

Contribution of balcony of *Rusunawa* Surabaya on the use of space

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Abstract. Balcony is actually not included as a basic functional space in the dwelling. However, for walk-up flats like *rusunawa* in Surabaya in which most masses are in double loaded, balcony can be the only space directly related to outer space where fresh air can be obtained. It must be noted that some of them are not real balconies, because they are covered with walls and glasses. Previous research has proven that balcony of *rusunawa* Surabaya is very effective in improving the thermal comfort of internal space. *Rusunawa* Surabaya, although it should be occupied temporarily for only 5-10 years, in reality many families still inhabit for longer period. Even many of them made changes on their space because their needs also increase spatially. Balconies often play an important role in terms of space adaptation. The purpose of this study is to find out how important the role of this balcony according to the residents of *rusunawa* in Surabaya. This research was descriptive explorative research. Data collection technique applied was field survey by spreading questioners on 110 respondents who were determined by stratified random sampling. The data collected was about whether the balcony was really desired by the occupants; what activities were carried out on the balcony; and the effectiveness of balcony in spatial adaptation. The result that is expected to assist provider of *rusunawa* ascertains that balcony is definitely required by the occupants.

Keywords: contribution, balcony, use of space, *rusunawa*, Surabaya.

1. Introduction

Outdoor spaces have been essential parts of a house because much of free time of household members were spent in the garden or terrace. Most families give high priority to enjoying outdoors as a way to improve health [1], on which health is the primary requirement for human being [2]. Easily accessible, high quality green open areas facilitate people to spend more time outdoors that has a positive effect on life expectancy, health, happiness and general wellbeing [3]. Outdoor space is indeed important and required by houses to supply fresh air to refresh the air of internal space [4][5]. This reality is enforced by [6] which said that the availability of natural ventilation and outdoor private living spaces play important roles in resident perceptions of liveability. For vertical dwelling, the chance of connection to the outdoor space is more available by the existence of balcony. According to [7] a balcony is even found to have also a positive effect on the value of a property irrespective of the quality of the view. Moreover, according to [8] balcony also plays a decisive role in the energy behaviour of the buildings since they may intervene and influence almost all of the mechanisms of how buildings interact with its environment. Even to be more creative, the balcony can also have additional function as potted desert garden [9] that can turn a simple balcony into a tropical paradise.



Outdoor space of skyscraper apartments of large cities in developed countries are created by providing roof garden completed with full greeneries, cafes, pools, gyms, barbecues etc. Such facilities are impossible to be created for *rusunawa*, a walk-up flat for low-income households, which even each unit space area is very limited. However, in a tropical city like Surabaya, the easiest way to get thermal comfort is through cooled outside air [10] and balcony is the exact intermediary. This is real, as only a few of residents capable of providing air conditioner. So it can be imagined how important the procurement of balconies on *rusunawa*, an apartment unit that addressed for the poor families. This demand is rarely done though in fact it is highly required [11]. Balcony is a platform on the outside of a building, enclosed by walls or balustrades, supported by columns or console brackets. The platform is projecting from the wall of a building, usually above the ground floor. Balconies are typically small and are not used as social spaces or for entertainment purposes [12].



Figure 1. Simple balcony (source: Homedit Interior Design & Architecture)

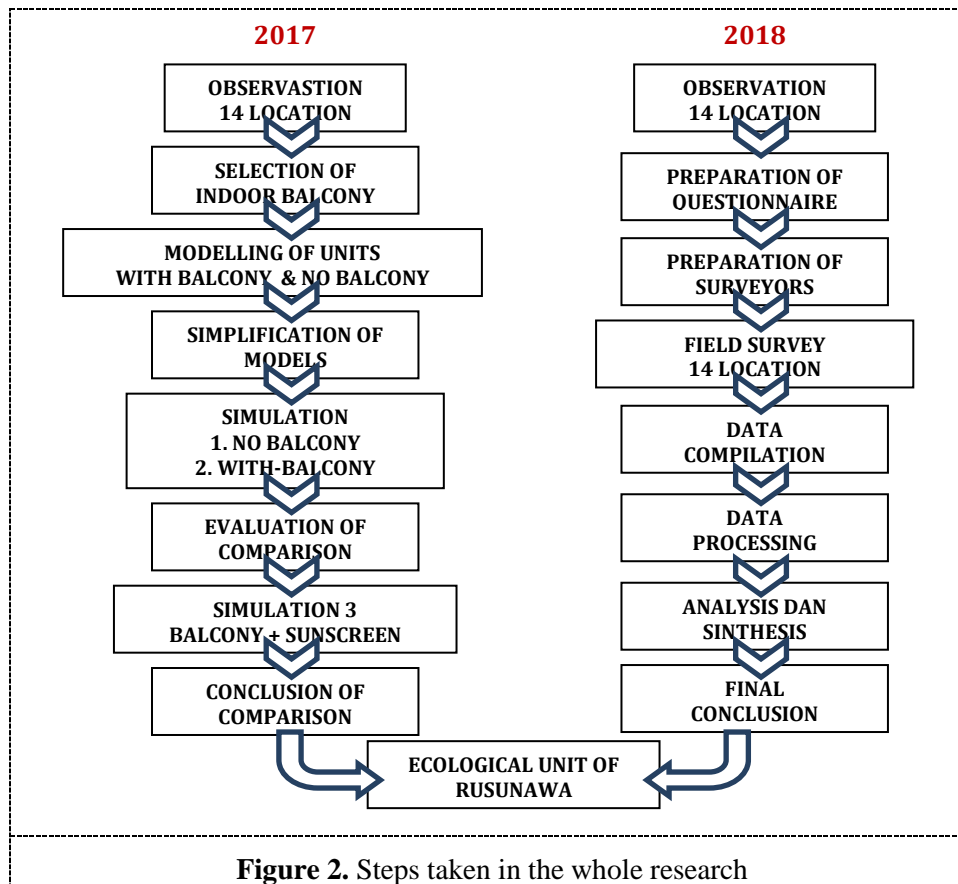
Although the space area is small, the balcony of *rusunawa* in Surabaya is not only used for enjoying outside air and outdoor view as intended, but also for conducting household activities such as drying, cooking, even sleeping and doing business activities [13]. These activities cannot be done inside the unit because the unit space is too small. Normally, balcony is designed to be located in front and it can greatly contribute to the look of an apartment. [14]. For *rusunawa*, especially that building mass is of double loaded, the balcony is designed to be backward of the unit as the entrance into the unit is at the corridor side. This condition often results in problems especially to the performance of the building, as the occupants use the balcony for storing and drying laundry pieces. Therefore, this research is meant to investigate whether the occupants desire the balcony.

2. Methods

This research is actually a whole study conducted in 2 years. In the first year (2017) the research focused on contribution of balcony on thermal comfort of the internal space with simulation method using Ecotect 2011. In the second year (2018), the focus of contribution is on the use of space of the balcony according to the residents of *rusunawa*, by field survey method using questioners. Result of research in first year indicated that contribution of balcony on thermal comfort of internal space was positive, meaning that the existence of balcony can reduce the temperature of internal space. By applying sun devices the reduction of temperature was more significant. This was in accordance with [15]. In this second year, the research aims to strengthen the importance of balcony existence based on the users' opinion, so that in the future design the inclusion of balcony for *rusunawa* is no longer doubted.

The step taken in second year research was initiated by observing the balcony types that exist in 11 locations of *rusunawa* spreading out in Surabaya. This observation was done in order to reconstruct the balcony types. Next action was preparing questionnaires in which the questions focused on among others: whether balcony existence is desired, which type of balcony is desired; what activities are carried out by the residents on their balcony; how effective the role of balcony in solving the space shortage, etc. Before data collection in field research it is important to prepare the surveyors. Surveyors must master exactly what is meant in each question. Thereafter is data compilation and

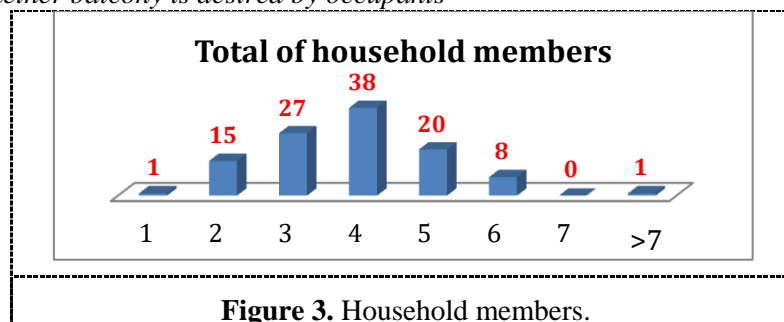
processing. The last step is analysis and synthesis that finalised by conclusion. In more detail, steps of research can be seen below.



3. Results

First of all it is necessary to explain that all questions in the questionnaires had already provided with certain answers that should be selected by the respondents. The intention was to provide certainty and ease [16] either for respondents or for analysers during the recapitulation of answers. In the choice of model or balcony design was also already given by samples in images in order to facilitate the respondents in illustrating and deciding choices. The number of respondents was 10 residents for each *rusunawa* that spreads out in 11 locations in Surabaya. The respondents were selected randomly, so the number of respondents in this study can be ascertained as many as 110.

3.1. Result on whether balcony is desired by occupants



Before discussing the desire on balcony, it is necessary to declare the mean or average number of household members. From the graph above it is seen that the dominant total member of household was 4 people, so from total of 110 respondents, the average amount of house' occupants was 3.81 members, if it was rounded up it became 4.

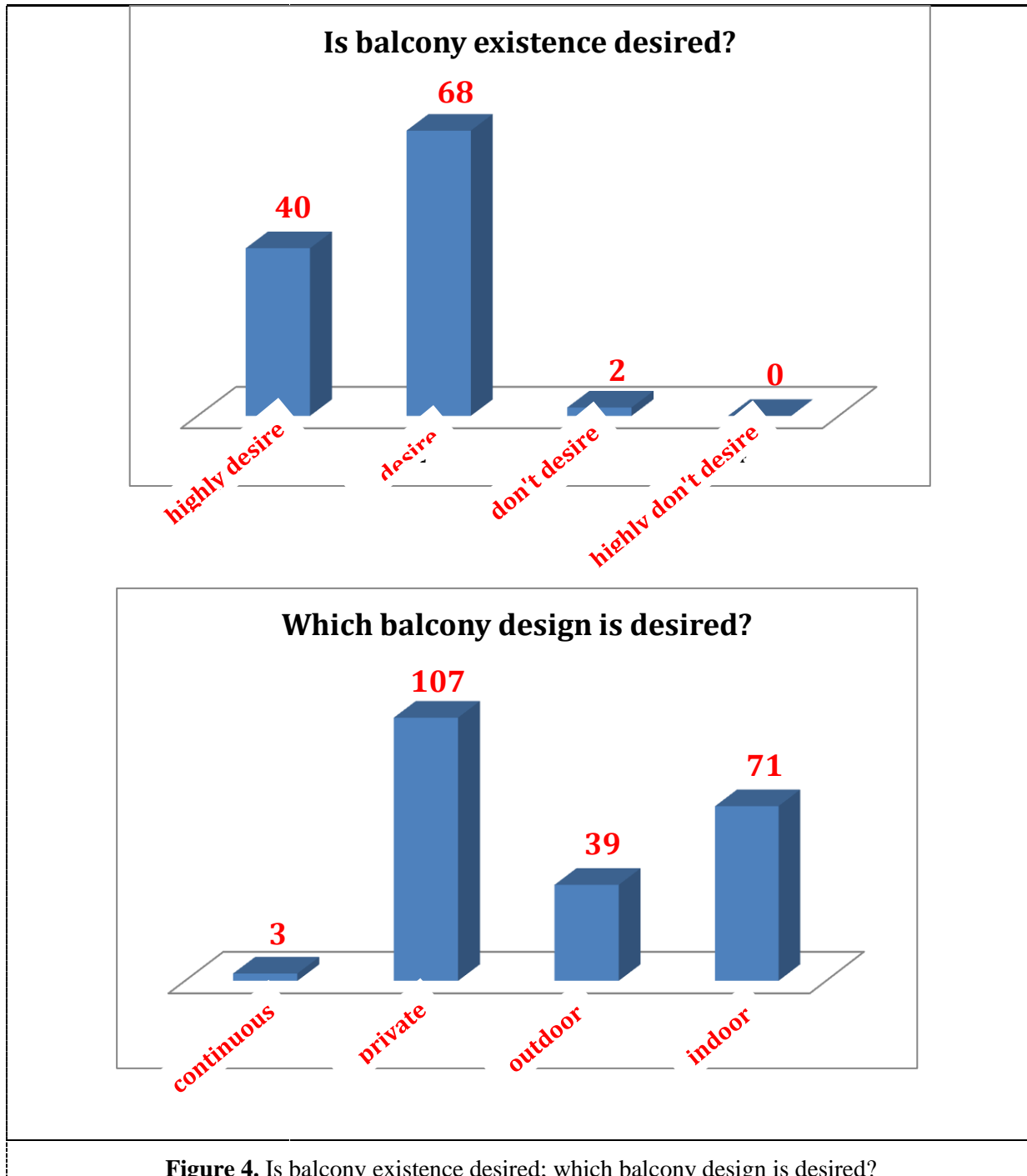
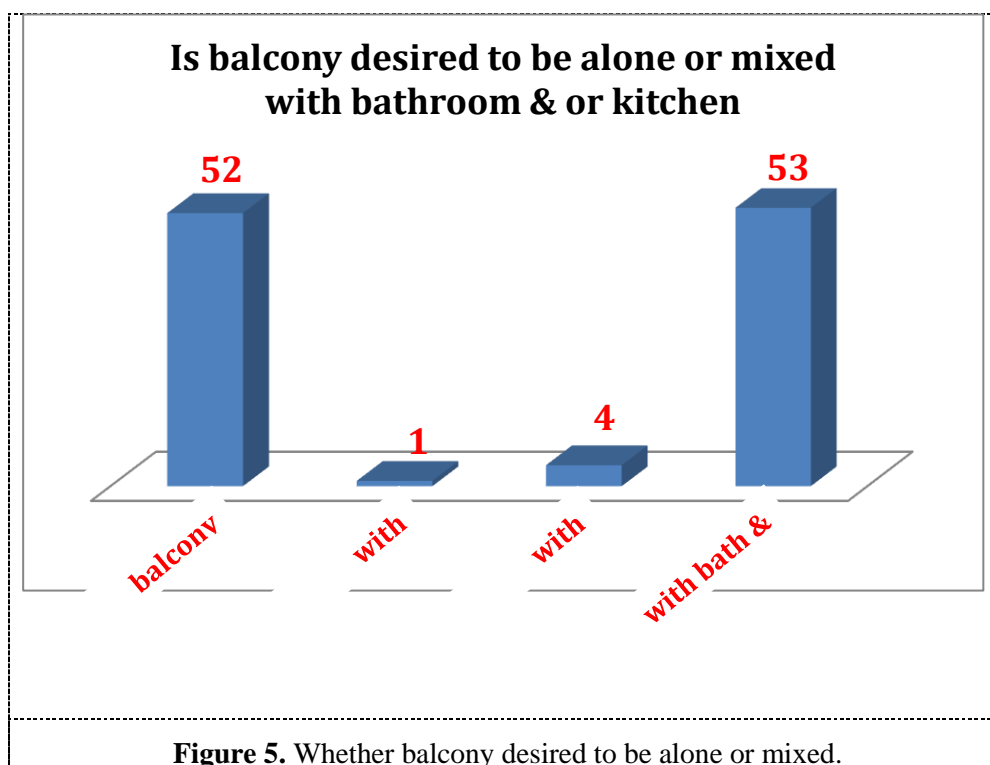


Figure 4. Is balcony existence desired; which balcony design is desired?

Figure 4 above shows that almost all respondents desired the existence of balcony. From 110 respondents only 2 of them did not need balcony on their units. Even 40 of 108 respondents who desired the availability of balcony declared that they were highly in need of the balcony. From here it can be ascertained that the presence of balcony was definitely required by the occupants of *rusunawa*.

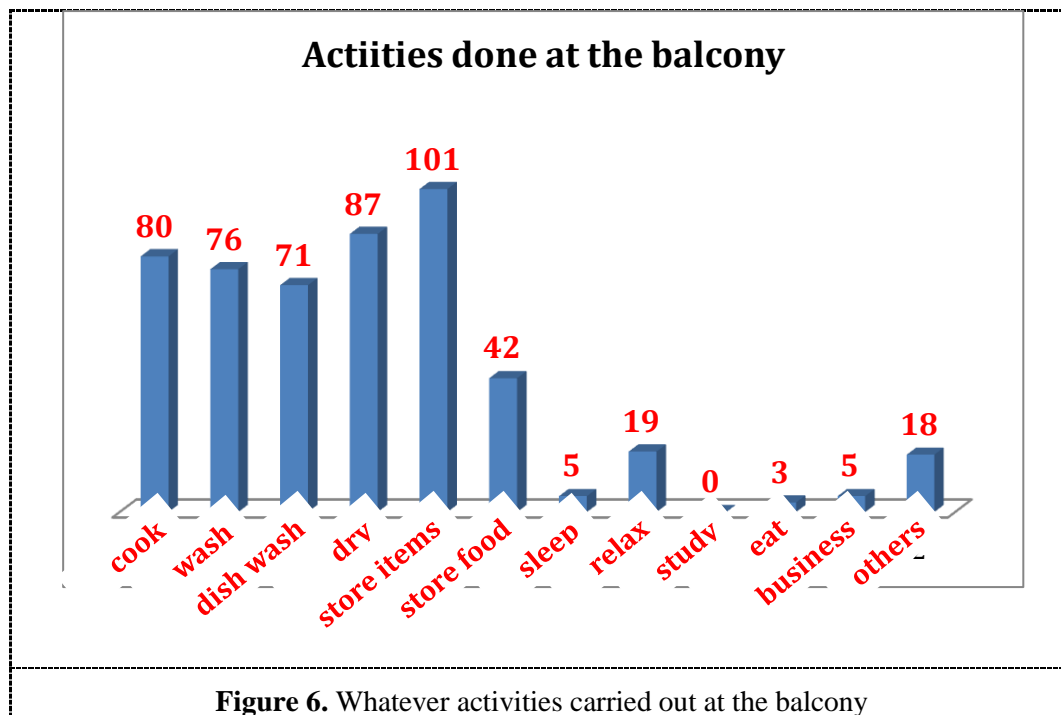
Regarding the design, seen from the right graph, almost all respondents expressed their desire to have a private balcony instead of a continuous one that can be shared and accessed by neighbours. From all 110, only 3 respondents preferred to have their balcony designed continuously. It was proved that almost all residents wanted a balcony that separated each other from their neighbour's. Further design requirements asked whether the balcony should be designed indoor or outdoor, 65% of total respondents liked their balcony to be indoor, meaning that the balcony should be protected or bordered by walls and glasses or windows, and only 35% or 39 respondents preferred that their balcony was provided outdoor or directly open to outside fresh air. This contradicted the previous research result that required the balcony to be designed outdoor. The outdoor balcony complete with the sun devices is proven to be successful in reducing the temperature of internal space.



Other design requirement resulted in almost fifty-fifty calculation. From all 110 respondents, 52 of them preferred that their balcony be provided alone with no bathroom or kitchenette mixed inside. While the other 48% or 53 respondents desired to have their balcony be provided along with bathroom and pantry within. 5 families liked their balcony to be mixed with only one of them. Four of them wanted to be mixed with pantry, and only one wanted their balcony to be mixed with bathroom.

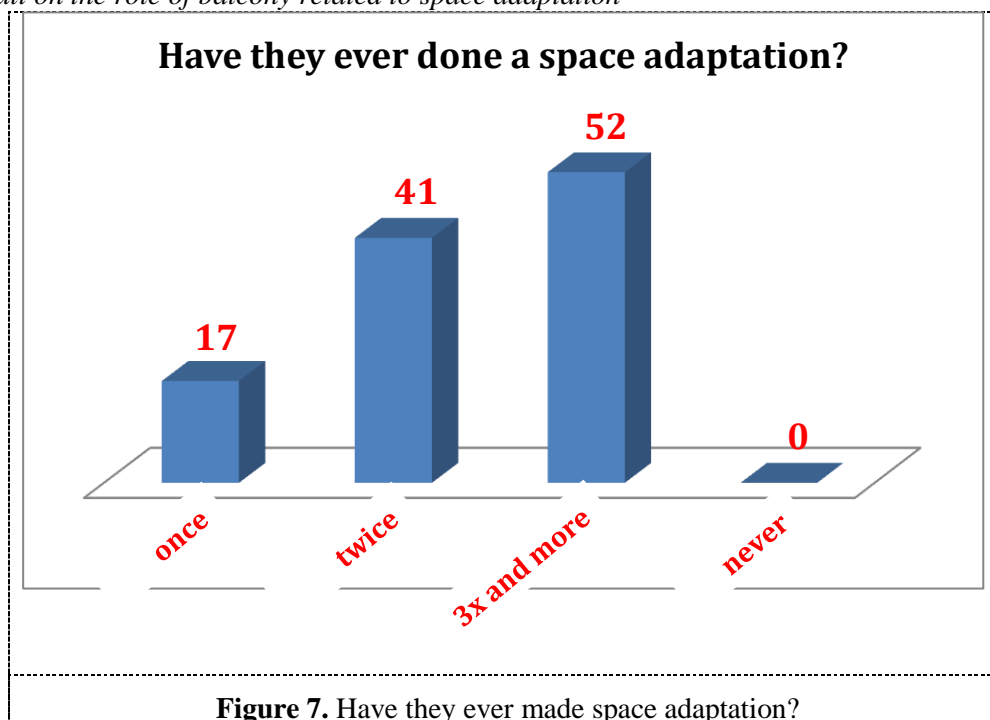
3.2. Result on whatever activities are done on the balcony

The most activity that carried out at the balcony was storing items. 101 respondents or 92% of them put their items at the balcony. The second top was drying in which 87 families or 79% respondents dried their laundry or others there. The third top was cooking. 73% or 80 respondents stated that they cooked at the balcony.



The top four was washing, which was done by 76 households, followed by dishwashing done by 71 respondents, storing food by 42 of them, and the rest were activities conducted by smaller than 20% of total respondents e.g. relaxing which was done by 19 respondents, sleeping and home based business by 5 respondents respectively, and eating by 3 respondents. Nobody studied at the balcony.

3.3. Result on the role of balcony related to space adaptation



From the figure it is shown that all respondents had ever adapted their space to meet their requirements, even most of them namely 52 respondents 47% did adaptation three times or more. The other 41 respondents or 37% did it twice, and the rest 17 or 15% did it once. Nobody of them had never done spatial adaptation. It can be confirmed that all occupants made adaptation as time goes by.

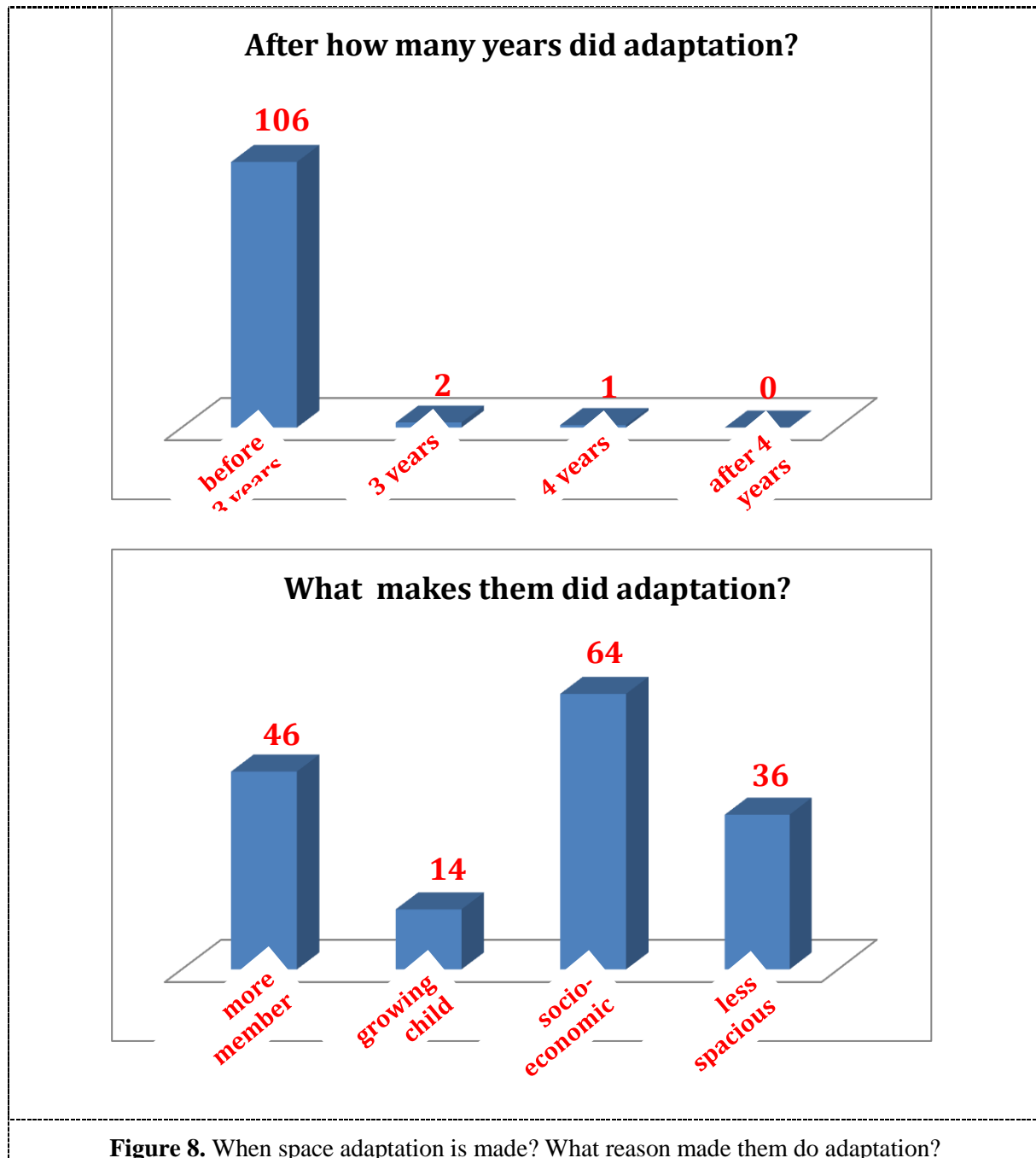
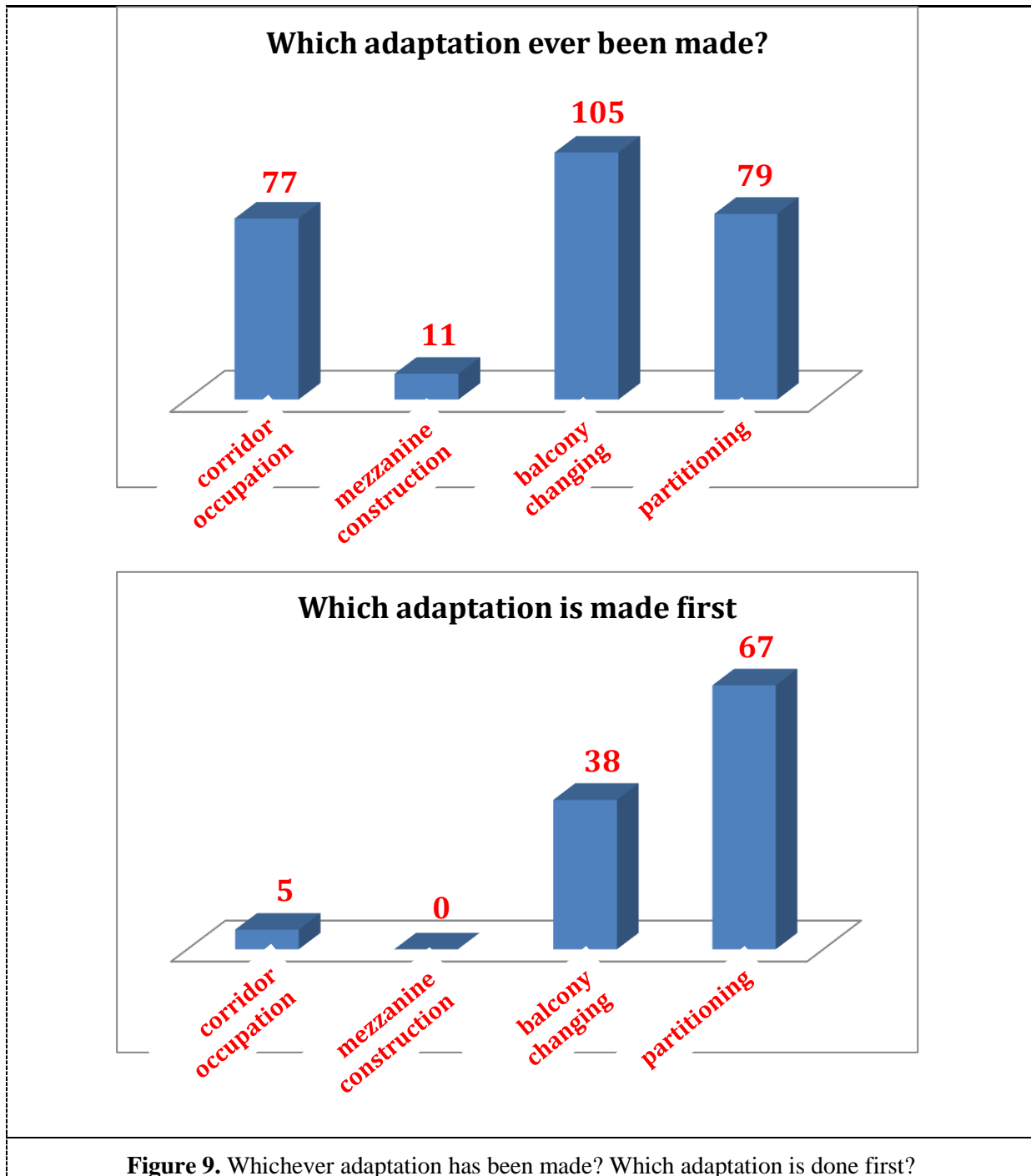


Figure 8. When space adaptation is made? What reason made them do adaptation?

The spatial adaptation even had already been made before 3 years of their living in *rusunawa* unit. As seen above, there were 106 families or 96% respondents adapted their space earlier than 3 years living in the unit. Only less than 4% respondents did adaptation after three years. This proved that occupants of *rusunawa* absolutely needed to do spatial adaptation [17]. This must be well anticipated [18].

When they were asked about what reason that encouraged them to do adaptation, most of 64 respondents said socio-economic condition made them adapt spatially. The second top reason was

because of additional household members. The other 36 respondents said because of less spacious space. While the rest 14 respondents stated that growing up with children pushed them to do spatial adaptation.



Regarding whichever adaptation has been made? Almost all respondents did more than one type of adaptation. However, from the figure above it is shown that most type of adaptation was balcony change. 105 respondents ever changed their balcony into another functional space or a more living space. Partitioning took the second place by making 79 respondents divided their internal space into smaller ones. Corridor occupation took the third in which 77 respondents occupied parts of the corridor space. While mezzanine construction was only done by 11 respondents.

From all 4 types of adaptation, partitioning was done firstly, in which 67 respondents said that from all adaptation types they had ever made, they initially did partitioning. The other 38 respondents declared that the first adaptation they made was balcony changing, and only 5 respondents stated that the first adaptation done was corridor occupation. Nobody said that they started by constructing mezzanine.

4. Discussion

Firstly from figure 4, it could be assumed that the existence of balcony on *rusunawa* units was definitely desired and demanded by residents, and it should be a private balcony, not a continuous one. The reality that the comparison between residents preferred their balcony to be indoor and outdoor was 65:35 confused the author. I am afraid that this is possibly because their balcony is currently an indoor balcony. In fact, the research in previous year proved that balcony that was able to reduce the heat of air and fix the thermal comfort of the internal space was an outdoor balcony. However, it is an absolute requirement that this outdoor balcony be equipped with solar thermal protectors or sun devices that meet the needs, both the design and the material.

The balcony (fig. 5) can be designed to be alone outside the unit, or mixed with bathroom and pantry. Either one was fine since the result indicated the same amount between respondents' interest in balcony alone and in balcony mixed with bathroom and pantry. When the balcony was designed to be alone then the bathroom and pantry were located inside. However these two should get fresh air and healthy sunlight from the balcony, which was located outside the unit. When the design of the balcony was mixed then the bathroom and pantry were located outside at the balcony. Both choices can be made in good and healthy design.

Considering (fig.6), it is clear that *rusunawa* occupants consider that the balcony was more appropriate for storing and drying space. However, cooking, washing, dishwashing, and storing food were also in favour for them to be conducted at the balcony. Since storing items cannot be ascertained in size, so it was recommended that the size of the balcony be designed by referring to the need for drying activity. At least the distance of balcony should cover times of drying line that needed 60 cm per line. It still needed extra space for the balcony itself at least 90 cm. So the distance of balcony should be minimally 1.50 m, however, more lines for drying were indeed preferred when additional distance was possible.

From (fig.3) it is confirmed that the rate of household members should account as 4 people. However with the increase of time there should be development occurred that could be caused by the growth and addition of children or the development of socio-economic condition of the family, which could be either an improvement or a decline. Frequently in low cost apartment, there is an establishment of home-based enterprise either when a family experiences an improvement or a decline in their socio economic condition. Both of them require additional space since for this business there should be a space that cannot be mixed with the private space, as there will be consumer who is outsider instead of member of the family. The space must be considered as public or semi public space rather than a private space.

Here the space that must be released is the existing living space, so that the family needs additional substitution of space transferred into the public space, as it becomes a business room. This situation will inevitably force residents to adapt spatially in order to meet their space demand. This is evident in this study where almost all residents had adapted 3 times and the adaptation was firstly done before 3 years they inhabited the unit. If it was like this usually occupants did some action, if not occupy the corridor they changed the balcony into a living or internal space because their private space was already sacrificed as a business room.

Regarding adaptation, it is clear that compared to the other two adaptation actions, corridor occupation and mezzanine construction, changing the balcony into an inner space is the most correct and legal, as well as inexpensive action. So, it is appropriate that most widely adaptation action chosen by residents is balcony changing, although the first action is partitioning space instead of changing balcony.

From the results of research survey it is proved that residents of *rusunawa* needed the balcony. Related to artificial ventilation, [19] has proven that applying the hybrid ventilation method using balcony space in apartment housings will not only create a comforting atmosphere but also reduce the cooling energy consumption compared to the constant mechanical ventilation. In *rusunawa*, most of residents apply mixed ventilation system by using fan and natural ventilation; only a few applied air conditioner and they only turned on the AC when it was too hot. When the air was cool enough they did not use AC. Unlike the hybrid system, *rusunawa* did not have intelligent control system that can switch automatically between natural and mechanical modes in order to minimize energy consumption. The design elements of a balcony affected the solar radiation entering the building (e.g. balcony depth, window-to-wall ratio, glazing optical properties, etc. have a significant impact on the heating loads [20]. Therefore the dimensions as well as materials applied need further investigation.

5. Conclusion

It can be concluded that the existence of balcony proved not only desired and needed but also benefited the inhabitants because they could carry out several household activities. It is also potential to solve the problem of lack of space, or to anticipate space adaptation. Moreover this balcony is proven to quantitatively improve the thermal conditions of its interior space. So it must be guaranteed that the balcony is provided on the design of the upcoming *rusunawa* units. Local government as the provider of *rusunawa* must be able to assure the availability of a private outdoor balcony at each unit of future *rusunawa* with the least distance of 1.5m.

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7. References

- [1] Palmer Isabelle (2012). *The Balcony Gardener: Creative ideas for small spaces*. Kindle Edition. Ryland Peters & Small and CICO Books.
- [2] Maslow (1970). *Motivation and Personality*. Harper & Row. New York.
- [3] Lestan, Erzen, Golobic (2014). *The Role of Open Space in Urban Neighbourhoods for Health-Related Lifestyle*. International Journal of Environmental Research and Public Health Vol.11/6, pp 6547-6570. doi: [10.3390/ijerph110606547](https://doi.org/10.3390/ijerph110606547).
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4078595/>
- [4] Canizares AG (2006). *Outdoor Spaces (Good Ideas)*. Collins Design. ISBN-10: 0060893230.
- [5] Givoni B (1998). *Climate Consideration in Building and Urban Design*. Copyright 1998, by Van Nostrand Reinhold. Publisher ITP, a division of International Thomson Publishing Inc.
- [6] Kennedy R, Buys L, and Miller E (2015). *Residents' Experiences of Privacy and Comfort in Multi-Storey Apartment Dwellings in Subtropical Brisbane*. Journal of Sustainability 2015, vol.7, issue 06, page 7741-7761; ISSN: 2071-1050; doi:10.3390/su7067741.
<file:///C:/Users/OWNER/Downloads/sustainability-07-07741-v2.pdf>
- [7] Kwong W.C, Siu K.W and Chung Y.Y (2004). *The value of the provision of a balcony in apartments in Hong Kong*. Journal of Property Management Vol.22 No.3, 2004 pp. 250-264
[http://www.lantm.lth.se/fileadmin/fastighetsvetenskap/utbildning/Fastighetsvaerdering_VFTF05/The value of balcony in Hong Kong.pdf](http://www.lantm.lth.se/fileadmin/fastighetsvetenskap/utbildning/Fastighetsvaerdering_VFTF05/The%20value%20of%20balcony%20in%20Hong%20Kong.pdf)
- [8] Tedjokoesoemo (2014). *Balcony and Jalousi Effectiveness Review to Promote Daylight in Interior for Tropical Country*. Journal of Dimensi Interior vol.12, no.1, 2014 pp 51-56. ISSN: 1693-3532. <file:///C:/Users/OWNER/Downloads/19370-23604-1-SM.pdf>
- [9] Marylee Pangman (2015). *The Potted Desert Garden: Transform a Balcony into a Garden Paraduse*. CV Independent January 13, 2016. <https://www.cv-independent.com/index.php/en-US/opinion/potted-desert-garden/item/1904-the-potted-desert-garden-transform-a-balcony-into-a-garden-paradise>
- [10] Lippsmeyer Georg (1994). *Bangunan Tropis*. Jakarta: Erlangga

- [11] King P (2004). *The room is too panic, an example of film criticism and housing research*. Journal of Housing Theory and Society. Vol.21, issue 1, 2004. Page 27-35.
- [12] Homedit Interior Design & Architecture (January 23, 2012). *45 Inspiring Small Balcony Design Ideas*. <https://www.homedit.com/45-inspiring-decor-ideas-for-small-balconies/>
- [13] Kisnarini R (2015). *Functionality and Adaptability of Low Cost Apartment Space Design. A case of Surabaya Indonesia*. Tue Eindhoven, the Netherlands.
- [14] Pile JF (1988). *Interior Design (book)*. Library of Congress cataloguing in Publication Data. Harry and Abrams Incorporated. New York.
- [15] Szokolay SV (1980). *Environmental Handbook for Architects and Builders*. The Construction Press Ltd Lancaster, England. Published in the USA by Halsted Press and division of John Wiley & Sons Inc. New York.
- [16] Groat and Wang (2003). *Architectural Research Methods*. Library of Congress Cataloguing-in – publication-Data. John Wiley & Sons. Canada.
- [17] Geraets Rob (2001). *Future Value of Buildings*. Faculty of Architecture. University of Technology Delft (TU Delft), the Netherlands.
- [18] West BN and Emmit Stephen (2004). *Functional design and analysis of new speculative house plans in the UK*. Journal of Design Studies. Vol.25, issue 3, May 2004. Page 275-299.
- [19] Won, Kim, and Leigh (). *An Evaluation of Energy Performance of Hybrid Ventilation System Using the Balcony Space in Apartment Housing*. CIB 8160, pp 757-762. <http://www.irbnet.de/daten/iconda/CIB8160.pdf>
- [20] Clarke, Johnstone, Kim, Kokogianakis, Strachan, Kim, Woo, and Kang (2008). *Study of the Energy Performance of Korean Apartment Buildings with Alternative Balcony Configurations*. World Renewable Energy Congress 2008. <http://www.esru.strath.ac.uk/Documents/lea70.pdf>