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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. 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.

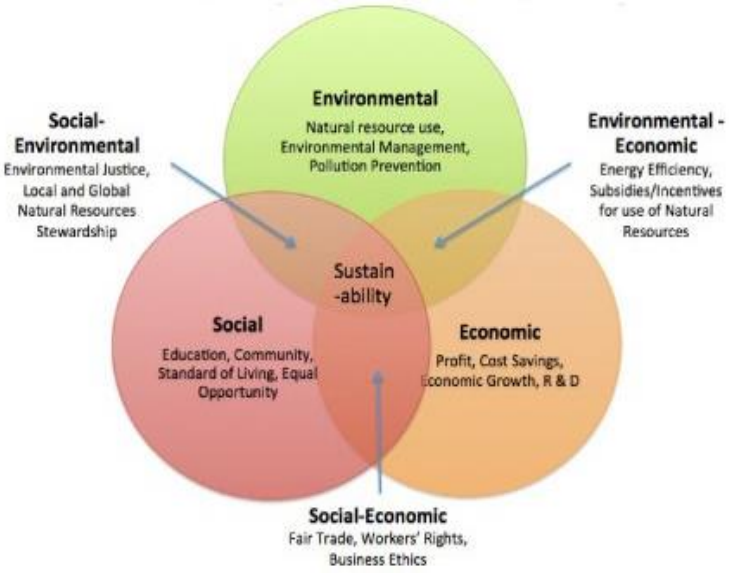


Figure 1.2. The three spheres of the sustainability concept

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)

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
b. Purimas Apartments, Surabaya, perumahan purimas, Surabaya, East Java, 60294.
c. Cosmopolis Apartment, Surabaya, Jl. Arif Rahman Hakim, no. 147, Surabaya, East Java, 6011

2.3 Case study documentation / identification

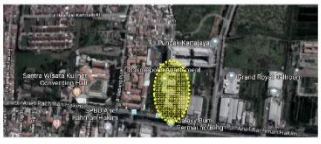
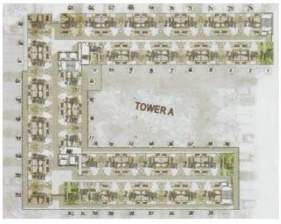
There are several data regarding the corridor:

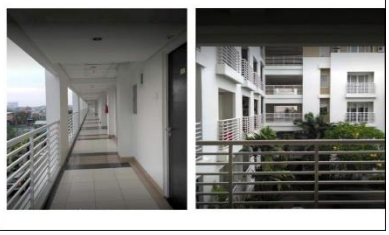
1. *Case Study 1*, on each tower floor, the corridor bears the circulation to accommodate 54 apartment units. The corridor type is the double-loaded corridor.
2. *Case Study 2*, on each tower floor, the corridor bears the circulation to accommodate 56 apartment units. The corridor type is the double-loaded 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.

DOKUMENTASI / IDENTIFIKASI STUDI KASUS

	DATA	STUDI KASUS 1	STUDI KASUS 2	STUDI KASUS 3
		Apartemen Puncak Permai Surabaya Jl Raya Darmo Permai III Pradahkalikendal Dukuh Pakis, Surabaya, Jawa Timur, 60226	**Apartement Purimas Surabaya** Gunung Anyar Surabaya, Jawa Timur, 60294	**Apartemen Cosmopolis Surabaya** Jl Arif Rahman Hakim no. 147 Surabaya, Jawa Timur, 60111
1	**MASTERPLAN** (surroundings)			
		located in a commercial area	located in a residential area (purimas housing) and close to the campus area (UPN)	located in the residential area (Galaxy Bumi Permai) and also close to the education area (ITS, HangTuah, vitaschool)
2	**SITEPLAN / BLOKPLAN** (neighbourhood)			
		housing, apartments, schools, markets, offices, commercial shops (cafes, restaurants, banks, laundry, shops)	perumahan, sekolah, ruko komersial (café, restoran, bank, laundry, toko)	residential, schools, commercial shophouses (cafes, restaurants, banks, laundry, shops)
3	**view from main road**			
4	**LAYOUT PLAN TOWER**			

4	**PROFILE TOWER DATA**			
	- apartment class	middle	middle	middle up
	- facilities	swimming pool, commercial on ground floor.	swimming pool, commercial on ground floor.	swimming pool, gym, parking lot, commercial on ground
	- number of towers	**3** towers (per des 2018)	**1** tower (per des 2018)	**5** towers (per des 2018)
	- number of floors	TOWER A : **16** storeys	**14** storeys	**6** storeys
	- total apartement units	TOWER A : **700** unit	**624** unit	**181** unit
	- total apartment unit / floor	**54** small unit type (studio)	**56** small unit type (studio)	**10** small unit type (studio) + **21** big unit type (1BR, 2BR)
5	**CORRIDOR DATA**			
	- corridor type	double loaded coridor	double loaded coridor	single loaded coridor
	- heigh ceiling corridor	2,4 m	drop ceilling 2,4 m, up ceilling 2,7m	2,6 m
	- corridor width	1,5 m	1,6 m	1,7 - 1,9 m
	- corridor boundary	LEFT = solid wall + door to apartment unit RIGHT = solid wall + door to apartment unit	LEFT = solid wall + door to apartment unit RIGHT = solid wall + door to apartment unit	LEFT = solid wall + door to apartment unit RIGHT = railling, can see the sky and the atmosphere outside.
	- form of corridor space	linear / continuous long aisle	linear / continuous long aisle	Linear, but some are protruding at the apartment entrance, and it does not feel like aisles.
	- an overview of the atmosphere / ambiance during the day	dark, monoton and gloomy	dark, monoton and gloomy	bright, "airy", and there are often residents hanging out next to the railling
				

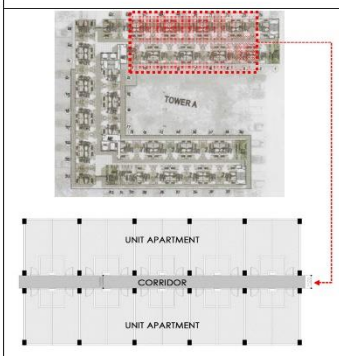
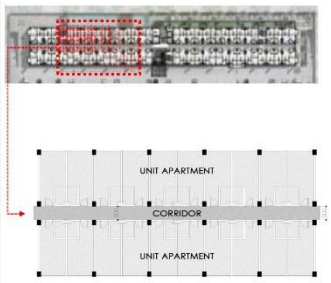
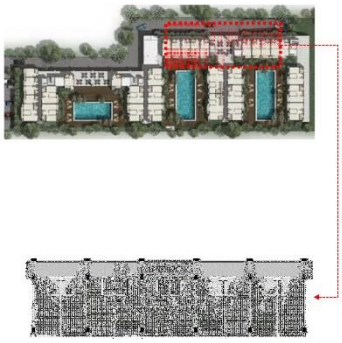
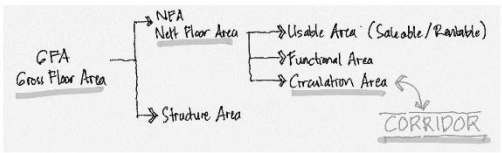
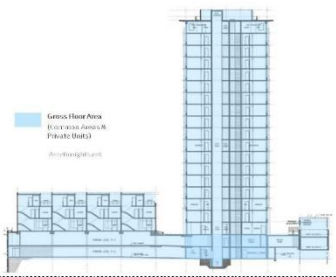
2.4 Case Study Analysis

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:

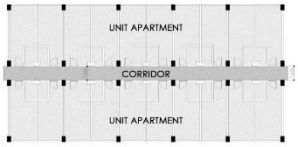
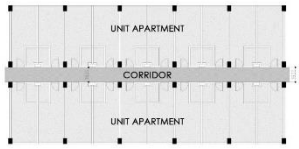
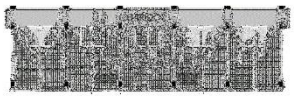
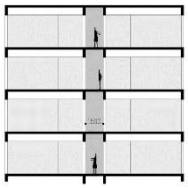
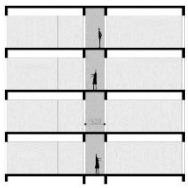
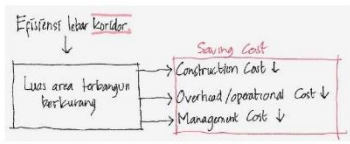
1. Economic sustainability
   (a) Profit; (b) Cost Saving; (c) Economic Growth
2. Environmental sustainability
   (a) Natural Resources case, (b). Environmental Management, (c) Pollution Prevention
3. Social sustainability
   (a) Education, (b) Community; (c) Standard of Living

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

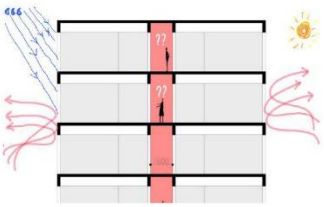
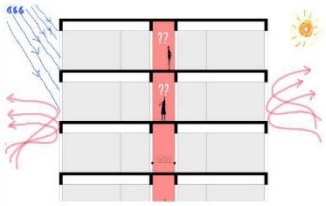
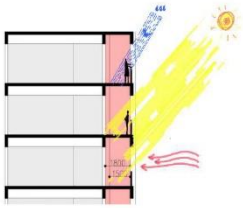
CASE STUDY ANALYSIS

	PARAMETER	CASE STUDY 1. Puncak Permai Apartment	2. Purimas Apartment	3. Cosmopolis Apartment
		CORRIDOR AREA THAT WILL BE ANALYZED		
				
1	**ECONOMIC**			
	A. EFFICIENCY			
	1. GFA area calculation	In high-rise building area calculation, corridors consider as GFA - Gross Floor Areas. Reducing the width of the corridor can reduce the area of the buildable area. This strategy will reduce construction costs and maintenance costs. In a high-rise building project, reducing the corridor width to just 10 cm only, for example, has a very significant impact on construction and operational costs because the multiplier factor is significant, namely the number of floors and the area of each floor. Another possible efficiency strategy is to move the difference in the area to the apartment unit area.		
				

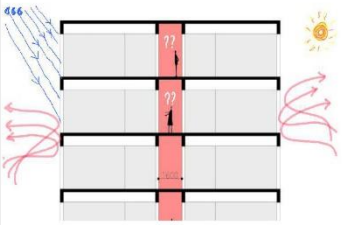
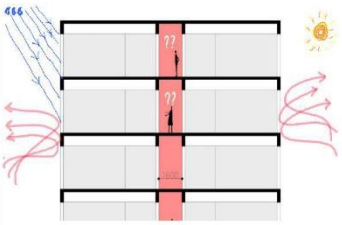
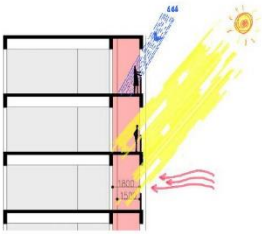
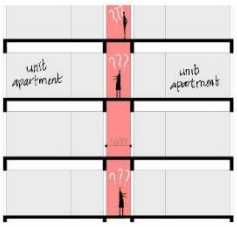
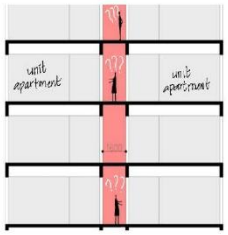
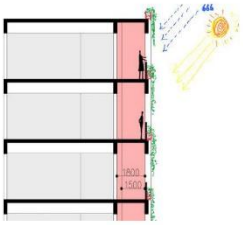
CASE STUDY ANALYSIS

PARAMETER	CASE STUDY		
	1. Puncak Permai Apartment	2. Purimas Apartment	3. Cosmopolis Apartment
	The corridor is **1.5** m wide. On the left and right sides of the corridor are straight and flat walls of the apartment unit. 	The corridor is **1.6** m wide. On the left and right sides of the corridor are straight and flat walls of the apartment unit. 	The corridor is **1.6 - 1.8** m wide. One side of the corridor is the railing. On the other side, break space occurs due to the notch at the apartment entrance door area. 
2. Corridor width efficiency	If referring to the regional regulation on building regulation, 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 **1.84** m		
			
3. Number of apartment units accessed from the corridor	the corridor can serve **54** apartments unit each floor.	the corridor can serve **56** apartments unit each floor.	the corridor can serve **30** apartments unit each floor.
	This type of corridor can serve two times more apartment units than the single-loaded corridor.	This type of corridor can serve two times more apartment units than the single-loaded corridor.	In this single-loaded corridor, the number of apartment units that this corridor must accommodate is less than the double-loaded corridor type.
B. Cost Saving			
1. Corridor width efficiency			
	The efficiency width of the corridor can reduce the built area to reduce construction costs, development costs, operational costs, and maintenance/management costs.	The efficiency width of the corridor can reduce the built area to reduce construction costs, development costs, operational costs, and maintenance/management costs.	This type of corridor is more inefficient than double-loaded because one side does not serve apartment units in terms of cost-efficiency.

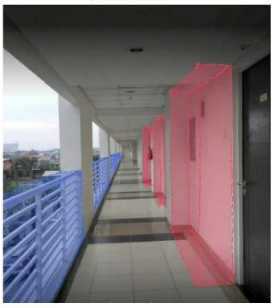
CASE STUDY ANALYSIS

PARAMETER	CASE STUDY		
	1. Puncak Permai Apartment	2. Purimas Apartment	3. Cosmopolis Apartment
2. Maintenance costs	This type of corridor is more enclosed from direct rain and direct sun. Therefore, in terms of the maintenance cost, this corridor is more efficient. 	This type of corridor is more enclosed from direct rain and direct sun. Therefore, in terms of the maintenance cost, this corridor is more efficient. 	There will be more operational maintenance costs in this corridor than double-loaded corridors because this corridor is open to the outdoors and exposed to direct sun and direct rain. As a result, the corridor tends to be dustier. 
	From the operational aspect, this corridor requires lighting (lamps) even during the day.	From the operational aspect, this corridor requires lighting (lamps) even during the day.	From the operational aspect, this corridor does not need lighting (lamps)—so more energy efficient.
3. Material selection	FLOOR : the floor material used is standard ceramics tile, matt, anti-slip. Economical price and low maintenance.	FLOOR : the floor material used is standard ceramics tile, matt, anti-slip. Economical price and low maintenance.	FLOOR : the floor material used is standard ceramics tile, matt, anti-slip. Economical price and low maintenance.
	WALL: brick masonry, plastered and painted with interior wall paint because not exposed to the sun and rain.	WALL: brick masonry, plastered and painted with interior wall paint because not exposed to the sun and rain.	WALL : one side is open, just a railing. The other side is brick masonry + exterior wall paint finish because it is open to sun and rain.
	CEILING : light steel frame + gypsum panel board with ceiling paint finish.	CEILING : light steel frame + gypsum panel board with ceiling paint finish.	CEILING : light steel frame + calsiboard panel with ceiling paint finish.
	The ceiling height is only 2.4m, which is efficient and one of the efforts to save construction and maintenance costs.	The ceiling height is only 2.4m, which is efficient and one of the efforts to save construction and maintenance costs.	The ceiling height is only 2.4m, which is efficient and one of the efforts to save construction and maintenance costs.
			

CASE STUDY ANALYSIS

	PARAMETER	CASE STUDY		
		1. Puncak Permai Apartment	2. Purimas Apartment	3. Cosmopolis Apartment
2	**ENVIRONMENTAL**			
	A. Natural resource use	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. 	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. 	There is connectivity with 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 humans outside the building. 
	b. Environmental management	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. 	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. 	This corridor is open and in direct contact with outdoor spaces, thus creating opportunities for environmental management. For example, in railings, planter boxes and vertical gardens can be made. 
	c. Polution Prevention	This corridor is in the middle, flanked by apartment units. Therefore, it can reduce pollution (air pollution, noise pollution) from outside that enters the corridor. Nevertheless, on the other hand, if something happens (e.g., air pollution/smoke) in the corridor, it cannot be quickly resolved because it only relies on the opening at the end of the corridor, which is quite far away.	This corridor is in the middle, flanked by apartment units. Therefore, it can reduce pollution (air pollution, noise pollution) from outside that enters the corridor. Nevertheless, on the other hand, if something happens (e.g., air pollution/smoke) in the corridor, it cannot be quickly resolved because it only relies on the opening at the end of the corridor, which is quite far away.	By farming some landscapes in corridors can help reduce pollution (air and noise pollution). However, if something happens (e.g., air pollution/smoke) in the corridor, it can be quickly resolved because one side is open, allowing air to escape directly.

CASE STUDY ANALYSIS

	PARAMETER	CASE STUDY		
		1. Puncak Permai Apartment	2. Purimas Apartment	3. Cosmopolis Apartment
3	**SOCIAL**			
	a. Education	The narrow corridor width and the gloomy ambiance make it impossible to carry out educational activities.	The narrow corridor width and the gloomy ambiance make it impossible to carry out educational activities.	There is a chance to make "opportunity space" to carry out educational activities in the corridor with sufficient width and a well-lit atmosphere. For example, it is still enough to place a chair or bench as a reading corner or discussion room. 
	b. Community	The narrow width of the corridor, and the gloomy ambiance, make it impossible to carry out community activities/activities that are a community in nature.	The narrow width of the corridor, and the gloomy ambiance, make it impossible to carry out community activities/activities that are a community in nature.	With a sufficient width and a well-lit atmosphere, and a high enough exposure seen from outside the building, there is a connection with the outside, creating an "opportunity space" to carry out community activities. Thus, for example, a bench placed to receive guests and discuss two people, or a "lion dance" is carried out, as in the following example, an apartment in Singapore. 

CASE STUDY ANALYSIS

PARAMETER	CASE STUDY		
	1. Puncak Permai Apartment	2. Purimas Apartment	3. Cosmopolis Apartment
c. Standard of Living	This corridor makes residents more individual because they will spend more time in the apartment unit, and there is no/little opportunity to get to know neighbors.	This corridor makes residents more individual because they will spend more time in the apartment unit, and there is no/little opportunity to get to know neighbors.	the standard/value of living can improve because there is still space for chat and discussion with neighbors in this type of corridor. (can be seen in the literature review chapter 2.2). In several apartments in Singapore that are similar to having single-loaded corridors, as in this case study, apartment units have windows facing the corridor. So that residents can find neighbors passing by, there is an opportunity to say hello, as in the following photo example—an apartment in Singapore. 
d. Equal Opportunity	This corridor provides equal opportunities to every occupant of the apartment unit.	This corridor provides equal opportunities to every occupant of the apartment unit.	This corridor provides equal opportunities to every apartment unit occupant, but this corridor can be more helpful in getting to know the living environment.
e. Social and creativity	The corridor is relatively narrow and dark. There is no "space of opportunity" to do anything in this corridor area. The created ambiance does not provide a "stimulus" to do something creative and social development. 	The corridor is relatively narrow and dark. There is no "space of opportunity" to do anything in this corridor area. The created ambiance does not provide a "stimulus" to do something creative and social development. 	This corridor provides stimulants, provides space for opportunities to develop, invites to do something other than just a space to pass. For example, it can do by farming some landscapes. There can be a small display for selling. There is space to discuss with neighbors while enjoying outside and add personification to apartment units' walls. 

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

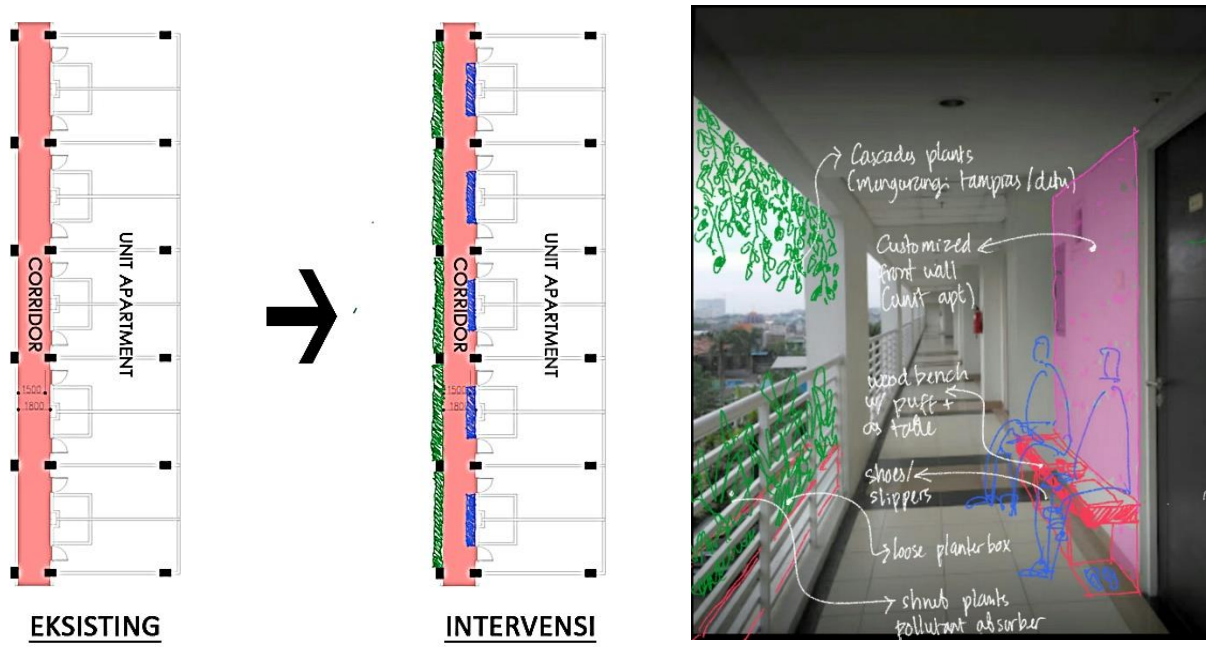


Figure 3.1 Design intervention concept type 1, for Single Loaded Corridor

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

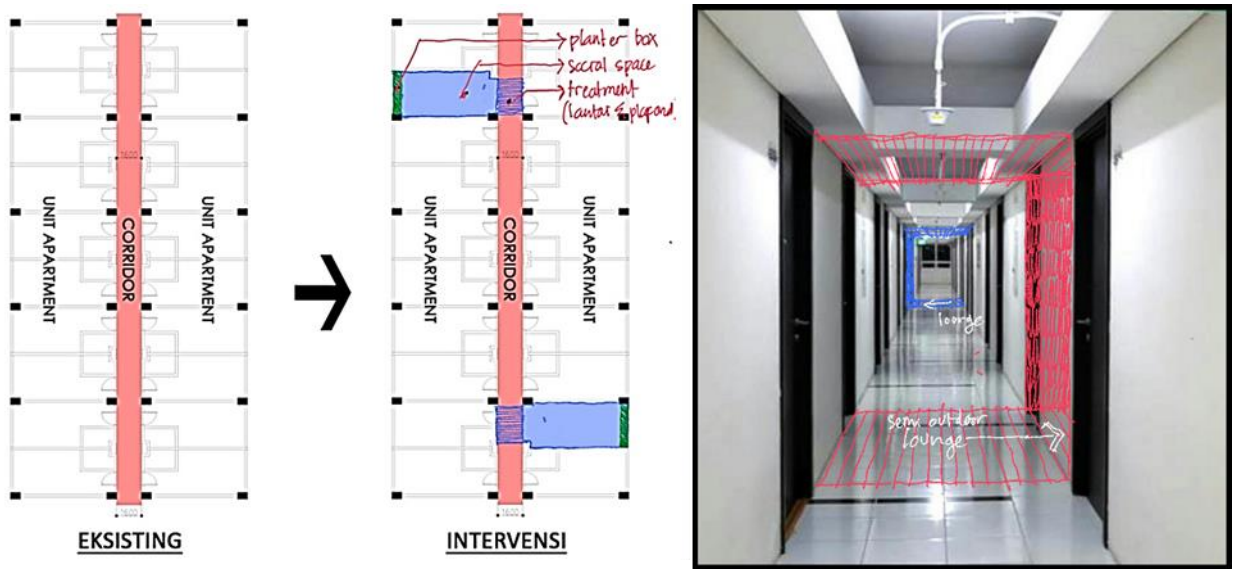


Figure 3.2 Design intervention concept type 1, for Double Loaded Corridor

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].

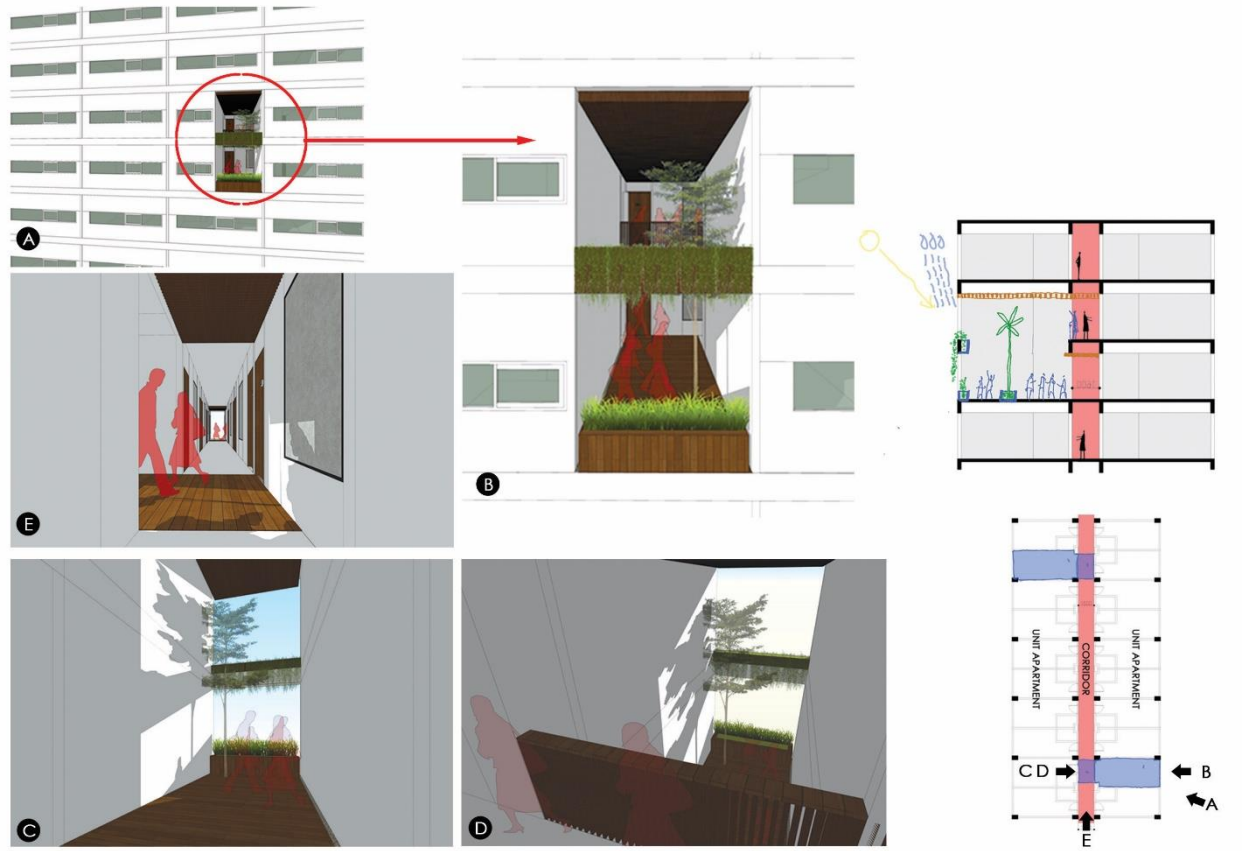


Figure 3.3 Illustration of Design intervention concept type 1, for Double Loaded Corridor.

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].

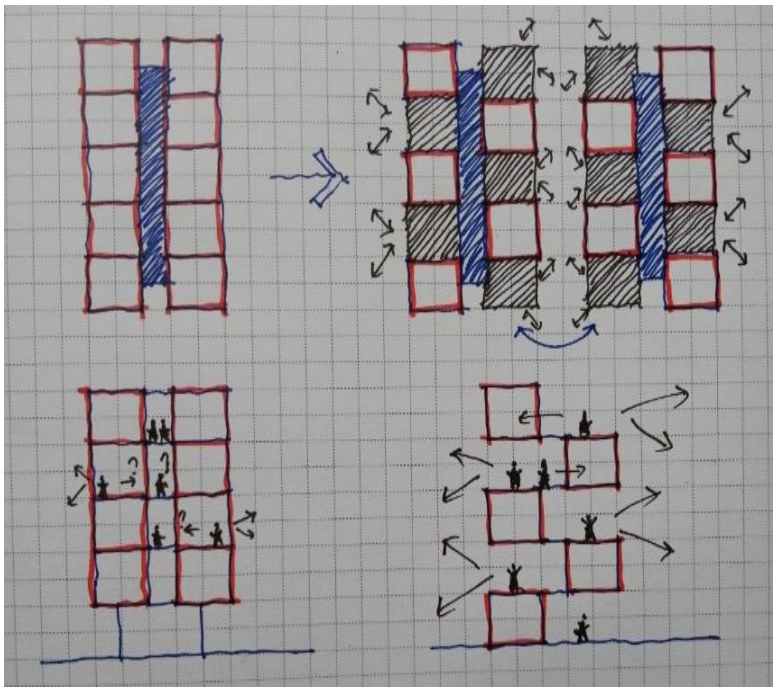
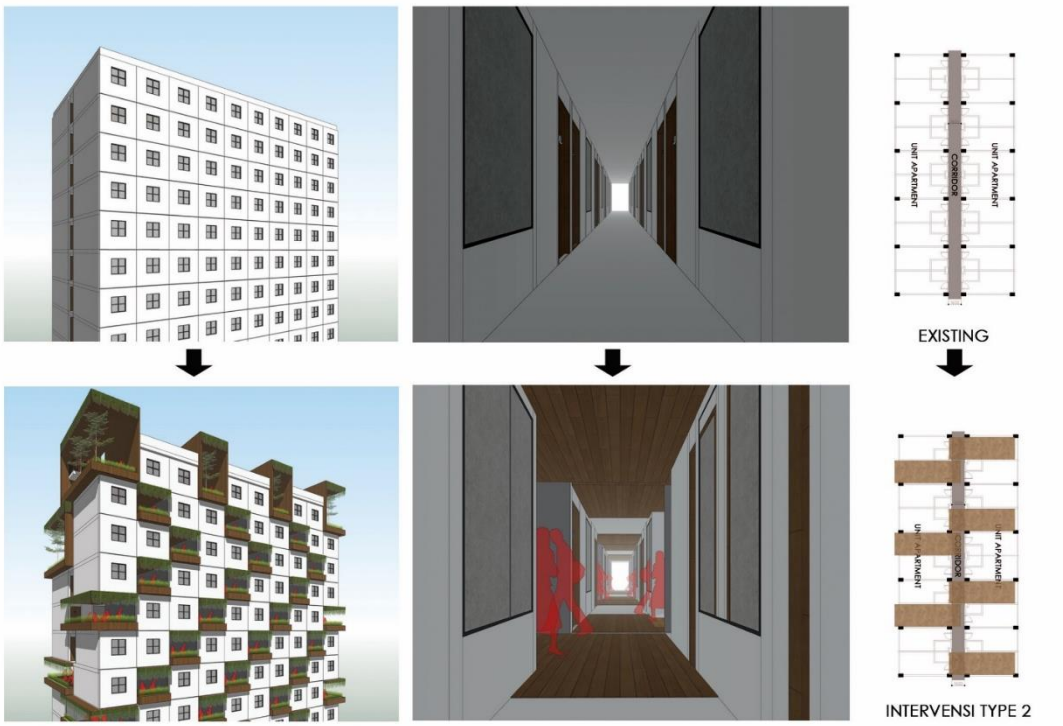


Figure 3.4 Design intervention concept type 2, dedicated zig-zag social space



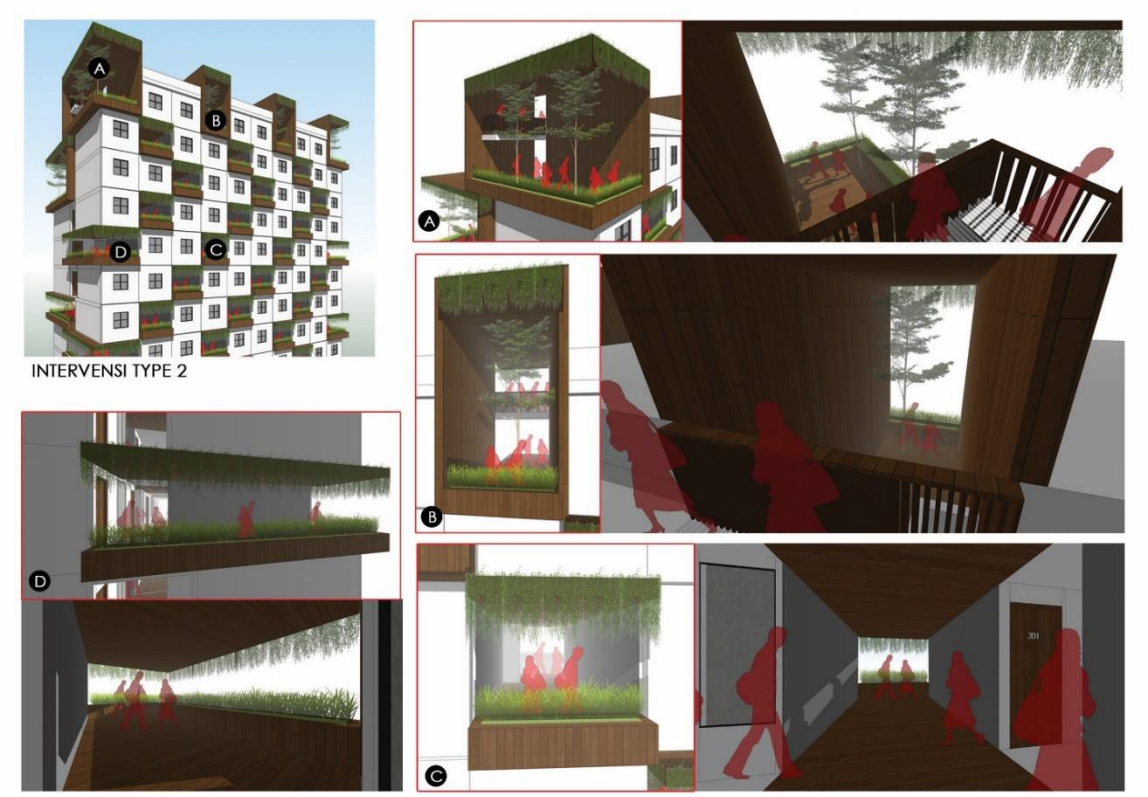


Figure 3.5 Illustration of Design intervention concept type 2, dedicated zig-zag social space

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.

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