CORRIDOR AS A SUSTAINABLE SOCIAL SPACE IN HIGH-RISE RESIDENTIAL BUILDING

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Abstract. Sustainable quality in high-rise buildings is not only seen from the physical building but also about how humans can have the opportunity to interact socially with other humans and between humans and their environment. This article is about an experiment regarding possible interventions that can carry out on corridors in high-rise buildings. The purpose of this experiment modelling is to open another perspective on sustainable thinking in high-rise buildings, namely on the aspect of considering the need for social space in high-rise buildings. In several precedent studies in this article, the efficiency of high-rise buildings corridors is often the main objective. The width of the corridor space, the height of the space, and the design process only fulfill the function of circulation passers-by. Whereas, on the other hand, the corridor as the central circulation in high-rise buildings, which of course will always be used and passed by residents, is the only space where the opportunity to interact with other residents can occur, as well as the opportunity to interact with the surrounding environment. The corridor has a significant potential to affect residents’ lives and ways of life. Therefore, if we as an architect can design intervention in the corridor by including social responsibility considerations, it will make the corridor more lively and create an excellent social interaction space between residents and residents with the environment. Consequently, in the long term, a good quality corridor will be able to change and influence the way of social life so that, in the end, it can help achieve sustainable architecture.

Keywords: Vertical Living, Highrise Residential Building, The Three Spheres of Sustainability, Social Space, Corridor, Sustainable Architecture

1. Introduction

1.1 Backgrounds

According to data from the Population Department of the United Nations Division of Social and Economic Affairs in June 2017, the world’s population currently reach 7.6 billion. This
figure predicts to rise to 8.6 billion in 2030, then 9.8 billion in 2050. This population growth will indirectly affect the development of the city. [1]

At present, the growth of cities in the world is getting faster, more crowded, denser, and more competing in vertical building, as seen in Figure 1.1. Earth occupation by humans and limited land make the construction of vertical residential buildings, especially in urban areas, inevitable.

![Figure 1.1](image1.png)

**Figure 1.1.** An overview of the growth of the cities in the world today.

One hundred seventy-nine countries, including Indonesia, attended the 1992 Earth Summit in Rio De Janeiro, held in response to the above phenomena and various environmental problems caused and natural resources increasingly apprehensive. This summit resulted in a collective agreement: the concept of sustainable development (Figure 1.2), which contains three pillars/principles, each of which cannot stand alone. These three pillars are interrelated and mutually support and complement economic, social, and environmental sustainability [2]. Thus, the concept of these three pillars becomes a kind of reference or mutual agreement. If we want to achieve Sustainable Architecture, these three pillars must fulfill [3].

The pillars of social sustainability are often forgotten, especially in high-rise projects. This opinion is upon observations on the green rating assessment parameters that are often used, such as LEED (America), BREAM (United Kingdom), and GBCI (Indonesia). Green rating assessment is a rating system or benchmarking tool that contains points of appraisal devices to assess the ranking of buildings to achieve the concept of environmentally friendly buildings. The parameters for green rating assessment regarding environmental sustainability and economic sustainability are more physical, tangible, visible, and measurable [4]. At the same time, social sustainability is something that is more intangible non-physical. Therefore, social sustainability is often forgotten
and not a top priority in vertical residential planning because this social aspect is challenging to measure or determine its parameters.

![Figure 1.2. The three spheres of the sustainability concept](image)

Another possible consideration is that this social space will reduce the efficiency of the economic value of a high-rise building. Therefore, more in-depth research on many case studies discussing social sustainability, especially in high-rise residential buildings, needs to be done [5].

### 1.2 Formulation of the problem

Figure 1.3 is an overview of high-rise residential corridors in Indonesia (Jakarta and Surabaya) that show the typical anatomy and ambiance of the corridor, which is generally a double-loaded corridor. We can see from the layout, the primary design consideration is area efficiency (both the area of the apartment unit and building area per floor), and the maximum GFA (Gross

![Figure 1.3 An overview of the corridor (double-loaded corridor) in high-rise residential building in Indonesia (Jakarta and Surabaya)](image)
Floor Area), NFA (Net Floor Area), and NSA (Net Saleable Area). Thus, the corridor becomes an impact on the remaining space [6].

The layout arrangement reflects that the primary orientation starts from the efficiency of the apartment units, maximizing the land to get a large number of apartment units. The corridor is more to the remaining space, which provides to meet the unit’s apartment circulation. Thus, the corridor is more like space only to be passed by, with left and right enclosing solid walls, a space that tends to be abstract, quiet, dark, and dead [7].

From several studies and analyses, many of these vertical living have not fulfilled social sustainability aspects. Accordingly, this study will emphasize creating sustainable social space in high-rise residential buildings but focus on CORRIDOR [8].

Corridor as a definite area and always exist in high-rise residential building, have a high frequency always to be used and passed by residents as the main circulation path from and to the unit of residence. Therefore, corridor has great potential to influence the lives and way of life of the residents. Therefore, if we as architects can propose a design intervention by including consideration of the rules of the social space parameters, the corridor can be an ideal sustainable social space that is needed and can be positively beneficial for residents, so that in the long run, it can help achieve Sustainable Architecture [7].

2. Case Study Analysis

2.1 Research Methods

The research method uses the case study evaluation and experimental modeling. First, the criteria for selecting the case study will be determined in advance so that the comparative analysis becomes more balanced, objective, and on target. Then, from the selected case studies, we will get an overview of the condition of corridors in high-rise residential buildings in Indonesia, especially in Surabaya. Next, the author makes direct observations on selected case studies, how the ambiance exists, how the atmosphere of the space occurs, whether there is a social space as intended, and how it affects the residents, how the overall space impacts the building, and the surrounding environment. Finally, the case study will analyze the “three spheres of sustainability” parameters after documentation and identification [9].

Then at the modeling method, the author uses ALOCATIVE / PRESCRIPTIVE modeling, an alternative comparison to get an “optimal solution.” This modeling determines by creating a set of conditions in selected case studies so that this modeling can provide the best solution for conditions. Scientific modeling in this research expresses the ideas that think so that they are easier to understand, define, measure, visualize or simulate by referring to existing knowledge and literature review and deepening the case studies analysis process. This modeling is searching for the most applicable possibilities for design interventions that can be applied in the corridor to create sustainable social spaces [8].

2.2 Case Study Criteria

The criteria or performance requirements of the case studies are :

1. High-rise buildings with the primary function are for residential (apartments).
2. The selected case studies are in the same range of class/level.
3. Have more than six floors.
4. It has been operating for more than five years.
5. The critical criterion is that the author has been occupied the case study for at least one month. Thus, the analysis can be more in-depth because the author has experienced and is involved in the corridor’s conditions.
6. The 3 case studies chosen by authors who meet the criteria above are:
a. Puncak Permai Apartment, Surabaya, Jl Raya Darmo Permai III, Dukuh Pakis, Surabaya, East Java, 60226
c. Cosmopolis Apartment, Surabaya, Jl. Arif Rahman Hakim, no. 147, Surabaya, East Java, 6011

2.3 Case study documentation / identification

There are several data regarding the corridor:
1. Case Study 1, on each tower floor, the corridor bears the circulation to accommodate 54 apartment units. The corridor type is the double-loaded corridor.
2. Case Study 2, on each tower floor, the corridor bears the circulation to accommodate 56 apartment units. The corridor type is the double-loaded corridor.
3. Case Study 3, on each tower floor, the corridor bears the circulation to accommodate 31 apartment units. Corridor type is a combination of the double-loaded and the single-loaded corridors [10].

The documentation of the case study, can be seen as below, in table 2.1.

Table 2.1. Documentation and identification of the selected case studies.
2.4 Case Study Analysis

To further deepen the analysis of the quality of the corridor, the three case studies will be reviewed by “the three spheres of sustainability” parameters:

1. Economic sustainability
   (a) Profit; (b) Cost Saving; (c) Economic Growth
2. Environmental sustainability
   (a) Natural Resources case, (b). Environmental Management, (c) Pollution Prevention
3. Social sustainability
   (a) Education, (b) Community; (c) Standard of Living

Table 2.2 Matrix comparison of the selected case studies, reviewed by the three spheres of sustainability parameters.
CASE STUDY ANALYSIS

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>CASE STUDY</th>
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<tbody>
<tr>
<td>1. Parok Formal Apartment</td>
<td>The corridor is 1.2 m wide. On the left and right sides of the corridor are straight and the walls of the apartment unit.</td>
</tr>
<tr>
<td>2. Parok Apartment</td>
<td>The corridor is 1.4 m wide. On the left and right sides of the corridor are straight and the walls of the apartment unit.</td>
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<tr>
<td>3. Corridor Efficiency</td>
<td>The corridor is 1.6 m wide. On the left and right sides of the corridor are straight and the walls of the apartment unit.</td>
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2. Corridor width efficiency
If referring to the regional regulation in building regulations, the minimum width of the corridor depends on the building type and the occupancy load, and the average width per person. The minimum width is 1.34 m.

3. Corridor efficiency

4. Cost-saving

5. Corridor width efficiency

- The efficiency width of the corridor can reduce the building area to reduce construction costs, development costs, operational costs, and maintenance/management costs.
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<td>1. Harsh Formal Apartment</td>
<td>The corridor is more enclosed from direct sun and direct heat. Therefore, in terms of the maintenance cost, this corridor is more efficient.</td>
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<td>2. Based Apartment</td>
<td>The corridor is more enclosed from direct sun and direct heat. Therefore, in terms of the maintenance cost, this corridor is more efficient.</td>
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<tr>
<td>3. Cosmopolitan Apartment</td>
<td>There will be more operational and maintenance costs in this corridor than double-loaded corridor because this corridor is open to the corridors and exposed to direct sun and direct heat. At a worst case, the corridor tends to be darker.</td>
</tr>
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6. Material selection

- MATERIAL: The floor material used is standard ceramic tile, matte, semi-gloss, and high gloss maintenance.
- WALL: Brick masonry, plastered and painted with cream wall paint because not exposed to the sun and rain.
- CEILING: Light steel frame and gypsum panel board with ceiling painted finish.
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<td>A. Natural Resource Use</td>
<td>This corridor is more enclosed, not open to the outdoors. Therefore, the user does not relate to the outdoor environment and does not experience time changing through the weather.</td>
<td>This corridor is more enclosed, not open to the outdoors. Therefore, the user does not relate to the outdoor environment and does not experience time changing through the weather.</td>
<td>There is a connection with the nature outside the building, such as still being able to see the sky, feeling the air outside, the changing weather outside, the landscape outside the building, other frames outside the building.</td>
<td></td>
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<tr>
<td>B. Environmental Management</td>
<td>This corridor is more enclosed, not open to the outdoors. Therefore, the user does not relate to the outdoor environment and does not experience time changing through the weather.</td>
<td>This corridor is more enclosed, not open to the outdoors. Therefore, the user does not relate to the outdoor environment and does not experience time changing through the weather.</td>
<td>This corridor is open and in direct contact with outdoor spaces, thus creating opportunities for environmental management. For example, in settings, plants and vertical gardens can be made.</td>
<td></td>
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<tr>
<td>C. Pedestrian Freindliness</td>
<td>This corridor is in the middle, Extensible apartment units. Therefore, it can reduce pollution (air pollutants, noise pollution) from outside that enters the corridor. Nevertheless, in the other hand, if something happens (e.g., air pollution) inside the corridor, it cannot be quickly resolved because it only ends at the opening at the end of the corridor, which is a dead end.</td>
<td>This corridor is in the middle, Extensible apartment units. Therefore, it can reduce pollution (air pollutants, noise pollution) that enters the corridor. Nevertheless, in the other hand, if something happens (e.g., air pollution) inside the corridor, it cannot be quickly resolved because it only ends at the opening at the end of the corridor, which is a dead end.</td>
<td>By forming some landscapes, corridors can help reduce pollution (air and noise pollution). However, if something happens (e.g., air pollution) inside the corridor, it can be quickly removed because it is able to open, allowing anyone to escape directly.</td>
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<td>A. Education</td>
<td>The narrow corridor width and the glassy ambience makes it impossible to carry out educational activities.</td>
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<td>There is a necessity to make &quot;apartments&quot; to carry out educational activities in the corridor with sufficient width and a warm and atmosphere. For example, it is still enough to place a chair or bench as a reading corner or discussion room.</td>
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<tr>
<td>B. Community</td>
<td>The narrow width of the corridor, and the glassy ambience, make it impossible for community activities to occur.</td>
<td>The narrow width of the corridor, and the glassy ambience, make it impossible for community activities to occur.</td>
<td>While a sufficient width is a work of atmosphere, and a high enough ambience from inside and the building, there is a connection with the outside, creating an &quot;apartment&quot; to carry out community activities that are a community to realize.</td>
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For example, a "front porch" is the place to receive guests and to discuss, but people can "a lavender" is turned to, as in the following example, an apartment to happen.
From the data of the 3 case studies can be concluded that the apartment with a double-loaded corridor type has several characteristics [11]

1. Tower layouts with the primary design orientation are to maximize the number of apartment units. The primary consideration is more on the calculation of area efficiency, such as optimizing the GFA (Gross Floor Area), NFA (Net Floor Area), NSA (Net Saleable Area)

2. Corridors are leftover spaces that are just there, only to meet the circulation needs of occupants to the apartment unit.

3. The corridor becomes a dark, gloomy space because the corridor is flanked by apartment units on the left and right, with no outside light entering. Therefore, there is no interaction with weather changes outside.

4. Residents tend to be in rooms/apartment units more often than in the corridor, lobby, or other shared areas. So the corridor tends to be quiet.

5. Occupants are more likely to be individual residents [12].

3. Modelling

The possible possibilities for design interventions modeling that can be done in the corridor are as follows:

1. Design Intervention type 1: The social space pocket.
A. For Single Loaded Corridor

Figure 3.1 Design intervention concept type 1, for Single Loaded Corridor

This proposed intervention applied to a single loaded corridor with a width of more than 1.5m and has overdrafts that can use for the smallest “social space.” Thus, 1.5 m is a minimum clean distance for circulation without disturbing the additional social space. The blue color shows the area of social space, and the green color in adding greeneries. The figure on the right is an illustration of the description of the intervention [10].

B. For Double-Loaded Corridor

Figure 3.2 Design intervention concept type 1, for Double Loaded Corridor

This intervention applied to the double-loaded corridor by removing several units, at least two units per 1 set of social space modules. One unit downstairs and one unit on the floor above. So that the social space created has a reasonably high floor to ceiling - “double-height ceiling.” [13].
Some of the benefits of this possible intervention are:

- Corridors become more “fun” because there is a feeling of having a destination place to go.
- The corridor feels not long because there is a pleasant “break” that breaks the length of the corridor.
- “Break” is used as a gap to enter natural air, natural light, and sounds from outside.

With direct contact with the outside, it is possible if farming carries out in the area. If successful, it can undoubtedly invite birds to come so that new biodiversity can occur created [14].

Figure 3.3 shows the results of the design intervention in the form of a double-height ceiling social space, complete with the landscape, and hopes to become an oasis for the existing corridor. Figure C shows the appearance/atmosphere of the social space from the downstairs corridor. Figure D shows the relationship between the hole in the corridor above it towards the void in the social space. Finally, figure E shows the marker of social space as a new “destination,” and there is a new life in the corridor space [3].

2. **Design Intervention type 2: Dedicated zig-zag social space.**

This intervention is also applied to double-loaded corridors and develops intervention type 1 (the social space pocket). The main concern in this intervention is the placement of crossing-cross ventilation positions. It can be seen in Figure 3.4 that the position of the social space is placed cross/zig-zag, not in line with the social space above. The benefits obtained from this type are in addition to the same benefits as the previous type. There are also other advantages, which can create more cross-circulation paths both horizontally and vertically [1].
From an economic point of view, this proposal is certainly not ideal because the eliminated apartment units are pretty significant. However, this strategy can give “commercial value” to the social space to be “sold” and provide added value.

Figures 3.5 shows the changes seen from before the intervention and after applying the proposed intervention. It can see that social space becomes more numerous and can be coordinate into a dedicated social space. Each unit has its own outside social space. Of course, with good packaging and strategy, this social space can be “sold” to provide added value commercially [15].

**Figure 3.4** Design intervention concept type 2, dedicated zig-zag social space
Figure 3.5 Illustration of Design intervention concept type 2, dedicated zig-zag social space

4. Conclusion

As the main circulation space, the corridor, which always exists in high-rise residential buildings, has a high frequency always used and always passed by the occupants. Therefore, the corridor has great potential to influence the lives and the way of life of the residents. Suppose we can do a design intervention by incorporating considerations of the social space parameters. In that case, the corridor can potentially be an ideal social space that is needed and positively beneficial for occupants, which in the long run can help achieve Sustainable Architecture. Corridors have the potential to become a sustainable social space that can fulfill social sustainability aspects, in addition to the other two pillars, namely economic sustainability and environmental sustainability, if they meet the following criteria:

1. Corridors have OPENINGS in the proper position and correct dimensions to allow nature to enter the corridor to connect with the outside create.
2. Corridors have RELATIONSHIP with outdoor spaces and also with other residents.
3. Corridors can create OPPORTUNITIES OF SPACE for residents to interact with both residents and guests to increase interaction quality.
4. Corridors can help identify and personalized residents living environments [16].

It has been mentioned in the previous chapter that the economic aspects are one of the essential aspects of the three pillars of sustainable architecture. However, in this study, there are minimum studies in-depth on this. The limitation of the author to calculate and assess economically is the main obstacle. The supporting technical data as material for calculating the cost of construction developing further research is a more in-depth discussion and technical aspects of the economy that can support the opinions from the economic experts involved and capable in the high-building construction and vertical residential management.
References