which published by Badan Standarisasi Nasional (BSN). AHSP is used by most stakeholder in count the Bill of Quantity (BoQ) and costing for material volume.

AHSP is used to divided all material from each unit types. AHSP could show the component, material, volume, material coefisien, labour, equipment and denomination. Then it create the new list by selected material only. It is called as Daftar Analisis Satuan Material or ASM List.

The new list will reveal the different of denomination material. it will converse to same denomination material and compare with EE denomination from inventory data sources. After all, it have a new list of EE material base on ASM.

ASM become an analyze concept to analyze EE by each material and or sum of material for every unit of objects. The result from ASM used to compare each unit and substitute each material.

Embodied energy inventory data

Inventory data of EE material was arranged as simultan with material building divided. The research refer to the data from ICE (Bath University, UK), CA (Canadianarchitect) and Material Life. Some material building from object are refered to inventory data and find out for amount EE in the list. The new inventory data of EE have to converse to same denomination or unit. It need justification to choose which one of source that will used to be.

The new inventory is compared to material list from object then use formula to calculate. The amount of each EEmaterial and fill it in the new list to show how much each EE material.

CHARACTERISTIC OF LOW COST HOUSING MATERIAL USAGE AND ITS EMBODIED ENERGY

Low cost housing has interpreted as an affordable house in price but still livable (Roo, 2009). Low-cost housing is also interpreted as a home for low income people (Butaru, 2010). It were made in the types of small to make low price of production. It were also developed to meet the requirements of the government house subsidised, as the selling price affordable to low-income poeple.

Low-cost housing is developed generally in the types of landed house and 21, 36 and 45 unit types. Most of developers provide these types and most of consumers looking for these type at first when decided to buy a house.

Most people choose low cost housing at the beginning their social life. It is caused by their financial condition. If their financial condition is going better, they can develop their house as they need or move to larger house. The characteristic of low cost housing are low costing than the other, affordable by most people, limited in types (material, configuration, fasade, etc).

Limitation in material usage of low cost housing show that limitation of EE material in it. But due larger demand for low cost housing and most of them are built, it need a large amount of material which needed to comply low cost housing requirement. It means a large amout of EE material will use.

The material resources and production process need a large amount of energy. The EE material for low cost housing is necessery as consideration in planning or pre-construction phase.

The system is developed to asses EE for low cost housing. There are 21, 36 and 45 unit types. The types are choosed because most developer built its types for low cost housing. Database of material is developing to support the embodied energy calculation system. The simulation of ASM could be seen in tabel 1.

Tabel 1. Walls material comparison result

Walls Material	Denomination	Denomination		
		Type 21	Type 36	Type 45
Brick	MJ/kg	46,878.30	48,132.00	55,336.50
Cement Portland	MJ/kg	1136.42	1167.68	1350.32
Agregate	MJ/m3	957.00	985.50	1,140.00

Source : result of ASM calculation (2014).

Table 1 showed that EE value increasing as linier. There is no significant different of walls material EE value for 21 and 36 unit types. But it will be seen significant EE value in large scale, eg. district and city. Then EE material building have to reduce to decreasing EE material. ASM as a tool could used to calculate amount of EE material value when it necessery.

SYSTEM OF ALTERNATIVE MATERIAL SUBSTITUTION PLANNING IN REDUCING EMBODIED ENERGY OF LOW COST HOUSING

In construction management, workers and equipment components need to be saving in time and costing. But the material component tends to be considered fixed. ASM is focused on material components remain. It became the basis for the development of valid models for the calculation of the amount of EE. The results of ASM will be obtained for each EE material where it can be developed for the calculation of the components and materials per unit.

If EE inventory data were complete and selected method of EE calculation were finish, the research will develop system of alternative material substitution planning. The new formula of EE material calculation for low cost housing can count EE material for each unit. Amount of EE will find out and fill in the next instrument.

The result describe amount of EE for each unit object as sum. It will show about composition material for each unit object as comparison. It will be reveal which one material with high and low EE material category.
The material whose high EE can be substituted by other material whose low EE and re-count by the new EE calculation. It will give the references about material substitute to the other by lower EE calculation. This process used by try and error to find out the best substitution can used. The references material use the inventory data that collected before.

The frame work for EE calculation model could be seen in figure 2.

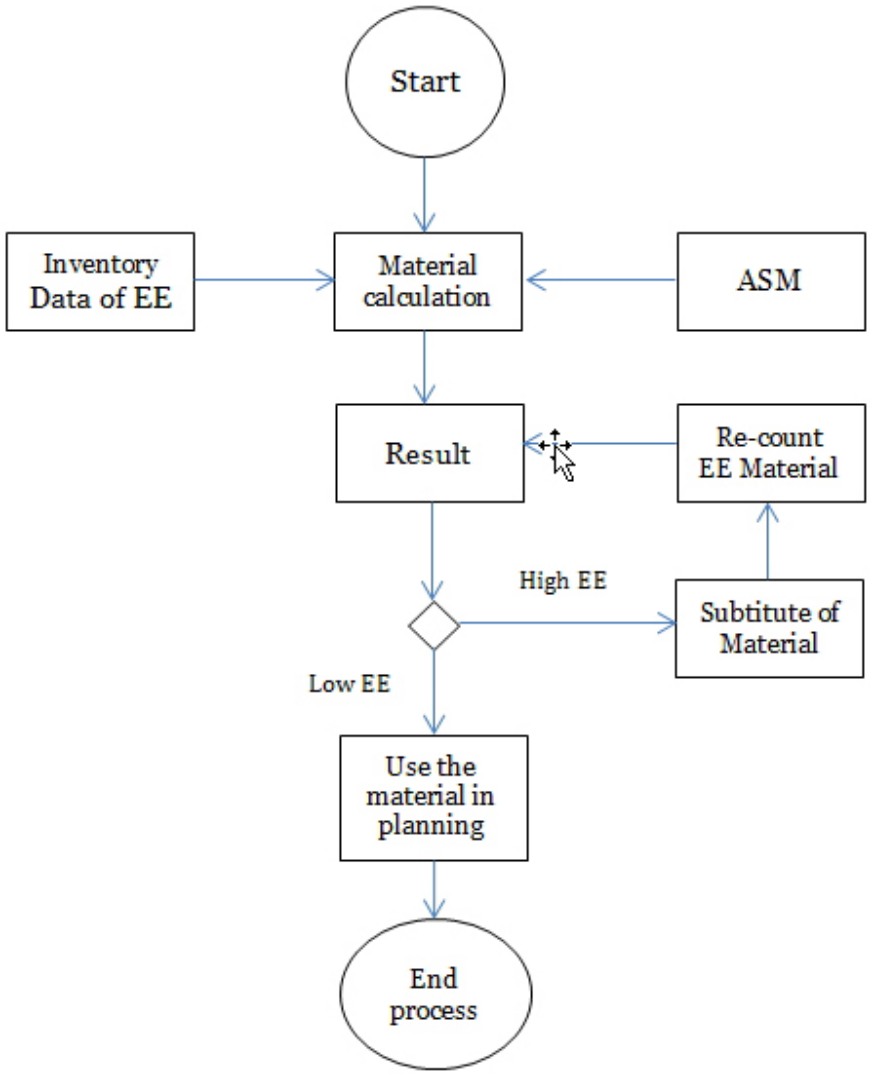


Figure 2. Frame work for embodied energy calculation model

The result can be analyzed by amount of EE material itself or by material composition. EE material show the low and high EE material value. It make decision to subtitute or not for some material. If we find the high EE material value, then we subtitute the material by another one which have lower EE material value and re-count it. At the end, we have optimize EE material value for each unit with material subtitution.

Furthermore, we can compare EE material value and look for the same or different EE material value pattern for any analyze.

CONCLUSION AND RECOMMENDATION

It is necessary to develop the EE calculation method for specific purpose. In this research, ASM has develop base on inventory data of material building for low cost housing only. It is a state of boundary system of EE calculation in this case. The system of alternative material substitution planning will guide people to choose material building by efficient energy consideration. It make easy for people to choose material which efficient EE material value.

The example, ASM as the EE calculation model has developed showed that low cost housing building types does not have significant different EE material value increasing for 21 and 36 unit types.

ASM is developed based on AHSP-SNI for material construction calculation that used to be in Indonesia. ASM is developed as a way to calculate EE material usage which could used in any project base on inventory data for spesific purpose. ASM offer EE material building calculation as a tool for planning, construction and material subtitution in construction system.

REFERENCES

Arifuddin, Rosmariani (2010). Identifikasi aspek-aspek kelayakan dalam keputusan pendanaan proyek pembangunan Rumah Sederhana Sehat (Rs Sehat/RSH). Downloaded at http://lib.ui.ac.id/opac/themes/libri2/detail.jsp?id=82825&lokasi=lokal

Butaru (Ed). (2011). Tantangan pembangunan Perumahan dan Permukiman di Perkotaan. Jakarta : Redaksi Butaru.

Chang, Yuan, Robert J. Riesa, Shuhua Leib(2012). The embodied energy and emissions of a high-rise education building: A quantification using process-based hybrid life cycle. Energy and Building 55 pp 790-798.

Chang,Yuan,Robert J. Ries, Yaowu Wang. (2010). The embodied energy and environmental emissions of construction projects in China: An economic input–output LCA model. Energy and Building 39 pp 6321-6330.

Dixit,Manish K. , Charles H. Culp, Jose L. Fernández-Solís. (2013). System Boundary for Embodied Energy in Buildings: A Conceptual Model for Definition. Renewable and Sustainable Energy Review 21 pp.153-164.

Dixit, Manish K., Jose L. Fernández-Solís, Sarel Lavy, Charles H. Culp. (2012). Need for an embodied energy measurement protocol for

buildings: A review paper. Renewable and Sustainable Energy Reviews 16 pp 3730-3743.
Dixit, Manish Kumar, José L. Fernández-Solís, Sarel Lavy, Charles H. Culp. (2010). Identification of parameters for embodied energy measurement: A literature review.Energy and Buildings 42 pp. 1238–1247.
Haynes, Robert, (2013). Embodied Energy Calculation within Life Cycle Analysis of Resideintial Building (draft articles).-- : Australia.
Kim, Jong-Jin, Brenda Rigdon, Jonathan Graves, (Ed) (2002). Sustainable Architecture Module: Qualities, Use, and Examples of Sustainable Building Materials. Project Intern; College of Architecture and Urban Planning, The University of Michigan. Michigan : National Pollution Prevention Center for Higher Education.
Sepang, Ronny. (2013). Hak Kepemilikan Atas Perumahan yang Sehat dan Layak Huni Bagi Masyarakat Miskin Di Kota Manado. Manado : Fakultas Hukum San Ratulangi Vol.I/No.3/Juli-September /2013
Sposto, R.M. Paulsen, J.S. (2012) An embodied energy analysis of social housing in Brazil : Case study for the "Program My house my life"-inventory model. International Journal of Civil and Environment Engineering IJNEE-IJENS Vol.12 No.05 pp. 36-39.
Sumarmi, Saptaningsih (2011). Pengambilan Keputusan Pemilihan Perumahan. Jurnal Akmenika Volume 1 Nomor 1 No
Tim (2010). Analisa Harga Satuan Pekerjaan. Jakarta, Indonesia – Badan Standarisasi Nasional
Treloar, Graham J., (2012 ; 1997). Extracting Embodied Energy Paths from Input-Output Tables :Towards an Input-Output Based Hybrid Energy Analysis Methods. Economic System Research Vol.9 No.4 pp 375-391.
Wahyuni (2015). Kajian Perkembangan Riset Embodied Energi. Draft article for submit in doctoral seminar.
Woo, Rosten, Mangin, John. (2009). What is Affordable Housing ?. New York-US : The Center for Urban Pedagogy

ONLINE SOURCES

www.canadaarchitect.com/emboodied energy. Downloaded at2013, October 07
Sukendar, Sukendro. (2012). https://abaslessy.wordpress com/2012/01/15/287/Penggunaan material dengan konsep hemat energi. Download at 2015, March 15
Rakhmanto, PriAgung (2011). http://www.reforminer.com/media-coverage/tahun-2011/1123-seolah-olah-mengelola-energi

THE MATERIALITY OF THE RUNGUS LONGHOUSE IN HARMONY WITH NATURE

Azizi Bahauddin[1]*, Aldrin Abdullah[2]**

[12]School of Housing, Building & Planning, Universiti Sains Malaysia
*azizigt@gmail.com, **aldrin@usm.my

ABSTRACT
The traditional Rungus longhouse is a dwelling that is dwindling to less than ten in number. Found in the northeast corner of Sabah, Malaysian Borneo, the Rungus tribal group can be found farming the land mostly of agricultural products on small plantations. Their longhouses are dual-purpose dwellings, for family and community use, constructed entirely of small split timbers lashed with rattan for the frame, palm fronds for the thatched roof, split bamboo for the floor and tree bark of hewn wood for the compartment walls. Each family has its own separate quarters off a common hall for socialising and community work enhanced by the materiality of the architecture. Strongly related to the spirit of the place, the 'rice spirit', in particular, figures prominently in the people's beliefs and practices in controlling the spirits and the people's daily affairs; controlled by bobohizan, the highest priestess. Unfortunately, all these unique beliefs are disappearing with time, requiring proper documentation of the longhouses. The objectives gear towards analysing the architectural values and investigating cultural understanding associated with the longhouses. Most importantly, the issue of how the Rungus people relate to the environment is studied through the tangible and intangible cultural aspects of the people. The research utilises the qualitative method based on content analysis, ethnography and case studies of three longhouses. The paper instigates an investigation into the dwelling of the Rungus people of their place in the environment and their interrelatedness, a relationship that feature the dwellers and their nature related dwelling materiality.

Keywords: Rungus, longhouse, materiality, spirit, environment

INTRODUCTION

The paper delves into one of the indigenous people of Malaysia and its architecture on the island of Borneo. The indigenous people of Sabah and Sarawak are synonymous with their longhouse architecture. Unfortunately, the Rungus people of Kudat in the Bengkoka Peninsula, the sub-group of the Kadazan-Dusun (Hans, 2008), with their longhouse design are not receiving attention. In theory, the longhouses have long existed as a mode of rural settlement, particularly among the indigenous peoples of Sabah and Sarawak (Ong, 2005). However, Malaysians in general have a vague conception of Rungus culture as well as the architectural language of this longhouse or *vinatang* as a housing pattern, with clear-cut boundaries of public and private spaces for the domestic families dwelling in these longhouses. This is due to the lack of research being done about this community and its architecture. To further aggravate the situation of lack of information, the Rungus community has been relocated to their new settlements away from their ancestral land (Appell, 1983). The original landscape of the Rungus people in Kudat includes *puru*, patches of forest approximately one hectare in size and inhabited by *rogon* (spirits) (Massey, et. al, 2011). But these areas are reducing in size. The problem indicates that the people are also losing their architectural heritage through the relocation of their settlements.

The Rungus people of Kudat are a sub-group of Kadazan-Dusun, Sabah's major indigenous people on the island of Malaysian Borneo (figure 1 & figure 2). Troubled by the relocation of settlements, these people are losing their strong foothold in their traditional land tenure where each village held rights as a corporate entity over its territory. The villages had clear boundaries and only members of it could harvest their cultivated open lands in this territory annually. Once the last crops were removed, the areas were given back to the control of the village and could be used again by anyone in the village in a system called 'circulating *usufruct*' (the right to enjoy benefits) (Appell, 1983). However, the right is slowly stripped away hence the loss of their communal architectural heritage with less than ten houses remaining.

Figure 1. Map of Sabah on the Malaysian Borneo

Source: Google Map


Figure 2. Map of Sabah

Culturally, the house is the embodiment of the community reflecting all communal rules and customs. The research aims:

a. To investigate the architectural and cultural aspects of a communal dwelling of the Rungus longhouse
b. To examine the cultural influences that dictate the communal space planning of the Rungus longhouse and its environment
c. To establish an architectural language between the philosophy of the detail embellishments and the Rungus longhouse for design understanding

There is no current exploratory research being done in understanding the Rungus longhouse in relation to its communal dwelling. This can be achieved by studying the traditional philosophy of the Rungus people. This research embarks into an unchartered territory that can be perceived as a new angle of studying a longhouse design setting in relation to communal dwelling. This investigation delves into the meaning of Rungus culture in order to understand the architecture of the longhouse by employing a few steps as research method.

Figure 3. Map of Kudat and vicinity

Figure 4. Rungus longhouse

Source: Huton, 2003

METHODOLOGY

The research employs a qualitative method relying on ethnography and phenomenology documentation supported by an in-depth investigation in the Rungus villages within the Kudat vicinity (figure 3). It will be supported by architectural detail studies on the longhouse, interviews, naturalistic observation and visual data collection. Ultimately, the expected outcomes include the understanding of the architectural and cultural aspects of the longhouse (figure 4) in relation to communal space planning and activities. However, the lack of secondary data requires the researcher to depend on and source out from primary sources. Since this research is focussing on the Rungus cultural interpretation of traditional philosophy of a communal dwelling in a longhouse design context, it is imperative that the study reviews the customs and understanding of Rungus longhouse. It is known that any culture in the world has a ritual that is related to practices of spiritual, mental and physical wellbeing associated with their life styles.

The longhouses chosen are the houses that have the most original form of Rungus longhouse features. A pilot study identifies specific longhouses before further work can take place. This process involves the

phenomenology method looking at the evolution of the longhouse and what influences warrant changes in the longhouse design. For this paper there are three case studies investigated. They are based in the District of Kudat, Sabah. This research method also involved some non-structured interview of the owners of the longhouse conducted simultaneously with the visual data collection. These steps focus on the residents and their perception of the detail of longhouse space planning while from the experts the interview will focus on types and customs, rituals and philosophy associated with their cultural system. This method is also looking into the tribal leaders' knowledge of the longhouse, be it associated with any cultural philosophy or traditional customs. Most important of all is the established connection between the traditions and the well-being of the house and how it stands.

THE RUNGUS COMMUNITY

This paper is examining the longhouse of the Rungus people in an area famed for the title 'The Tip of Borneo', along the northern coastal line of Sabah. Though it is uncertain how long the Rungus have been occupying the area, they are considered to be the most traditional tribe in Sabah due to their isolation from the bigger towns for so many years. While many have adapted to modern living rather well, the older generations still cling to their unique culture and traditions (Heaven at the Edge of Borneo, 2012). The Rungus longhouse is singled out for this research for the reason that the Rungus community has lived, or are still living, in these longhouses. The longhouse embodies a communal house design made up of individual spaces. This interrelationship concept is very valuable to the understanding of the longhouse design. On the other hand, the Rungus longhouse has also been targeted as one of the major tourism attractions in Sabah that contribute to the construction of the improvised version of the Rungus longhouse, a detachment from the authentic form of the structure. Non-Rungus people perceive the Rungus longhouse as a communal dwelling where its occupants share a big house. The villagers are mainly farmers and many of its women are quite renowned in their handicraft making skills. They display a very close-knit bond among the people where communal activities demonstrate the involvement of every person in the community (Pengiran Bagul, 2005). The domestic family's economy is based on (1) the *swidden* or slash and burn is a system in agriculture where lands are cultivated until its fertility diminishes, then it is abandoned until is restored naturally in the cultivation of rice, maize, cassava, and a variety of vegetables; (2) the raising of pigs, chickens, and frequently water buffalo; (3) the planting and cultivation of a large

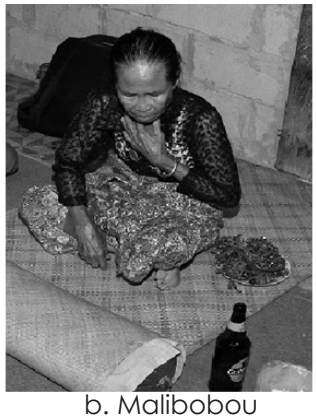
variety of fruit trees; and (4) the sale of domestic manufactures. The most important of these are clothing of various types that are woven exclusively by women from cotton they have grown, spun into thread, and dyed (Appell & Appell, 2003; Anonymous, 2009). These activities are also the governing factors in the design direction of the longhouse along with their cultural beliefs and communal activities.

The Rungus Cultural Values and *Bobohizans*

The Rungus in Kudat area, in the north of Sabah, are arguably the most traditional ethnic group here. They remain remarkably strong in this time of transition, and keep up with an age-old life-style. Their life, as that of most tribes in Borneo, revolves around rice: the preparing of the rice field or the clearance of a hill plot, the growing of rice and looking after it, and finally the harvest. Large coconut and banana groves enable the Rungus to earn cash. Their traditional life-style suits them very much and seems to keep them out of trouble and stress. They seem to have been the last Dusunic immigrants to Sabah to settle here permanently, long before the arrival of the British. They have up to-date conserved much of their cultural heritage. The Rungus are a sub-group of the Kadazan-Dusun, with a distinctive language and a few dialects, architecture, *adat* (customs), and outfit. Many people still, especially from the elder generation, dress the way they have attired when they were still unaffected by outside influences and it is presumed that most of the other tribes of the Kadazan-Dusun community had similar dress and attire: simple black sarongs for the women, wide black trousers for the men and beaded accessories. Although they are considered backward, changes in their lifestyles and religious beliefs due to rural area development have started to take impact on their cultural values.

Christianity had mostly replaced the original religion of animism. Largely governed by the ancestral beliefs, the Rungus culture is rich in oral traditions that can be seen being practiced in their religious performances for curing illnesses, for celebrating success in agricultural activities and for the perpetual fecundity of the village and individual families. Whereas these performances had previously been performed by high priestesses, the *bobohizans* (figure 5), who were also spirit mediums, by 1986 these ritual ceremonies were seldom held. In the past, when there had been a death, friends and neighbours would come and spend the night sitting with the body of the deceased, retelling myths and legends to keep people awake and to hold the predatory spirits at bay even to the erecting of new longhouses. This was now seldom practised (Appell & Appell, 2010).


a. Momolian


b. Malibobou


a. Momolian

Figure 5. Various bobohizans
Source: Personal

The *bobohizan* or *bobolian*, in the context of Rungus longhouse, contributes in the building of the house by determining its right location based on good and evil spirits residing in the area. With the results of the consultation, she would then know if a chicken, pig, or buffalo was required for a sacrifice or just a simple prayer or *rinai* sufficed, the same practice applied for healing sick people. Every ritual taken place is always related to nature. In the Rungus context, nature must be respected thus; the material for constructing the longhouse must come from the surrounding natural resources, to be able for them to be close to nature without damaging them. Problems arise when harmony and respect of nature are breached, disaster occurs and certain rituals are needed to bring back the balance, heal the sick, appease the spirits and restore the order. In the construction of the longhouse, the *bobohizans* are perceived as an institution and the main source for indigenous information and knowledge. They lead in the spiritual matters and in cultural affairs for they are the ritualists, herbalists, therapists, teacher of *adats* (customs) and consultant in every aspect of the Rungus livelihood. Besides traditional healing with natural herbs the *Bobohizans* are to maintain harmony between humans, nature and astral world according to their age-old belief system. This is where customs and traditions play important roles in harmonising the existence of the house. But despite this peace and aspect of eternal sleepiness, the Rungus are far from being disconnected from the modern times. Cash crops have allowed them over the last 30 years to earn money, and in some cases wealth. The young people are being educated, some of them having gained university degrees and have entered the Sabah State Government (Herman, 2014).

THE RUNGUS LONGHOUSE

Many Rungus people live in longhouses, with each family having its own separate quarters off a common hall. At the edge of the communal hall, a well-ventilated platform of split bamboo with outward sloping walls provides a place for socializing and communal work. The houses are not perched on high stilts, but are usually only three to five feet above ground (figure 6).

Figure 6. The Rungus longhouse stilts

Figure 7. Sloped roof

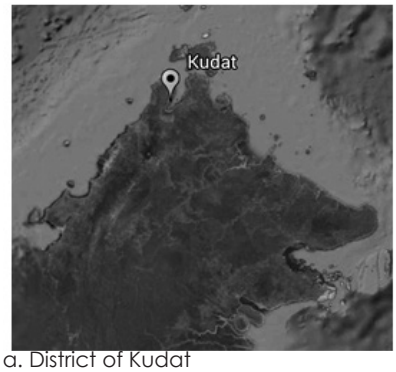
Source: Personal

Through observation, one can see that the roof is low, and the walls slope outward (figure 7). In olden times, longhouses of over 75 doors are said to have been common. Now, they rarely exceed 10 doors. Usually single storey, more modern two-storey versions of the longhouse also exist. Single-family houses are sometimes built near the longhouse – these take the same form, but are short. Dogs, chickens and other domesticated animals abound in the clearing where the houses stand, and children too young to help with the daily chores play in the sand in the clearing. According to an interview with one of the owners of the longhouse, the Rungus people being friendly and warm will quickly announce the arrival of a stranger, and whoever passes will be invited into the house for a rest. During the hot afternoons, a palpable laziness prevails in the houses. People doze on the platform in the gallery or work on some handicraft if they are not at work in the fields, or catch fish and crabs. When everybody comes back from work in the late afternoon, the general area bounces under the many feet. When the house gets alive in the late afternoon, the ladies will take out their work of basketry, string beads or weave sashes on back strap looms. It is not infrequent to see old ladies who have their wrists still encircled in brass coils with white and black shell-bracelets at either end, and wear the traditional home-woven sarong with antique heirloom beads. Ladies who do wear traditional gear are often very much

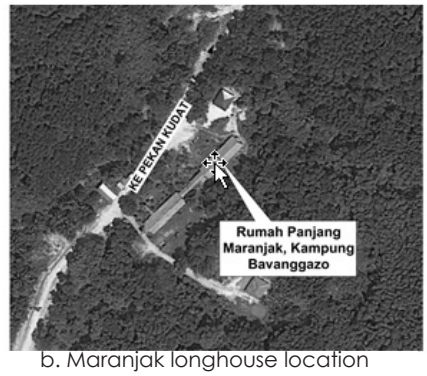
respected *Bobohizans*, a tradition that is diminishing.

CASE STUDIES

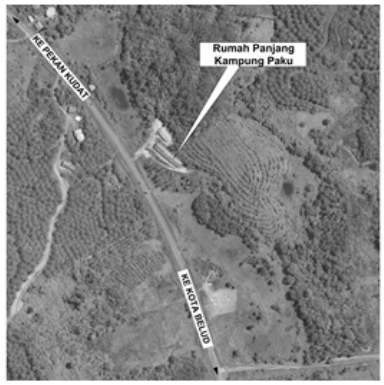
The Rungus tradition was gradually disappearing due to modernisation resulting in the remaining longhouses that preserve their original form are very low in number. A few selected longhouses in the vicinity of Kudat District (figure 8) are the bases and locations for the pilot study and the fieldwork. The few identified Rungus villages are Kampong Bavangazo, Kampong Tinangol, Kampong Minyak and Kampong Paku. However, through first observation, many of the houses identified are no longer authentic. They have been through a lot of changes and only a few remaining can be considered authentic. Three of the longhouses that still maintain the authenticity of the Rungus architecture are the Maranjak longhouse, Kampong Paku longhouse and Tindakon Dazang longhouse. All these three houses can be found in close proximity to one another and maintained mainly to educate the locals and tourists alike about the Rungus architectural heritage.



a. District of Kudat



b. Maranjak longhouse location



c. Kampong Paku longhouse location

d. Tindakon Dazang longhouse location

Figure 8. Locations of case studies

Source: Google Map

Maranjak Longhouse

The Maranjak longhouse (figure 9) is located in Kampong Bavangazo, Matunggong located about forty kilometres from Kudat. It now serves as a lodge and has a variety of functions and facilities for tourists such as accommodation and recreational activities. Visitors and locals alike will be able to identify a way of life and traditional culture of old Rungus here as it also functions as a museum. Everything in the house is filled with heavy reflections of the local Rungus tribe's cultures and traditions. In early August 1992, the construction of the first long house with nine rooms was started. It was built using local materials. Water supply came from two natural water reservoirs on the top of Gomantong Hill. There are only six families involved in the operation. This longhouse offered homestay products to visitors and it has become a living museum with a showcase of Rungus custom and culture. It was gazetted as a village reserve for five acres. Next to it is another reserve for water catchments on Gomantong Hill. The surrounding villages managed to specialise in one industry such as Sumangkap Village on gong making (figure 10) and Gambizou Village on honeybee farming (Pengiran Bagul, 2005). Kampong Bavangazo decided on tourism as their sole industry. There was support from the state government in form of seed funding and consultation.

Figure 9. The Maranjak longhouse

Figure 10. Maranjak gong making

Source: Personal

Kampong Paku Longhouse

The Kampong Paku longhouse (figure 11) is located in the vicinity of Kampong Bavangazo. It is still habitable and privately owned by the

Linsapu family led by Raymond Majuma. The family gathers together in the house during cultural festivities. The house accommodates 16 families and most of the family members have converted into Christianity and Islam although traditional rituals are still celebrated in this house.

Figure 11. Kampong Paku longhouse

Figure 12. Tindakon Dazang longhouse

Source: Personal

Tindakon Dazang Longhouse

Tindakon Dazang longhouse (figure 12) has been in operation since early 2010. The idea of emerging this tourism spot in Kudat was started by a local Rungus man who is passionate about travelling and seeing the world around him, motivated by his passion to see Kudat as a tourist destination resulted in the 9-acre development of land. The longhouse has 12 rooms, a restaurant and a meeting room on an eight-acre land fronting the South China Sea. In keeping with traditions, the walls of the house are made entirely of traditional materials such as split bamboos and the *Darasan* tree bark, while the roofs are made of *nipah* palm leaves. However, the longhouse is equipped with modern amenities such as toilets and showers.

THE MATERIALITY OF THE RUNGUS LONGHOUSE ARCHITECTURE

The three longhouses chosen as case studies are longhouses that are quite long with the Maranjak longhouse being the longest in dimension, extending to almost 100 metres in length; Tindakon Dazang being the medium length in size and Kampong Paku being the shortest of them all. The typical materiality of the traditional Rungus longhouse utilises small split timbers lashed with rattan for the frame (figure 13), leaves for the thatched roof (figure 14), bamboo for the floor (figure 15) and tree bark

for the compartment walls (figure 16). These materials are sought from the environment requiring rituals and community participation in erecting the house. These longhouses can accommodate more than twenty rooms and houses more than 100 people at one time. They are houses that cater for the communal needs by providing a communal space for meetings and areas for activities and functions (figure 17). These traditional Rungus longhouses feature truly creative designs. In detail, the traditional raw material used for their construction such as the thatched roofs are made from a tight weave of dried *nipah* palm, and the solid house frames are a sturdy type of timber from a tree called *Berlian*. The floors are an elevated platform of split bamboo, allowing for great natural ventilation of the hall area and makes for a comfortable sitting area. The walls are simple partitions made of textured tree bark, which is prepared and then stacked in rolls at the side of the house for later use.

Figure 13. Rattan frames

Figure 14. Leaves for thatched roof

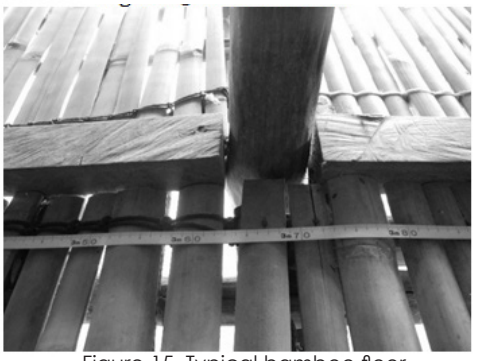


Figure 15. Typical bamboo floor

Figure 16. Tree barks for typical compartment walls

Source: Personal

The Rungus longhouse is designed in such a way that all daily activities can be done in the shade. Slanted side walls (figure 18) – an element synonymous with the traditional architecture of the Rungus people – allow occupants to sit comfortably without the need for modern or elaborate

furniture. This is especially important for the Rungus womenfolk who are renowned for their skills as bead weavers, and have to sit around all day with their legs stretched out to in order to produce their intricate handicrafts. One interesting architectural angle of the Rungus longhouse is that, regardless of the terrain, the occupants of the longhouse will always try to make the building as linear and as parallel as possible – which means an assortment of timber posts of all shapes and sizes propping up the single level floors of the longhouse, some of which may span up to 50-60 metres long. In fact, it was speculated that there once existed a Rungus longhouse in Kudat that had a span of 90 *pintu* or doors.

Figure 17 – *Apad lansang* (communal area)

Figure 18 – Typical slanted side walls

Source: Personal

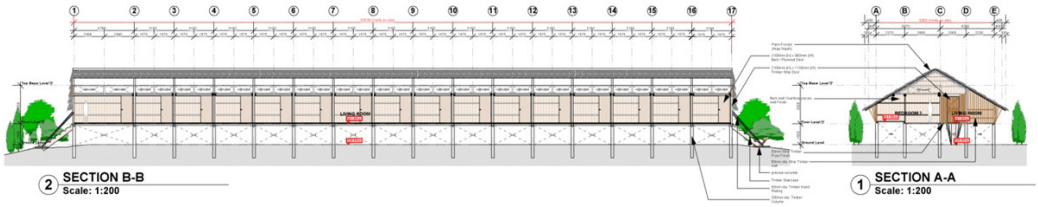


Figure 19 – Typical elevation and section – Kampong Paku longhouse
Source: Personal

Assuming that each door represented a single dwelling unit (approximately 3 metres in width), then this longhouse would have had been 270 metres long. Longhouses were usually built off the ground and along a terraced river bank. The longhouses were built on stilts (figure 19) for a number of reasons including to raise the building above the water should flooding occur, to allow the animals such as pigs, chickens and water buffalo to live underneath, too serve as a refuge or fortress in case of attack and to allow air to circulate throughout the house. One can see that the floor is made from split bamboo for practicality in terms of ventilation

and the availability of the material. When one walked on it the floor was soft, spongy and one could feel the breeze come up from underneath. In fact, air circulated freely through the walls, roof and floors. It was cool and a slight breeze could be felt in all rooms. Hence, this architectural and cultural understanding of respecting nature's offerings has established an architectural language of the longhouse (Sokial, 2014). A typical Rungus longhouse (*vinatang*) measures approximately about 3 meters by 15 meters (figure 20) and comprises a long gallery or corridor (*langsang sid apad*), where socializing and community activities takes place, as well as several family 'apartments' (*valai*) (figure 21) each with own sleeping unit (*tingkang sid ongkob*), areas for cooking (*ropukan/rapuhan*) (figure 22) and working (*langsang sid ongkob*) and an attic (*abai sid ongkob*) and (*abai sid apad*). Each family has its own *valai*. A typical longhouse has about ten *valai*, but larger ones may have fifteen or more. The most distinctive feature of this longhouse is a tower called *rorizan* (figure 23) a place to keep the most beautiful girl in the longhouse.

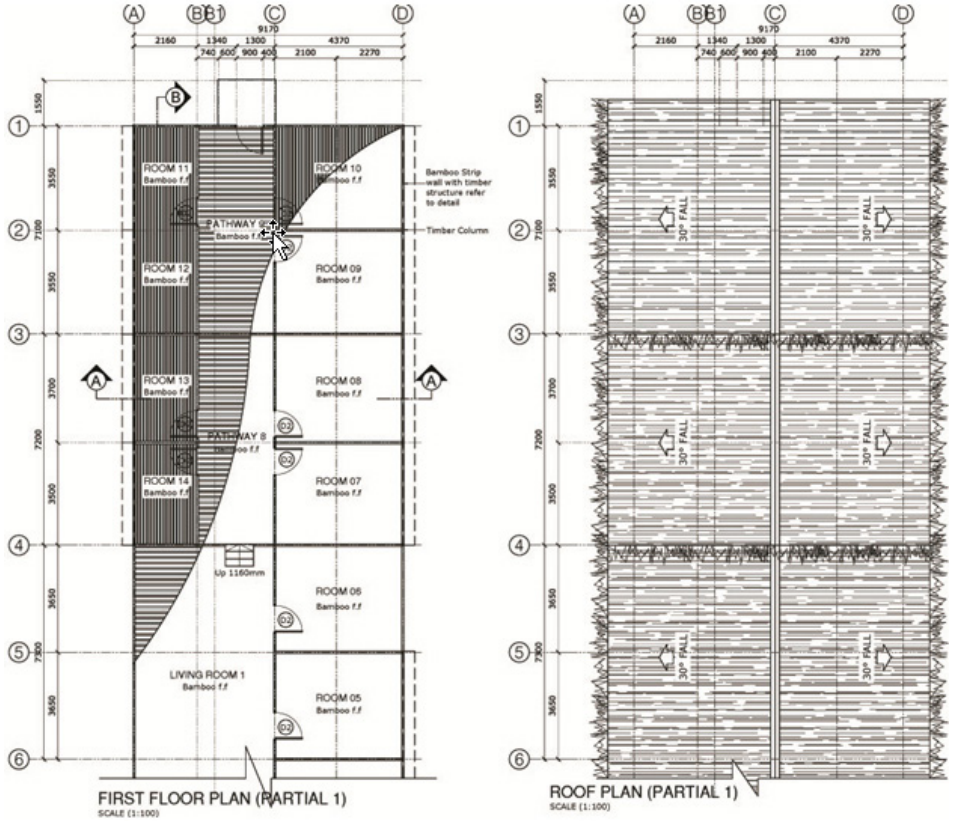


Figure 20 – Typical floor plan, partial floor plan of the Maranjak longhouse
Source: Personal

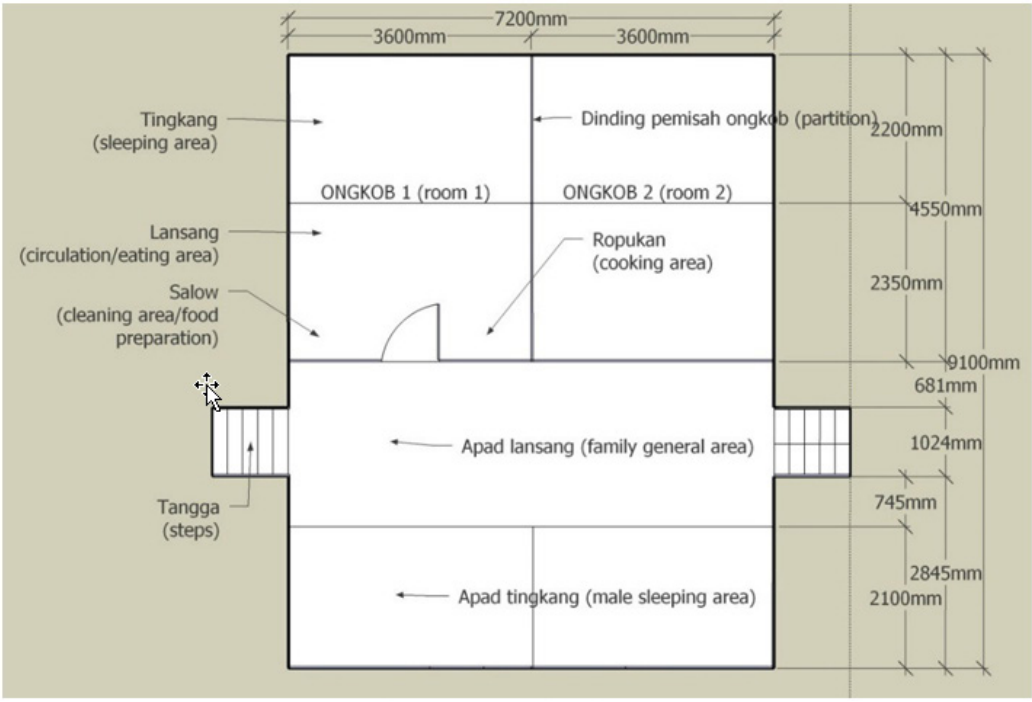


Figure 21 – Breakdown of the typical valai floor plan for *ongkob* (rooms)
Source: Personal

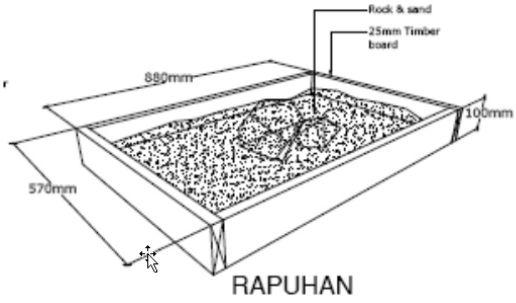


Figure 22 – *Ropukan/rapuhan* – kitchen in ongkob

Figure 23 – *Rorizan* (tower)

Source: Personal

To avoid flood and wildlife such as snake, the house is lifted off the ground by stilts made of hard wood such as *bogil*, belian ironwood, mangrove wood and *manzalangan*. In the old days, the Rungus people also raised pigs under the longhouse. The roof is dry palm leaves of sago or nipah,

and needs to be replaced every 3 to 5 years. There are many taboos about longhouse. For example, the site of a new longhouse is chosen based on signs such as dreams, animals, weather and human behaviour. If a python symbolises death in local belief appears at the construction site, they would not build the longhouse there. In contrast, a tortoise is an auspicious sign. Guests who enter an apartment under construction, or leaving the house without informing the host will bring bad luck. The wood of the *toodopon* and *puvok* trees cannot be used in making a house, as they will bring illness, disaster or bad luck. Nevertheless, after many Rungus embraced Christianity, they may not strictly uphold these beliefs anymore. However, the steep cultural traditions are still visible in the design of the longhouse dreamt by the *bobohizans*. They are able to control a habitable architecture design, friendly to the environment and the application of the architectural materiality acquired from natural resources that are in abundance.

CONCLUSION

This paper examines and analyses the longhouse and its materiality associated with the Rungus culture as the focus of the study. The research looks into the understanding of the longhouse and the meaning of Rungus cultural beliefs associated with the architecture. There exists a vast inventory of poetry, prayers, songs, hymns related to the *bobohizan* and word pictures of the life that they have led, their relation with the absolute and their relations with each other, hence the creation of the longhouse to reflect the communal bond. This accumulation of oral literature, winnowed through the ages, is exquisite in its beauty and in its depth of wisdom. It provides a unique portrait of life as lived in a different time and place by individuals who share the human spirit. It encodes the basic cultural themes, values and propositions of this society, and it contains the creative voice of the people. This paper also analyses the cultural information in relation to communal dwelling in the longhouse. The research also establishes an architectural language derived from the architectural survey done on the longhouse and its materiality based on natural resources acquired from the environment. The merger between the meaning of the communal dwelling from the traditional Rungus point of definition and the architectural language understanding of the longhouse becomes a major determinant and contributor in this study. It encompasses issues of an architecture designed for communal activities that are steeped in tradition. The findings also include the understanding of philosophy of Rungus and their interpretation in the contemporary language of architecture. As in the Rungus culture, the longhouse is

defined in many aspects of life's activities, imprinted with spiritual beliefs and religious teachings. Interpretation from the cultural point of view of its architecture has shown the meaning of this longhouse in depth and has, in a way, preserved some cultural and architectural knowledge of the longhouse despite its extinction. It has exhibited the issue of materiality applied in an architecture that respects nature and its environment, a move by the Rungus people to live in harmony in a surrounding that bears spirituality since ancient times.

ACKNOWLEDGEMENTS

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REFERENCES

Anonymous. (1992). Head Hunting in Borneo. The Sea Dyaks and Other Races of Sarawak. Kementerian Pendidikan Malaysia. Kuala Lumpur: Dewan Bahasa dan Pustaka.

Anonymous. (2009). Penjelasan konsep Magahau berdasarkan keputusan Konvensyen Undang-undang Adat Matunggong. Sabah Daily.

Appell, G. N. (2010). The Sabah Oral Literature Project. World Oral Literature Project: Cambridge.

Appell, G.N. (1983). Ethnic Groups in the Northeast Region of Indonesian Borneo and Their Social Organizations. Borneo Research Bulletin 15:38-45.

Appell, GN. (1995). Community Resources in Borneo: Failure of the Concept of Common Property and its Implications for the Conservation of Forest Resources and the Protection of Indigenous Land Rights. Yale Forestry and Environmental Studies Journal: 98, 32-56.

G. N. Appell, G.N. & Appell L.W.R. (2003). Sabah Oral Literature Project: Death among The Rungus of Sabah, Malaysia: The Dissolution Of Personhood And Dispersion Of Multiple Souls And Spiritual Counterparts. Journeys of the Soul: Anthropological Studies of Death, Burial, and Reburial Practices in Borneo, William D. Wilder, Editor. Borneo Research Council Monograph No. 7. Phillips, Maine: Borneo Research Council, Inc.

Heaven at the Edge of Borneo. Communications & Publicity Division, Tourism Malaysia. 2 July 2012.

Herman. (2000). The Rungus: The Art of Blending Traditional Life-Style into the 20th Century accessed on 27/02/2014 at www.flyingdusun.com.
Hutton, Wendy. (2003). Kudat. Natural History Publications: Kota Kinabalu.
Massey, A. et. al (2011). Beware the Animals that Dance: Conservation as an Unintended Outcome of Cultural Practices. Society, Biology and Human Affairs: Durham.
Ong, P. L. (2005). Rumah Panjang Tradisi Rungus dalam Arus Pembangunan: Perbezaan Pengertian. Akademika 68 (Januari) 2005: 43 – 64.
Pengiran Bagul, A. H. B. (2005). (ed. Kaye Chon) Community-Based Ecotourism Development and Local Community Participation. One Earth One Family: Travel & Tourism - Serving a Higher Purpose. 3rd Global Summit on Peace through Tourism - Education Forum. Pattaya, Thailand. October 2-5, 2005. p. 6.
Philips, M.E. (2008).The Longhouse of the Tarsier: Changing Landscapes, Gender and Well Being in Borneo. Borneo Research Council Monograph Series. Carol J. Pierce Colfer (ed.). 433 pp. Southeast Asia Program Publications: Cornell University.
Sokial, R. N. A Comparison between Traditional Longhouses in Sabah and Sarawak. The Sabah Architectural Heritage accessed on 27/02/2014 at www.sabahwarriors.blogspot.com.
Teo, A. & Lan, M. A Better Life Threatened. Asian Beacon. Dec 18, 2003.

INDETERMINATE BOUNDARIES: DWELLING IN NEIGHBOURHOOD FACING RECURRING FLOODING

Kristanti Dewi Paramita[1]*

[1]Architecture Department, Faculty of Engineering,
Universitas Indonesia
*kristantiparamita@yahoo.com

ABSTRACT
This article explores dwelling boundaries in neighbourhoods facing yearly recurring floods. The findings within this paper are based on observations in the dwelling practices of informal settlement dwellers along the corridors of the Ciliwung River in Jakarta. The capital city of Indonesia is frequently inundated as a result of insufficient urban infrastructure in coping with increasing densities of people and descending level of land. As flooding could increase in terms of time span and water level, boundary of the dwelling in flooded neighbourhoods becomes indeterminate as it expands, shrinks, and becomes displaced.

Living in such indeterminate boundaries shakes grounds on established dwelling properties. Indeterminate boundaries are manifestation of boundary maintaining system carried by the dwellers in engaging with the dwelling's surfaces, objects, and infrastructures that change based on how the water transgresses the dwelling boundaries. Certain surfaces become unnecessary, such as window glass, partitions, and bathroom doors. Transitory objects such as trash bins and chairs are largely absent, as it becomes displaced by the flooding. In addition, when temporary relocation is inevitable, their shelter choices are linked to their present dwelling spaces, and thus become a temporal part of their overall living space.

This article is an examination of how dwelling boundaries dynamically adapt in response to the environment. The use and disuse of various dwelling properties as a result of this adaptation also creates social and environmental implications in the dwelling process, therefore further developments of dwelling in flood prone areas must take such dynamic into account.

Keywords: dwelling, boundary, indeterminate, flooding, transgression

INTRODUCTION

This article explores the notion of boundaries on dwellings in recurrent flooded neighbourhoods. Dwellings boundaries are a reconstruction of socio-cultural values held by the dwellers, which includes its environmental and ecological contexts (Ozaki & Lewis, 2006). Boundaries are not finite (Borden & Rendell, 2000) but rather, depends on the location and habits of its dwellers (López & Sánchez-Criado, 2009).

The focus of this study is boundaries in informal settlement dwellings around Ciliwung riverbanks in Jakarta, Indonesia. In the event of rare and singular floods, dwellers adopt various forms of defensible boundaries to prevent exposure of flood water in the future. In contrast, the phenomenon of recurring flooding has shifted the objective of these measures from defence to risk management, allowing incursions of floodwater but still preventing further damage (Few, 2003). The presence of the physical construct in boundaries in this measure is as the protector of the dwellers' assets while they take refuge in a separate location.

Nevertheless, the inadequate water infrastructure in Jakarta creates prolonged inundation in the event of a heavy rainfall that is increasingly frequent and can last for weeks (Kompas, 2014b). This long time span creates uncertainty for the dwellers as they are not financially viable to evacuate for such a long time. This condition has led to additional measures in the dwellings, enabling the dwellers to continue occupying the house in the event of a flood and adjust their living process with the progression of water level as long as possible. The emergence of boundaries in this measure changes the dweller's living space into a dynamic space that adapts in accordance with shifting water levels.

There are currently limited research on how dwellings are adjusted to accommodate life with frequent flooding, and individual perceptions are frequently ignored in the event of natural hazard (Wong & Zhao,

2001). This study is significant as it explores the overall boundaries of their dwellings and simple structural and non-structural approaches conducted by the dwellers in response to flooding that influences their daily practices. Boundaries are 'used to define our daily affairs and restrict and regulate the interactions of people and the use of spaces' and they are the product of 'ritualised practices' (Ozaki & Lewis, 2006, p.92-93). In the likely increasing incidence of flooding worldwide (Few, 2003; Lopez et al., 2011), findings from exploring individuals' perception and everyday practices in adapting boundaries of their dwellings exposed in this study may contribute on further knowledge about dwelling forms in the flood prone areas.

This article briefly discusses theoretical background in understanding boundaries of home and the emergence of its indeterminacy in relation to flood. It gives current details of the background context of flooding in Jakarta especially in Kampung Pulo neighbourhood and its dwellers that become the focus of this study. It explores how dwelling boundaries can be reconstructed in the event of flooding through spatial and temporal analysis of Kampung Pulo's dwellers' living experiences. It also discusses their experience of extending their dwelling boundaries flooding as well as relocating outside their dwelling boundaries. In particular, the boundary analysis in this paper is structured around the dwellers practices in constructing their boundaries in three phases; before the flooding, when the water level is under one storey high (below 2 metres) and when the water level forces them to evacuate. This paper examines spatial and perceptual changes in boundaries and their influence in the overall spatial organisation of the dwellings in the neighbourhood.

METHODOLOGY

Analysis of the dwelling boundary reconstruction process offered in this paper is based on the study of an urban informal neighbourhood in the Jatinegara area, Jakarta, Indonesia from June to July 2014. The observation took place in the Kampung Pulo neighbourhood that occupies part of the Ciliwung riverbanks in that area. During data collection, the residents have just recovered from the 2014 flooding in Jakarta that lasts from January to March with water level that varies from 30 cm to 2 metres in the span of three months.

The method engaged in this fieldwork is qualitative research method and primarily based on semi-structured interviews and field observations of a total of 32 people. The respondents include community leaders and

dwellers with various types of occupations and dwelling types. Most of the interviewees are long-time residents of Kampung Pulo, residing in the area since their birth or outsiders marrying established local residents. This paper will be focused on the dwellings of three residents located in various altitudes of the neighbourhood.

This fieldwork was intended to build a collection of narratives depicting the practices of different dwellers in order to understand their living processes through enquiry of daily rituals and routine activities of the dwellers before and during the flood. Direct observation to understand how the rituals were performed in the event of flooding is only limited to the condition without the flood. Boundaries of the dwellers' living spaces in the event of flooding and its relations are then compiled in this paper in order to explore how it emerges dynamically.

RETHINKING THE CONSTRUCTION OF DWELLING BOUNDARIES

The Indeterminate Boundaries

This article examines how indeterminacy emerges from dwelling boundaries in flood prone areas. Indeterminacy refers to being present with 'blurred edges', permeable models that merge the body with the 'not-body' (Modeen, 2014, p.338). The concept is influenced by transgressions that 'incorporates the environment, and all that is implied in changing ecosystems, rather than closing it out entirely' (Modeen, 2014, p.355). Transgressions enable boundaries to be seen as a process, with a specific system that exists to maintain the boundary (Jenks, 2003), and this is done by maintaining 'the conditions of the distinctiveness of the system within its boundaries over against its environment' (Parsons & Smelser, 2012, p.23). Indeterminate boundaries project the boundary as more than a singular closure but as a maintaining system influenced by transgressions of environment.

Such occurrence of transgression is explored by Mosley (2013) in the work of Superflex titled *Flooded McDonalds. Flooded McDonald's* is a short film that depicts a familiar scene at regular McDonald's retail space, complete with burger racks, half eaten food in trays, a Ronald McDonald statue and menu wall. However, the film later shows how this setting was slowly flooded.

Flooding McDonald's outlined space transgressed by the water, and shows the gradual changing conditions and locations of objects, surfaces,

and infrastructures during the flooding.

> 'But as the water enters, the architecture fundamentally changes. The composition of elements begins to uproot and to shift. Efficiency and order are replaced by a breaking down of order and function. The architecture becomes unfamiliar, otherworldly in its instability and mutation.' (Mosley, 2013, p.101)

Figure 1. Flooded McDonald's scene
Source: Mosley, J. (2013). An Architecture of Exception: Transgressing the Everyday – Superflex's Flooded McDonald's. Architectural Design, 83(6), 96–101.

The process of becoming flooded varies based on how water transgress inside the space, particularly how it interacts 'with the particular built form and physical materiality of their home' by seeping differently in places such as the walls, the floors and the sewer hole (Walker, Whittle, Medd, & Walker, 2011, p.2310). Additionally, when the water recedes, 'it did not entirely disappear, as some was left behind as an embedded trace in the hidden infrastructure of the home' (Walker et al., 2011, p.2312). Further exploration of surfaces, objects, and infrastructures arrangement that perform as an active process is important to understand how boundaries are situated within the dwelling.

Constructing the Indeterminate Boundaries

Boundaries as a physical construct emerge from the need 'to connect' and 'to separate', or 'to open' and 'to exclude'(Ozaki & Lewis, 2006). George Simmel (1997) elaborated these needs in his essay titled '*Bridge and Door*'. A bridge is a path of connection between previously two separated places (Simmel, 1997). A bridge leads and gathers movement in relations to directing them to the other side (Heidegger, 1997). Therefore, a bridge is a boundary that becomes an interval between spaces, directing the movement of people in crossing such boundary.

On the other hand, a door is an entity that marks a space and 'transcends the separation between the inner and the outer' (Simmel, 1997, p. 67). Permeability of such threshold enables a more flexible attitude towards boundaries (Leach, 1997) in comparison to walls. A door is a boundary that does not direct the movement, but specifically presents the difference of space in the act of crossing it from different direction. Going inside a door of a dwelling means being at home while going outside means being exposed to the outside world. This is primarily different with bridge, 'where it makes no difference of meaning in which direction one crosses a bridge'(Simmel, 1997, p.68).

This idea of a bridge and a door creates an understanding of how physical boundaries situate the relationship between dwellers, dwellings, and the outside world. It categorises the way of connecting and separating using two mediums, which is through interval (bridge, alleys, corridors, stairs) and through bordered surface (doors, walls, windows, raised platform). The permeability of such surfaces is also an important feature as it guides the level of access between dwellers and the other side and vice versa.

Boundaries are widely discussed as an active process directed by dwellers' practices (Borden & Rendell, 2000; Halverson, 2015), however there is still limited discussion on how such thing can be driven by transgressions of natural forces. A boundary is 'malleable through diversifying engagements and events', and 'time produces variation in boundaries' (Chan, 2012). Dwellers negotiate these boundary changes by engaging with the interval and bordered surface boundaries through the placements of surfaces, objects and infrastructures in certain time spans, such as during the gradual increase and decrease of water level.

Dwellings with boundaries as active processes are not only a 'space of control and protection, but also a fluid, dynamic, and fragmented one' (López & Sánchez-Criado, 2009). Such boundaries enable dwellings to not only be perceived as one single space, but as 'a dispersed set of linkages across the different places through which they move'(Morley, 2012, p.309). These linkages particularly related with the event where dwellers must relocate to other spaces during big flooding and reconstruct their dwellings elsewhere.

The article aims to elaborate further on the idea of indeterminate dwelling boundaries in the event of flooding through a detailed study of three dwellings and its dwellers' domestic practices. This exploration will be preceded by a brief overview on the context of flooding in the

neighbourhood of study and backgrounds of the dwellers that has become the focus of this exploration.

FLOODED DWELLINGS BOUNDARIES EXPLORATION IN JAKARTA

Background Context

In 2014 alone, the annual floods that occur in Jakarta left the city inundated for weeks and has affected more than 10,000 dwellers that inhabit the river terrain, forcing them to evacuate (Kompas, 2014a). The downfall of rain precipitation in comparison with the 2013 flooding implies that heavy rainfall was not the main cause of last year flooding but instead it was flagging infrastructure and less than stellar environment conditions (Tempo, 2014). The widespread flooding is attributed by blockage of channels, unfortunately, dredging attempts were continually hampered by the presence of informal settlement (Lamond, Bhattacharya, & Bloch, 2012). The rate of coverage in sewerage and sanitation in Jakarta is low (Sheng, 2013) and this condition further exacerbates floods and prolongs the period of floodwater inundation.

Figure 2. Kampung Pulo map and the annotated dwellers location, Mrs. S (above), Mrs. D (middle), Mrs. I (below)
Source: self-drawn

The analysis presented here is primarily based on the findings of the

domestic narratives of dwellers in Kampung Pulo, an urban kampung that is situated alongside the river terrain in Jatinegara, Jakarta and has been regularly experiencing flooding for years (Kompas, 2012). It is part of the 120,000 households of informal settlement dwellings in Jakarta that are situated in 'riverbanks, empty lot, and floodplains' (UN-Habitat, 2003, p.212).

Kampung Pulo is located next to a Jatinegara market in a busy street that is situated higher from the entire neighbourhood. Dwellings in the furthest area in relation to the river are located in lower altitudes and thus face greater damage in terms of inundation. In addition, dwellings that are located next to the river have greater risks of flooding sooner than other dwellings. The three dwellers that has become the focus of this study are chosen based on their locations to provide a wide variety of examples in relation to the river within the neighbourhood as can be seen in the above map.

The following exploration will start by describing current spatial organisation of the dwellers and will later annotate how dwellers engage with surfaces, objects, and infrastructures to construct interval boundaries and bordered surface boundaries in different phases of flooding. It explores how the arrangement of the physical construct within these boundaries influences the dynamics of a dwelling in flood prone areas.

Dwelling's Indeterminacy

Mrs. S—local rice seller

Mrs. S's dwelling is a two storey dwelling unit with a ground space area of 3 m x 5 m, located in an alley near the main street outside the neighbourhood. The front façade of the first floor is covered with ceramics. Her door is always open during the observation period. Inside her home, the first floor consists of a multi spaced room that divided using curtain into living areas at the front and service spaces for cooking, bathing and washing at the back. This curtain is newly bought after the last flooding; the last one was a blue coloured one that got discarded due to heavy stains. Mrs. S specifically chose the brown colour because the colour would blend with the stains if the dwelling got flooded again. There is a raised platform in front of the house that can be used for sitting during the day. There are no chairs and sofas inside Mrs. S's home. She said that most people in here don't have any chairs due to probable damage from the floods and therefore usually sit on the floor or on the terrace floor outside.

Figure 3. Mrs. S's floor plan before flood (left) and after (right)
Source: self-drawn

The second floor of Mrs. S's dwelling is used for sleeping, storing clothes and ironing. She has a balcony above her home that is covered by a corrugated zinc sheet. They use the upper floor's balcony to cook as well as sleep and iron. When the rain started pouring down, Mrs. S instructs her daughter to put down an oilcloth that is attached to her roof from the balcony and cover the front part of her house as well as the glass rack that contain food to sell. Most houses have the same oilcloth attached in front of their home. Mrs. S said that oilcloth is also useful to cover the ground when they are in the evacuation area.

During the flood, they would wash their clothes in the stairs using a water tap that is located next to the stair in the height of 1.5 meter. Bathing is done through washing their body with flood water and later on rinse with water from the water tap. When the flood is higher than the second floor (like the great flood in 2007) the family would evacuate to the front area in the adjacent building shop that is higher than their houses.

Mrs. D—traditional snack maker

Mrs. D's dwelling is a two storey dwelling unit with ground space area of 2 m x 5,5 m right next to the river in the middle part of the neighbourhood. It is situated next to the river facing away from the river beds. The first floor consists of two areas, a multi space area and a washing area. She normally uses the multi space area as a kitchen to make and pack her snacks for daily distribution. The washing area is used as a bathroom without toilet and also as a space to wash her big cooking utensils. The washing area

has a water tap for washing purposes that uses a ground water pump, as she is not connected to national water system. In the washing area there is one window without glass, only covered by a steel mesh sheet. There is also a door next to the window leading to the river area where she disposes her waste daily. Mrs. D shops staple foods in bulk once a week and stores supplies for her business such as sacks of rice, glutinous rice and sugar at home. If the dwelling floods, she would bring snacks to the evacuation zone using a lorry and simultaneously putting away her stock of supplies at the second level of her house. However, if the flood is too big she will stop working for a while.

Figure 4. Mrs. D's floor plan before flood (left) and after (right)
Source: self-drawn

Mrs. I—local shop owner

Her dwelling is situated in the furthest part of the neighbourhood from the main street in comparison with other two dwellers. It is a two-storey house with a larger ground space of 9 m x 4 m, situated along a public football field next to the river. In the first floor, the front area is used for a small grocery shop, with a glass display rack and a small refrigerator to store cool drinks for the shop. The refrigerator is placed above a steel rack so it is not easily drowned by the flood. There is a small living room next to the shop where Mrs. I puts her baby while keeping the shop. Next to the living room there is a small kitchen, that Mrs. I rarely use. She usually buys food from surrounding neighbours that owns a rice stall. Next to the kitchen, there is a bathroom with toilet and stairs on the side. Mrs. I's family also sleeps in the living room as they find it too hot to sleep in the above spaces.

Figure 5. Mrs. I's floor plan before flood (left) and after (right)
Source: self-drawn

Mrs. I's uses the above space primarily to store, wash, and dry their clothes. The exception is for Mrs.I's children's clothes that are stored in a plastic rack at the first floor next to the living room. There are an additional bathroom and toilet at the second floor usable during flooding. There are not many objects found at the house. When the flood started to come, Mrs. I will put her TV, refrigerator, and clothes at the second floor and let all of her racks got flooded. If the flood reaches the second floor she will evacuate to the local sport centre in the area.

Figure 6. (above left) Kampung Pulo next to the river , (above right) Mrs. S's water tap, (below left) Mrs. D's mesh window , (below right) Mrs. I's raised refrigerator
Source: author's documentary

The above narratives show different uses and disuses of surfaces, objects and infrastructures in all dwellers dwellings that are influenced by the flooding as follows:

1. Water level 0-10 cm
   Without water inundation, boundaries are maintained as a water invasion prevention system. This system minimise impact by limiting the use of closure and transitory objects, and uses vertical and horizontal surfaces to avoid water incursion. Mrs. S and Mrs. D do not have any interior doors, while Mrs. I has one door only for her bathroom. Mrs. S replaces it with curtains, using only these cloths as a bathroom door. Windows become a vulnerable surface for houses located near the river, so Mrs. D situates her front window in a higher level (above 1 m) and replaces the window glass facing the river with wire mesh. Mrs. S and Mrs. D both have windows with retractable glasses that do not hold the water stream. Large objects are particularly limited as no chairs, tables, and waste bins were seen in both three houses. Simple storages are still available but largely made out of steel or plastic. Raised surfaces are used to protect vulnerable objects such as electronics, kept above the rack in 1 m above the floor – including large-scale electronics such as the refrigerator. This ensures that there is an opportunity to move the object when the water comes. Meanwhile, vertical surfaces are used as temporary measures to shield the dwellings from rainwater using oilcloths.
2. Water level 10-200 cm
   During water inundation with levels below 200 cm, boundaries are maintained to enable co-existence with flood. Typically almost all dwellings in the area are two storeys high, enabling temporary residence in the second floor as the water transgresses the first floor. The presence of a balcony as in Mrs. S's dwelling is also important as it offers an open area to cook, additionally used to hang their laundry thus ensuring a supply of food and clean clothes. However, maintenance of the boundary of the dwellers does not only involve the availability of a higher platform to stay in, but also access to clean water infrastructure that can still be used during power outages. Mrs. S created a water tap with the height of 1,5 m in the middle of the stairs for water access during the flood to cook and wash. Mrs. I has an additional bathroom and toilet in the second floor of her dwelling to enable access during less than 200 cm of flood. Mrs. D, however, does not have additional water source and therefore largely uses her second floor for storage purposes during the flood, relocating her family to another area immediately.

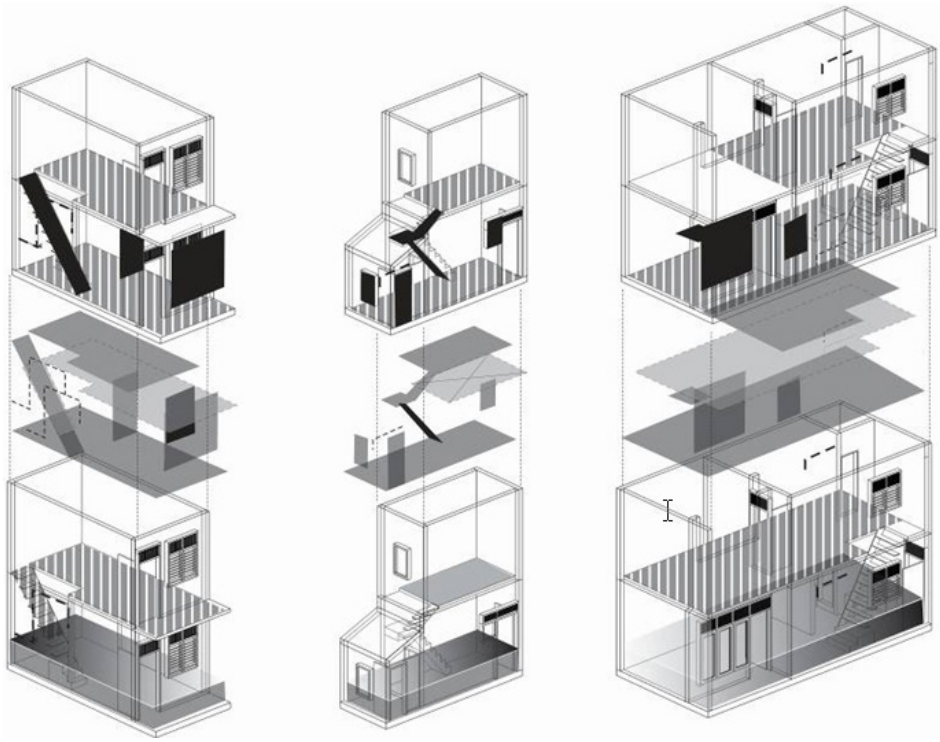

Figure 7. Dwellings' boundary maintaining system before (above) and during flood (below), black for arranged surfaces and objects, stripes for occupied spaces
Source: self-drawn

3. Water level 200 cm onwards
   In this level of inundation, most dwellers would have to evacuate outside their dwellings as water has reached the second floor. Mrs. D usually rents a bedroom space near the area and continues to produce her snacks in that space. She will bring her cooking utensils and cook from there. Renting an individual space will also become necessary since Mrs. D's dwelling is located next to the river and thus will be inundated longer than the other dwellings. Mrs. I picked the evacuation space in a sport centre due to her young kids (aged six and two years old). The sport centre's location is quite far from the neighbourhood but Mrs.I prefers to go there because the space is bigger and better for young children so they don't easily get sick during the flood. On the other hand, Mrs. S's children are all teenagers so that it becomes easier to reside in the street in front of the neighbourhood. Her dwelling is also located near the neighbourhood gate which means her dwelling will not get flooded quickly, enabling late evacuation.

CONCLUSIONS

This article has explored dwelling boundaries in an urban *kampung* neighbourhood facing recurrent floods as active manifestations of boundary maintaining systems carried by the dwellers. Such system changes based on how the dwellers engage with their dwellings in response with various ways of water transgression to the home that creates indeterminacy.

Indeterminate boundaries are driven by changes on physical constructs of dwelling boundaries that consist of bordered surface and interval boundaries. These physical constructs emerge based on how dwellers engage with their surfaces, objects and infrastructures differently during flooding. The bordered surface boundaries are primarily important to prevent and minimise the impact of water incursions that occurs through the use and disuse of a number of surfaces such as thresholds, openings, and partitions. On the other hand, interval boundaries such as the presence of stairs enable temporary separation between the dwelling area and the water that transgresses the dwellings during the flood. This interval boundaries can also activated through the presence of infrastructure and becomes part of the dwellings boundary system to sustain the dwellers during the flood.

The narratives from the dwellers relocation area also show that there are multiple scenarios developed to maintain their living quality during frequent movement. The emergence of these scenarios are interrelated with the location of the dwellers main dwellings, the location of the dwelling in relation with the flood source and the neighbourhood entrance, and the dwellers' basic family needs. It becomes part of the the dwellers' journey in constructing their dwellings as active process that links different spaces throughout their movement.

There are further concern in living with indeterminacy that particularly related with the use and disuse of objects. For instance, the disuse of waste bins lead to self-organisation of the neighbourhood's waste disposal process and often influence the waste displacement. Such concerns raised by the exploration of boundary maintaining systems suggest the importance of deeper understanding of the dwellers engagement with the arrangements of dwellings' surfaces, objects and infrastructures. This knowledge expands the discussion of flooded dwellings beyond the polarity between flood prevention and removal of the neighbourhood, by understanding the formations of dwellings through the indeterminate living with floods and its social and environmental implications.

REFERENCES

Borden, I., & Rendell, J. (Eds.). (2000). Intersections: Architectural Histories and Critical Theories. London ; New York: Routledge.

Chan, P. (2012). Vancouver's Laneway Houses: Changing Notions of Home. In C. Briganti & K. Mezei (Eds.), The Domestic Space Reader (pp. 278–284). Toronto: University of Toronto Press.

Colin McFarlane. (2009). Infrastructure, Interruption, and Inequality: Urban Life in the Global South. In S. Graham (Ed.), Disrupted Cities: When Infrastructure Fails (1 edition, pp. 131–144). New York: Routledge.

Few, R. (2003). Flooding, vulnerability and coping strategies: local responses to a global threat. Progress in Development Studies, 3(1), 43–58. http://doi.org/10.1191/1464993403ps049ra

Halverson, S. (2015). Encountering Occupy London: boundary making and the territoriality of urban activism. Environment and Planning D: Society and Space Advance Online Publication. http://doi.org/doi:10.1068/d14041p

Heidegger, M. (1997). Building Dwelling Thinking. In N. Leach (Ed.), Rethinking Architecture: A Reader in Cultural Theory (pp. 100–109). New York: Routledge.

Jenks, C. (2003). Transgression. London: Routledge.

Kompas. (2012). Kampung Pulo, Riwayatmu Kini... Retrieved March 27, 2015, from http://megapolitan.kompas.com/read/2012/10/14/07491195/Kampung.Pulo.Riwayatmu.Kini.

Kompas. (2014a). Kompas - VirtualNEWSPAPER - 18/01/2014. Retrieved March 27, 2015, from http://epaper1.kompas.com/kompas/books/140118kompas/#/1/

Kompas. (2014b). Sudah Lelah Mengungsi dari Banjir, tapi Belum Ada Solusi Segera... Retrieved March 25, 2015, from http://megapolitan.kompas.com/read/2014/02/07/0813181/Sudah.Lelah.Mengungsi.dari.Banjir.tapi.Belum.Ada.Solusi.Segera.

Lamond, J., Bhattacharya, N., & Bloch, R. (2012). The role of solid waste management as a response to urban flood risk in developing countries, a case study analysis. In D. Proverbs, S. Mambretti, C. A. Brebbia, & D. D. Wrachien (Eds.), Flood Recovery, Innovation and Response III. WIT Press.

Leach, N. (1997). Rethinking Architecture: A Reader in Cultural Theory. New York: Routledge.

Lopez, A., Davies, J., Bhattacharya, N., Bloch, R., Papachristodoulou, N., Jha, A., … Barker, R. (2011). Five feet high and rising : cities and flooding in the 21st century (No. WPS5648) (pp. 1–68). The World

Bank. Retrieved from http://documents.worldbank.org/curated/en/2011/05/14140574/five-feet-high-rising-cities-flooding-21st-century
López, D., & Sánchez-Criado, T. (2009). Dwelling the Telecare Home Place, Location and Habitability. Space and Culture, 12(3), 343–358. http://doi.org/10.1177/1206331209337079
Modeen, M. (2014). Breaking the Boundaries of "Self": Representations of Spatial Indeterminacy. Architecture and Culture, 2(3), 337–360. http://doi.org/10.2752/205078214X14107818390630
Morley, D. (2012). Heimat, Modernity and Exile. In C. Briganti & K. Mezei (Eds.), The Domestic Space Reader (pp. 309–314). Toronto: University of Toronto Press.
Mosley, J. (2013). An Architecture of Exception: Transgressing the Everyday – Superflex's Flooded McDonald's. Architectural Design, 83(6), 96–101. http://doi.org/10.1002/ad.1681
Ozaki, R., & Lewis, J. R. (2006). Boundaries and the meaning of social space: a study of Japanese house plans. Environment and Planning D: Society and Space, 24(1), 91 – 104. http://doi.org/10.1068/d62j
Parsons, T., & Smelser, N. J. (2012). The Social System. New Orleans, LA: Quid Pro, LLC.
Sheng, D. Y. K. (2013). Urban Challenges in South-East Asia. Unpublished. Retrieved from http://dx.doi.org/10.13140/2.1.1747.4563
Simmel, G. (1997). Bridge and Door. In N. Leach (Ed.), Rethinking Architecture: A Reader in Cultural Theory (pp. 66–69). New York: Routledge.
Tempo. (2014). BMKG: Banjir Jakarta 2014 Bukan Karena Curah Hujan. Retrieved March 27, 2015, from http://www.tempo.co/read/news/2014/01/17/083545651/BMKG-Banjir-Jakarta-2014-Bukan-Karena-Curah-Hujan
UN-Habitat. (2003). The Challenge of Slums: Global Report on Human Settlements 2003 United Nations Human Settlements Programme. United Nations. Retrieved from http://mirror.unhabitat.org/pmss/listItemDetails.aspx?publicationID=1156
UN-Habitat. (2010). State of the World's Cities 2010/2011 - Cities for All: Bridging the Urban Divide. UN-Habitat.
Walker, G., Whittle, R., Medd, W., & Walker, M. (2011). Assembling the flood: producing spaces of bad water in the city of Hull. Environment and Planning A, 43(10), 2304 – 2320. http://doi.org/10.1068/a43253
Wong, K., & Zhao, X. (2001). Living with Floods: Victims' Perceptions in Beijiang, Guangdong, China. Area, 33(2), 190–201.

MODEL OF SUSTAINABLE CITY BASED ON INTERRELATONSHIP OF MODALITY ASPECTS IN SURABAYA

Bambang Soemardiono[1]*, Eko Budi Santoso[2], Defry Agatha Ardianta[3]*****

[123]Department of Architecture,
Institut Teknologi Sepuluh Nopember (ITS)
*bamsoem03@yahoo.com, **ekobudis2000@yahoo.de,
***agathadefry@yahoo.co.id

ABSTRACT
Built environment show the significant topic of sustainable development and connected not only with the environmental (physical) but also the human (social and economic) systems. The need of framework in understanding and evaluating sustainable in planning and design is a new holistic and integrated one which has been formulated in 15 modalities of urban sustainability which influence each other and the interrelation between the modalities could be found in understanding each other and a number of issues related to the built environment (Brandon and Lombardi, 2005). Moreover Robinovitch (1992) wrote in sustainable city, relationship serves as guidance and development tools. The previous research (Soemardiono et al, 2013) conclude that five important modalities in Surabaya such as creedal, juridical, social and the juridical modality as well as physical modality are included in the poor areas. Based on set of frameworks for assessing urban sustainability, a depth interview will be developed in gaining the best possibility and deep answer. This study aims also to inform the practice and education and the knowledge of sustainable dwelling. The descriptive qualitative method with consideration of people participation has been developed by setting up the depth semi-structured questionnaire as tools for interviewing vary urban stakeholders such as academicians, professional,

practician, student as well as corporation. The results are the cinematic is the performance in the "poor area", while other fourtheen (14) modalities in "rich area" performances. By analyzing the interrelationship, a model of sustainable city could be developed and supported by the criteria as follows: the environmental transportation system in the urban should increase the air quality.

Keywords: Interrelationship, Integrated modality aspects, Model, Surabaya, Urban sustainability

INTRODUCTION

The built environment has the significant issue of sustainable development and connected not only with the environmental (physical) but also with the human (social and economic) systems.Based on Lombardi, P, Brandon, S (2005), the most important component in decision making of sustainable development regarding urban planning and design are the frameworks in structuring the problems as guidelines for planners and designers as well as for contractors, government and decision maker through the process understanding and evaluating in a hollistic new structure which are serve as generator and checklist, which has been formulated in 15 modalities from numeric until creedal modality. By evaluating the performance of urban sustainability an effective method can be applied from the "poor performances" into "model of development". The fifteen modalities from Brandon and Lombardi (2005) are interrelated within each other to provide continuity between modalities, with each modality affecting and informing the level above, which is the greater the distance between the ordered modalities, the less influence they have on each other. Moreover Robinovitch (1992) wrote in sustainable city, relationship serves as guidance and development tools. An evaluation of sustainable development need integrating frameworks to develope the interconnectedness and interdependence of systems by focusing on the policy or integrated decision making. Moreover the use of indicator in the evaluating the urban sustainability is important and worldwide adopted (Shen, L. Y, et al, 2006). The previous research (Soemardiono et al, 2013) conclude that five important modalities in Surabaya such as creedal, juridical, social and the juridical modality as well as physical modality are included in the poor areas. By making an depth research and einterrelationship, a model of sustainable city could be developed .

THEORETICAL REVIEW

Sustainable City and Sustainable Urbanization

There is a relation between sustainable city and urban form as stated that "more compact is more sustainable". It describes the composition between size, form, land use, configuration and openspace distribution with the city transportation and urban design features. Besides the sustainability depends on the environment (included transportation), social and economi isues. The urban sustainability and urban form discusses about tn the increasing of density, mix-use, urban "sprawl" diversity of social and econnomy as a compact city (Jenks and Jones, 2010). Without sustainable urbanization, the sustainable development may not occured (ADB, 2009) because it is important component and key to sustainable growth. Moreover Sustainable Development serve as a development which provides the needs of the present without compromising the ability of future generations to meet their own needs (Brundland Commission, 1987) and Blackburn (2007), wrote sustainability concept as development of a long term period, which its practice implemented economic, enviroment and social aspect and its philosophy integrate economics, environment, and social performance (Abu Hassan Abu Bakar and Khor Soo Cheen, 2013). In 1992 United Nations of "Earth Summit", held in Rio de Janeiro have developed an action program namely The Local Agenda 21 and followed by Habitat Conference in 1996, where special emphasis goes to urban development consequences in changin the life quality or the environmental impact. (Martin Symes, Mark Deakin and Steven Curwell, 2006). Based on set of frameworks for assessing and creating a model of urban sustainability, a depth interview will be developed in gaining the best possibility and deep answer. This descriptive qualitative method with consideration of people participation based on developed semi-structured questionnaire as tools for interviewing important stakeholders. Through a process of understanding and evaluating sustainable development in the planning context, on the basis of a new holistic structure as a checklistand as collaborations between disciplines, experts and people. Although the scope of hollistic framework is not for all dimensions of sustainable development, but it can be as guide for the planner or policy-maker.

Table 1. Proposed framework for sustainable development decision making particularly in the field of planning or design

First level aspects	Second level aspects	Multi –modal aspects (modalities)	Issues of the built environment
Physical environmental capital	Urban and infrastructural development	1. The numerical modality	Numerical accounting
		2. The spatial modality	Spaces, shape and extension (e.g. urban density)
		3. The kinematics modality	Transport and mobility (e.g.environmental quality level)
	Environemntal and physical quality	4. The physical modality	Physical environment, mass and energy
		5. The biological modality	Health, biodiversity and eco-protection (e.g. greenery)
Human Cultural capital		6. The sensitive modality	People's perception towards the environment
	Education and scientific development	7. The analytical modality	Analysis and formal knowledge)e.g. university reputation)
		8. The historical modality (Formative)	Creativity and cultural development
		9. The historical modality (Formative)	Communications and the media (e.g.ICT level)

	Social and economical development	10. The social Modality	Social climate and social cohesion
		11. The economic modality	Efficiencuy and economic appraisal (e.g.GNP)
		12. The aesthetic modality	Visual appeal and architectural style (e.g. Cultural heritage)
	Governance	13. The juridical modality	Rights and responsibilities (e.g.legal framework)
		14. The ethical modality	Ethical Issues (equity)
		15. The credal modality	Commitment, interest and vision

Source: Lombardi, P, Brandon, S, P (2005). Evaluating Sustainable Development in The Built Environment

Table 2. The example of appropriate criteria and sub criteria in multi modal frameworks on the environment project

Goals	Criteria	Aspect of modality	Modality	Spesification of criteria and Sub criteria
Sustainable Development	Infrastructure development	numeric	Numerical counting	Consideration of quantitative issue such as density and waste as well as transportation
		spatial	Space, form and development urban density)	
		cinematic	Transport and mobility (level of environment quality)	

	The Quality of Environment and physic	Physic	Physical environment, mass and energy	Included sub criteria such as safeguarding for atmosfer, water reservation, land, landscape and community healthyness
		biologic	healthness, biodiversity and ecological safety (greenery)	
		sensitive	Community perception towards environment	
	Development of Education and Knowledge	analitycs	Analysis and formal knowledge (university reputation)	Considering the tecnology and issue from good communication from watewater fucntion and aeasy inmplementation (sub criteria)
		historic	Creativity and cultural development	
		communicative	Communication and media	
	Social and Economy Develeopment	social	Climate and social cohesion	Included in this sub criteria is minimalizing hazzards and maximalize cost/ revenue ratio And visual site
		economy	Efficeincy and economical prediction	
		aesthetic	visual feeling and architectural style (Cultural heritage)	

	Government	juridical	Right and Responsibility (legal frame-work)	Including Right and Responsibility
		ethic	Ethic Issue	
		creedal	Committ-ment, Vision	

Source : Lombardi, P, Brandon, S, P (2005). Evaluating Sustainable Development in The Built Environment

In other hand innovations in urban sustainability have benefits which has been implemented in some innovative cities that ecological sustainability and economic sustainability can significantly reinforce each other and benefit a range of stakeholders. One role of the Eco 2 Cities Initiative is to reflect on these examples and find ways to transfer the lessons and successes to cities elsewhere. These case study involves the implementation of a successful integrated waste management program through systematic engagement with stakeholders that led to significant environmental and economic gains. An illustration of successful path dependency (spatial, institutional and cultural) in urban development (Hiroaki, S et al, 2010).

An interrelationship diagram is an analysis tool that allows to identify the cause-and-effect relationships among critical issues. The analysis helps to distinguish between issues that serve as drivers and those that are outcomes by using the interrelationship diagram among several issues.

This analysis tool can also be useful in identifying root causes, even when objective data is unavailable. To develop the problem statement, the issue is presented as a complete sentence and is clear to all team members.

METHODOLOGY

Participation in Semi Structures Questionnaire

This qualitative and descriptive research will be developed first by collecting data through questionnaires supported by the researchers which is the process and subjective perspective are play an important role. The method with participation of important stakeholders from varying

backgrounds (academician, professional, government, practician etc) are developed in a semi-structured questionnaire from 15 modalities which is implented in depth interviewing for the best, deep and specific answer based on the of urban sustainability. The asessment performances are not only in poor area but also in rich area and its interrelation which are effect each other. To develope a sustainability model a technical approach is made by creating the interrelationship of a poor performances.

From the previous research on the role of integrated modalities with case studies Surabaya, it is obtained three modalities are considered very important position and role as a "key", namely: spatial, juridical and physical modalities. Based on this result show that the sustainable performance is not quiet strong based on the only the spatial modality included in the *rich area*, whereas the juridical modality and physical modality are still included in the *poor areas*. Therefore, to increase the sustainable performance in the city of Surabaya, it is necessary to consider the modalities that affects and affected directly by both modalities, which will be discussed in the next research.

THE SUSTAINABILITY PERFORMANCES OF CITY SURABAYA

The Performances of each modalities of Surabaya are produced by the reuslt from semi structured interviews with 8 (eight) respondents from different backgrounds. The indicators of performances of each modalities representing the key question, which can be describe as seen at the table 3 as follows:

Table 3 The Scale of Modalities and and the Indicators of Performance from 8 (eight) Stakeholders

Nu	Modalities : Scale	Indicators of Performance
1	Numeric Modality: very good	a. Developments period b. Community wellfare c. Cost of natural ressources development and the amount of decision maker Conclusion : The Developmnt of City Surabaya is quite good through the cooperation between private, academician in enhancing the quality of life of the. Social and environment

Nu	Modal	Indicators of Performance
2	Spatial Modality: good	a. Flexible development and the urbanform b. Appropriatness in urban density c. Environment friendliness of density and new urban form and d. Stakeholder's participation in form of the city, layout and its regulation Conclusion: The development of City Surabaya recently is very dynamic and ideal with the central activities in the distric in modern and commercal basic.
3	Cinema tic modality: Poor	a. Longterm development system in increasing the mobility b. Stakeholder get easy with the public transportation c. Environmental transportation system in increasing the air quality d. All stakeholders involve in a transportation system development e. Considering unrenewable natural ressource in longterm periode f. Involvement of local environmental community in development g. Stakeholder enjoy the adequate quality of air, water and land in developed area as well as healthy green area services, sport facility etc h. The pattern of appropriate environmental i. Planning in improving the quality of air, water and land as well as imrovement of health facilities in developed area j. Active role of local community to the environment planning development system Conclusion: Transportation system has not yet implemented the sustainability, there is no integration between modes, pollution of private cars as well as uncomfortable public transportation.
4	The physical modality: very good	a. Energy efficiency in a longterm development b. Environmenta planning in a energy effisiency in a longterm development? c. Considering unrenewable natural ressource longterm d. Involvement of local environmental community in development

Nu	Modal	Indicators of Performance
		Conclusion: the orientation of physical planning's pattern development is the environmet but not yet considered limited ressource and unrewable.
5	The biological modality: very good	a. The potency of area and consideration of keeping the unrenewable natural ressources in the longterm dvelopment b. Stakeholder enjoy the adequate quality of air, water and land in developed area as well as healthy green area services, sport facility etc c. The pattern of appropriate environmental d. Plnning in improving the quality of air, water and land as well as imrovement of health facilities in developed area e. Active role of local community to the environment planning development system Conclusion: the development of Surabaya has already oriented in the environment and also considered to the limited ressource. The example is the existenz of green open spaces in form of gardens and streetsmedians
6	Sensitive Modality: good	a. A longterm safety system b. Stakeholders feels secure and safe towards the design to avoid from criminality and violence issue as well as considering the woman and child as users c. Planing can make solution to the visual aspect and the existing noise d. The consideration to all active and passive stakeholders in the planning e. The active role of local community right for struggling woman and children in decision making Conclution : the criminalities in the Surabaya city is relative lower than other big cities as well as the safety in the city is quite good coordinated
7	Analitycal Modality: good	a. Scientific analysis and coping the problem included longterm perspective b. Availability Fund supporting the solution in the longterm perspective c. Education planning for the people

Nu	Modal	Indicators of Performance
		d. Education Programm deal with Environment for the community e. Access and agree of majority of stakeholder ga of the developed analysis Conclution : The development of researchs in the different aspect has already done before the implementation. Besides the government has already take efforts to educate the community in achieving sustainable development
8	Historic modality: good	a. Restoration programm of heritage in the urban planning b. Local based inovation in planning and design c. Planning can improve living standard and culture aspiration for the middle low community and disadvantaged d. Environmrntal friendly technology e. Consultation process Conclution: the city of Surabayaa have already " peraturan daerah /local regulation" about conservation and historical area and already implemented in " city tour heritage" supporte by private Enterpreuner Sampoerna. The support of the government should be enhanced and addresed to the owner of the building.
9	Communicative Modalitty: good	a. Monitoring system in planning b. Improvement communicative infrastructure recently or in the future c. Longtrerm urban signs d. Does planning improve ease accessibility to communication facilities to the whole community (including medium and disadvantaged communities)? e. Are planning including analysis of environmental impact? Is socialization (advertising)? f. Is information about the plans / schemes of urban development (such as the city master plan, construction of the town conservation preservation etc.) Can be accessed by all stakeholders? g. Is related community residents can participate in discussions, arguments and evaluations in the planning? Are all parties can understand the language used?

Nu	Modal	Indicators of Performance
		h. What's planning can improve and maintain long-term of social interaction? i. Does the plan consider the impact of development on the social climate in the long term? j. Is the planning has involved cooperation and association between individuals and institutions? k. Does it improve the accessibility of social function (social utilities) to all members of the (community)? l. Is the plan has considered the impact of tourism on the natural environment and cultural background? m. Has social communities, volunteer groups, and cultural associations have been involved in development planning?
10	Social Modality Very good	a. What kind of planning can improve and maintain long-term of social interaction? b. Does the plan consider the impact of development on the social climate in the long term? c. Is the planning has involved cooperation and association between individuals and institutions? d. Does it improve the accessibility of social function (social utilities) to all members of the (community)? e. Is the plan has considered the impact of tourism on the natural environment and cultural background? f. Has social communities, volunteer groups, and cultural associations have been involved in development planning? Conclusion : the planning and developing of Surabaya City already consider the social interaction aspects with the impact to the social cycle in the longterm , and afected in the stability on the social function such as green open space
11	Economic Modality: good	a. Is financial valuations in the long term has been done? b. Is there any form of financial distribution to stakeholders? c. Has employ local labor in construction activities?

Nu	Modal	Indicators of Performance
		d. Is there an efficient management system? Is there an effective environmental management system? Is a comprehensive recycling program in the city benefit? e. How many stakeholders in the assessment of financial commitment? Conclusion: Financial evaluation has been implemented in short time beause of the needs in the rush develeopment of the city
12	Aesthetic Modality: good	a. Does the development schemes improve the artistic character and significance of the building and perumahaman in the short term and long term? b. Is the condition of the built environment enhancing the visual appeal? c. Is it satisfactory aesthetic interventions of all stakeholders? d. Is the development already in harmony with the context, the environment and the ecosystem? Does the scheme increase the visual appeal of natural? Conclusion : the development is addressed already into harmonization of the building, but not good distributed. For instance the development of the green open space already distributed but there are many buildings that less in artistic form.
13	Juridical Modality: good	a. What are the rights and obligations of all developers, owners and users of the building has been taken into account in the long term? b. Does the scheme identify who gets the benefits and who pays for such development? Does the scheme have included some possibilities to overcome the dangers for those who receive? c. How that people can change their environment either directly or through their elected representatives? d. Does SEA (Environmental Assessment) has done? Has SEA met the standards of planning techniques related to the environmental protection? e. Where the community is involved in the decision-making process?

Nu	Modal	Indicators of Performance
		Conclution : the Rights and obligation in the development process of all stakeholders has alreday done, shown by the efforts to enhance the environment of the settlement
14	Ethical Modality: good	a. Is the development schemes provide the same opportunities and improvements to the community in the future as well as now? b. Is development schemes reduce social inequalities? Is the development schemes support group volunteer? c. Does the scheme provide environmental protection of the biosphere, ecosystems and animal species? d. Are all the stakeholders involved in the development schemes? Conclution : the development scheme has already given to each programms and the governemnet has already givien the chance in improvement and development based on the needs of the people.
15	Creedel Modality: good	a. Is the political situation stable? b. Does the scheme fulfill national or regional planning? c. Are funds available for environmental protection and how long it will last? d. What is the commitment of each person in charge or the stakeholders of making the scheme? Conclution: Political condition in the government is stable for development programm abd foolow the national regulation

Table 4. Development of Criterion and Model of Interrelation

Aspect of modality	Modality	Factors	Criteria
Cinematic	Transport and mobility (level of environment quality).	Infrastructure development : Development system in increasing the mobility in longterm Stakeholder get easy with public transportation Environmental transportation	The environmental transportation system in the urban should increase air quality.

		system in increasing air quality: All stakeholders involve in a transportation system development.	

Source : Analysis.

Table 5. Scale of Modality's for each respondents

Nu	Modalities	Stakeholders Number								Score	Description
		1	2	3	4	5	6	7	8		
1	Numeric	2	4	3	4	4	3	4	3	27	Very good
2	Spatial	2	2	2	4	4	3	4	3	24	Good
3	Kinematic	2	1	2	2	3	1	4	5	20	Poor
4	Physical	2	4	3	3	5	4	5	2	28	Very Good
5	Biological	3	2	3	4	5	4	5	3	29	Very Good
6	Sensitive	2	4	3	3	4	3	3	2	24	Good
7	Analitycal	0	4	2	4	5	4	3	3	25	Good
8	Historic	2	2	3	3	3	2	4	3	25	Good
9	Communicative	2	3	3	3	5	5	3	3	22	Good
10	Social	1	5	4	4	2	2	3	4	29	Very Good
11	Economic	2	4	3	3	4	3	5	2	26	Good
12	Aesthetic	3	3	4	4	4	3	3	3	26	Good
13	Juridical	2	2	3	3	5	3	3	3	23	Good
14	Ethical	0	4	3	3	3	3	2	4	21	Good
15	Creedel	3	4	0	0	4	4	5	3	25	Good

Score	Description
1	Exellent
2	Very good
3	Good
4	Poor
5	Very poor

Value intervals in 4 respondents who answered the question	16,9 - 20	Excellent
	13,7 - 16,8	Very Good
	10,5 - 13,6	Good
	7,3 - 10,4	Poor
	4 - 7,2	Very Poor

Value intervals in 5 respondents who answered the question	21,1 - 25	Excellent
	17,1 - 21	Very Good
	13,1 - 17	Good
	9,1 - 13	Poor
	5 – 9	Very Poor

Value intervals in 5 respondents who answered the question	33,7 – 40	Excellent
	27,3 – 33,6	Very Good
	20,9 – 27,2	Good
	14,5 – 20,8	Poor
	8 – 14,4	Very Poor

Source : Analysis 8 respondents

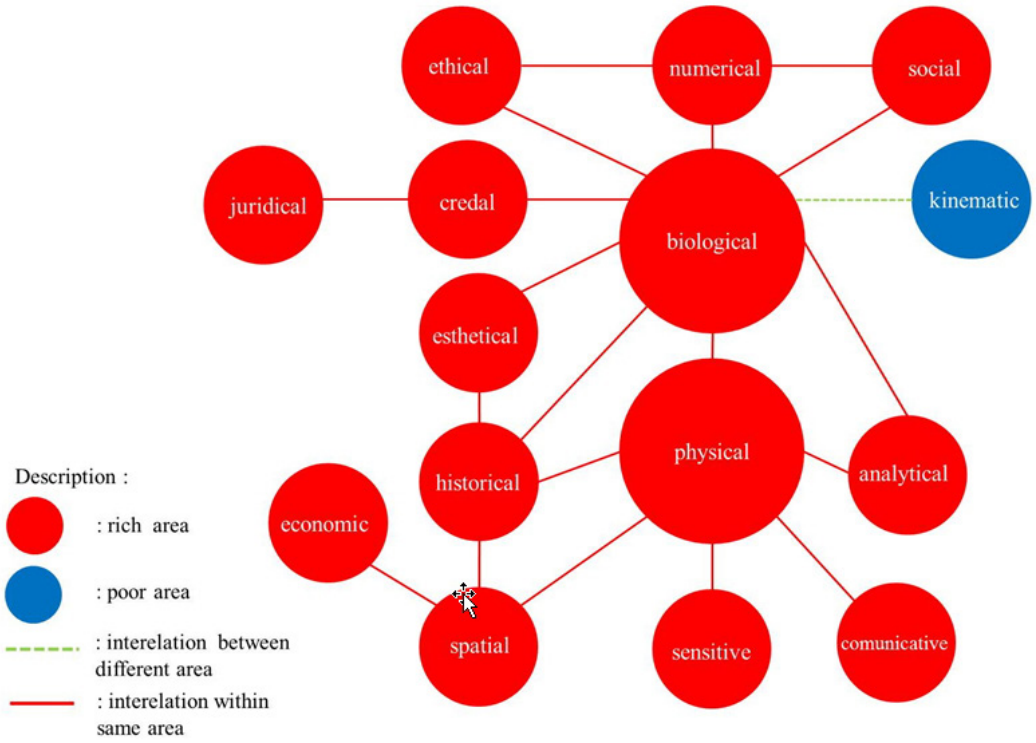

Figure 1. Interelation Diagram
Source: analysis base on the 8 respondents

CONCLUSION

The result shows that the very good performances are *numeric, physical, biological, and social.* It is such a progress comparing with the previous research on the role of integrated modalities with case studies Surabaya (Soemardiono, 2013) that three modalities are considered very important position namely: *spatial, juridical* and *physical* modalities, The result of this research shows also that only one modality is the weakest, namely the *kinematic* modality comparing with the result of previous study that *physical, creedal, juridical, aesthetic* and *economical performances are weaks performances*. With more stakeholders, the results of in-depth interviews with 8 (eight) stakeholders such as academics, practitioners, students and private can be seen in the following table. Therefore, to increase the sustainable performance in the city of Surabaya, it is necessary to consider the modalities that affects and affected directly by both modalities.The aspect of cimematik modality as a poor performance should be developed in urban area as environmental transportation system in increasing air

quality by developing the appropriate transport and mobility with level of environment quality. Besides the lomgterm infrastructures development system in increasing the mobility and how the stakeholders get easy with public transportation and involve in a transportation system development.

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REFERENCES

Abu Hasan Abu Bakar, Khor Soo Cheen. (2013). A Framework for Assessing the Sustainable Urban Development. Procedia - Social and Behavioral Sciences Vol. 85, pp. 484-492.

AMCHUD, Bamako, Mali. (2010). African Ministerial Conference on Housing and Urban Development Land in context of Sustainable Urbanization. [online] URL: http://www.unhabitat.org/downloads/docs/AMCHUD3.pdf.

Andersson, E. (2006). Urban Landscapes and Sustainable cities. Ecology and Society 11(1): 34. [online] URL:http://www.ecologyandsociety.org/vol11/iss1/art34/.

ASEAN Conference on Environment-Behaviour Studies. Cultural Sustainability in the Built and Natural Environment. Hanoi, Vietnam, 19-22 March 2013.

Brandon, P, S, Lombardi, P. (2005). Evaluating Sustainable Development In The Built Environment. Blackwell Publishing,

Hiroaki, S et, al. (2010). Eco 2 Cities. The International Bank for Reconstruction and Development. The World Bank.

Jenks, Mike and Jones, Colin. eds. (2010). Dimensions of the Sustainable City. Springer Dordrecht Heidelberg London New York.

Martin Symes, Mark Deakin and Steven Curwell, eds. (2006) Sustainable Urban Development. The Framework and protocol environmental assessment Vol.1. ISBN 0-203-35108-8. Published in the USA and Canada by Routledge 270 Madison Ave, New York.

Mega, V, Pedersen, J (1998). Urban Sustainability Indicators. European Foundation for the Improvement of Living and Working Conditions, 1998.

Rabinovitch, Jonas. (1992). Curitiba: Towards Sustainable Urban Development. Environment and Urbanization 4: 62. [online] URL: http://eau.sagepub.com/content/4/2/92 .

Shen, L-Y, et, al. (2010). The Application of Urban Sustainability Indicators - A Comparison between Various Practices, Habitat Internasional, doi:10.1016/j.habitatint.2010.03.006.
Shen, L-Y, et, al. (2011). Key Assessment Indicators for the Sustainability of Infrastructure Projects. Journal of Construction Engineering and Management ©ASCE/June 2011/441.
Soemardiono, B. Danardi W.R., Nugroho S., Khaerunissa. (2014). The Role of Integrated Modality Aspects in Urban Sustainability Case Study Surabaya, Indonesia. 2nd International Conference On Innovation And Technology For Sustainable Built Environment, Malaysia.
The Faculty of Construction and Land Use (FCLU) of The Hong Kong Polytechnic University (PolyU). The First International Conference on Sustainable Urbanization (ICSU) on 15-17 December 2010 in Hong Kong.
URL (http://ciptakarya.pu.go.id/profil/profil/barat/jatim/surabaya.pdf)
URL (http://usir.salford.ac.uk/14764/1/DX214551.pdf)

I-DWELL: TRANSFORMING HERITAGE TO ECO-SUSTAINABILITY

Diane Valerie Wildsmith[1]*

[1]Department of Architecture, Faculty of Engineering, Universitas Indonesia

*idc2003@cbn.net.id

ABSTRACT

According to Martin Heidegger in "Building Dwelling Thinking," (1971), *buan* not only means to dwell, but also to stay in a place. This concept opens the way for historic preservation and conservation of Old Town (*Kota Tua*), Jakarta and subsequently interrogates eco-sustainability in the Giant Seawall and Great Garuda project. Heidegger defines dwelling in terms of constructing or building as *bauen* in order to consider how far the notion of dwelling reaches and what it means to dwell. Heidegger considers that, "Building as dwelling unfolds into the building that cultivates growing things and the building that erects buildings." (Heidegger, 1971, p. 146). Consequently, there are three nuances related to the concept of dwelling, firstly, what it is to dwell, secondly, how building belongs to dwelling and thirdly, how dwelling is essential for eco-sustainability. Using a comparative methodology, the paper argues how 'I Dwell' in the postcolonial district of *Kota Tua* will be markedly different from dwelling in a future ecological city. Eco-sustainability encompasses the natural and human cycles from resources to dwelling to waste, inclusive of agriculture. The findings are that eco-sustainability depends on the materiality of technology as well as [im] materiality of social and iconic architectural issues.

Keywords: Dwelling, Eco-Sustainability, Heritage

INTRODUCTION

Using the analogy of a bridge, Martin Heidegger in "Building Dwelling Thinking" develops the idea of dwelling between earth and sky. An arched structure swings over the water to gather the earth from one side to the other. The force that creates a passage links one part of the city with the hinterlands as a source of economic sustainability. In describing the fourfold, Heidegger remarks, "The bridge *gathers* to itself *in its own way* earth and sky, divinities and mortals," (Heidegger, 1971, p. 151). The bridge brings into existence a location between places, provides a way of crossing, and defines a measurable interval of space, a passage through space and time that metaphorically links eco-cultural, eco-social and eco-technical spaces. Poetically, Heidegger states that, "The bridge is a location. As such a thing, it allows a space into which earth and heaven, divinities and mortals are admitted," (Heidegger, 1971, p. 153). The bridge brings into existence a location between places and provides a means for crossing over an interval of space and is in itself a transitory kind of dwelling. Using Heidegger's

Figure 1. "Pont de Langlois with Women Washing at Arles," Vincent Willem van Gogh, Kröller-Müller-Museum, (1888). Source: http://en.wikipedia.org/wiki/File:Vincent_Willem_van_Gogh_-_Pont_de_Langlois_-_Kr%C3%B6ller-M%C3%BCller.jpg

analogy, Vincent Van Gogh's painting "*Pont de Langlois with Women Washing at Arles,*" (1888) opens to the sky to let the boats pass and closes

to the earth to allow the horse and cart to go from one place to another. The water and the earth affords a place for women to dwell, to wash, (Figure 1).

This essay initially follows Heidegger's thinking in designating a bridge as a as an intellectual construct to discuss the [im] materiality of dwelling in the tropics. Using a metaphor of the bridge to cross the chasm between heritage and innovation, the overall purpose is to investigate dwelling in postcolonial *Kota Tua* in the context of historical preservation and conservation, which is in contrast with dwelling in an eco-sustainable way in the Giant Seawall and Great Garuda project. The paper argues how 'I Dwell' in the postcolonial district of *Kota Tua* will be markedly different from dwelling in a future ecological city. The Giant Seawall project will be defensive infrastructure against climate change which in itself could provide a bridge for dwelling in a green city. Pedestrian oriented living places with urban farming and fisheries could involve agrarian and maritime communities in addressing sustenance and economic issues. The Giant Seawall and Great Garuda project could engage eco-social issues with a balance between elite residential towers, *eco-kampungs* and public places leading towards Jakarta as an ecological city. Just as Kota Tua was the mercantile entrepot of Batavia in the 17th-century, the Giant Seawall aspires to be Jakarta's waterfront capitol city in the globalized 21st-century. The relevance of the heritage of Batavia to the Giant Seawall lies in the economic, social, and technological 'space of flows' in relation to dwelling and the 'space of places' in a maritime environment during markedly different periods of globalization.

METHODOLOGY

To imagine dwelling in colonial times, the essay traces the historical development of Batavia via antique maps, lithographs and eventually photographs to define the image of the city and its transformation into present day Jakarta. The methodology follows the pedagogical approach advocated by Prof. Dr. Kemas Ridwan Kurniawan (2014) to use antique maps to trace the development of Batavia and then to compare the maps of the 17th-century with those of the 21st-century for the Giant Seawall to defend Jakarta as a port city from the adverse effects of climate change. This method was also instrumental in Dr. Christopher Silver's lecture, "*Creating the Sustainable Megacity: Lessons from Jakarta's Past to Shape Its Future,*" (2015), especially in relation to Jakarta as a water city.

Figure 2. The Castle of Batavia, Andries Beeckman, (1656).
Source: http://www.wga.hu/html_m/b/beeckman/batavia.html

DWELLING IN THE TROPICS

In order to reveal how people dwell in *Kota Tua*, human activities are considered to capture a contemporary sense of place within the boundary of an historical setting. The Castle of Batavia is depicted in the painting by Andries-Beeckman dated 1656, with a panoply of Oriental figures and tropical palm trees; a cosmopolitan market place is implicit, (Figure 2). Identifying issues, such as authenticity in relation to heritage districts and tourism as well as the flow of natural and human resources within the heritage district, are of paramount importance for the eco-sustainable development of *Kota Tua*. The process is likely to raise more questions than answers in how to qualify as an UNESCO World Heritage City and at the same time to meet the social, political, and economic needs of the inhabitants, tourists, and bureaucrats in *Kota Tua*. To construct a teleological bridge between past and present in terms of technology firstly requires an examination of Batavia as a colonial entrepôt.

In considering dwelling in terms of mapping and iconography, antique maps and lithographs of Batavia reveal the transformation of the Dutch utopian ideal. An antique map (1575) of Groningen with its star-shaped fortifications was a possible inspiration for Batavia. Circa 1619, "Batavia was founded by Jan Pieterszoon Coen, who had the town laid out after a map made by Simon Stevin, who was also a town planner," (Vanden Berghe, G. and Devreese, J.T., 2010, p.11). Iconic lithographs by Johannes

Nieuhof show the infrastructure, institutions and types of buildings in the 17th-century entrepôt of Batavia. The town's defensibility is ensconced in the perimeter wall and its bastions. The Governor's house within the castle walls includes various dignitaries shaded by parosals from the tropical sun. The maps and renderings portray a mercantile entrepôt, which give an insight into the entrepreneurial activities of Batavia in the 17th- and 18th-centuries with an explicit relationship between building technology, naval engineering and local resources, both human and material.

With the influence of military architecture, the United Dutch East India Company (*Vereenigde Oostindische Compagnie, V.O.C.*) map dated 1627, shows the fortified castle with its defensive ramparts and bastions to enclose Batavia's street grid of streets and canals. The western border is defined by the natural flow of the river with the rice fields and sugar plantations beyond. The *Tropenmuseum* map (1667) illustrates canals for the delivery of goods and movement from the hinterlands to the walled city and to the port. Canals were built to cope with flooding in the monsoon season as well as a way to temper the tropical heat and provide access to water for human and animal needs. A street grid laid out as a military camp rationalized the flow of goods between warehouses and the port.

As a symbol of civic order and colonial governance, the Governor's House within the Castle (1669) was followed by the Town Hall (*Stadhuis*), (1710) which featured a symmetrical, classical façade centered on a cupola as a symbol of colonial power. The morphology of Amsterdam as a canal city and port on the development of Batavia is clearly shown in the maps by John Andrews, 1771, (Figures 3 and 4). As a marker for an ecological city, the rice fields are shown in close proximity. By 1789, the image of Batavia as a mercantile enclave and the 'Queen of the East' or the 'Jewel of Asia' was clearly established in the lithographs depicting a bustling East Indies tropical entrepôt, (Homann, 1773, Daumont, 1780). By 1789, the image of Batavia as a mercantile enclave and the 'Queen of the East' or the 'Jewel of Asia' was clearly established in the lithographs depicting a bustling East Indies tropical entrepôt, (Homann, 1773, Daumont, 1780).

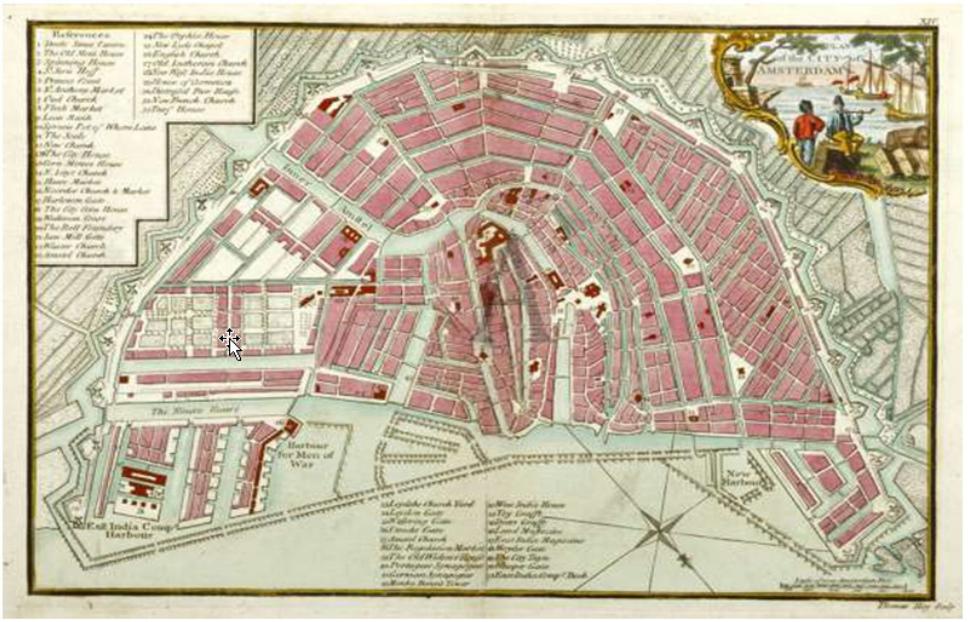


Figure 3. A Map of Amsterdam, 1771, John Andrews (1766-1798).
Source: http://www.antiqueprintroom.com/catalogue/view-catalogue?id=d1f-fa84f6d325ac36d3f6d39eb8db028&sessid=f88a838eecfadb9f48b23d389f6e26eb

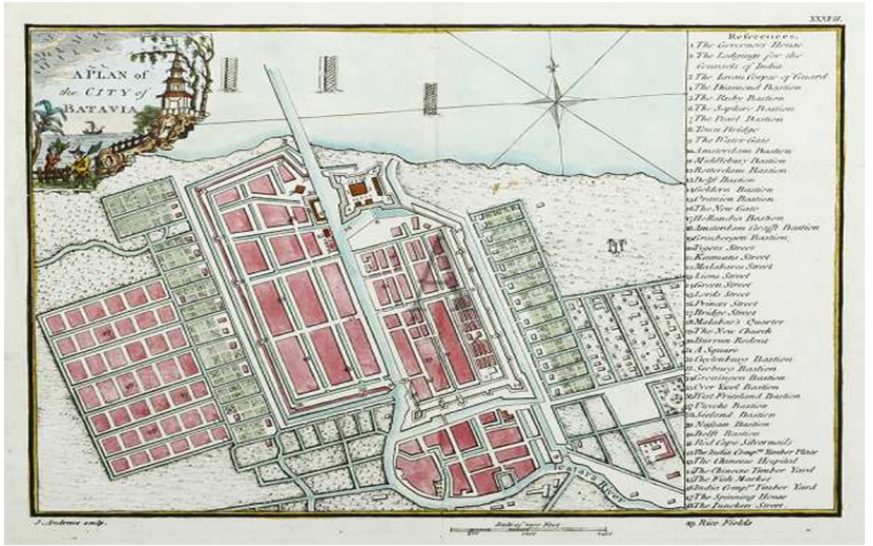


Figure 4. A Map of Batavia, 1771, John Andrews (1766-1798).
Source: http://www.antiqueprintroom.com/catalogue/view-print?id=4fcbde6f-3282584418c7e15ba911cc5d

POSTCOLONIAL HERITAGE

Moving beyond its colonial roots in Batavia, postcolonial heritage in Old Town (*Kota Tua*) Jakarta includes plans to accommodate local and international tourists with the development of tourist facilities, clinics, museums, restaurants, hostels and hotels as well as seating areas and clean toilets. Cultural heritage offers an income producing opportunity as well as employment for local residents. Understanding the connection between heritage, preservation and spontaneity of dwelling involves looking through the prism of the 'tourist's gaze', both as an onlooker and as an inhabitant, in order to imagine life in Batavia as a colonial entrepôt compared to Jakarta as a megacity in the post-reformation era. The tourist's 'engazement' is defined as "…the process through which the gaze transforms the material reality of the built environment into a cultural imaginary," (AlSayyad, 2001, p. 4). The cultural imaginary is synonymous with the [im] materiality of dwelling which relates to economics, eco-aesthetics, and eco-social attributes. Furthermore, there is a delicate balance between tradition and simulacra to preserve an historic district that exudes authenticity as well as cultural theatre with modern technological interventions. Nezar AlSayyad elaborates on the colonial spectre that polarized the relationship between the European colonial elites and the indigenous and immigrant society, particularly in the case of Batavia for the Chinese foremen and laborers as well as the *Mardijkers* (freed slaves of Portuguese and Indian, African, Malay or other descent), resulting in an intangible fascination with the 'other,' presumably from all sides of the multicultural colonial society. The [im] materiality of the social system was apparent in the building facades, in which the edifices became not only icons representing colonial repression of the native peoples, but also the materiality of the technological and physical development of Batavia. To capture the esprit of colonial development as a bustling port from the 17th- to 18th-centuries with façade restoration alone borders on pastiche or the commoditization of the colonial past as an urban theme park. Moreover, the restoration of colonial buildings in *Kota Tua* as museums alludes to "mummification" in which colonial history is preserved in an urban container without recognizing the needs of the current residents for employment and proper shelter. In the eyes of the local population, many of whom are living in *kampungs* and ruins of the colonial past, the colonial perception is inverted: the tourists are the 'outsiders' or the 'others'. In relation to the "Disneyfication" of heritage districts as a global phenomenon, AlSayyed points out the disparity between tourism and local communities. "As a result, culture(s), as embodiments of living traditions are reduced to superficial subjugates of consumerism and lose

their active social aspect, political function and authenticity," (AlSayyad, 2001, p. 18). Instead of a lively, 24-hour urban community, *Kota Tua's* residents are subjected to the pressures of rising land prices, abandoned buildings, flooding and a subsequent increase in social risk due to crime, local *pre-men* collecting fees and insecurity in vacant urban spaces.

Figure 5. Fatahillah Museum was the Town Hall (Stadhuis), Jakarta, (1710). Source: http://www.magnoliabox.com/tag/Batavia

Yet, the multicultural aspects of globalization of the tourist's experience is in sharp contrast with the reality of Kota Tua with its traffic jams created by every conceivable mode of transport (cars, buses, trucks, motorcycles, ojeks, and pedestrians) competing for access to meet the demands for movement of goods, commodities and people in a globalized world. The preservation and conservation of the colonial past is rooted in the motivation for classification as a UNESCO World Heritage site.

Jakarta, in terms of dwelling and housing its expanding population, faces development and population pressures of a 21st-century Asian megacity in the post-reformation era, well beyond the bounds of its colonial enclave. In reconciling the contemporary demographic and economic pressures, the proposal for a new waterfront city in the form of a Giant Seawall or the Great Garuda Master Plan potentially offers an ecological solution to the independent preservation of former Batavia and leads towards the creation of a new city district in Jakarta Bay. More importantly, the Giant Seawall concerns infrastructure as a defense against the ill-effects of climate change and seasonal flooding. In short, parallel plans to preserve

the colonial past with UNESCO World Heritage status and at the same time building a giant seawall provides a bridge between the past and present with a future geared for eco-sustainability and innovation. The obvious conundrum, in terms of dwelling between the old and new portions of North Jakarta, involves economic, social and technological issues.

'SPACE OF FLOWS' VERSUS 'SPACE OF PLACES'

Dwelling in 20th- and 21st-century cities recognizes the growing tension between the 'space of flows' and the 'space of places.' (Castells, 2004). In this sense, Fatahillah Square, the former town square of Batavia, spans across colonial and postcolonial history to reveal hyperconnectivity between colonial structures, cyberspace and tourism, (Figure 5). Manuel Castells indicates, "The 'space of flows' links up electronically separate locations in an interactive network that connects activities and people in distinct geographical contexts. The 'space of places' organizes experience and activity around the confines of locality." (Castells, 2004, p. 444). In this local-global dualism, tourists experience Kota Tua as a Dutch colonial city whose street grid layout, canals, and architectural edifices are reminiscent of Amsterdam, thus reinforcing the experience of materiality in the 'space of places.' Yet, the impression of *Kota Tua* is one of a perpetual global city whose aspects of dwelling also encompass cyberspace and the memory of *Kota Tua* as a colonial entrepôt, thus supporting the notion of the [im} materiality in the 'space of flows'. Historic preservation advocates the retention of the physical environment, yet in parallel with the contemporary pressures of traffic, flooding and decaying buildings, this situation creates a crisis in terms of dwelling sustainably. If dwelling in *Kota Tua* means creating a postcolonial theme park to mimic the past in terms of an urban virtual reality, then the authenticity of living in a hypermodern space is compromised, wherein modern inhabitants become actors in response to tourism and imagined realities of the past.

An understanding of sustainability in colonial times as a 'space of place' provides a linkage between past and present technologies. In response to the tropical climate, colonial buildings were designed with high roofs to separate the living space from direct solar heat gain. The use of high ceilings, ornately patterned vent blocks and operable windows augmented natural ventilation. Overhanging roofs with architraves and lintels above the windows and doors provided a modicum of solar control. Thick masonry walls inherently allowed for passive design and white plastered walls reflected the heat. The canals were a logical response to the need for infrastructure to control flooding during the monsoon season, to allow

for a source of water for daily activities like cooking, washing, cleaning and waste disposal as well as the transport of goods and agricultural commodities from the hinterlands to *Sunda Kelapa* port. The quality of life was compromised by the lack of sanitation and mosquitoes as a cause of cholera and malaria. The sugar plantations and sewage polluted the canals, eventually resulting in paved streets during the 1800's. Socially, Batavia was arranged in district quarters, allowing for the colonial elites to live near the Main Canal (*Kali Besar*). The Chinese traders, labourers and the local community lived in separate compounds. In terms of methodology, the historical analysis of Batavia maps and lithographs reveals a colonial entrepôt, symbolizing the epitome of technological development in the 17th-century with specific urban functions for governance, hospitals, dwellings, schools, a fish market, a slaughter house, a spinning house and warehouses as shown in the renderings of Johannes Nieuhof (1669), thus symbolizing an ecological relationship between human activities and the natural environment.

The morphology of the colonial city becomes a communication artifact between its colonial past and its hypermodern present. The street plan reflects the evolution of transportation systems from horse and cart with manual labour to canals and boats, to electrification and street cars, to automobiles and trucks with the resultant congestion of the petroleum age and ultimately with the introduction of the Mass Rapid Transit (MRT) planned for 2016. The supremacy of the transport grid imposes a splintered urbanism on the social mechanisms of dwelling. To reintroduce connectivity among dwellings, pedestrianization and bicycles are part of the tourism plan to inject life into the colonial quarter. Yet, the condition of the actual infrastructure means that sidewalks are in disrepair and bicycles share the streets, alleys (*gangs*) and thoroughfares with every mode of transport. Rainbow colored hats and pastel-painted bicycles contribute to the joie de vivre and the urbanity in *Kota Tua* which connects one historic place to another and reinforces the idea of connectivity between the 'space of places.' Yet, these modes of conviviality only exacerbate the disparity between those who dwell in and those who visit *Kota Tua*. The social issues of inclusion and exclusion within the tourism economy are scarcely recognized in the shadow of *kampung* communities dwelling in informal settlements along the river and canals. If the intention is to preserve and restore the historic city, then the construction of public and private space requires equity and interaction, not only between various types of economies, but also between the various disciplines of architecture and urban design. Manuel Castells notes, "However, the defining factor in the preservation of cities as cultural forms in the new

spatial context will be the capacity of integration between planning, architecture, and urban design," (Castells, 2004, p. 451). The connectivity and materiality between the 'space of places' and the 'space of flows' is manifest in the Mass Rapid Transit (MRT) system with plans to connect Jakarta as a megacity with its colonial past in *Kota Tua*. In 1996 the attitude towards heritage planning for Kota Tua expanded beyond the confines of preservation and conservation to encompass culture and tradition as well as ecology and the environment in parallel with socio-economic adjustments. Within the context of economic and social sustainability is the reality of mixed use urban activities with dwelling and working in close proximity to foster not only economic transactions, but also social interactions. The contemporary functional divisions of *Kota Tua* include: the Chinese quarter (*Pecinaan*), which is synonymous with trade, shophouses and street market stalls, the former colonial elite and postcolonial commercial strip on Kali Besar, composed of hotels, banks, offices, warehouse and residences, the Town Hall (*Stadhuis*) known as the Fatahillah Museum, the Fish Market (*Pasar Ikan*) and the former Dutch trading company (VOC) warehouses within the traditional port of *Sunda Kelapa*. "Today, conservation is ruled [by] more than a sense of history. It is now ruled by a sense of (functional) use – including the community need[s] and even ecological concerns," (Martokusumo, M., 2010, p. 7). Therefore, the concept of sustainability provides a thread of continuity between eco-cultural, eco-social, and economic issues. Environmentally, the City of Jakarta (DKI) has earmarked expansion of green and public spaces in its proposal to develop *Kota Tua*, (Handhayani, S., 2014), Figure 6. The Jakarta Old Town Reborn (JOTR) initiative also identified 12 priority projects to be undertaken in the period from 2013 to 2017.

Figure 6. Additional Green Space Proposed Near Fatahillah Square, (2014). Source: DKI, Pengembangan Kawasan Kota Tua pdf.

Lacking sustainability, abandoned warehouses and dilapidated colonial buildings as well as the damage inflicted by flooding, inclement weather, and subsidence results in dysfunctional economic and civic spaces, largely abandoned at night and inaccessible due to daily traffic congestion. Nonetheless, the prevalence of museums as a cultural panacea for the preservation or restoration of the historic structures reveals a degree of reliance on tourism.

In summary, the 'space of flows' also relates to the transfer of technology and design ideas. In terms of heritage, the transmigration of technology and architectural styles during the colonial era derived their inspiration from 17th-century Netherlands. The architectural style of the Town Hall in Batavia mirrored the Town Hall in Amsterdam. Twentieth-century globalization continues with similar technological impetus and iconic visualisations. The idea of building artificial islands as investment havens occurs with Palm Island in Dubai, 2001, (Figure 7), which serves as an inspiration for the Giant Seawall and Great Garuda project in Jakarta, 2014, (Figure 8).

TOWARDS ECO-SUSTAINABILITY

Generically speaking, ecological sustainability is the capacity of natural and human ecosystems to maintain their processes and biodiversity over the long term for the benefit of successive generations. Ec0-sustainability in an urban environment is dependent on people using public transport, reducing energy consumption, reusing water, recycling waste, growing food and building to support basic dwelling needs. According to the Green Cities report by the Asian Development Bank, (2012), the need for green city design in Asia is imperative due to urban population growth, greenhouse gas emissions and climate change. "The development of comprehensive and sustainable green city models, or eco-cities, will be vital for the urban future of Asia and the Pacific, which has the fastest-growing regional economy, and hence the fastest-growing energy and carbon consumption, and greenhouse gas (GHG) emissions," (Steinberg and Lindfield, 2012, p. 24). Greenhouse gas emissions are a contributing factor to sea level rise and act as a major driver in the rationale to build the Giant Seawall to protect the capital city of Jakarta. In the context of Green Open Space (GOS) and ameliorating the ill-effects of greenhouse gas emissions, "Jakarta, for example with only 9 percent, has merely 7.08m GOS per capita…Besides that, the average GOS ratio of Asian cities is 15 square meters per person and the world average is 11-134 square meters per person...," (Kirmanto et al., 2012, p. 4.) Additionally, the Green City

Development Program (GCDP, 2011), launched by the Ministry of Public Works, concerns a balance between economic efficiency, ecological preservation and social justice. Eight green attributes are identified as: planning and design, community, open space, water, waste, energy, transportation and buildings. These attributes are useful as green indicators to assess the environmental qualities of the Giant Seawall and eco-social qualities in the Great Garuda Master Plan (2014), resulting in a markedly different way of dwelling in a sustainable way. Additionally, the first phase of the Pantura Project reclamation of 5,100 hectares and 17 islands focuses on a commercial development with a green city agenda.

The 10,000 hectare seawall in the Great Garuda Master Plan spans from east to west as a 60-kilometer dike to defend Jakarta against climate change, rising sea levels and subsidence. According to the National Capital Integrated Coastal Development data, the Giant Seawall is "…a giant dike (32 kilometers-wide) which includes an airport, harbor, toll road, residential area, industrial area, waste treatment, water reservoir, and green areas, on a space of about 4,000 hectares," (NCICD, 2014). A US$40 Billion city development project of 1,250 hectares is planned for 1.5 million residents and workers, which will be funded by private developers. Egg-shaped districts within the Great Garuda project offer a model for sustainable development, combining living and working environments. A designated area for maritime communities will ameliorate the inherent social disparity between elite high rise residential buildings in the proposed CBD and the needs of the indigenous fisherman whose livelihood extends well beyond the confines of the fishing community in North Jakarta. As a national symbol of 'Unity in Diversity', the Great Garuda Master Plan could be the pathfinder for designing Jakarta as an ecological city. The development considers not only the seawall and transport infrastructure, but also the need to address water purification and drainage issues as well as electrical generation from renewable energy resources such as wind, solar and tidal technologies. The lagoon created between the coastline of Jakarta and the Giant Seawall requires extensive engineering to deal with the issues of water quality and trash from the 13 rivers discharging their monsoon seasonal runoff into Jakarta Bay. Obviously. the engineering issues related to the seawall infrastructure and the formation of new islands for development require careful design and environmental assessment so as to avoid complications with waste water, plumbing and sewage that beset the Palm Islands in Dubai in 2011, whereby the residents were forced to take showers and attend to their needs at a nearby hotel. Similarly, "The future resilience of Jakarta depends on water management by understanding the past to guide the future," (Silver, C.,

2015). Additionally, the Giant Seawall provides a defensive barrier against the inundation and subsidence of Kota Tua related to the seasonal high tide (rob) and the prevalence of wells for domestic and commercial water usage throughout Jakarta.

CONCLUSION: DWELLING [Im] materiality

Using a comparative methodology, this essay juxtaposes maps of the mercantile port of Batavia in the 17th-century with the proposed Giant Seawall master plan for Jakarta in the 21-st century, as iconic images of dwelling in a maritime environment. The argument is based on the potential of the Great Seawall master plan to serve as a clarion call for Jakartans to realize an ecologically designed waterfront city in terms of eco-social, eco-technical and economic criteria, beyond that of an engineering intervention for commercial development, a seawall defense against climate change, a water purification reservoir and a multi-tiered transport bridge. In comparing postcolonial Batavia with the post-reformation Giant Seawall master plan, the findings are that eco-sustainability depends on the materiality of technology as well as the [im] materiality of social and iconic architectural issues, which will act as a teleological bridge for engineering design and dwelling in a future ecological city. The historical analysis of the technological exchange between the morphology of Amsterdam and Batavia as canal cities is mirrored in the transfer of building topology and iconic symbolism between Palm Island in Dubai and the Great Garuda in Jakarta as capitalist developments. In eco-social terms, the Great Garuda symbolizes the national emblem of Indonesia and its national motto of 'Unity in Diversity,' which substantiates relocation of government offices to the CBD.

In terms of an Asian green city, the initiative to offset carbon emissions and to add green space in postcolonial Kota Tua is also replicated in the green parks shown in the Giant Seawall master plan, included in a 55% ratio for infrastructure and green space. However, the social contiguity between the 'space of places' and the 'space of flows' needs to be considered in response to Jakarta's indigenous culture and its preference for sidewalk traders and open air markets rather than the mere replication of New York City's Central Park and its high rise buildings topology in the Great Garuda planography.
Moreover, the allocation of human and economic resources is of concern in considering the expenditure involved for both the restoration of Kota Tua to UNESCO Heritage status and the considerable cost of land reclamation and new infrastructure for the Giant Seawall. The relationship

between the city and the hinterland in terms of commerce and food supply was clearly defined in the antique maps of Batavia. This duality meets Heidegger's criteria for dwelling as the materiality of erecting building and growing things. However, the provision of basic human needs, including water supply and urban agriculture plus the potential of urban fisheries, is yet to be resolved in the Giant Seawall master plan. In conclusion, the methodology of this paper investigates dwelling as a tangible, fixed materiality, expressed by maps and master plans and then it questions the future ecological relationship between dwellings, dwellers and environments in terms of intangible social issues or [im] materiality in what portends to be an ecological city built upon a giant seawall. The Great Garuda champions how 'I [will] Dwell', sustainably and ecologically throughout the entire city.

Figure 7. Palm Island, Dubai, (2001).
Source: http://www.telegraph.co.uk/news/worldnews/middleeast/dubai/8697231/Trouble-in-paradise-as-plumbing-problems-hit-Dubais-Palm-island.html

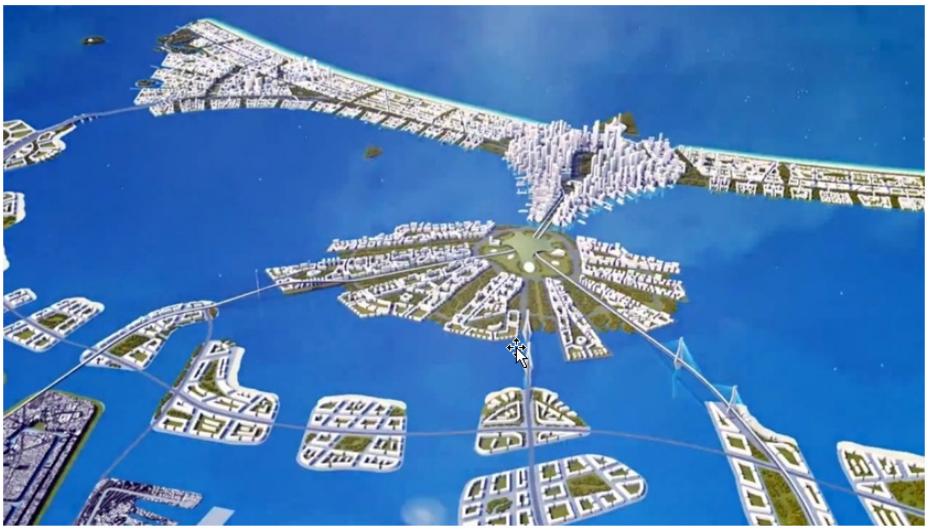


Figure 8. National Capital Integrated Coastal Development (NCICD) Giant Sea-wall and Great Garuda master plan acts as a bridge and a green city, (2014). Source: http://defence.pk/threads/will-the-great-wall-of-jakarta-save-the-capital-from-floods.346405/

REFERENCES

AlSayyad, N., editor, (2001). Global Norms and Urban Forms in the Age of Tourism: Manufacturing Heritage, Consuming Tradition, Chapter 1. Consuming Tradition, Manufacturing Heritage: Global Norms and Urban Forms in the Age of Tourism. London: Routledge, 4.

Castells, M. (2004). Space of Flows, Space of Places: Materials for a City of Urbanism in the Information Age, 444, 451. http://design.epfl.ch/wiki/tiki-download_file.php?fileId=502

Handhayani, S., Deputi Gubernur Provinsi DKI Jakarta, (2014). Pengembangan Kawasan Kota Tua, Bidang Tata Ruang dan Lingkungan Hidup, Pemerintah Provinsi DKI Jakarta, pdf, 30.

Heidegger, M. with translations and Introduction by Albert Hofstadter. (1971). Building Dwelling Thinking, Chapter 4. Poetry, Language and Thought. New York: HarperCollins Publishers, Inc., 146, 151, 153. http://ssbothwell.com/documents/ebooksclub.org__Poetry__Language__Thought__Perennial_Classics_.pdf

Kirmanto, D., Ernawi, I.S. and Djakapermana, R.D., (2012). Indonesia Green City Development Program: An Urban Reform. 48th ISOCARP Congress 2012, 4. http://www.isocarp.net/data/case_

studies/2124.pdf
Martokusumo, W. (2010). The Old Town Jakarta: Perspectives on Revitalization, Conservation, and Urban Development, 7. http://www.ar.itb.ac.id/pa/wp-content/uploads/2007/11//THE-OLD-TOWN-JAKARTA-Perspectives-on-Revitalization-Conservation-and-Urban-Development.pdf.
National Capital Integrated Coastal Development (NCICD), (2014). http://ncicd.com/wp-content/uploads/2014/10/MP-final-NCICD-LR.pdf and http://defence.pk/threads/will-the-great-wall-of-jakarta-save-the-capital-from-floods.346405
Silver. C., Dean of College of Design, Construction and Planning, University of Florida, (2015). "Creating the Sustainable Megacity: Lessons from Jakarta's Past to Shape Its Future," lecture delivered at Universitas Indonesia, Faculty of Engineering, 3 February 2015.
Steinberg, F. and Lindfield, M., (2012). Spatial Development and Technologies for Green Cities, Chapter 1. Green Cities, Asian Development Bank (ADB) Urban Development Series, Philippines, 24. http://www.adb.org/publications/green-cities
Vanden Berghe, G. and Devreese, J.T., (2010). Simon Stevin and the Art of War. Universiteit Gent and Universiteit Antwerpen / Technische Universiteit Eindhoven, 11. http://users.ugent.be/~gvdbergh/files/publatex/Stevinkrijg-2.doc

CORRELATION BETWEEN ARCHITECTURAL DESIGNS WITH THERMAL AMBIENT ON RESIDENTIAL UNITS I MASS PUBLIC HOUSING (MPH) SARIJADI IN BANDUNG, INDONESIA

Yasmin Suriansyah[1]*

[1]Parahyangan Catholic University
*yasmin@unpar.ac.id, yasminsuriansyah@gmail.com

ABSTRACT
Mass Public Housing (MPH) Sarijadi is one of the first generation of MPH in Bandung Indonesia, which is provided for low-middle community, and as an example of architecturally designed byusing natural ventilation and until now occupied mostly without artificial air-condition. This paper is a research result on the correlation between variables of architectural design with thermal ambient in the residential units of the MPH Sarijadi. Sub variables of architectural designs include the orientation of dwelling units, design of facade, window to wall ratio, and sun-shading. Sub variables of thermal ambient include its air temperature and relative humidity.By using data loggers which can collect data continuously for 24 hours with a range of each three minutes, this study measured and recorded daily data of thermal ambiance patterns obtained in each dwelling unit that is unique and more accurate compared to manual measurement which is widely used previously. Data retrieval of temperature and relative humidity was taken purposively in 24 residential units of different orientation, facade design, window to wall ratio, and sun shading. Using cross correlation and regression analysis, this study founda unique phenomenon, which is a significance of correlation between architectural designs and its thermal ambient, represented by building block type and wet bulb temperature. The findings are very important to be noticed by all those who take part in the development of green affordable residential building of MPH that promotes energy-saving principle, toward a better and sustainable built environment in the future.

Keywords: green building; mass public housing; thermal ambient

INTRODUCTION

Natural ventilation in dwelling units of MPH for lower-middle-income people is very important to be concerned, because it directly affects to thermal comfort of the occupants in their daily activities, and indirectly affects to the use of energy for artificial air-condition to be financed.

Usually MPH is designed for low-income households without using artificial air condition. Ventilation only relies on natural ventilation and window or door openings. To refer to SNI03-6572-2001 about procedure for designing ventilation and air conditioning systems in buildings, the Green Building Council Indonesia requires ventilation openings size of not less than 5% of the floor area of the room that needs ventilation.

More than a half of the total electricity consumption is used for building [13]. Recent studies reveal that 50-60% for air conditioning and 20-30% for artificial lighting [10].

Among the many parameters that can affect the energy consumption in buildings, especially in tall buildings are window to wall ratio (WWR), coefficient of solar heat gain (SHGC) and light transmittance (LT) have an important role in the amount of solar heat and light into in the room and have a significant impact on energy consumption in buildings [14].

According to Zain-Ahmed et.a.l in Malaysia, optimal size of the window (the facade openings) is 25% WWR [1], for building without fin, while in Hong Kong; research shows that the optimal WWR for building with fin is 36% [14].

Indonesia by Ministry of Human Settlement and Regional Infrastructure has regulations on window to floor ratio (WFR). The minimum WFR should be one-tenth of the floor area of the room. WFR is more related to the quantitative of space floor size and the figure of the building façade. The WWR is quantitatively also associated with the amount of wall area and has directly impact on building façade.

MPH is a multi-story residential building, which always has a dilemmatic problem between shape and size of facade openings design, with thermal comfort and visual quality perceived by the occupants [20, 22]. Additionally, architecturally the WWR is very important to be concerned, because it is closely related to the balance between the aesthetics of the building and building energy usage for ventilation, especially for multi-

story building that requires the use of energy in appropriate proportion, and related to the occupants thermal comfort.

MPH Sarijadi Bandung (MPH SB) is a first-generation mass public housing (1975s) in Bandung city, and still inhabited. It is one of the mass public housing in Bandung that is intended for lower middle-income people. MPH SB is a unique mass public housing in terms of as the only existing vertical residential in Bandung city, which has a series of cluster typology with one stair for every four dwelling units. Every unit has two facades. MPH SB quite often becomes the research object [8, 17, 22], but less is discussed about natural ventilation potential that is associated with the thermal comfort. Therefore, the research on the MPH SB's WWR is very important to do.

The research question is how the correlation between architectural designs with thermal ambient on residential units in mass public housing (MPH) Sarijadi in Bandung Indonesia.

Special purpose of this research is to complete knowledge vocabulary that can be used as suggestions for optimizing the better use of natural ventilation, through correlation between physic-spatial configurations of architectural elements with indoor thermal ambient.

LITERATURE REVIEW

Though not entirely, a good architectural product is a form of built environment that can create a better quality of life. Therefore, ongoing efforts to find physic-spatial configurations of architectural elements that offer an opportunity to make a better quality of life are imperative [21]. One of them is to find the physical configuration of spatial architectural elements that give optimal natural ventilation opportunities. Therefore this study used the theoretical base that includes the results of previous research related to principles of natural ventilation, as well as some earlier research that addresses similar issues in the study of different objects, as well as previous studies related to the MPH SB.

Some research and discussions that are relevant to this research that has been done are about energy conservation in MPH [2, 4], energy consumption in MPH [15, 23], electricity use [14]; passive solar design strategy [1], solar radiation [10], and photovoltaic [16].

Some regulation in Indonesia consist of standard of energy conservation [2]; ventilation system [3, 5]; and guidance on healthy affordable housing

[12].

Related to occupants of MPH, there are some research about man, climate and architecture [7], lifestyle [15, 19], perception [18], and inhabitation of space in MPH [19].

Study of thermal comfort usually cannot be avoided to discuss daylight quality in MPH as well [11, 14, 20, and 22]. Beside thermal comfort there are some study about comfort, among others comfort analysis in Italy [6], thermal comfort [8], and psychological comfort in MPH [9].

There are some researches of configuration of physical elements of MPH [16, 21]; some are related to wall opening and thermal condition [17]; WWR and shelf-shading [13], and OTTV [11, 13].

Some study were conducted in MPH Sarijadi [8, 17, 22], and in Bandung [22]; also in other cities in Indonesia, like Cimahi, Soreang, and Baleendah [20], Cirebon [21], and Medan [18], also in some outside Indonesia like Malaysia [1], and Hong Kong [10], and Italy [6].

METHODS

This research used descriptive and quantitative method, looking for correlations between the variable of physic-spatial configuration of architectural elements (PSCAE) with the thermal ambient (TA) in dwelling units in the MPH Sarijadi Bandung. The PSCAE variable consists of sub-variables: unit type, interior space configuration, and window to wall ratio (WWR) of the dwelling units. The TA variable consists of sub-variables air temperature and relative humidity on residential units in MPH SB.

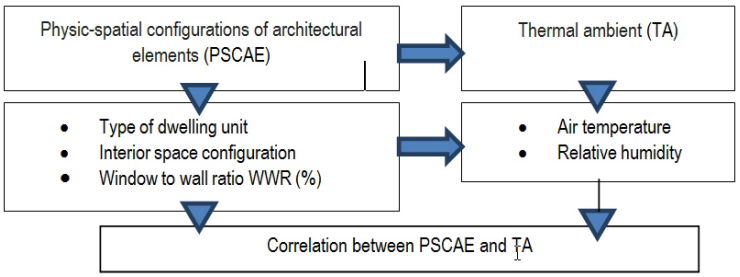


Fig. 1 Flow Chart of Research

As seen in the diagram above, the study started with a field survey to collect data of the physic-spatial configurations of architectural elements at MPH SB, which consist of the type of unit, space lay-out, window to wall

ratio (WWR) of dwelling units, and data on thermal ambient consisting of air temperature and relative humidity.

RESEARCH OUTCOMES

The expected outcome of this research is the description of the spatial correlation between the physical configurations of architectural elements with the thermal ambient in residential units in mass public housing Sarijadi in Bandung Indonesia. Outcomes of this research can be used to construct hypothetical comparison between MPH SB with other mass public housings in terms of the correlation between PSCAE and TA on each of its. The hypothesis can be put forward as part of a more complex research in the future.

LOCATION AND DESCRIPTION OF RESEARCH OBJECT

Location of research object is in Jalan Sarijadi Bandung Indonesia (Fig. 2 and 3), where MPH SB is located. MPH Sarijadi Bandung (MPH SB) compound consists of 11 long type blocks (LB) and 5 short type blocks (SB).

Fig. 2. Location of MPH Sarijadi in Bandung city

Fig. 3. Aerial view of MPH Sarijadi

All long blocks facing west-northwest and east- northeast are row of 4 clusters consist of 4 units which are united by a stair, while the short type is a combination of the two clusters. Dwelling unit as research object was taken as the unit of analysis, by purposive sample, taken at least one unit on each side of the block on each floor, as seen in the following pictures. See Fig.4.

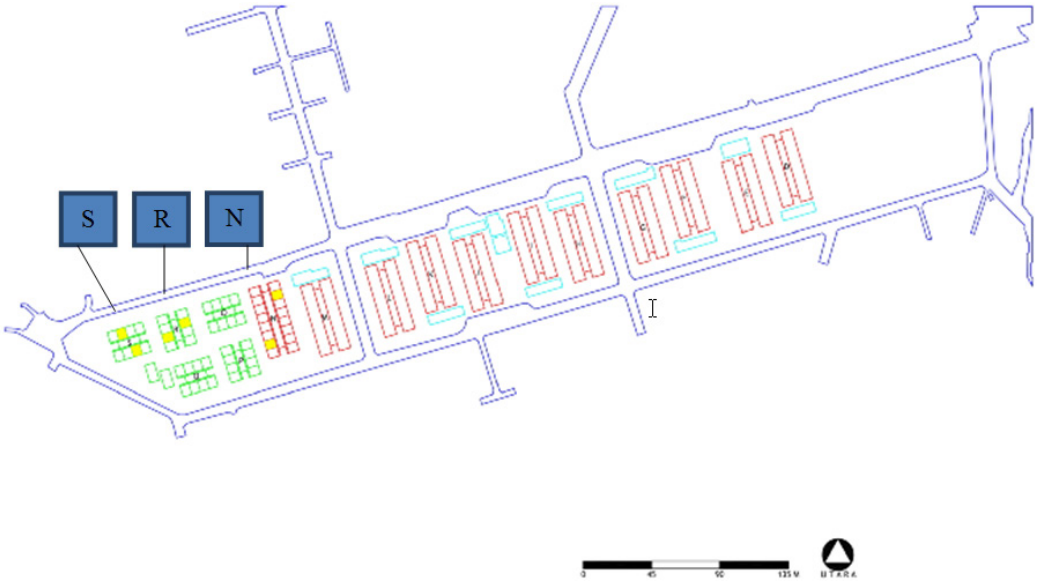
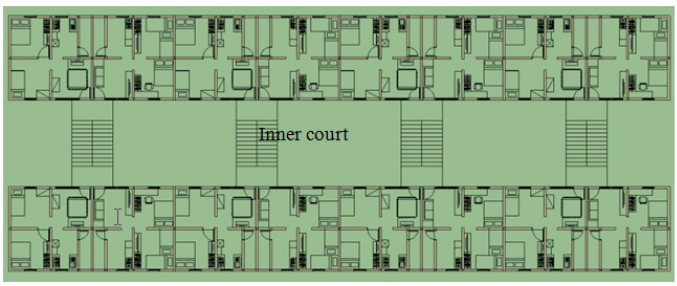


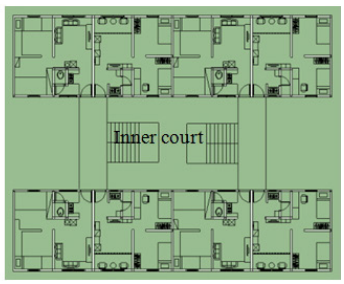
Fig.4. MPH Sarijadi Bandung (MPH SB) Compound in Bandung Indonesia

Building blocks to be surveyed are Block S, R, and N. Those blocks were chosen because they represent every type of blocks in the MPH SB compound. Block S represents the type of short blocks with orientation to the north-northwest and south-southeast. Block R represents the type of short blocks facing west-northwest and east-northeast. Block N as representative of long blocks types, all facing towards the west southwest and east-northeast. Both block types have similarities and differences in terms of the interior space composition. The similarity, both have size 36 m2, consist of two bedrooms, a sitting room (living room as well as a family room), a kitchen and a toilet. Bedrooms are on one side by side. See Fig.5, 6, 7 and 8.



Outer façade

Fig.5. Long Block Type (LB)



Outer façade

Fig. 6. Short Block Type (SB)

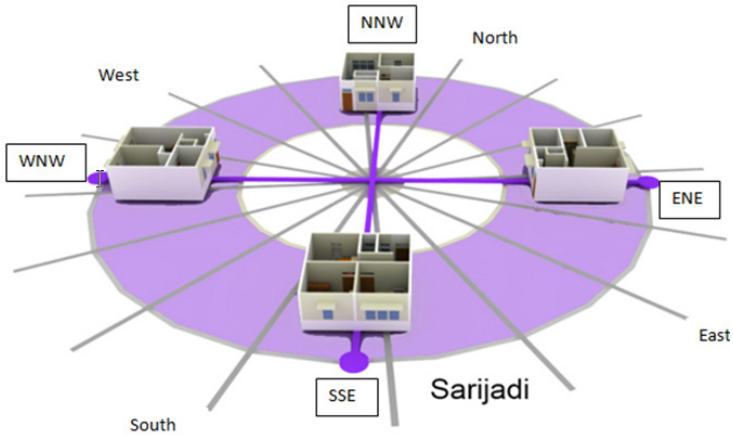


Fig.7. Residential Unit Name Based on its Façade Direction

Fig. 8. Façade Deviation from North

The difference is in the arrangement of these spaces. In LB, service zone (toilet and kitchen) is on outer façade side, while in the SB, the service zone is on the inner court façade side. Thus contrary to the position of sitting room, at LB is located on inner court side, while at the SB is on the outer facade side, which is adjacent to the courtyard space.

Both have a partition in the middle of the room, separate and located between two bedrooms, although not completely blocking the separated spaces, but partition has the potential to reduce the entry of air flow into the depths of space. See Fig. 9 and 10.

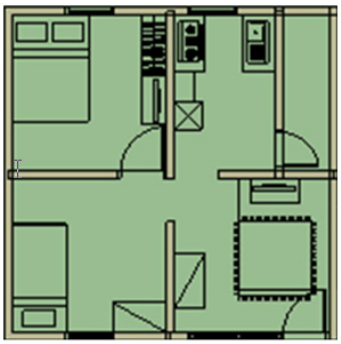


Fig.9. LB Residential Unit Type

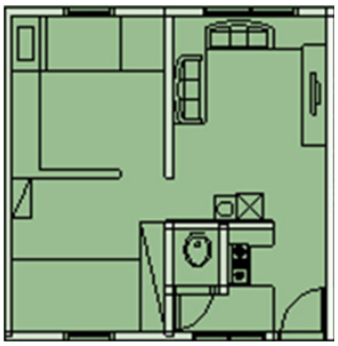


Fig. 10. SB Residential Unit Type

Size of WWR on SB type is larger than on LB type. It means, potentially natural ventilation on SB type is also bigger than on LB type. Potential natural ventilation on SB type is 21.2 % of floor area, and on LB type is 19.38 % of floor area. See Fig. 11 and 12

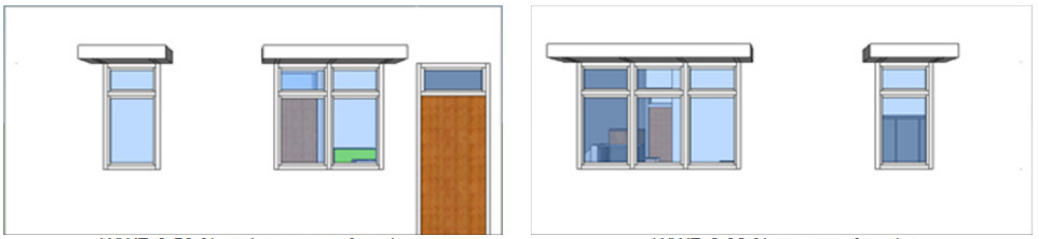


Fig. 11. WWR on SB Type at Unit NNW 1, SSE 2, WNW 3, and ENE 4.

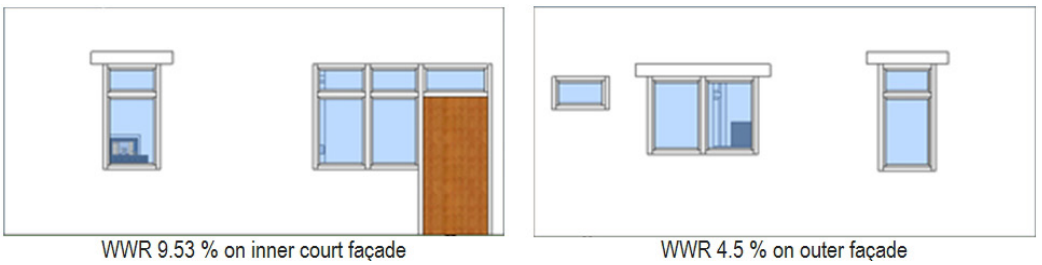


Fig. 12. WWR on LB Type at Unit ENE 5 and WNW 6

Variety of partition and furniture layout is seen in figure below. In this study a representative sample was taken for each façade direction. On each block were taken two façade directions and the opposites. Therefore there are 6 units each floors, with different levels to represent the floor position

that is on 1st to 4th floor. See Fig. 13. Twenty-four units are measured on air temperature and relative humidity at certain moments and continuously of 24 hours by data loggers. Eight of them are presented on this paper.

Fig. 13. Some Surveyed Dwelling Units at WNW Orientation (Short and Long Block)

RESULT AND DISCUSSION

According to Indonesian National Standard (SNI), comfort zone in tropical area can be divided into: (1) cool-comfort, with effective temperature 20.5 oC ~ 22.8 oC; (2) optimal-comfort, with effective temperature 22.8 oC ~ 25.8 oC; (3) warmth-comfort, with effective temperature 25.8 oC ~ 27.1 oC. Zone of Indonesian thermal comfort for building design, commonly defined as 25oC ±1oC of air temperature; and relative humidity 55 % ±10 %.

In object of study, Sarijadi MPH, the thermal conditions of each residential unit, grouped based on the direction of the building block. It can be seen on Table 1.

Table 1. Measurement Result of Thermal Ambient Variables
On Each Unit Basedon its Orientation

#	Orientation Floor Unit	Block Name	Block Type	Floor	Orientation	Air Temperature (oC)	Globe Temperature (oC)	Wet Bulb Temperature (oC)	Relative Humidity (%)	Air Velocity (Meter/second)
1	WNW 1 3	R	S	1	WNW	25.7	24.6	22.7	70.1	0
2	WNW 1 5	N	L	1	WNW	26.3	25.8	23.6	72.8	0
3	WNW 2 3	R	S	2	WNW	25.9	26.7	23.1	69.5	0
4	WNW 2 5	N	L	2	WNW	27.8	25.7	22.8	56	0
5	WNW 3 3	R	S	3	WNW	25.7	25.8	22.7	70.5	0
6	WNW 3 5	N	L	3	WNW	26.4	26.1	21.3	52.2	0
7	WNW 4 3	R	S	4	WNW	26.8	26.8	23.7	68.4	0
8	WNW 4 5	N	L	4	WNW	27.2	27.2	22.6	55.4	0
9	SSE 1 2	S	S	1	SSE	26.6	26.4	23.6	68.9	0
10	SSE 2 2	S	S	2	SSE	27.2	26.2	23.3	58.7	0
11	SSE 3 2	S	S	3	SSE	27.7	27.4	23.4	58.9	0
12	SSE 4 2	S	S	4	SSE	27.8	27.1	23.2	56.3	0
13	ENE 1 4	R	S	1	ENE	27.6	27.8	23.8	61.4	0
14	ENE 1 6	N	L	1	ENE	25.5	26.2	21.8	62.2	0
15	ENE 2 4	R	S	2	ENE	27.2	27.7	23.1	59.4	0.01
16	ENE 2 6	N	L	2	ENE	27.1	26.1	22.7	56.8	0.21
17	ENE 3 6	N	L	3	ENE	26.9	27.1	23.7	66.2	0.48
18	ENE 3 4	R	S	3	ENE	27.1	26.4	23.7	65.3	0.02
19	ENE 4 4	R	S	4	ENE	26.4	25.9	23.1	67.6	0
20	ENE 4 6	N	L	4	ENE	27.4	27.8	22.9	53.3	0.18
21	NNW 1 1	S	S	1	NNW	29.3	29.1	24.4	54.6	0
22	NNW 2 1	S	S	2	NNW	25.9	26.6	23.2	67.4	0
23	NNW 3 1	S	S	3	NNW	25.8	25.8	22.6	65.5	0
24	NNW 4 1	S	S	4	NNW	29.4	29.3	24.8	55.5	0
	max					29.4	29.3	24.8	72.8	0.48
	min					25.5	24.6	21.3	52.2	0
	avg					26.95	26.73	23.16	62.20	0.04

In Sarijadi MPH, air temperature (AT) average is 26.95 oC. There are nine residential units that have higher than the average of AT. The highest AT is 29.40 oC at 4th floor of the north-northwest (NNW 41), and the lowest is 25.50 oC on first floor of the east northeast (ENE 16). It can be classified as optimal-comfort up to warmth-comfort.

Relative humidity (RH) average in Sarijadi MPH is 62.20 %, still in the range of comfort zone. There are twelve residential units having a lower than the

average of RH. The highest RH is 72.80 %, in the west-southwest, at first floor (WNW 15), and the lowest RH is 52.20 % in the west-southwest, at third floor (WNW 35).

Globe temperature (GT) average in Sarijadi MPH is 26.73 oC. There are ten units that have the lower than the average of GT. The highest GT is 29.30 oC at the 4th floor of the north-northwest (NNW 41), and the lowest GT is 24.60 °C at the first floor of the west-southwest (WNW 13).

Wet bulb temperature (WBT) average in Sarijadi residential units is 23.16oC. The range is 21.30 oC (WNW 35) up to 24.80 °C (NNW 41). There are ten units that have the higher than average of WBT.

Air flow (air velocity - AV) in most of residential units in Sarijadi MPH is not detected by the instrument at the time of measurement (0m/sec). Only in 5 dwelling units, its air flow was detected; all are in the east-northeast of ENE 24, ENE 26, ENE 36, ENE 34, and ENE 46. The highest air flow is 0.48 m/s.

Cross Correlation. Cross correlation coefficient between thermal ambient with architectural elements variables shows significance of relationship between all variables: air temperature, relative humidity, globe temperature, wet bulb temperature, air velocity, block type, floor position, and orientation of dwelling units one to each others. A significant correlation can be seen on asterisk marks on Table 2.

Table 2. Cross Correlation Coefficient between Thermal Ambient With Architectural Elements Variable

Kendall's tau_b Correlation	AIR TEMPERATURE	RELATIVE HUMIDITY	GLOBE TEMPERATURE	WET BULB TEMPERATURE	AIR VELOCITY	BLOCK TYPE	FLOOR	ORIENTATION
AIR TEMPERATURE (AT)	1	-.537**	.545**	.387*	0.095	-0.027	0.183	-0.11
RELATIVE HUMIDITY (RH)		1	-.324*	0.052	-0.123	-0.277	-0.221	0.05
GLOBE TEMPERATURE (GT)			1	.399**	0.161	-0.146	0.187	-0.042
WET BULB TEMPERATURE (WBT)				1	0.036	-.359*	-0.046	-0.132
AIR VELOCITY (AV)					1	0.328	0.133	.541**
BLOCK TYPE (BT)						1	0	.392*
FLOOR (F)							1	0
ORIENTATION (O)								1

All of thermal ambient variables (air temperature, relative humidity, globe temperature, and wet bulb globe temperature) are correlated one to each others significantly except air velocity. It is normal. Not all of architectural designs variables (orientation, façade design, WWR, and sun-shading represented by block type) are correlated one to each other's significantly, only between orientations with block type.

An interesting correlation between thermal ambient and architectural designs can be seen on diagram below. Fig.14. Bridging between those variables is the correlation between building type and wet bulb globe temperature. This finding point out that building type in this case is block type as representation of façade design, WWR, and sun-shading has an important role to indicate the tendency of thermal ambient.

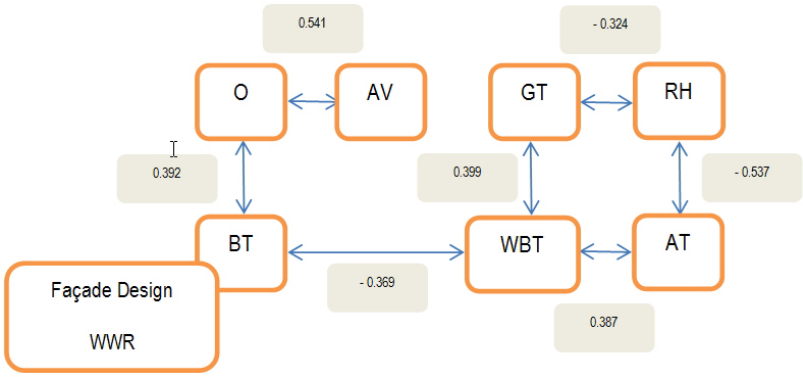


Fig. 14. Diagram of Cross Correlation Coefficient between Thermal Ambient with Architectural Elements Variables

Regression coefficient. Regression coefficient of the architectural design effect to air temperature shows that block type and orientation where the dwelling units are in is very low, as well as the effect to relative humidity. In other words, contribution of block type and orientation of dwelling unit to thermal ambient is not significant. See Table 3 and 4.

Table 3. Regression of the Effect of Architectural Design to Air temperature

Coefficients[a]

Model	Unstandardized Coefficients		Standardized	t	Sig
	B	Std. Error	Beta		
(Constant)	27.607	.714		38.670	.000

BLOCK TYPE	.098	.499	.046	.197	.846
ORIENTATION	-.280	.220	-.296	-1.269	.218

a. Dependent Variable: AIR TEMPERATURE

At = f (27, 607 + 0.098 Block type – 0.280 Orientation)

Table 4. Regression of the Effect of Architectural Design to Relative Humidity

Coefficients[a]

Model	Unstandardized Coefficients		Standardized	t	Sig
	B	Std. Error	Beta		
(Constant)	65.505	4.218		15.531	.000
BLOCK TYPE	-5.851	2.947	-.442	-1.986	.060
ORIENTATION	1.589	1.302	.272	1.221	.236

a. Dependent Variable: RELATIVE HUMIDITY

RH = f (65,505 –5,851 Block type + 1,589 Orientation)

Description of Correlation. The highest air temperature is in unit NNW 14. It is the short block type and facing to north-northwest, with the bigger WWR. See Table 5.

Table 5. The Highest of Air Temperature and the Window to Wall Ratio (WWR)

Block type	Block name	Unit name	Highest Air Tempera-ture (oC)	Outer facade	Inner court facade	Outer WWR (%)	Inner court WWR (%)
Short (SB)	R	BBD/WNW 25	26.8			6.02	9.53
	R	TTL/ENE 14	27.6				
	S	ST/SSE 42	27.8				
	S	UBL/NNW 14	29.4				
Long (LB)	N	TTL/ENE 46	27.4			4.50	9.53
	N	BBD/WNW 25	27.8				

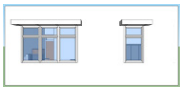
WWR = window to wall ratio. Potential natural ventilation SB = 21,2% and LB = 19,38% of floor area

Theoretically, the size and position differences of doors and windows should affect to the air flow and distribution. Door and window positions that have a distance between the openings affect more evenly distributed

air flow, compared with the continuous one. But in the object of this study, the effect of door and windows size and position are not making any difference to the air flow and distribution. As mentioned above, air flow (air velocity) in most of the residential units in Sarijadi MPH is not detected by the instrument at the time of measurement (0 m/sec), except in 5 dwelling units.

The lowest air temperature is in unit ENE 16. It is the long block type and facing to east-north east, with the lowest WWR. See Table 6.

Table 6. The Lowest of Air Temperature and the Window to Wall Ratio (WWR)

Block type	Block name	Unit name	Lowest Air Tempera-ture (oC)	Outer facade	Inner court facade	Outer WWR (%)	Inner court WWR (%)
Short	R	BBD/WNW 13&33	25.7			6.02	9.53
	R	TTL/ENE 44	26.4				
	S	ST/SSE 12	26.6				
	S	UBL/NNW 41	25.8				
Long	N	TTL/ENE 16	25.5			4.50	9.53
	N	BBD/WNW 15	26.3				

WWR = window to wall ratio.

The highest relative humidity is in unit WNW 33 and NNW 15. Both are the short and long type, and facing to west-northwest and north-northwest, with difference WWR. See Table 7.

Table 7. The highest of relative humidity and the window to wall ratio (WWR)

Block type	Block name	Unit name	Highest Air Tempera-ture (oC)	Outer facade	Inner court facade	Outer WWR (%)	Inner court WWR (%)
Short	R	BBD/WNW 33	72.8			6.02	9.53
	R	TTL/ENE 44	67.6				
	S	ST/SSE 12	68.9				
	S	UBL/NNW 21	67.4				

Long	N	TTL/ENE 36	66.2			4.50	9.53
	N	BBD/WNW 15	72.8				

WWR = window to wall ratio

The lowest air temperature is in unit WNW 25. It is the long type and facing to west-northwest, with the lesser WWR. See Table 8.

Table 8. The Lowest of Relative Humidity and the Window to Wall Ratio (WWR)

Block type	Block name	Unit name	Lowest Air Tempera-ture (oC)	Outer facade	Inner court facade	Outer WWR (%)	Inner court WWR (%)
Short	R	WNW 34	68.4			6.02	9.53
	R	ENE 42	59.4				
	S	SSE 24	56.3				
	S	NNW 11	54.6				
Long	N	ENE 26	56.8			4.50	9.53
	N	WNW 25	56.0				

WWR = window to wall ratio.

Refer to Indonesian National Standard, the highest air temperature at unit NNW 41is exceeds of standard, as well as the highest relative humidity at unit ENE 16. The lowest air temperature at unit WNW 15 is met standard, as well as the lowest relative humidity at unit WNW 25.

Table 9. Comparison between Thermal Ambient and its Standard

	Block type	Block	Unit	Measure-ment Result	Standard	Comparison
The highest air tempera-ture	Short Bigger WWR	S	UBL/NNW 41	29.4 oC	26 oC	Exceed of standard
The lowest air tempera-ture	Long Lesser WWR	N	TTL/ENE 16	25.5	24 oC	Met stan-dard
The highest relative hu-midity	Long Lesser WWR	N	BBD/WNW 15	72.8	65 %	Exceed of standard

The lowest relative humidity	Long Lesser WWR	N	BBD/WNW 25	56.0	45 %	Met standard

Cross correlation between dwelling unit orientation and its indoor air temperature as followed. Dwellings in ENE direction tend to have low indoor air temperature (25.5 up to 27.6 oC), in SSE tend to be high (26.6 up to 27.8 oC). In NNW tend to be extremely low and high (25.8 up to 25.9 oC and 29.3 up to 29.4 oC). In SSW tend to be varied (25.7 up to 27.8 oC). See Table 10.

Cross correlation between dwelling unit orientation and its indoor relative humidity as followed. Dwellings in NNW direction tend to be low and rather high (54.6 up to 67.4 %). In SSE tend to be rather low (56.3 up to 58.9 %), with one unit has anomaly rather high (68.9 %), in SSW tend to be extremely low and high (52.2 up to 72.8 %), and in ENE tend to have moderate indoor air temperature (56.8 up to 67.8 %), with one unit has anomaly low (53.3 %). See Table 11.

Table 10. Air Temperature * Orientation Cross Tabulation

	ORIENTATION				
AIR TEMPERATURE	NNW	SSE	SSW	ENE	Total
25.5	0	0	0	1	1
25.7	0	0	2	0	2
25.8	1	0	0	0	1
25.9	1	0	1	0	2
26.3	0	0	1	0	1
26.4	0	0	1	1	2
26.6	0	1	0	0	1
26.8	0	0	1	0	1
26.9	0	0	0	1	1
27.1	0	0	0	2	2
27.2	0	1	1	1	3
27.4	0	0	0	1	1
27.6	0	0	0	1	1
27.7	0	1	0	0	1
27.8	0	1	1	0	2
29.3	1	0	0	0	1
29.4	1	0	0	0	1
Total	4	4	8	8	24

ENE low (<27.6)	25.5 d 27.6
ESE high (>26.6)	26,6 sd 27.8
NNW extremely low and high	25.8 - 25.9 dan 29.3-29.4
SSW varied	25.7 sd 27.8

Table 11. Relative Humidity * Orientation Cross Tabulation

	ORIENTATION				
RELATIVE HUMIDITY	NNW	SSE	SSW	ENE	Total
52.2	0	0	1	0	1
53.3	0	0	0	1	1
54.6	1	0	0	0	1
55.4	0	0	1	0	1
55.5	1	0	0	0	1
56.0	0	0	1	0	1
56.3	0	1	0	0	1
56.8	0	0	0	1	1
58.7	0	1	0	0	1
58.9	0	1	0	0	1
59.4	0	0	0	1	1
61.4	0	0	0	1	1
62.2	0	0	0	1	1
65.3	0	0	0	1	1
65.5	1	0	0	0	1
66.2	0	0	0	1	1
67.4	1	0	0	0	1
67.6	0	0	0	1	1
68.4	0	0	1	0	1
68.9	0	1	0	0	1
69.5	0	0	1	0	1
70.1	0	0	1	0	1
70.5	0	0	1	0	1
72.8	0	0	1	0	1
Total	4	4	8	8	24

NNW	low and rather high
SSE	rather low, with one unit has anomaly high
SSW	extremely low and high
ENE	moderate, with one unit has anomaly low

Cross correlation between block type of dwelling unit and its indoor air temperature as followed. Dwellings in short block type as if tend to have higher air temperature, rather than in long block type.

Theoretically, long block type is potential to affect the wind tunnel between two blocks of masses, but in this research case, the air flow in

short block has significant contribution to thermal ambient in its dwelling units.

Cross correlation between block type of dwelling unit and its relative humidity as followed. Dwellings in short block type tend to have higher relative humidity, rather than in long block type, with one unit has extremely high. See Fig. 12 and 13.

Table 12. Air Temperature * Block Type Cross Tabulation

AIR TEMPERATURE	BLOCK TYPE		Total
	BLOCK TYPE	LONG BLOCK	
25.5	0	1	1
25.7	2	0	2
25.8	1	0	1
25.9	2	0	2
26.3	0	1	1
26.4	1	1	2
26.6	1	0	1
26.8	1	0	1
26.9	0	1	1
27.1	1	1	2
27.2	2	1	3
27.4	0	1	1
27.6	1	0	1
27.7	1	0	1
27.8	1	1	2
29.3	1	0	1
29.4	1	0	1
Total	16	8	24

SB	high, but balance
LB	as if low, but more high

Table 13. Relative Humidity * Block Type Cross Tabulation

RELATIVE HUMIDITY	BLOCK TYPE		Total
	BLOCK TYPE	LONG BLOCK	
52.2	0	1	1
53.3	0	1	1
54.6	1	0	1
55.4	0	1	1
55.5	1	0	1
56.0	0	1	1
56.3	1	0	1
56.8	0	1	1
58.7	1	0	1
58.9	1	0	1
59.4	1	0	1
61.4	1	0	1
62.2	0	1	1
65.3	1	0	1
65.5	1	0	1
66.2	0	1	1
67.4	1	0	1
67.6	1	0	1
68.4	1	0	1
68.9	1	0	1
69.5	1	0	1
70.1	1	0	1
70.5	1	0	1
72.8	0	1	1
Total	16	8	24

SB	high
LB	low (+one of anomaly)

Cross correlation between dwelling unit orientation and its indoor air temperature as followed. Tendency of air temperature condition in dwelling units by sequent from low to high is 1st floor, 3rd floor, 2nd floor, and 4th floor.

Cross correlation between dwelling unit orientation and its indoor relative humidity as followed. Tendency of relative humidity condition in dwelling units by sequent from high to low is 1st floor, 3rd floor, 2nd floor, and 4th floor; contrary with air temperature conditions. See Table 14 and 15.

TTable 14. Air Temperature * Floor Position Cross Tabulation

AIR TEMPERATURE	FLOOR				Total
	1	2	3	4	
25.5	1	0	0	0	1
25.7	1	0	1	0	2
25.8	0	0	1	0	1
25.9	0	2	0	0	2
26.3	1	0	0	0	1
26.4	0	0	1	1	2
26.6	1	0	0	0	1
26.8	0	0	0	1	1
26.9	0	0	1	0	1
27.1	0	1	1	0	2
27.2	0	2	0	1	3
27.4	0	0	0	1	1
27.6	1	0	0	0	1
27.7	0	0	1	0	1
27.8	0	1	0	1	2
29.3	1	0	0	0	1
29.4	0	0	0	1	1
Total	6	6	6	6	24

from low to high	1st, 3rd, 2nd, 4th floor

Table 15. Relative Humidity * Floor Position Cross Tabulation

RELATIVE HUMIDITY	FLOOR				Total
	1	2	3	4	
52.2	0	0	1	0	1
53.3	0	0	0	1	1
54.6	1	0	0	0	1
55.4	0	0	0	1	1
55.5	0	0	0	1	1
56.0	0	1	0	0	1
56.3	0	0	0	1	1
56.8	0	1	0	0	1
58.7	0	1	0	0	1
58.9	0	0	1	0	1
59.4	0	1	0	0	1
61.4	1	0	0	0	1
62.2	1	0	0	0	1
65.3	0	0	1	0	1
65.5	0	0	1	0	1
66.2	0	0	1	0	1
67.4	0	1	0	0	1
67.6	0	0	0	1	1
68.4	0	0	0	1	1
68.9	1	0	0	0	1
69.5	0	1	0	0	1
70.1	1	0	0	0	1
70.5	0	0	1	0	1
72.8	1	0	0	0	1
Total	6	6	6	6	24

from high to low	1st, 3rd, 2nd, 4th floor

Another Measurement. The disadvantage of this research method mentioned above is on the quality of the data taken only from ambient thermal based on momentarily measurements. The result would have been different if the method of measurement performed periodically during a full day with recording every 3 minutes. See Table 16 and Fig. 15.

Description of thermal ambient measurements result has been made using a data logger, and then compared with the results of momentarily measurements. In this case, the results of the comparison indicate that there are not significant differences between the ambient thermal data based on momentarily measurements with the measurement using data logger. See Table 17.

Therefore, the conclusions that have been mentioned above are not only valid for daytime conditions, but also valid when using a full day measurement data, can be carried out by a similar method, with the possibility of the same result.

Table 16. Comparison between Thermal Ambient Based on Momentarily Measurement and Full-Day Measurement

#	Dwelling unit	Thermal ambient based on momentarily measurement		Thermal ambient based on full-day measurement	
		TEMP	RH	TEMP	RH
1	WNW 1 3	24.9	72.7	25.7	70.1
2	WNW 1 5	26.7	82.9	26.3	72.8
3	WNW 2 3	25.9	69.9	25.9	69.5
4	WNW 2 5	25.3	72.8	27.8	56
5	WNW 3 3	26.0	69.4	25.7	70.5
6	WNW 3 5	27.8	68.3	26.4	52.2
7	WNW 4 3	26.9	66.8	26.8	68.4
8	WNW 4 5	25.9	69.5	27.2	55.4
9	SSE 1 2	25.5	72.5	26.6	68.9
10	SSE 2 2	25.9	72.9	27.2	58.7
11	SSE 3 2	26.6	68.2	27.7	58.9
12	SSE 4 2	26.5	71.1	27.8	56.3
13	ENE 1 4	25.6	70.6	27.6	61.4
14	ENE 1 6	26.8	71.4	25.5	62.2
15	ENE 2 4	25.7	72.1	27.2	59.4
16	ENE 2 6	26.5	68.3	27.1	56.8
17	ENE 3 6	26.7	69.1	26.9	66.2
18	ENE 3 4	26.4	67.3	27.1	65.3
19	ENE 4 4	27.0	66.1	26.4	67.6
20	ENE 4 6	26.8	67.0	27.4	53.3
21	NNW 1 1	25.8	69.2	29.3	54.6
22	NNW 2 1	25.2	69.9	25.9	67.4
23	NNW 3 1	26.9	67.1	25.8	65.5
24	NNW 4 1	25.6	66.7	29.4	55.5

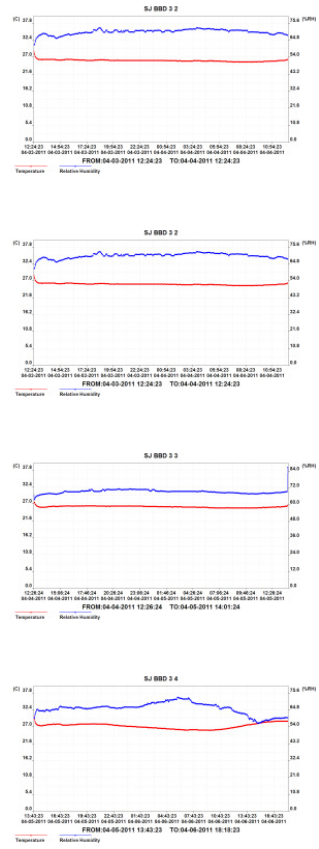


Fig. 15. Some of Measurement Results Using Data Logger

Table 17.Comparison thermal ambient based on different measurement

DATA Thermal ambient measurement	
momentarily	full-day
TEMP (A)	TEMP (B)
24.9	25.7
26.7	26.3
25.9	25.9
25.3	27.8
26	25.7
27.8	26.4
26.9	26.8
25.9	27.2
25.5	26.6
25.9	27.2
26.6	27.7
26.5	27.8
25.6	27.6
26.8	25.5
25.7	27.2
26.5	27.1
26.7	26.9
26.4	27.1
27	26.4
26.8	27.4
25.8	29.3
25.2	25.9
26.9	25.8
25.6	29.4
26.20	26.95

RANK Thermal ambient measurement	
momentarily	full-day
TEMP (A)	TEMP (B)
1	2.5
17.5	7
10	5.5
3	21.5
12	2.5
24	8.5
21.5	11
10	16
4	10
10	16
16	20
14.5	21.5
5.5	19
19.5	1
7	16
14.5	13.5
17.5	12
13	13.5
23	8.5
19.5	18
8	23
2	5.5
21.5	4
5.5	24
12.5	12.5

Comparison by Chi-square calculation

	A	B
count	24	24
rank sum	12.5	12.5
U	863.5	863.5

a	0,05
tails	2
U	863.5
U-crit	192
sig	no

CONCLUSION

Research result showed that physic-spatial configuration of architectural elements has some correlations to thermal ambient. Type of dwelling unit; interior space configuration; and window to wall ratio together have

correlation to indoor air temperature and relative humidity. In this research case, window to wall variable ratio is not really significant to influence thermal ambient.

Orientation and floor position also have influence to the thermal ambient in the dwelling unit. On the same type of dwelling unit, orientation of outer façade that contributes the balance thermal ambient is at south southwest direction. Dwelling units in short block, in SSW direction, at 1st floor are more recommended to choose as a better living space due to air temperature and relative humidity condition.

To optimize architectural design for multi storey public housing can be made by arrange blocking the mass of building so that the outer façade of dwelling units dominantly facing to SSW direction, and by arrange indoor architecture elements configuration like in the short block type.

Some theories due to thermal ambient are not applied in this research object in terms of wind tunnel between two long masses; as well in terms of correlation between size and position of wall openings. Some other theories are fitted with this research object in terms of the better orientation of outdoor façade; as well in terms of the floor position of dwelling units.

Configuration of architectural elements inside dwelling unit is the important thing, like partition wall for bathroom and kitchen. It causes the obstacles of air flow in dwelling units so that needed the artificial mechanical or electric fan that means inefficiency on energy usage. To optimize cross ventilation by using both in below and above the wall is also very importance to consider, to make air flow distribution and spread evenly. In other words, the most important thing is to optimize the configuration of interior space. To design an appropriate and good configuration of interior space today will contribute on efficient energy usage in the future. The consciousness related to this research is very important for every party that involved particularly in the vertical housing development for a better quality of life in urban area.

REFERENCES

[1] A.Z. Ahmed: Daylighting as a Passive Solar Design Strategy in Tropical Buildings: a Case Study of Malaysia. Energy Conversion and Management, 43, (2002), p 1725-1736.
[2] Badan Standardisasi Nasional, SNI 03-6197-2000:Konservasi Energi Sistem Pencahayaan pada Bangunan Gedung. (2000).

[3] Badan Standardisasi Nasional, SNI 03-6572-2001:Tata Cara Perancangan Sistem Ventilasi dan Pengkondisian Udara pada Bangunan Gedung. (2001).
[4] John DeCicco, et.al.:Energy Conservation in Multifamily Housing: Review and Recommendations for Retrofit Programs. Berkeley: Lawrence Berkeley Laboratory. (1994). [Online] Available: http://epb.lbl.gov/homepages/Rick_Diamond/Multifamily_aceee_94.pdf. (June 29, 2009).
[5] Richard C. Diamond: Ventilation and Infiltration in High-Rise Apartment Buildings. Berkeley: Lawrence Berkeley Laboratory. (1996). [Online] Available: http://epb.lbl.gov/homepages/Rick_Diamond/index.html. (June 29, 2009).
[6] Alessia Giovanardi, et.al.:Comfort Analysis of a Passive House in Different Locations in Italy. WORKING EURAC Research.GROUP XX, Frankfurt 2009. Italy: Università Degli Trento. (2009).
[7] Baruch Givoni: Man, Climate and Architecture. London: Applied Science Publishers. (1976).
[8] Irena V. Gunawan:Analisa Kenyamanan Thermal pada Rumah Susun di Sarijadi. Thesis of Architecture, Parahyangan Catholic University. Unpublished. (1993). [Online] Available: http://library.unpar.ac.id/dscgi/ds.py/ViewProps/File-22558.05. (August 05, 2009).
[9] Desy Tri Handayani:Pengaruh Kenyamanan Psikologis terhadap Pemilihan Unit Apartemen. Obyek studi: Apartemen Majesty. (2006).
[10] J.C. Lam, and D.H.W. Li: Study of Solar Radiation Data Significant Energy and Environmental Implications for Hong Kong. Energy Conversion and Management, 37, (1996), p. 343-351.
[11] D.H.W.Li, and J.C. Lam, and S.L. Wong: Day lighting and Its Implications to Overall Thermal Transfer Value (OTTV) Determinations, Energy, 27, (2002), p. 991-1008.
[12] Menteri Permukiman dan Prasarana Wilayah Republik Indonesia: Keputusan Menteri Permukiman dan Prasarana Wilayah, Nomor: 403/Kpts/M/2002 tentang Pedoman Teknik Pembangunan Rumah Sederhana Sehat (RS Sehat), (2002), p. 7.
[13] Nikpour, Mansour, et.al: Investigating the Effectiveness of Self-Shading Strategy on Overall Thermal Transfer Value and Window Size in High Rise Buildings, International Journal of Civil and Environmental Engineering, 3:2 2011, (2011). 111-116.
[14] Mansour Nikpour, et al.: Study of the Effectiveness of Solar Heat Gain and Day light Factors on Minimizing Electricity Use in High-rise Buildings, World Academy of Science, Engineering and Technology, (2011), p. 73, 73-77.

[15] K. Nishio, and H.Asano: Development of the Residential Energy Demand Generator Reflecting the Household Diversity. Report of Central Research Institute of Electric Power Industry, Report Y05008 (2006-04), (2006), p. 1-32. In Fong, Wee-Kean; Matsumoto, Hiroshi; Lun, Yu-Fat; and Kimura, Ryushi.(2007). Influences of Indirect Lifestyle Aspects and Climate on Household Energy Consumption. Journal of Asian Architecture and Building Engineering. 6,2. November 2007.
[Online] Available: http://gcs.jstage.jst.go.jp/article/jaabe/7/2/7_403/ article. (June 29, 2009).

[16] Septana Bagus Pribadi: Optimasi Konfigurasi Bangunan dalam Perencanaan Rumah Susun untuk Menunjang Kinerja Modul Photovoltaics Studi Kasus: Perencanaan Rumah Susun di Kota Bandung. Thesis Master Arsitektur, Institut Teknologi Bandung. Unpublished. (2001). [Online] Available: http://digilib.bi.itb.ac.id/go.php?id=jbptitbpp-gdl-s2-2001-septana-1102-fosil. (July 07, 2009).

[17] Abdullah Rahman:Evaluasi Desain Bukaan Dinding pada Rumah Susun Sarijadi Bandung berdasarkan Studi Kondisi Termal dalam Ruang. Thesis (Master). Jurusan Arsitektur. Institut Teknologi Bandung. (1993). [Online] Available: http://digilib.gunadarma.ac.id/go.php?id=jbptitbpp-gdl-s2. (June 29, 2009).

[18] Fashbir H.M. Noor Sidin:Keselesaan Bermukim di Flat: Kajian Kes Persepsi Masyarakat terhadap Rumah Susun Sukarama, Medan, Indonesia. Thesis (Ph.D.), Jabatan Antropologi dan Sosiologi, Fakulti Sastera dan Sains Sosial, Universiti Malaya. Unpublished. (1999).
[Online] Available:20terhadap%20Rumah%20Susun%20Sukaramai,%20Medan,%20Indonesia%20%7B245%7D.15 Jul 2009.

[19] Yasmin Suriansyah: Pola Pemanfaatan Ruang (PPR) pada Perumahan Massal Vertikal (PMV) sebagai Refleksi Gaya Hidup (GH) Penghuninya. Disertation. Universitas Pendidikan Indonesia. Bandung. (2009).

[20] Yasmin Suriansyah: Kualitas Pencahayaan Alami pada Enam Rumah Susundi Bandung, Cimahi, Soreang, dan Baleendah. Presentation on Seminar Nasional dan Pameran Kebijakan dan Strategi Pengadaan Perumahan Berkelanjutan di Indonesia. Bandung 22-23 November 2011. (2011).

[21] Yasmin Suriansyah:Konfigurasi Elemen Fisik Spatial di Rumah Susun Dukuh Semar Cirebon. Bandung: LPPM Universitas Katolik Parahyangan. (2012).

[22] Yasmin Suriansyah: Daylight Quality Potency at Sarijadi Mass Public

Housing in Bandung Indonesia, Journal of Energy Technologies and Policy, Vol 3, No.7, 2013, www.iiste.org, (2013).
[23] A.Tanaka, and A. Nagasawa: Analysis of the Influences of Family Pattern and Location on Household Energy Consumption. Energy Economics. 32, 2, (2006), p. 60-76. In Fong, Wee-Kean; Matsumoto, Hiroshi; Lun, Yu-Fat; and Kimura, Ryushi. (2007). Influences of Indirect Lifestyle Aspects and Climate on Household Energy Consumption. Journal of Asian Architecture and Building Engineering. 6, 2. November 2007. [Online] Available: http://gcs.jstage.jst.go.jp/article/jaabe/7/2/7_403/_article. (June 29, 2009).

A SUSTAINABLE CONSTRUCTION PLANNING MODEL FOR HOUSING IN THE CITY OF MEDAN

Irma Novrianty Nasution[1]*, Syahreza Alvan[2]**

[12]Department of Engineering, State University of Medan
*irma_nst11@yahoo.com, **syahrezalvan@gmail.com

ABSTRACT
Norms in the construction practice in the city of Medan have tended to prioritize the immediate physical factors in buildings often disregarding local building rules, lack context with the surrounding environment and the short term thinking with regards to the use of space. This study aimed to identify new concepts applied to community housing in Medan by proposing a sustainable construction planning model. The method used to develop the model involved a review of diverse literature, analysis of case studies and follow up group discussions. Data were analized by descriptive analysis and then discussed in groups in order to enrich the study. This allowed a deep exploration of issues and perspectives from professional practitioners, government agencies, developers and economists. The results provide a practical method for planning and design that effectively incorporate sustainable criteria such as; land use, building mass, spatial layout, material selection to construction management. However, there are challenges that must be addressed: capacity and cultural challenges facing practitioners in the city of Medan in implementing such a model. Nonetheless, the sustainable construction management model generated by this study provides comprehensive approach to planning, design and a system for construction management. This research can be used as a basis to advance practice based research in sustainable planning methods for growing cities that share Medan's development characteristics.

Keywords: planning models, sustainable construction, residential, Medan.

INTRODUCTION

Medan the 4th largest city in Indonesiais undergoing rapid growth and development. This is characterized by accelerated rate of population growth coupled with economic activity and a growing property sector. The growth of properties in Medan increases 5-10% every year along (Wibisono, 2014). This is expected to continue creating a metropolis for trade and financial services. Property development will bring a positive impact to the economy such as employment and increasing incomes. However, the question that needs to be explored is whether or not the growth in the property sector leading to a new metropolis in Sumatra will improve the quality of life in Medan.

A city's social and public facilities, infrastructure, public services, parks and their level of availability, and its civilized and cultural products (Kuswartojo, 2010:21). The phenomenon of high population growth in urban areas is directly related to impacts to a city's environment.

The concept of sustainable development has emerged alongside related concerns such as climate change. Climate change is today recognized as one of the most serious challenges to the global community, potentially affecting almost all aspects of life across the planet. The United Nation is convening and catalyzing international efforts to reduce the causes and effects of global warming. Climate change is no longer seen as only an environmental problem but the effects of health, food production, economic development, infrastructure, and even peace and security are now commonly recognized (UNEP). One factor contributing to environmental degradation and quality of life in Asia is poorly planned urban development. The construction sector consumed 50% of natural resources, 40% of energy, and 16% water, as well as contributing the highest CO2 emissions (Akmal, 2007:4). Sustainable construction is grounded on the best considerations relating to the long term quality of life and energy efficiency. The application of sustainable construction is an excerise to best manage the use of water, materials, energy and all development activities to minimize impacts to natural resources and natural capital. This study aims to provide a practical guide for key parties, i.e. planners, practitioners and owners on sustainable concepts in order that they can benefit from planning, designing and constructing more sustainable building construction developments.

METHODOLOGY

Data was collected through study of literature, and case studies. Field studies involved documentation of the domestic and enviromental situation in house sthrough questionnaires. The purpose of questionnaires was to understand construction management and planning factors from an owner's perspective. Results from the field studies and the literature elaborated an understanding of the construction process for dwellings in Medan.

Selection object of study is determined by location of a single type houses in 21 districts in the city of Medan. Limitation of research objects is determined by the area of residence which has an area of 100 m2 - 300 m2. Object taken with a sample to one district. The selected sample is an object that can represent the concept of design and construction management. In this paper, the object is represented by only four residential houses, because of the limitations of the discussion.

Data collected were analyzed by descriptive analysis. The results of the analysis used as a guide to developed an integrated planning approach to sustainable values; i.e. considering health, safety and comfort. In terms of land use, criteria were; mass of building, spatial arrangement, material selection, and construction management systems.

LITERATURE STUDY

An issue of sustainable development and construction has become a leading concept in the 21st century. The sustainable construction emerged as one concrete step of planners, architects, and construction participants in providing solutions and design alternatives to create a better quality of life, globally and locally, individuals and or groups. Definition of the sustainable construction is associated with the approach of "sustainable development" which is disclosed in the Report of the World Commission on Environment and Development in 1987. The concept of "sustainable development" can be simply defined as the development to meet the needs of the present generation without sacrificing the needs of future generations. In addition to the above definition, according to the UNEP (United Nations Environment Programme), sustainable construction is how construction industry develops to achieve the quality of sustainable development, by taking into account the preservation of the environment, socio-economic, and cultural issues. Specifically, this involves issues such as design, construction management, materials, and quality of building

operations, energy consumption, and natural resources. In other words, the sustainable construction requires a synergy between various methods and approaches with the exploration of engineering technology, planning, and the current development strategies. At the same time, development must be based on the efficiency and the responsible use of environment of the scarce society's natural, human, and economic resources.

Sustainable construction frameworks have been proposed by many. However, the most important is the one disclosed by the UIA (International Union of Architects) at the world architect congress held in Copenhagen 7 Desember 2009. UIA is an organisation of non-profit architect association, and at the declaration, the UIA conveyed that the building and the construction industry impact on the climate change currently happening. These various impacts can be reduced by determining the built environment system. UIA is committed to reduce these impacts through "sustainable by design strategy" programs or "sustainable design strategies" (Tanuwidjaja, 2011 : 2).

The concept of this UIA sustainable design strategy is outlined in this 9 (nine) points, namely:

a. Sustainable by Design (SbD) begins in the early stages of the project and involved the commitment of all stakeholders, i.e. clients, designers, engineers, government, contractors, owners, users and the community;
b. SbD should integrate all aspects of the construction and its use in the future based on "full life cycle analysis and management";
c. SbD should optimize efficiency through design. The use of renewable energy, modern and environmentally friendly technologies must be integrated into the practice of drafting the project;
d. SbD should be aware that the architecture and planning projects are complex interactive system and linked to the wider surrounding environment, including the historical heritage, culture, and social values;
e. SbD should look for "healthy materials" to construct a healthy building, respectable use of land ecologically and visually, and an inspiring aesthetic impression, convincing, and glorifying;
f. SbD should aim to reduce the "carbon imprints", reducing the use of hazardous materials, and causing the impacts on human activities, especially within the scope of the built environment;
g. SbD should keep trying to improve the quality of life, promote equality both locally and globally, advance economic prosperity, as well as provide opportunities for sharing activities among community

members and community empowerment ;

h. SbD also recognizes the local linkages and earth planetary system affecting the whole humanity. It also recognizes that the urban population depends on the rural-urban system which is integrated, interrelated for survival (clean water, air, food, shelter, employment, education, health, culture, and others);
i. SbD also supports the UNESCO declaration on cultural diversity as a source of exchange, discovery, and creativity needed by mankind.

The Concept of Sustainable Building

In creating a better condition of the building, from the tenant and the environment, there are some concepts that serve as a guide for the construction executants to be able to apply it in the real community. A summary of the concepts described as follows (LEED for homes):

a. The efficiency of energy use
    - Harnessing the sun for natural lighting during the day to the fullest, to suppress the huge amount use of electrical energy;
    - Utilizing natural air circulation instead of artificial air conditioner;
    - Using vents and openings, criss-cross air circulation, and other innovative ways;
    - Making use of rainwater in innovative ways to accommodate and treat rain water for domestic purposes.

b. The efficiency of land use
    - Using land as needed, not all the land part is used or covered by buildings. Utilization of the used land should be accompanied with greening. This utilization should be done in an efficient, compact, and integrated way;
    - Potential of greening can be replaced and maximized with a variety of more innovative ways;
    - Appreciating the presence of existing plants in the area as a great potential in creating a domestic and surrounding environment;
    - Providing flexibility of a large space by adopting open space design facing the garden or outdoor space, so the outer and inner space of the building are integrated;
    - The design must consider things related to the technical regulations of the building, as a benchmark in the use of various land potential. These include Building Coverage Ratio, Building's line perimeter, Floor Average Ratio, Green Open Space Ratio, land use regulated in Spatial Planning which will have an impact on the building and the neighbourhood area.

c. The efficiency in using materials
   - Utilizing waste material to be used in the construction process, so that no waste material;
   - Utilizing waste materials.

d. The use of materials and new technologies
   - Exploiting the potential of renewable energy such as wind energy, sunlight and water to produce domestic electrical energy for household and other buildings independently;
   - Utilizing new materials through new discoveries which is globally can open opportunities to use renewable materials rapidly and economically produced, as well as open to innovation.

e. Waste management
   - Creating a domestic wastewater treatment system, e.g. sewage with the black water or grey water method. This is independent and does not burden the city flow system;
   - Using innovative ways such as making the decomposition system of organic waste or domestic waste from materials that can be easily recycled or naturally decomposed.

RESULTS AND DISCUSSION

In general, homes were independently planned and built through building contractors. The house from the outside gave the impression of sturdy construction. Buildings occupied almost all existing land, where as building regulations such as the Building Coverage Ratio, Building's Line Perimeter, and Green Open Space Ratio, and the skyline regulations were largely ignored. A concrete feature was the mixing of types of different building types in residential areas. For example shophouses were found alongside residential housing. There was loss of green space in front of houses due hard standing. Material selection for aesthetic elements of building gave a less impression friendly impact to the environment.

Fig.1: The condition of exterior and interior of case study houses
(Source : Alvan et al, 2014)

Land Use

Case studies observed in this research were a single mass with approximately 80% of land use for the building with open space, i.e. green areas covered by pavement. Orientation patterns of buildings did not consider climate

and weather. A lack of utilization of sunlight and wind as well as a lack of groundwater management through rainfall recharge. Homes were built not considering appropriate technology waste with self-management. By waste management is expected to reduce environmental pollution.

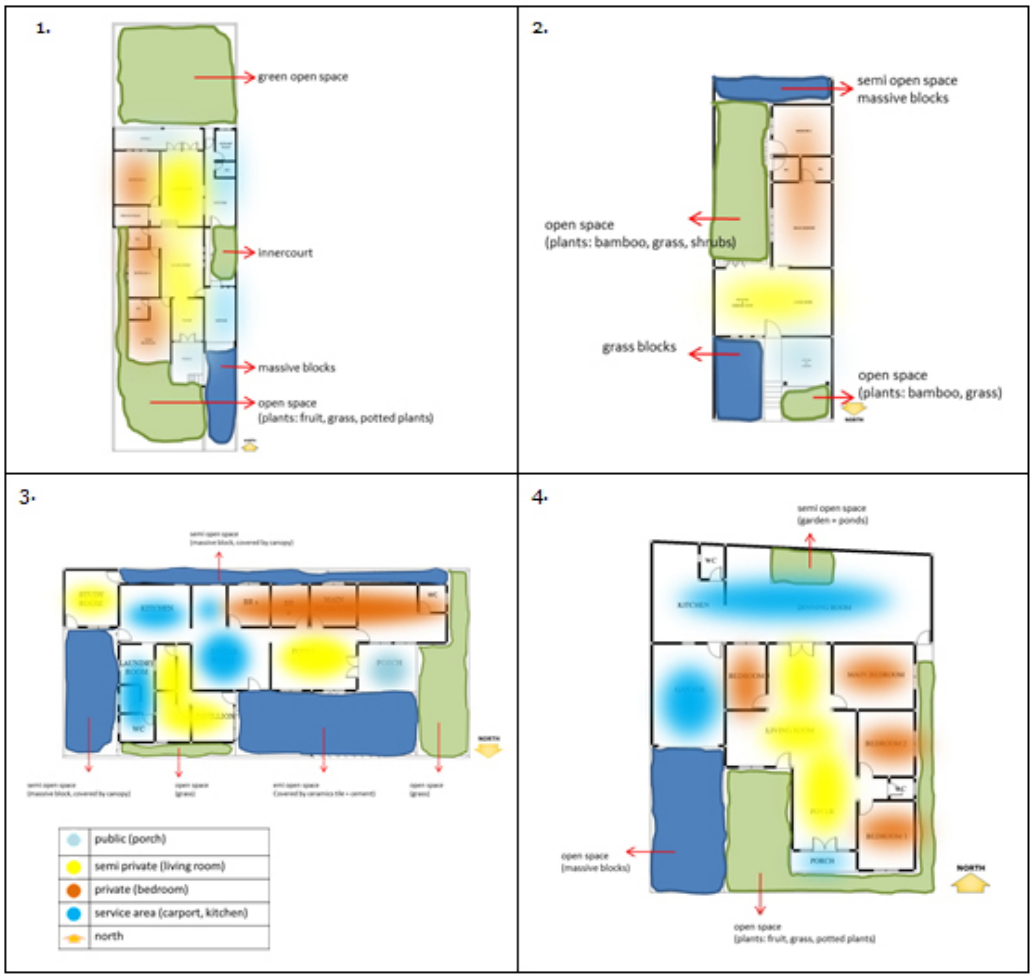


Fig.2: Case Study Land Use
(Source : Alvan et al, 2014)

The arrangement of land use in neighborhoods in Medan rarely followed municipal rules set by Departement of City Planning. In some buildings, building mass did not consider Building Coverage Ratio, Building Line Perimeter, and the Green Open Space Ratio. As a result, buildings were crowded with limited air circulation.

Sustainable initiatives can be realized through the Building Coverage Ratio, Building'sLine Perimeter, and Green Open Space Ratio to acquire the comfort of living with the surrounding environment such as making fences from plants or fences that have suitable heights. The design should not obstruct the view from and into the site, and fits with the surrounding environment. In addition to fences, circulation space for pedestrians and vehicles to and from the property, drainage and utilization of groundwater can be planned. Drainage and groundwater should not impede the builidng footprint such as land around the Building's Line Perimeter. In case of overflow and damage to drainage channels, then can be handled directly without demolition of the building through control hole-making in certain areas.

Spatial Layout

Spatial layout refers to a review of activity patterns and the needs of residents. The main thing to understand is the occupant's character, activities, and culture in a household. Once the patterns and cultural activities of the owner are known, the next activity is to plan the size of space required, circulation patterns and future organization of living space.

The spatial layout in the case studies was open plan with a central space as a living room. The houses was observed to have an average number of occupants 4 (four) persons consisting of a mother, father and two children. However, house exceeded the capacity of existing residents. As a result, the entire land used by the buildings was not optimal. In the other case study houses there was sufficient space to accommodate the arrangement of activities and needs of residents. Space here was arranged into a more flowing form for enabling activities outside and inside these homes.

In general, each house consisted of three space groups, namely a space to rest,a space to be with family and/ or guests, and a space for service/ utility. Not every activity required a special room, but every activity required space. Layouts should be planned based on the analysis of activities and the needs of the space that can be used either individually, jointly or multifunctionally (Frick, 2007:113). In case studies, the analysis of the spatial layout based on the space groups can be show in Table 1.

Table 1.Case Study Spatial Analysis

Space Namely	Case Study			
	1	2	3	4
Rest	• position in west side • near to bath-room • there is a gap with surround-ing buildings in anticipation of noise reduction • space dimen-sion is measure of needs	• position in west side • house has a garden in antic-ipation of noise reduction • circulation inter-rupted between master bedroom and kid bed-room (access from outside) • it has a land use and building costs of limitation • space dimension is measure of needs	• position in south side, partly in north • daylight came into the house from south and north side • it has less green open space • pavement cov-ered by massive blocks • bedroom and bathroom has a distance • the gap be-tween neigh-boor's house is close, no anticipation of noise reduction • space dimension is measure of needs	• position in east side, partly in north • master bedroom has access to green open spaces • all bedroom has direct access to bathroom • space dimension is measure of needs
Family	• composed of living room, foyer, porch • living room fac-es open space on north and east side • space dimen-sion is measure of needs	• it has a living room joined service area • it has a direct view to green open space • front porch is positioned as a foyer • space dimension is less measure of needs	• composed of liv-ing room, foyer, porch • living room faces garage and neighbor's house • there are exces-sive space and poorly function-ing • space dimension is measure of needs	• composed of living room, foyer, porch • there is living room joined study room equipped by innercout • living room has direct access to open space • space dimension is more measure of needs • no privacy be-tween living room and foyer
Service	• composed of servant room, kitchen, garage, drying room • no storage and laundry room • it have a quite extensive of backyard and frontyard • space dimen-sion is less mea-sure of needs	• composed of carport, kitchen, laundry room • it has more access to the courtyard and front yard • pavement covered by grass blocks • space dimension is measure of needs	• composed of garage, laundry room, drying room, kitchen • It is sufficient to provide a stor-age room • backyard and front yard are open space cov-ered by canopy • space dimension is more measure of needs	• composed of kitchen, garage, laundry room • It is sufficient to provide a storage room • it has a front yard • front yard cov-ered by massive blocks ang grass • space dimension is measure of needs

(Source : elaborated by researcher, 2015)

Building Complements

Design of windows and doors, canopies, roof covering materials, pavement type and the type of plants found in the study had a common design. Most houses were designed without considering the benefit of complementary elements. Windows and doors were made with standard measures, large windows and high, and the coated glass as the entry of light, but most forms of the selected window were not functioning efficiently to maximize air and light due to the position of windows.Houses were too close to one another which led to blocking airflow and sunlight. Following Building's Line Perimeter in planning would limit this condition.

Canopies functioned as an aesthetic element, were minimal in size and are not able to protect windows from glare and rain. Some canopies covered the entire building so it was difficult for air and light to flow inside homes.

Landscaping with plants affected the thermal comfort both inside and outside the building. Owners using fairly large plants with ample shade gave the impression of comfort and coolness, whilst house using minimal plants gave the impression of heat and dryness.

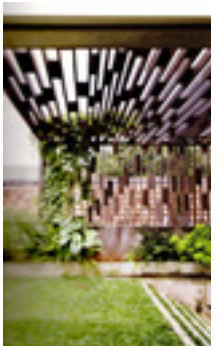
Wall color selection is also influential in forming the thermal comfort inside and outside a home. A group of contrasting colors instead of natural colors can be soothing. Complementary elements should follow the ideal standard for residential functions, the size or dimensions, design, as well as function for such elements. For windows and doors, materials and design should allow maximum lighting and good air circulation with air exchange in every room taking place. By placing the windows and the doors at the right place, spaces that do not require lighting and air conditioning can be realized thus limiting energy consumption.

The preferred roofing material was varied ranging from zinc and concrete roof tiles, with wood and steel frames. Roofs exposed to heat and sunlight will affect internal temperatures. To anticipate this, it is recommended to use roofing material that can reduce heat effects such as a roof garden system.

Plants can create a natural landscape effect with a more comfortable microclimate. The right choice for pavement is one that can absorb water like grass such as porous blocks. Another way is to incorporate water elements into the gound is by using fish ponds. Fish ponds can be

used to soothing occupancy and add to the aesthetics of the landscape. In addition to absorbing and dipsensing heat directly into the ground, building elements can create a more element microenvironment which are inherently more environmentally friendly, refer to Figures 3 in caption 1until 4.

1. Example of a partition made of wood and a row of potted plants



2. Example of a canopy using natural materials

3. Example of water storrage that can be applied to open space

4. Example of bio-pore pavement

Figure.3: Potential elements applicable for sustainable buildings
(Source: from a variety of sources)

Building Materials

Building materials used were commonly used by the building sector with little insight into materials and sustainability. Materials for construction such as foundation, beam, poles, and roofs were obtained from the area around the city.

To complete the building, supporting elements such as paint materials, ceramics, and materials used to achieve different aesthetic impressions were sourced outside the city. Currently developing business groups collected second-hand materials from old buildings in Medan such as frames, doors, windows, closets, washtafel, fences, and timber roof trusses. The success of these buisnesses have been due to people who want to build with limited funds.

In selecting construction materials and fittings, owners of residential house in Medan did not look for products that were environmentally friendly. It because of a lack of understanding of the sustainable values from material usage. Material properly used to aimed to energy saving and environmentally friendly. The material should have good quality and obtained locally thus saving cost and energy transport. By using local materials will support the economic growth of the community as maintaining the presence of a small industry. Saving consumption and environmentally friendly aspects of the material factors contained in rapid renewal, water use efficiently, energy and transportation costs are minimal, and energy-efficient of craftmanship. Saving consumption and environmental conservation increasing when used waste materials or recycled materials.

In sustainable construction, materials used is partly reused material from the following: recovered 1) reused for new projects, 2) recycled into new materials of equal value (recycle), or higher (upcycle), or lower (down cycle) of used materials including environmentally friendly salvaged materials. Sustainable materials are natural materials and include natural stone, wood, bamboo, and clay.

Construction Management

Owners of residential house in Medan generally built houses assisted by experts (such as architects or contractors). This involved self-management in terms of planning and construction work using knowledge obtained from sources such as books, magazines, internet, and implementation of construction works under direct supervision of contractors. Some of the existing residential buildings are planned and managed by experts in the field of construction such as architects, contractors, and or consultants. Experts selected by the owner were usually limited to planning and architectural design.

Construction management for housing is not well planned and lacks the

concept of sustainabilty. Sustainable construction should be formulated early in the planning stage, but this did not occur in the management of residential construction in the case studies. House construction was detached from planning and consideration of social, aesthetic economic, and environmental factors. In delivering a sustainable construction project, all construction activities must create green or sustainable value by themselves. For example taking material, processing material, material distribution from the source to the user, the construction process, taking of land for building, and energy consumption during the construction process. In generally, the findings of research described into Table 2 by analyzed explanation form.

Table 2.Findings of Research

Approach	Findings
Land Use	• almost of land covered by buildings, in some cases encountered land use considered an aspects of ecological • there are buildings considered building regulation, and some are not • limitations of shape and position of the land to orientation pattern produces less building utilizes natural resources such as daylight and air circulation • land use has a larger percentage of the building compared to the open space is80%
Spatial Layout	• space organization not accommodate occupant comfort and health aspects, selection of the position of spaces (bedroom, living room, service area) are less precise • it has a combined two different types of rooms in a zone make it unconvenience of each room less intact • no direct air circulation and daylight came into room in case study 3 • it has less access to the open space in case study 3 • in generally, space dimension is measure of needs but any homes that has less dimension of space
Building Complement	• in ergonomics, doors and windows have a measure of shape and equipped with ventilation. In most homes, windows and ventilation system is

	not functioning due to lack of proper aperture so that the circulation of air into a space less than the maximum • selection of roofing material is not followed by the coating of sun heat • roof covered vary from corrugated iron to concrete tile. Currently zinc is more widely used because it is more practical and economical • selection of canopy are less precise and less function • selection of building paint is more consider a trend factor then aesthetics and visual factors
Material	• selection of building structure material obtained from around the city of Medan • selection of materials to support buildings such as paints, roof coverings not consider a products with eco green values • in case 1 and 2, doors and windows frame material choosen from building used material • selection of pavement combined with massive blocks and grass blocks • decorative stone for aesthetics function obtained by ordering from other areas outside Medan
Management Construction	• all case study have a process of conventional construction • it is using self-management method, construction management and or a combination of both • the factors of environmental damage and pollution during construction not considered in planning stage
Sustainable Values :	
building	• the efficiency of energy for domestic use less considered in design • the efficiency of land use less considered in design • the efficiency of used material during construction process less considerd in design • it does not utilized a renewable materials and technologies in producing domestic energy as individually • it does not considered the domestic wastewater treatment as individually

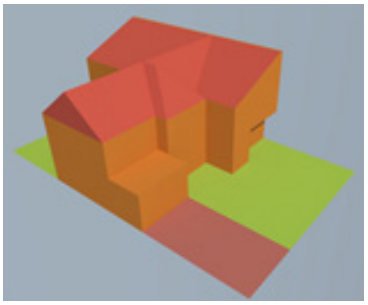
management construction	• the construction process has not been integrated • there is no accommodated building operation and maintenance documents compiled and set by planners

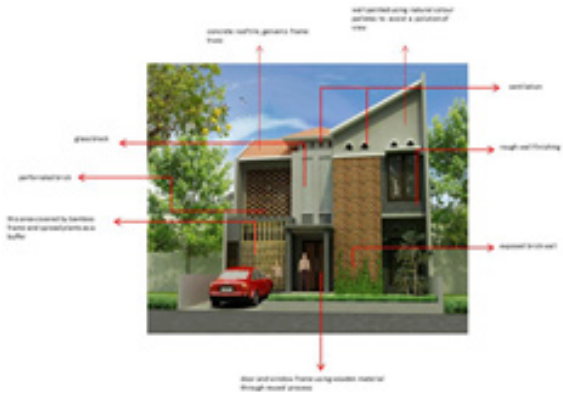
(Source: elaborated by researcher, 2015)

A Model for Sustainable Construction Planning

Given current thinking amongst owners and developers, this study proposes recommendations for planning and design using sustainable values. The approach taken is design planning approach, material selection, optimized land use which considered to the need for sufficient open space. Table 3 shown the approaches and a model for planning proposed to develop a residential house in Medan scale.

Table 3. A Model for Sustainable Construction Planning and Approach

Approach	Model	Notes
Land Use	 	• building height adjusted to obtain sufficient air circulation in the room and it should not spoil the skyline around the land with about 3 meter gap between floors • building Coverage Ratio is 56.5 % • utilization of land use of 56.5 % and 46.5 % open space • floor Average Ratio is 0.6 (number offloors = 2)

Space Layout		• land use covered by "L" shape of mass building • the building has north-south orientation • in east side, any spaces have direct sunlight. Part of rooms with close to outdoor covering by plants, concrete or bamboo canopies and spread plants • pavement by grass blocks • semi open space covering by concrete canopy constructed by truss bamboo and spread plants • space organization utilized an efficiency energy in daylight through ventilation and porous wall to direct sunlight and air circulation
Facade	front view 	• it is a 2 storey buiding • the limitation of land use has been given a single house type of building in city of Medan • phisically, the building was design by simplicity to generate an enviromentally friendly as well as visual • buiding style was approached to tropical climate responsive by using pitched roof and ventilation to air circulation and sunlight in a daytime • decorative material choosen by natural resources to generate a simplicity and friendly design

	rear view 	• backyad equipped with fish ponds, grass, fruit tree, shrubs, spread plants, pavement by grass blocks
Manage-mentCon-struction	to building a model in sustainable construction process through considering items : • priority • project team • construction method • construction process	• priority focus in planning, designing and sustainable process of implementation • the project team (consisting of consultants , contractors , sub – contractors) to develop planning and design outcomes integratedly • each of project team should be understanding to each phase in construction process with a feedback • the process should be notice in environment factors, emission reduction, natural resources, biological diversity • project management should be notice in cost, quality and time, even environment and social factors • bonding the whole process with the contract documents and the terms attaching to the articles related to the sustainable concept • scheduling process, organizing, implementing, and integrated control of the sustainable values and promoting sustainable natural resources and environmental quality

(Source: elaborated by researcher, 2015)

CONCLUSION

Some of points could be concluded from above explanation which is design approach undertaken owners not yet fully reflect of sustainable building values as well as management construction approach has relies on conventional process. Findings of research could be developed through sustainable planning and design approach that emphasizes efficiency energy and natural resources, reused waste material of construction, efficiency of land use, and developing an innovation for renewable material and technology for better building in the future. Recommendation in this study used as a basic guidance to owners, designer, and contractors then it has not been disseminate because of limitation of this study.

REFERENCES

Afrizal. (2014). Metode Penelitian Kualitatif : Sebuah Upaya Mendukung Penggunaan Penelitian Kualitatif Dalam Berbagai Disiplin Ilmu, Jakarta: PT. Rajagrafindo Persada.

Akmal, I. (2007). Sustainable Construction. Penerbit PT. Gramedia Pustaka Utama. Jakarta.

Alvan, S., I.N.N, P.L.A.L (2014). "Pengembangan Model Perencanaan Konstruksi Berkelanjutan Pada Rumah Tinggal Berdasarkan Persepsi Masyarakat Urban di Kota Medan". Laporan Kemajuan, Lembaga Penelitian Universitas Negeri Medan, Medan.

Ervianto, W. (2012). Kajian Reuse Material Bangunan Dalam Konsep Suistainable Construction di Indonesia. Jurnal Teknik Sipil 12 (1); 18-27.

Frick, H.,S.F.B.(2007). Dasar-dasar Arsitektur Ekologis: Penerbit Kanisius& ITB. Kuswartojo, T. (2010). Mengusik Tata Penyelengara Lingkungan Hidup dan Permukiman, ITB, Bandung: Penerbit Kelompok Keahlian Perumahan Permukiman Sekolah Arsitektur Perencanaan dan Pengembangan Kebijakan.

Santoso, I., M.R. (2011). Penyehatan Permukiman : Konsep dan Pendekatan Rumah, Yogyakarta: Gosyen Publishing.

Tanuwidjaja, G. (2011). Desain Arsitektur Berkelanjutan di Indonesia: Hijau Rumahku Hijau Negeriku. Prosiding Seminar Nasional Lingkungan Hidup; Living Green: Mensinergikan Kehidupan, Mewujudkan Keberlanjutan, Univ. Kristen Petra Surabaya, A-1.

Wibisono, K. (2014). Properti di Medan Tumbuh 5-10 persen, (Online), http://www.m.antaranews.com/berita/462924/properti-di-medan-tumbuh-5-10-persen

http://www.unep.org/

http://www.usgbc.org/leed

SUITABILITY ANALYSIS OF SUSTAINABLE LAND USE ON THE ISLAND OF BUNAKEN MANADO

Verry Lahamendu[1]*

[1]Department of Architecture, Faculty of Engineering,
University of Sam Ratulangi Manado
*verry_lahamendu@yahoo.com

ABSTRACT
Land use on the island of Bunaken national park continues to increase. This is evident from the development of tourism facilities and infrastructure that tend to negatively impact the environment because the development is not in accordance with the allocation of the existing spatial plans. Land use that is inconsistent with the regional spatial plan when it exceeds its carrying capacity can cause environmental degradation. Environmental degradation if not immediately addressed can have an impact on people living on the island of Bunaken also to the existence of the Bunaken Marine Park as one of the most beautiful marine park in the world. This study analyze the suitability of sustainable land use on the island of Bunaken Manado based on the function of the area's plan as defined in the spatial plans. The study was performed using overlay analysis of land use or landscape in graphical form approach. From this study it can be concluded that there were land uses that did not comply with the land use designation as specified in the Spatial Plan. Some land for farming, mangrove, and settlements has been converted into land for tourism area. Changes of land use also impacted the settlement and dwelling patterns on Bunaken Island. Most of the farm land has been converted into settlements land. Land use that is inconsistent with its carrying capacity will cause degradation to the land and the environment and impact on Bunaken Marine Park ecosystems.

Keywords: sustainable development, land use, Bunaken

INTRODUCTION

Critical awareness of the limited natural resources and the ever-increasing human needs requires an efficient approach of the use of natural resources. Moreover, resource use must not sacrifice the right to fulfill the needs of future generations. In the perspective of the a balanced concept, the development approach is required to consider the balance and fairness between generations. The concept of development approach known as sustainable development, which is a concept of development that can meet the needs of the present generation without compromising the future generations (Rustiadi, et al. 2009).

Land use by any development activity must line with the principles of sustainable development, namely balanced economic development, social cultural and environmental as the pillars that are interdependent and mutually reinforcing each other. Development with the purpose to improve the welfare of the people cannot avoid the use of excessive natural resources or exploitation that threaten sustainability, this will result in reduced the ability of the environment to support human survival in the future.

Bunaken Island is included in the Bunaken National Park and is one of the protected areas that became the main tourist destinations in the city of Manado. Currently tourist arrivals to the island of Bunaken are quite high every year. The high visits led to improved services to the tourists in terms of both providing living facilities and other infrastructures. This encourages the development of tourism infrastructures and facilities to increase which tend to have adverse effects on environment in Bunaken Island. The impacts of the construction of commercial buildings in coastal areas that tend not to be environmentally friendly because their constructions were not in accordance with the designation of the existing spatial plans. This leads to increasing environmental degradation that occurs in Bunaken Island (Lahamendu, 2013).

For the development and use of land in Bunaken Island to be comfortable, productive and sustainable, it must be in accordance with the land use designation that has been set. Related with limited land conditions, land use must be done in a planned, rational, optimal and responsible and in accordance with its carrying capacity (Isaac, 2008). Land use that does not fit its carrying capacity will cause degradation to the land and environment. This study will analyze the suitability of current land use on the island of Bunaken, whether it is in conformity with the regional spatial

plan or is not in accordance with the allotment of land by the area function. This is as one of the efforts in creating an effective, efficient and sustainable land use in order not only enjoyed by the present generation but also for generations to come.

LITERATURE REVIEW

Land use is a form of human intervention on land resources in order to meet the necessities of life, both material and spiritual (Juhadi, 2007). Furthermore, according to Juhadi land use is a manifestation of the interaction between human as biotic component and land as abiotic component. The interaction of these two components varies from place to place and from time to time. He also explained that the realization of the pattern of land use in a certain place within a certain period is influenced by multiple factors and or barrier associated with the characteristics of the community, reflected in the population number as well as the form or level of culture, and soil conditions that are influenced by other components of physical environments.

According to Darmawan in Yusran (2006) land use is regulating the use of land to determine the best option in the form of allocation of certain functions, so as to provide an overall picture of how the area in a region is supposed to function. Another description is land use is an ongoing process in the use of land for purposes of an optimal and efficient development.

According to Barlow in (Juhadi, 2007) that the land use is influenced by some key considerations such as land physical factors, economic factors and institutional factors. Institutional factors may include social, cultural, embodied in the local tradition, belief systems embraced by the community and government policy. The individual decision in determining land use is related and influenced by physical factors of the land and human resources conditions, Silalahi in (Juhadi, 2007).

From the definition of land use, land-use principle can be summed up as a basis for the provision of land use according to various considerations, components and criteria to produce optimal ouput land use. Therefore, the use of the concept of land use right will determine land use good products.

According to government regulations of the Republic of Indonesia Number 16 Year 2004 on land stewardship, the use and utilization of land in protected areas or cultivated areas must be in accordance with the

function of the area in the Spatial Plan. The utilization and land use in protected areas should not interfere with the function of nature, does not alter the landscape and natural ecosystems; land use in the area of cultivation should not be contradicting, do not interfere with each other and provide added value to the land use.

As per the direction of the Spatial Plan of Manado, the management of Bunaken Island which is included in the National Park Bunaken is adjusted and harmonized with the directives of the management of Bunaken National Park that has been set. This is intended to make the management of the Bunaken National Park area integrated, sustainable and has the same goal and vision (BTNB, 2010).

The development plan of Bunaken Island according to the City of Manado Spatial Plan year 2011- 2031 is the development of marine tourism region. This is due to the potential of the natural beauty of Bunaken Island and the very famous Marine Park that is right in front of Bunaken Island.

RESEARCH METHOD

The analytical method used is the overlay analysis which is an approach to land use or landscape in a graphic form that is formed from merging the various individual maps (that have specific information/data base). Each maps and transparency provide information on environmental and social components.

Based on the land-use map of the Spatial Plan of the City of Manado year 2011-2031, these maps were overlaid with the map of existing or current condition of land use on the Island of Bunaken to produce a map of land use change. The results of land use change map show changes in land use from a use to other land uses in the area.

In analyzing the suitability of land use by using the criteria of suitability of land that includes land use efforts in a focused, efficient, and effective in accordance with the spatial plan that has been determined. The suitable criteria are if in the same location, the type of land use was in accordance with the planned function of the area as specified in the regional spatial plan. The not suitable criteria are when in the same location, the type of land use is not in accordance with the planned function of the area as specified in the spatial plan.

RESULTS AND DISCUSSION

Based on Spatial Plan map of the City of Manado 2011-203 the most dominant land use on the Island of Bunaken is farm land with an area of 622.37 hectares or 78.99% of the total area of the Island of Bunaken which is 787.9 ha. This is followed by mangrove land 2.05 ha or 11.68%, land for residential 51.64 ha or 6.55%, land for tourism 8.39 ha or 1.06%, while the scrub and forest land each measuring 12.86 ha (1.63%) and 0.59 ha (0.07%). The details can be seen in Figure 1 below.

Figure 1. Map of Land Use Plan of the Island of Bunakan Spatial Plan 2011-2031
Source: Analysis Result

The land-use map of the Island of Bunaken in 2012 shows that the land for farm was still the largest land in Bunaken island and has an area of 594.46 hectares or 75.44% of the total area of the Island of Bunaken. The second-largest land after farm land was mangrove land which has an area of 88.25 hectares or 11.19%. Residential land on the Island of Bunaken was 45.04 hectares or 5.76%. Tourism which is a mainstay of the island of Bunaken in developing the potential of nature tourism has a land area of 17.97 hectares or 2.28%. Shrubs that are on the island of Bunaken extent 42.18 hectares or 5.35%. Map of land use of the Island of Bunaken in 2012 can be seen in Figure 2 below.

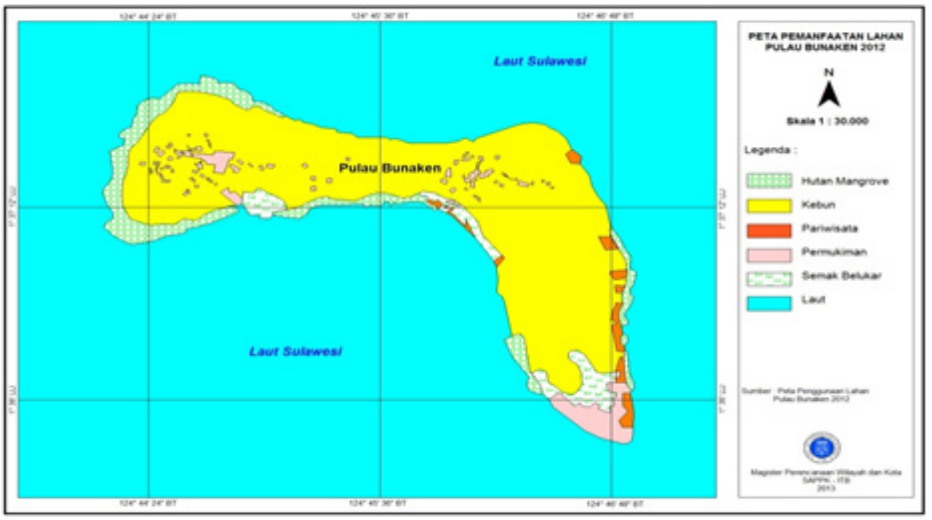


Figure 2. Map of Land Use of the Island of Bunaken Year 2012
Source: Analysis Result

The results of the analysis of land use on the Island of Bunaken using overlay map of Spatial Plan map and existing land-use map of Bunaken island can be seen in Figure 3 below.

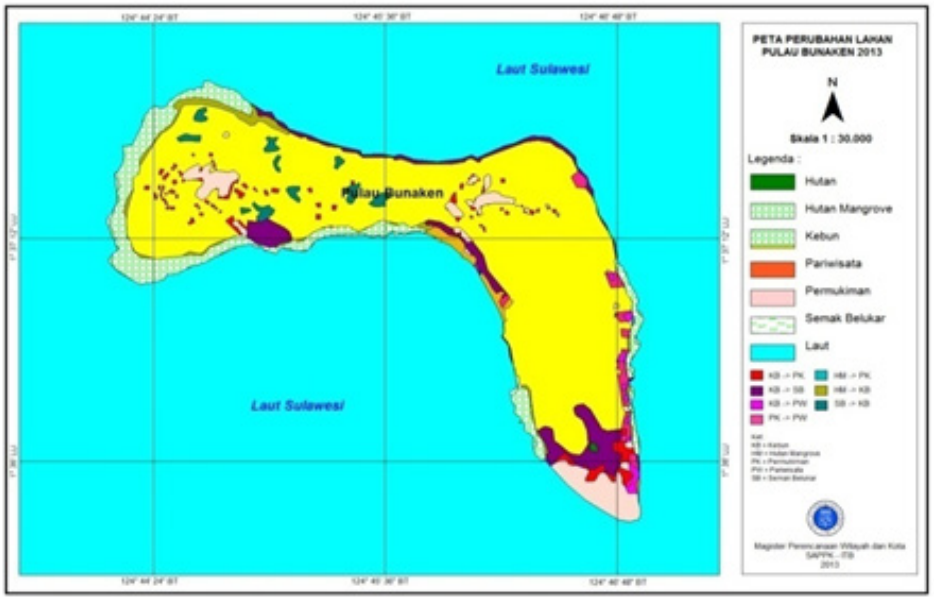


Figure 3. Map of Analysis Results of Land Use of the Island of Bunaken
Source: Analysis Result

Overlay of maps between Spatial Plan maps with map of the existing land use condition show that changes to the land use had took place with area measurements as follows:

1. Farm land area which changed function into residential area with land area of 18.65 hectares.
2. Farm land area which changed function into tourism area with land area of 10.88 hectares.
3. Residential land area which changed function into tourism area with land area of 4.8 ha.
4. Mangrove land area which changed function into a tourism area with land area of 0.8 ha.
5. Mangrove land area which changed function into residential area with land area of 0.4 ha.
6. Mangrove land area which changed function into farm land area with land area of 14.5 hectares.

The suitability analysis of land use in the Island of Bunaken can be seen in the Table 1 below.

Table 1. Overlay Results of Plan Map and Existing Land Map

No	Land Area	Spatial Plan Land Use (Ha)	Existing Land (Ha)	Analysis	Conclusion
1	Mangrove Land Area	92,05	88,25	The mangrove area land use was in accordance with the planned function of the area.	Suitable
2	Tourism Land Area	8,39	17,97	The land use was not in accordance with the planned function of the area as set in the Spatial Plan.	Not Suitable
3	Residential Land Area	51,64	45,04	The land use in residential area was in accordance with the planned function of the area as specified in the Spatial Plan	Suitable
4	Farm Land Area	622,37	594,46	At farm lands, the land use was in accordance with the planned function of the area	Suitable
5	Forest Land Area	0,59	-	Land use was not in accordance with the planned function of the area as specified in the Spatial Plan	Not Suitable

Source: Analysis Results

Changes in land use can not be separated from the rapid development of tourism on the Island of Bunaken. The Island of Bunaken is the only entrance

to the Bunaken National Park area where every year more and more tourists come to the island to enjoy the panoramic beauty of the famous Bunaken Marine Park. Therefore, there is a big demand for construction of infrastructure and tourism facilities on the Island of Bunaken. The number of cottages, restaurants and home stay built are sufficient prove that the development requires a large land area.

The increasing the number of tourism facilities and infrastructure at the end exceed the land area designated for tourism activities resulting in land use that is not in accordance with the land use designation as specified in the spatial plans. Some of the land for farm, residentials and mangrove has been converted into land for tourism. Whereas most agricultural lands has changed into residential land and mangrove land portion has been converted into farm lands.

Land use changes that occurred on the island of Bunaken is a reasonable thing and will occur due to current development. However, development must not degrade the natural environment. Some of the mangrove land has been converted into land for tourism, although mangrove land is part of the conservation area to be protected and preserved. Mangrove ecosystem has very important role in coastal areas, and has both the ecological and economical function. Ecologically, mangrove serves as a protective beach barrier that protects the land from sea water wave action, withstand strong winds blowing from the sea and as a buffer against the intrusion of sea water, as well as nesting and breeding ground for various species of fish and shrimp. Economically, mangrove provides building materials, pharmaceuticals materials, pulp and paper and other commercial products.

Land use when viewed based on Government Regulation No. 16 of 2004 on The Stewardship of the Land, in Article 13 states that (1) the use and utilization of land in protected areas or cultivated areas must be in accordance with the function of the area in the Spatial Plan. (2) the use and utilization of land in protected areas should not interfere with the function of nature, does not alter the landscape and natural ecosystems. (3) The use of land in cultivation areas should not be contradicting, does not interfere with each other, and provide added value to the land use. Article 15 of Government Regulation No. 16 of 2004 states that the use and utilization of land on small islands and areas of land that are in the coastal border, the border of lakes, reservoirs and river banks, should pay attention to: (a) the public interest and (2) the limited carrying capacity, sustainable development, ecosystems linkages, biodiversity and sustainable function

of the environment.

The Impact of Land Use Changes in Bunaken Island on Settlement Patterns and Dwelling Patterns

Changes in land use on the island of Bunaken as a result of the rapid development in the tourism sector, has brought changes to settlement patterns and dwelling patterns of the community.

Settlement Patterns

On Bunaken Island, Liang Beach village is a village where the center of tourism and diving activities are located due to its proximity to the most beautiful dive spots and sea garden. Before Bunaken Island was established by the Government as one of the five islands included in the Bunaken National Park area, the majority of its settlers are fishermen and farmers. At that time the settlements in in Liang Beach were only in the form of "daseng" or hut that were used by fishermen as a resting place and a gathering place after a day at sea.

After Liang Beach area was developed into tourist areas, fishermen who lived in the area of Liang Beach began to move to the Eastern part of Bunaken Island. East Bunaken village was developed with a pattern of new settlement construction, semi-permanent, tight, crowded and with simple and modest facility. The development spread from the coast to the inland region with a linear pattern where houses were built following the pattern of the existing road network. People who work as fishermen prefer to stay in East Bunaken precisely in coastal areas because the conditions of slightly sloping beaches, where fishermen often use the beach as a mooring area for boats, repairing damaged nets, and repairing boats or building new boats. Currently, the road that connects between the villages is in better condition with paving stone material with a length of approximately 400 meters. The rest of the roads only use concrete pavement where in many places were damaged. The majority of the population on the island of Bunaken work as fishermen and farmers with a level of income that is irregular and usually depends on the season, resulting in building permanent houses were deemed too expensive as most of building materials must be purchased in the city of Manado.

With the development of tourism on the island of Bunaken with Marine Park as an icon of tourism in North Sulawesi, tourist visits to Bunaken Island each year are quite high. The peak occurred in 2003 with the number of

tourist of 39,259, which consists of in-country tourist of 31,084 and as many as 8,175 foreign tourists (Kementrian Kehutanan, 2007). In recent years, the number of people who worked as fishermen showed a decrease (Kementrian Kehutanan, 2010). This is due to the transfer into alternative livelihoods in certain villages, among others, working as a tour guide, both in cottages or in the dive centres that located on the island of Bunaken. People who work in the tourism sector have visible increase in their financial income. Many of them begin to build permanent houses.

Figure 4. The settlement pattern and placement of building masses in East Bunaken
Source: Research documentation

Dwelling Patterns

The tourism industry that is developing very rapidly in Bunaken island not only increase revenue for the the city of Manado government, but also for the people living on the island of Bunaken. It can be seen from the increase in income, where the people have been able to build houses

that are more viable and permanent. There are even some people whose homes were used as a home stay (lodging) for tourists who stay on the island of Bunaken. This is also a source of income for people who are on the island of Bunaken.

The houses developed in several patterns, a result of interaction between the needs, the opportunity and ability to obtain existing resources. Placement pattern of residential buildings in the mainland looks more orderly and follow the pattern of the existing road, while the houses located on the coast tend to be dirty and not well ordered, with the leftover wood and sawdust that comes from the place of the boats or tourist boats manufacturing process. Besides cluttering the coastal areas, the litter is also creating less aesthetic view in the tourist area.

People in this region using mangrove wood as the raw materials for the building houses, but over time because the mangroves are forbidden to be cut down, then people started using the building materials that were purchased directly in the city of Manado although the prices were quite high because they had to use boats with travel time about 45 minutes from Manado to the island of Bunaken.

Figure 5. People's residence which changed function into Homestay
Source: Research documentation

Settlement and dwelling patterns on the island of Bunaken, when associated with the concept of sustainable development, then the development must still be able to meet the human needs of the present without compromising the potential of future generations to meet their

own needs. Therefore, the utilization of potential for tourism in the island of Bunaken should not to damage the preservation of nature and environment there.

Similarly, in planning and building houses for people on the island of Bunaken, as much as possible one should use environmentally friendly building materials by utilizing the existing resources and minimizing negative impacts on nature, the environment and humans. One alternative to develop their houses in an environmentally friendly manner and in accordance with the local architecture is the concept of Minahasa stilt house. The stilt house model construction is very much in tune with the natural environment since from the start of the process of selecting the land, materials selection and manufacturing process were created after going through the process of adjustment to the natural environment and climate in which the houses exist for many years (Lahamendu, 2014).

Construction of Minahasa stilts houses is suitable for houses that are close to streams or coastal areas. The ground below the house on stilts (lower part of the house) can absorb water or water can pass through, meaning environmentally friendly and in tune with the hydrological function (Lahamendu, 2014). The dominant wood material also make the building light and very good for earthquake resistance. The lower part of the house on stilts can also be used as a storage area for fishing equipment and various other household items.

Figure 6. Example of Minahasa Stilts House
Source: Lahamendu, 2014

CONCLUSION

From the analysis of the suitability of land use on the island of Bunaken some conclusions can be drawn as follows:

1. Land use in Bunaken need to be managed and planned in accordance with the functions and usage based on the characteristics of the land taking into account the limited carrying capacity, sustainable development, ecosystem linkages, biodiversity and the sustainble function of the environment.
2. Any plans to build on the island of Bunaken should always refer to the the existing Spatial Plan, as a form of anticipation of changes in land use, which in turn impacts on the environment and degrade the ecosystem of Bunaken Marine Park, which is the pride of the community of North Sulawesi.
3. It is time for the law enforcement agencies to act firmly and do not give a construction permit on land that has been set within the Spatial Plan as a conservation area.
4. The land use that is not in accordance with the function of the area on the island of Bunaken has impacted the pattern of new settlements in East Bunaken, so that settlements occur uncontrolled, tight, crowded with simple and modest facilities and are semi-permanent.
5. The impact on community residential or dwelling as a result of improper land use is dwelling evolved in several patterns, interaction between the needs, the opportunity and ability to utilize existing resources. Dwelling or residential buildings placement patterns on the mainland were more regularly and follow the pattern of the existing road, while the houses located on the coast tend to be dirty and not well ordered.

REFERENCES

Ishak, Marenda, 2008. Penentuan Pemanfaatan Lahan, Kajian Land Use Planning dalam Pemanfaatan Lahan untuk Pertanian, Makalah.

Juhadi, 2007. Pola-Pola Pemanfaatan Lahan dan Degradasi Lingkungan Pada Kawasan Perbukitan, Jurnal Geografi, Vol. 4.

Kementrian Kehutanan, 2007, Rencana Teknis Pengembangan Ekowisata Taman Nasional Bunaken, Balai Taman Nasional Bunaken (BTNB)

Kementrian Kehutanan, 2010. Rencana Pengelolaan Jangka Panjang Taman Nasional Bunaken periode Tahun 1996-2021 Provinsi Sulawesi Utara. Balai Taman Nasional Bunaken

Lahamendu, Verry, 2013, Evaluasi Pemanfaatan Lahan Berbasis Rencana Tata Wilayah, Program Pasca Sarjana ITB.

Lahamendu, Verry, 2014, Konsep Rumah Panggung Ramah Lingkungan dalam Mengantisipasi Banjir dan Gempa, Seminar Rumah Tradisional 2014
Rustiadi, Ernan, dkk. 2006. Perencanaan Dan Pengembangan Wilayah, Penerbit Crestpent Press.
Yusra, Aulia, 2006. Kajian Perubahan Tata Guna lahan pada Pusat Kota Cilegon, Program Pasca Sarjana Undip.

TOWARDS IMPLEMENTATION OF GREEN CRITERIA IN INDONESIA: NEEDS AND REALITY

Sahid[1]*, Dewi Larasati [2], Prinka Victoria[3]*****

[13]Graduate School of Architecture,
Institut Teknologi Bandung,
[2]School of Architecture, Planning and Policy Development,
Institut Teknologi Bandung
*sahidmochtar@yahoo.com, **dewizr_ar@yahoo.com,
***prinka.victoria@yahoo.com

ABSTRACT
Implementation of Green Building concept, especially on High-rise Buildings, implies the possibility of using passive and active strategies. Passive strategy refers to how the design of the building is able to interact with the external environment for the benefit of occupants and the environment. On the other hand, Active strategy use an effective and efficient electrical and mechanical equipment to meet the occupant's need and bring out a minimum damage to the surrounding environment. Passive strategy is not something new in architectural context; this strategy is a basic strategy that has been learned for years. However, the reality shows that the implementation of passive strategy is not simple, there are various reasons to consider since the project involved many factors and parties. The study began with interviews of project parties including architects and academics about understanding, role, contribution, willingness and constraints associated with the implementation of passive strategies in high-rise office buildings in Jakarta. The interview indicates that several factors considered by the architects during the design process in implementing passive strategy to the design product. These factors were then confirmed back to the architects using questionnaire to determine the weight of influence. Using the same questionnaire, architects and academics were asked regarding the green performance of passive strategies from their point of view. The green performance in this study

represents concept of sustainability (environment, social and economy) and also concept of reciprocity (benefit and effort) of the passive strategies implementation. The results are then compared to obtain a clear direction for future implementation of passive design strategies. The findings are still preliminary since this is an on going research.

Keywords: Passive Design, Green Criteria, High-rise Building, Passive Strategy

INTRODUCTION

Data from the US Energy Information Administration 2011 shows that building consumes approximately 39% of total energy consumption, 21% of which is used for residential buildings and 18% for commercial buildings. The majority of the energy consumption is used for the HVAC 40% and lighting 35%, the rest is used for appliances and water heating. Conditions in Indonesia is approximately similar, according to Executive Reference Data, National Energy Management, National Energy Council in 2014, the building sector consumes 31.08% of national energy consumption.

Implementation of green concept in building is intended one of them to obtain a high performance energy efficiency. In order to achieve the intention, green building could adopt active and passive strategies. These strategies is expected to minimize the environmental impact and maximize the building's users benefit. This paper attempt to explore the passive design strategies which represents by building orientation, building shape, building envelope and room layout and greenery arrangement. Passive strategy in humid tropical regions like Indonesia are generally done by heating avoidance, building cooling, exploit drying and utilization of natural lighting. In order to achieve building with high-performance, Ken Yeang (2005) suggest to optimize passive strategies before utilizing active strategy.

Theoretically all architects have known the passive design strategy since passive strategy is compulsory subject for architecture students at the beginning year but the implementation of passive strategies in real project is not simple. As an example, high-rise office buildings (more than 20 floors) along the Thamrin street Jakarta (main street of Indonesia capital city) tend to ignore the strategy of building orientation criteria since most of the facades exposes to the east-west direction so its exposed to direct sunlight. It seems that architects are more likely to keep using glass curtain wall without shading device or rely entirely on the specification of glass to

withstand solar radiation. The problem is why was that happened, what is the motives of practitioner behind those condition. How the passive strategies performance is understood by pratitioner and academics This research seeks the difficulties and potential of passive design strategies implementation in high-rise office building and it's performances refers to understanding of practitioner and academics.

THEORY OF PASSIVE STRATEGY

Passive strategy is one of the energy saving strategy in a way that consider the building design environment and use it as optimal as possible for the benefit of its occupants. According to Sharma (2002), the use of passive strategy is done through the following basic strategies:

1. Understand the Climate and the Climatic zone.
2. Identify the comfort zone
3. Identify the heat source or the heat sink
4. Optimize the microclimatic conditions
5. Defining the characteristics required for the configuration of the building or the building envelope

Sarte (2010) adds that each site is unique. Design Team integrate building with its site and reduce building energy consumption through development site analysis, clear definition about the needs and objectives of the project, and matching understanding of the possibilities available energy. Furthermore Sharma (2002) states that one of the important things in passive strategy is passive cooling using placement of window properly and consider natural lighting design, selecting specific material for the glass of windows and skylights, proper shading design if the heat is not desirable, the use of materials with light color for the building envelope and roofing, proper sitting and orientation, and planning a suitable landscape design

For natural ventilation, Sharma (2002) stated that the ventilation is good cooling technique and has been used throughout the world, which provide cooling by using air to take the heat out of the building (convective cooling) and of the human body (physiological cooling). Relates to natural ventilation, windows are an important factor to obtain optimal ventilation. The parameters that need to be considered in the window design are climate, wind direction, the location of openings, opening size, room size, shading elements, curtain and internal partitions

Sarte (2010) adds that the use of passive strategy can improve the energy

performance of buildings. Passive strategy can be done through:

1. The building design and orientation of buildings
2. Landscape design to create the desired microclimate
3. Selection of appropriate building envelope
4. Design of natural ventilation
5. Selection of building materials
6. The use of low-emittance glass
7. Installation of radiant barrier
8. The use of bright colors / reflective

About the performance of passive strategies, research conducted by the Xiaoxia, et all (2014) indicate that special attention to the use of the building envelope insulation, overhang, selecting the right color, the right proportion of openings and the selection of the appropriate glass material can help reduce the consumption of HVAC to 46, 81%. Kats, GH (2003) also stated that application of green concept in buildings can save energy up to 37%. On the othe hand, regarding to Kats (2003), the additional cost of investment needed to have a building with green standard is an average of only 1.84% or a maximum of 6.5%.

Referring to William (2007); Mc Lennan (2004); Abdidin (2010); Bauer (2007); Hegger (2008); Bougdah (2010); Sarte (2010); Sharma (2002); and Aun (2009), we trying to draw a whole picture of a passive strategy and implementation on building systems that could be applied in the tropics.

A. Passive strategies are grouped as follows:
    1. Passive Strategy for Thermal Environment
        a. Heating Avoidance Strategy
        b. Minimize heat conduction
        c. Minimize heat radiation
        d. Minimize heat convection
    2. Building Cooling Strategies
        a. Striving for convective cooling
        b. Striving for evaporative cooling
        c. Striving for convective cooling
        d. Exploit Drying Strategies

B. Passive Strategy for Visual Environment
    1. Replenish the lighting intensity
    2. Optimize the lighting distribution
    3. Minimize the lighting distraction

In order to encourage practitioner for wider implementation of passive strategies, definition of passive strategies expanded to strategies that use low-energy mechanical equipment as well as strategies to utilize the environment potential conditions beside the usual definition that does not use electrical and mechanical equipment (Table 1). Results of mapping passive strategy on building system proposes 30 passive design strategies that can be applied. Specifically for high office buildings there are 17 passive strategies that can be applied and grouped into 6 category, namely material, orientation, shape, envelope, interior and greenery. All of seventeenth passive strategy alternatives are then sought the opinion of academics and architects for rated or assess in accordance to 6 green criteria (considerations), namely energy efficiency improvement, environmental impact reduction, comfort improvement, operational cost savings, ease of implementation, investment cost saving.

Table 1. Scope of Passive Design Strategies

	Passive Strategies	Sub-strategy
1	Without using electrical and mecahanical equipment	Orientation and building shape
		Envelop design and its material
		Room layout and its material
2	Using mechanical or electrical equipment with very low energy consumption	Manual Using device that could be operate manually
		Otomation Technology Using device that operate with fixed input
		Smart Technology Using device that could adjust directly to surrounding environment condition
3	Utilizing surrounding environmental condition	Utilize surrounding landscape condition
		Utilize surrounding building condition
		Utilize surrounding micro and macro climates

METHODS

The research compare between the views of practitioners and academics related to the implementation of passive strategies in high-rise office buildings Jakarta with a minimum building height of 20 floors. The comparative study includes:

1. Comparing green performance of each passive strategies alternatives from the perspective of practitioners and academics by providing appropriate ordinal value Likert scale. The definition of green criteria

in this study is refer to sustainable development pillars which consists of environment, social and economy. The pillars represents by :

a. Environmental criteria, namely energy efficiency improvement and environmental impact minimization
b. Social criteria, namely occupant's comfort improvement
c. Economic criteria, namely operational cost savings, ease of implementation and investment cost savings

The above criteria also represents the concept of reciprocity, the relation between effort and benefit. In this study the benefit is represented by energy efficiency improvement, environmental impact reduction and occupant's comfort improvement. While the effort is represented by operational cost savings, ease of implementation and investment cost savings (Figure 1).

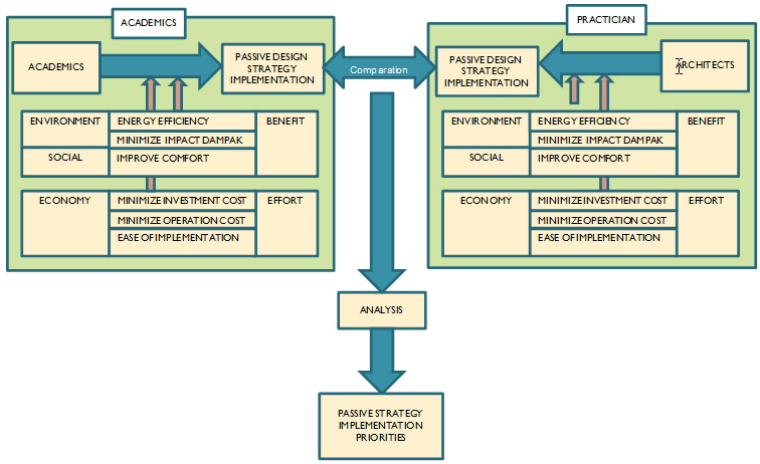


Figure 1 Comparative Study of Practitioner and Academics

The passive strategy alternative is an alternative that has been generated from previous studies on mapping the passive strategy. In order to fit with the case study which is high-rise office buildings in Jakarta with minimum 20 floors, there are 17 alternatives available that proposes to apply. All of the 17 alternatives could be group into 6 groups of alternatives.

2. Comparing green performance between groups of alternative design strategies. All of seventeenth passive strategies alternatives can be grouped into 6 groups, namely material, orientation, shape, envelop, interior and greenery/ landscape (including roof graden and vertical

landscape)

3. Comparing the performance of each green criteria, namely energy efficiency, minimization of impact, occupant comfort, operational cost savings, ease of implementation and cost savings investment.
4. Mapping out a the performance of passive strategies that could be considered to be agreed or disagreed between academics and practitioners
5. Comparing academics and practitioners opinions regarding the green performance of each passive strategy alternatives by giving the value in the questionnaire using a Likert scale.
6. Researcher also involving practitioner (architects) in determining matters that affect their design processes and products related to green issues. This process is a confirmation process to the results of interviews that have been done at the initial stage. In a previous interview, researcher gained some points related to the design process and product by architectural consultants. Confirmation process was done by giving questionnaires to determine architect's consideration in design stage to deliver a design product.

COMPARATIVE ANALYSIS BETWEEN THE POINT OF VIEW OF ACADEMIC AND PRACTITION (ARCHITECT)

The results shown on the paper are temporary since the research is still on progress. The input data is about 30%, but there are already some interesting findings from this research.

1. Regarding comparison of green performance based on passive strategy alternatives between practitioner and academic, Figure 2 shows the result so far of passive strategy alternatives performance. Number 1 to 17 on x-axis represents the order of passive strategy, while y-axis represents the total performance of six green criteria. The total performance is a mean from passive strategy performance's score sum.
    - Based on statistical result using software SPSS v21, it is known that whether practitioner and academics found 17 alternatives are not significantly different, based on practitioner's *p-value* or *asymp.Sig* (0.218) and academic's (0.458) which are more than significance probability (0.05).
    - Generally there is a same pattern between practitioner and academic, but in detail there are significant value differences on alternative 1 and 3 (material), 5 (form strategy), 8 (envelope strategy), 12 (interior strategy), and 15 to 17 (greenery strategies)

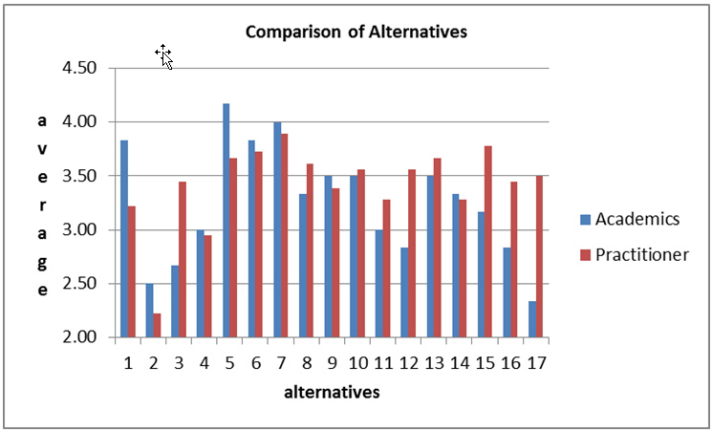


Figure 2. Comparison of alternatives

2. Regarding comparison of green performance based on group of alternatives between practitioner and academic, Figure 3 shows passive strategy group of alternatives performance's result so far. X-axis represents the groups of passive strategy alternative, while y-axis represents the total performance of six green criteria.
   - Based on six groups of alternative's statistical result, it is known that whether practitioner and academics are not significantly different, based on practitioner's p-*value* or *asymp.Sig* (0.416) and academic's (0.416) which are more than significance probability (0,05), in other word both of them are good.
   - Generally there is a same pattern between practitioner and academic except greenery group of alternative

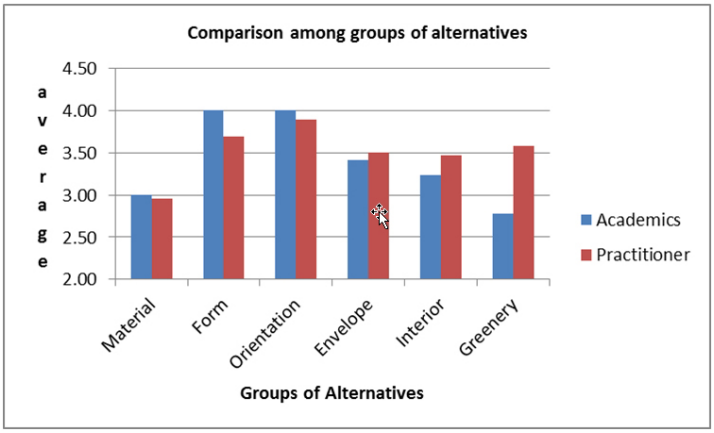


Figure 3. Comparison among groups of alternative

3. Regarding comparison of total green performance between practitioner and academic, Figure 4 shows the result of total green performance between practitioner and academic. The x-axis represents criteria while y-axis represents the total performance of 17 alternatives.
    - Based on statistic result for practitioner and academic consideration, it is concluded that all six consideration are significantly different by the score of *p-value* or *asymp.Sig* on practitioner (0,008) and academic (0,003) which are smaller than the significance probability (0,05). In other word, there are something more prioritized by practitioner and academic among these six consideration.
    - Generally there is a same pattern between practitioner and academics, but in detail there is a difference in comfort criteria, technical criteria, and investment saving criteria.

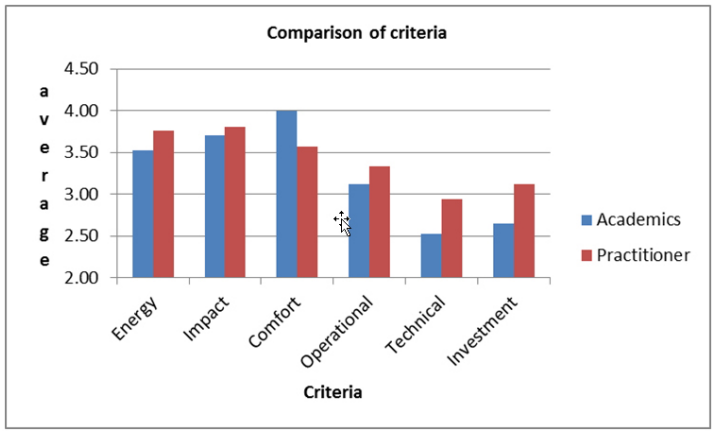


Figure 4. Comparison of green criteria

4. Regarding comparison of partial green performance between practitioner and academic, Figure 5 shows the comparison of economic performance (operational saving, implementable degree, and investment saving), social performance (comfort enhancement), and environment performance (energy efficiency and impact reduction). Academic shows less confident in economic performance in passive strategy (score less than 3) but sure enough about social and environment performance (score more than 3), while practitioner much more confident to all three aspects in passive strategy (score more than 3).

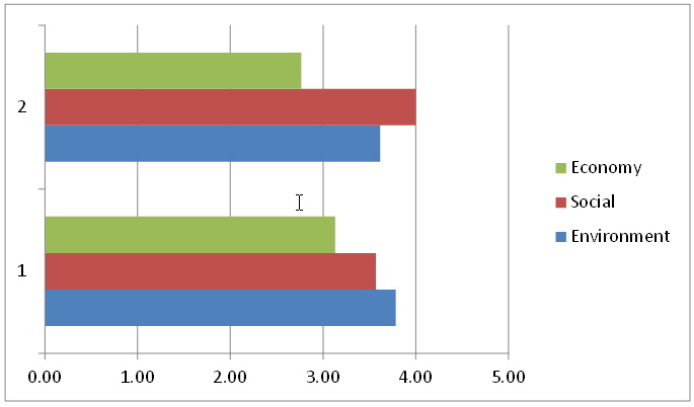


Figure 5. Comparison of green performance

5. Regarding comparison of benefit and effort between practitioner and academic, Figure 6 shows the comparison between effort (operational saving, implementable degree, and investment saving) and benefit (energy efficiency, impact reduction, and comfort enhancement). It is shown that from benefit point of view, both parties believe in the advantage of passive strategy performance. But from effort point of view, practitioners are slightly surer of passive strategy performance than academic. Both parties also believe that the benefit in implementing passive strategy is bigger than the effort.

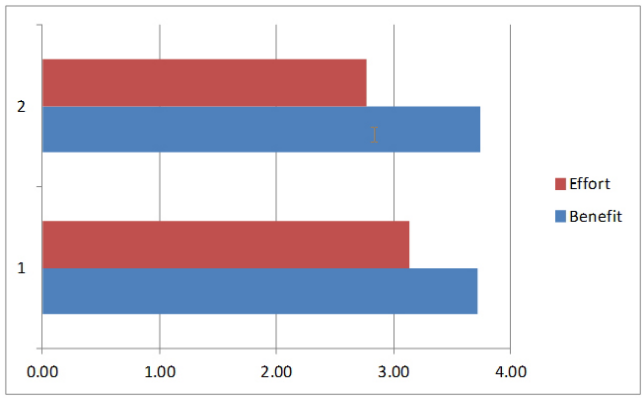


Figure 6. Benefit versus Effort

6. Regarding comparison of stake holder impact, this section was gathered by asking designers about the stake holder role on process and product design. Stake holder factor generally has a significant impact on the green building process and product design by consultant (*Asymp.Sig/p-value = 0,035 < 0,05*). Developers has the

biggest portion, followed by government and academic (Figure 7). It means that government and academic can contribute by giving input for designers in rule's establishment or even research result's dissemination.

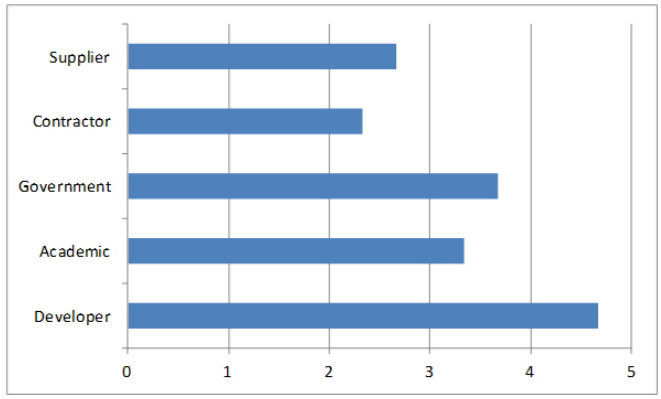


Figure 7. Stake Holder Factors

7. Regarding comparison of external factor impact
   Generally, internal factor has no significant impact on the green building process and product design by consultant (*Asymp.Sig/p-value = 0,810 > 0,05*). But based on the rank and graphic, green building rules are considered to have most impact compare to others (Figure 8). Designers still consider the concept of green building as an obligation rather than a consciousness to design a better building

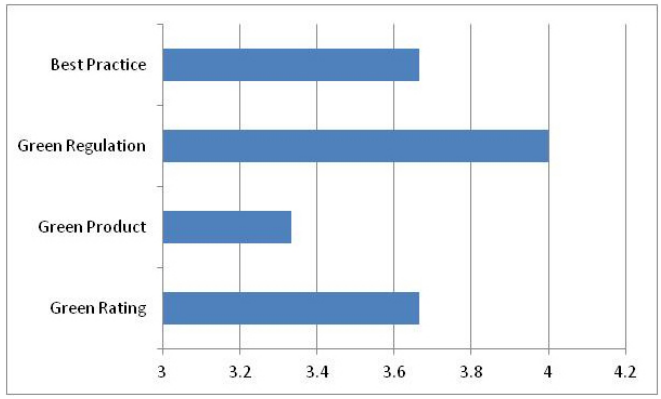


Figure 8. External Factors

8. Regarding comparison of internal factor impact
   Generally, internal factor has no significant impact on the green building process and product design by consultant (*Asymp.Sig/p-*

value = 0,301 > 0,05). But based on the rank and graphic, operational process has more impact than the others (Figure 9). It can be concluded that the designer's knowledge about operational as the most energy consuming process, makes the implementation of passive strategy which effect the operational energy efficiency process gain more consideration.

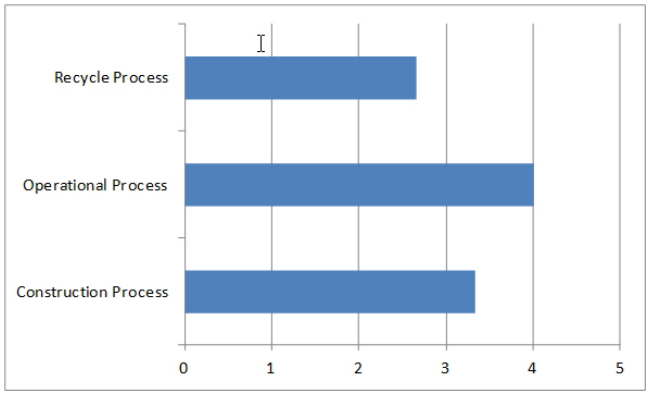


Figure 9. Internal Factors

9. Regarding comparison of the stake holder, external, and internal factor impact
   Generally, there are no significant impact between stake holder, external, and internal factor on the green building process and product design by consultant (*Asymp.Sig/p-value = 0,873 > 0,05*). But based on the rank and graphic, external factor has more impact than the others (Figure 10). It means that the existence of green building rules, rating system, material or green component, and best practice will be so helpful for designers to design a green product.

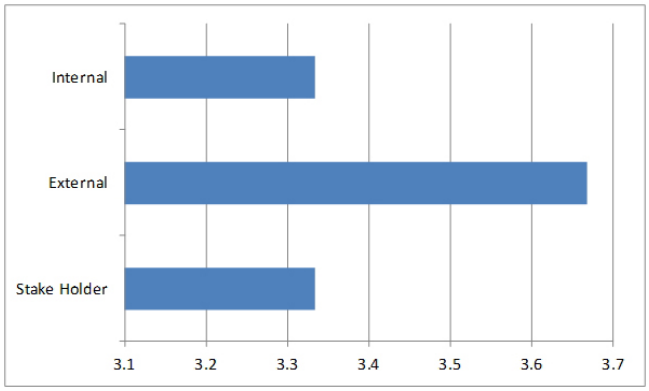


Figure 10. Comparison among factors

CONCLUSION AND RECOMENDATION

Although this research is still in progress of completion however there are some interesting indications to be observed, including:

1. Indication of different understanding between academics and practitioners (architects) including :
   a. Different understanding on alternatives :
   - In term of material, the difference indicates that practitioners tend to depend on strategy to obstruct heating process whereas academics on strategy to store heating process.
   - In term of building form, the difference indicates that academics tend to rely on strategy to minimize the area that directly exposed by sun's radiation whereas practitioners seem to optimize the strategy to minimize sun's radiation and maximize the natural daylight.
   - In term of building orientation and building envelope, both parties seem to have a same consideration.
   - In term of interior, both parties seem to have the same understanding except the strategy to use plant inside the building. The difference indicates that practitioners might be disoriented between capability to absorb CO2 and capability to reduce heating.
   - In term of greenery, practitioners much more confident on its performance than academics. The difference indicates that practitioners tend to consider appearance than performance.

   b. Different understanding on group of alternatives :
   In general, both parties have the same understanding except on the performance of greenery group's alternative (which consists of greenery on site, façade, and roof). The difference might indicate misunderstanding of actual performance of greenery on green building concept.

   c. Different understanding on green criteria :
   In general, both parties have the same understanding, however in detail there are wider gap on comfort, technical and investment criteria. Academics tend to more confident on comfort performance of passive strategies than practitioners, in contrary to the technical and investment performance which are practitioners are more confident. The difference indicates practitioner's hesitancy on the performance of passive strategy to create a comfort environment and practitioner's conviction of passive strategy to be easily implemented and minimize the investment cost.

   d. Different understanding on sustainable concept :
   In general, both parties are more likely to have the same understanding about the economic, social and environmental

performance of passive strategy, although academic shows less confident in economic performance

e. Different understanding on reciprocity concept :
Both parties believe in the advantage of passive strategy performance and both parties also believe that the benefit in implementing passive strategy is bigger than the effort. However the difference indicates that practitioner tend to assume that the effort is quite high

2. Indication of external factors influence on process and product design and also party's factors influence.
   - Developer is the most influential party that affects process and product design followed by government and academic.
   - Architects still consider that green building concept as an obligation rather than a consciousness to design a better building
   - In the design process, architects tend consider operational process higher than construction and recycle process
   - In the design process, architects tend to consider external factor (green building rules, rating system, material or green component and best practice) higher than internal and stake holder factor.

Regarding to tentative conclusions above, this study recommends to:

1. Encourage the practitioners and academics to share their green performance perception of passive design strategies
2. Encourage the government and academics to play a significant role in supporting the implementation of a passive design strategy (especially for high-rise building) by dissemination of passive design strategy performance and also formulate and establish green regulations to enforce practitioner implementing passive design strategies.
3. Encourage practitioner to optimize the implementation of passive strategy since it would resulting a minimum operational cost

REFERENCES

Abidin, Nazirah Zainul. (2010): Sustainable Construction in Malaysia – Developer's Awareness, International Journal of Human and Social Science

Aun, Ar Chan Seong (2009) Applying MS1525:2007 Code of Practice on Energy Efficiency and Use of Renewable Energy for Non-Residential Buildings, CPD Seminar 14th February 2009

Bauer, Michael. (2007): Green Building, Guide Book for Sustainable Architecture, Springer, Berlin

Bougdah, Hocine dan Sharples, Stephen (2010): Environment Technology and Sustainability, Taylor & Francis, New York
Executive Reference Data, National Energy Management, National Energy Council 2014
Hegger, Fuchs dan Zeimmer, Stark. (2008): Energy Manual, Sustainable Architecture, Birkhauser, Basel
Kats, GH (2003) The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force, Sustainable Buildings Task Force, Sacramento, CA,
Mc Lennan, Jason F. (2004): The Philosophy of Sustainable Design, Ecotone Publishing, Bainbridge
Saaty, Thomas L. (1990): Decision Making for Leaders, RWS Publication, Pittsburg, PA, USA
Sarte, S Bry. (2010): Sustainable Infrastructure: The Guide to Green Engineering Design, John Wiley & Sons Inc, Hoboken, New Jersey
Sharma, Anupama., Tiwari, K K Dhote R. (2002): Climatic Responsive Energy Efficient, Passive Techniques in Building, Eighteenth National Convention of Architectural Engineers, Jaipur
US Energy Information Administration 2011
William, Daniel E. (2007): Sustainable Design : Echology, Architecture and Planning, John Wiley & Sons Inc, Hoboken, New Jersey
World Energy Outlook 2012
Xiaoxia Sang, Wei Pan, M.M. Kumaraswamy (2014). Informing Energy-efficient Building Envelope Design Decisions for Hong Kong Energy Procedia, Volume 62, 2014, Pages 123-131
Yeang, Ken (2005) Green Design in the hot humid tropical zone

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