Jurnal Ilmiah Arsitektur, Vol. 13 No. 2, 188 – 197
ISSN(print): 2354-869X | ISSN(online): 2614-3763

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To cite this article: Kamaruddin, M., Satria, W. D., Harjunowibowo, D., Jaya, N. S., Monang, F. R., & Owen, Y. G. (2023). INTEGRATED PUBLIC SPACE DESIGN WITH A PASSIVE ARCHITECTURAL APPROACH IN THE TINGKIR SUB-DISTRICT, SALATIGA. Jurnal Ilmiah Arsitektur, 13(2), 188-197.

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Homepage Information
Journal homepage : https://ojs.unsiq.ac.id/index.php/jiars
Volume homepage : https://ojs.unsiq.ac.id/index.php/jiars/issue/view/336
Article homepage : https://ojs.unsiq.ac.id/index.php/jiars/article/view/4637

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ARTICLE INFO

Article History :
Received : May 26, 2023
Revised : November 23, 2023
Accepted : November 27, 2023
Publsihed: December 31, 2023

Keywords*:*
Integrated Public Space
Architecture Design
Passive Design Strategies
Sustainable building

ABSTRACT

Public places that provide a secure, welcoming, and beautiful environment are becoming increasingly important to enhance community welfare. The government is attempting to enhance public services in Salatiga's Tingkir sub-district by creating an integrated public space design for the neighbourhood. Presenting this integrated public space is difficult as it must allow for various community activities in a typical community area, including sports, education, recreation, and events.

In response to this problem, a passive design strategy that optimises building operations and conserves resources by considering context and microclimate elements is given in the design of a public space. These include modifications to the traditional Javanese stilt house form, skylights for daylighting, and roof protection against predicted excessive rains and sunshine. Integrated public space planning aims to fulfil many communities' requirements and provide a visually stunning and sustainable environment for everyone via these strategies.

This study's most effective passive design techniques are adapting the traditional stilt house model to increase natural ventilation on artificial cooling systems and roof protection as shading, which can effectively regulate temperature. These methods are anticipated to enhance public spaces' overall sustainability and livability, transforming them into ecologically conscious and neighbourhood-focused hubs of activity and engagement.

INTRODUCTION

The notion of a network of urban public spaces has contributed to the creation and even expansion of metropolitan regions. It is claimed that networks that are linked with urban planning may stimulate economic growth via their multifunctional socioeconomic characteristics, such as creating a vibrant and secure environment for urban residents (Gavrilidis et al. 2022).

The network is a huge collection of linked networks of urban public spaces and greenways. According to Boglietti (Boglietti and Tiboni 2022), randomly distributed public spaces are key components of the urban network. The existence of public spaces as a form of human expression in the social world is the physical and metaphysical heart of the city since they serve as conduits for mobility, communication hubs, and cultural activities' common ground.

Public space is described as an area that may be used by all levels of society for everyday activities. The nodes and landmarks that serve as navigational aids throughout the city are public places (McCunn and Gifford 2018). In the meanwhile, Kaklauskas (Kaklauskas et al. 2021) describes public space as an open and neutral area where anybody may engage in activities, social contact, and access to resources to satisfy daily requirements. Added by Panjaitan (Panjaitan, Pojani, and Darchen 2022), public space is an area that requires open togetherness as one of its conditions, which in turn will require a level of equality, at least in terms of economic well-being or equality of social groups, in contrast to shopping malls, which are only accessible to the middle class. Compared to this, Halecki (Halecki et al. 2023) defines public spaces as parks, playgrounds, roadways, and green open areas.

Figure 1. Granary Square, London (Carmona 2019)

In the course of its evolution, public space evolves into a public space or land where individuals may engage in functional public activities and other side activities that might link a community via everyday activities or activities. Carmona (Carmona 2019) investigated many public areas, as seen in Figure 1, in which everyone has the right to free, unrestricted entry, including London's Granary Square, where people of various ages and backgrounds congregate to engage in a variety of activities.

Public space refers to any areas of the natural and constructed environment that are accessible to the general public. Nurdiani [8] stated that in terms of public space and architectural context, the scope encompasses highways, pavement land, green open spaces and parks, as well as public and private areas with unrestricted access, as seen in Jakarta's Child-Friendly Open Public Spaces (RPTRA).

(a)

(b)

Figure 2. Creative space for various activities at RPTRA Vlaboean Klender. (a) Residents gather, socialize, and gain knowledge from outsiders. (b) mini library (Sofa 2022)

Since 2015, the Government of Jakarta has constructed 291 RPTRAs and aims to construct more in the near future (Rahmaningtyas and Rahayu 2019). The built public space will serve to transform municipal parks into children's playgrounds, sports facilities, residents' and community meeting places, horticultural gardens, breastfeeding rooms, and a micro-library. Figure 2 depicts one of them at the Vlaboean RPTRA in Klender. With an area of 1,100 square metres, this public space merges many roles of public activities into a single location, allowing citizens of all backgrounds, ages, and genders to enjoy it despite the scarcity of urban open space (Permanasari and Lientino 2018).

In the meanwhile, urban public areas on riverbanks in Bandung, West Java, have been

transformed into natural tourist destination. The Cikapundung Terrace is one of the benchmarks as an inner-city neighbourhood that has effectively turned from a slum and slum area that pollutes the surrounding environment into a renowned and popular tourist destination (Wijaya and Syahrizal 2019). The revitalization of the Cikapundung River has had an impact on the community's economic, social, and healthy lifestyle. In terms of the economy, regional development has been successful in expanding tourism opportunities, allowing local communities to develop independent business activities, such as selling locally. However, Abdulhadi (Ratri et al. 2021) believes that it is vital to focus environmental conservation work on the Cikapundung Terrace to preserve the natural environment.

In urban areas, public spaces play an important role by offering possibilities for social interaction, relaxation, and cultural expression. However, the design of these areas is often impacted by conflicting economic, political, and environmental goals and restrictions. In recent years, there has been an increasing awareness of the need for a more holistic and sustainable approach to the design of public spaces, one that takes into account the complex interaction between physical, social, and environmental aspects.

Passive architecture has emerged as a viable solution to these issues. Recent instances of story studies within the passive design may be found in the work of Kamaruddin (Kamaruddin, Arminda, and Sukrayane 2021) on the Bandar Lampung Office Building Design. Passive architecture refers to the use of design principles that reduce energy and resource use while enhancing user benefits and comfort. This strategy is founded on the concepts of bioclimatic design, which strives to connect buildings and public spaces with their natural surroundings to improve the performance and sustainability of the built environment (Kamaruddin et al. n.d.).

This article proposes a passive architectural concept for an integrated public space in a residential neighbourhood of Salatiga City, Central Java. In addition, via qualitative research, we highlight the advantages of this strategy, including the use of climate-adaptive architecture, natural lighting, and ventilation. The design emphasis highlights the constraints and limits of passive systems and provides solutions to overcome them via cooperation and creativity. The design of this integrated public area is anticipated to be ecologically sustainable and aesthetically pleasing for the benefit of local inhabitants and the environment.

METHOD

The methodology chapter commences by delineating the approach that was employed to construct the public space, specifically emphasising the chosen site in Taman Mutiara Housing, Tingkir-Salatiga. In the pre-design phase, the microclimatic conditions at the chosen site will be examined. Determining which passive design strategy will be implemented for this open public space building is, of course, of the utmost importance.

Public space principles including accessibility, comfort, safety, and security are incorporated into the design process. In order to bolster this approach, a number of exhaustive and pertinent related references are provided as a guide. In order to improve the methodology's lucidity, an additional comprehensive elucidation of the procedures undertaken to derive conclusions from the research outcomes will be provided. In a similar fashion, supplementary sources will be incorporated to bolster and validate the foundation of the research methodology employed.

A. Introduction to the Project and Selected Site

During the pre-design phase, the municipal administration mandated several community requirements that necessitated incorporation into the design, taking into account the prevailing climate and land conditions. These requirements included:

a. the building footprint does not exceed 150 m² on a site plan of 327 m².
b. a location for residents to congregate that is open and unenclosed.
c. there is a playground for youngsters.
d. do not utilise mechanical ventilation or air conditioning.
e. public space structures may harmonise with the surrounding environment
f. optimize perspectives in all directions

The design approach should also include the public space principles of convenience, safety, security, and accessibility (Kumar and Makarova 2008)(Luymes and Tamminga 1995). Thompson (Thompson 2002) emphasised that aesthetic and health aspects play a significant part in sustaining the sustainability of urban open spaces in light of the rising prevalence of virtual connections in modern culture, which eliminates the necessity for deliberate social interactions.

Numerous social, economic, and political factors, in addition to moral and ethical considerations, make 'inclusivity' crucial in light of the diverse activities that will occur in the future. The concept of inclusive design for integrated public spaces indicates that goods and services fulfil the demands of different populations regardless of age, occupation, gender, or ethnicity. Instead of designing for a specific subset of the population, which often ends in meeting the demands of the majority group or 'generic' consumers, this method employs a holistic perspective, including all present and future users in the design process.

Upon comprehending the architectural standards and principles governing public spaces, the subsequent course of action involves evaluating the existing site based on diverse factors such as orientation, accessibility, and the overall outlook from the site's interior to the exterior. The proposed

site for the integrated public area is situated in the Tingkir subdistrict of Salatiga, located at coordinates 7.33° S and 110.50° E. The Salatiga area is located at an elevation ranging from 450 to 825 metres above sea level. With a population of 150,000, the city is situated in Central Java, Indonesia, and is renowned for its lovely scenery, including woods, rice fields, and streams (Fandy Aprianto 2020). As seen in Figure 3, the city of Salatiga is close to two active volcanoes in Central Java: Mount Merbabu and Mount Merapi near Magelang.

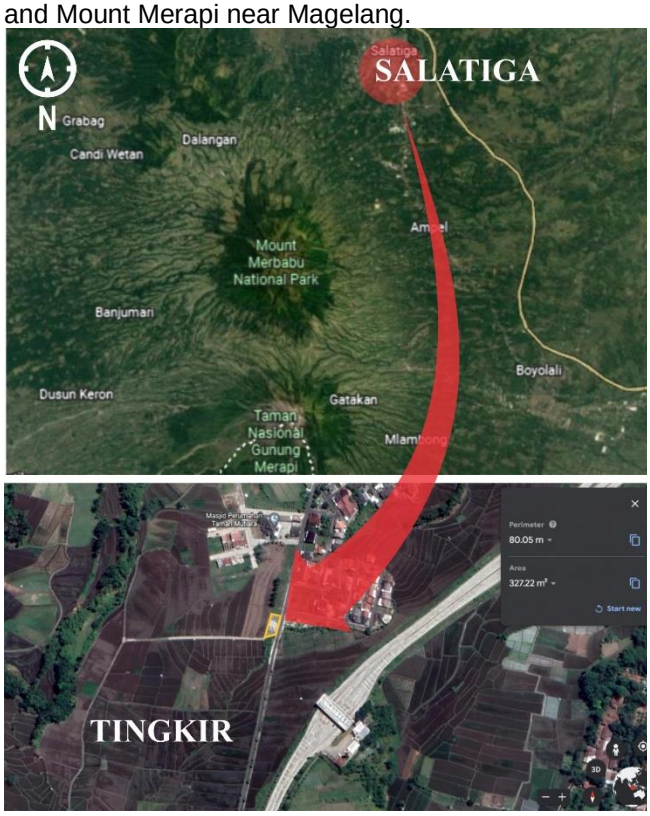


Figure 3 Selected Site. Source: Google Earth

As illustrated in Figure 4 (Salatiga Weather & Climate | Temperature & Weather By Month - Climate-Data.org n.d.), the shape of the mountains gives Salatiga a tropical climate with an average air temperature between 23°C and 24°C. The relaxed air condition is a result of its geographical position, which is on the slopes, and the placement of Salatiga on a plain that slopes to the west with a slope ranging from 50 to 100 degrees so that Salatiga is both a plain and mountain slopes and mountains.

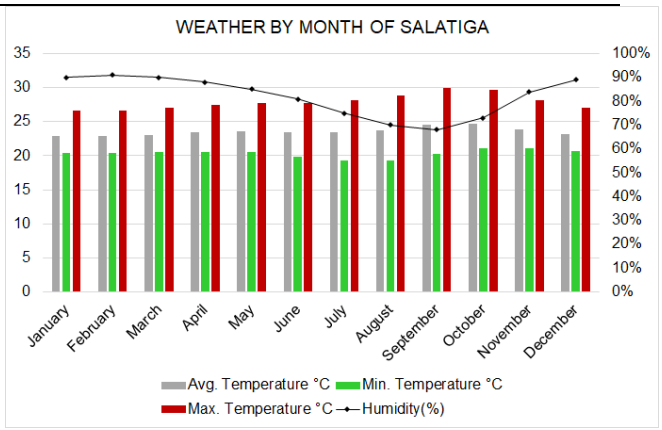


Figure 4. Climate condition in Salatiga (Salatiga Weather & Climate | Temperature & Weather By Month - Climate-Data.org n.d.)

The planned location is within the Taman Mutiara Housing Complex, Tingkir - Salatiga, which is immediately adjacent to the Semarang - Surakarta Toll Gate on the eastern side, rice fields on the western side, residential parks on the northern side, and expansive views of Mount Merbabu and Mount Merapi on the southern side. When constructing building facades, it is possible to take into account views from all directions.

B. Passive Design Approach

In wealthy nations, buildings account for about fifty percent of the overall energy usage. Transport and industry, whose activities are similarly tied to structures and location, are the other consumers (Kamaruddin 2021). In the meanwhile, the present design difficulties are growing more complicated as buildings must fulfil functional, socio-economic, and environmental standards in order to obtain the best design solutions to meet energy demands and the required balance.

The built environment's expansion ought to transcend its utilitarian function of providing shelter, in alignment with prevalent architectural design philosophies. The design methodology ought to tackle significant challenges that align with the increasing complexities of urban issues. The ramifications of an excessive human population on the environment encompass the depletion of forests and the contamination of natural resources. The constructed environment's claim of being healthy and safe for both humans and the natural environment is no longer valid due to a deficiency in self-awareness. The phenomenon of global warming serves as a subtle manifestation of the consequences of unbridled human activity on the planet. The combustion of fossil fuels, natural gas, and coal is a significant contributor to the emission of greenhouse gases, which is a leading factor in the phenomenon of global warming. The accumulation of these gases in the atmosphere of the Earth increases the global average temperature.

If this matter is unprecedented, the potential solution is a daunting prospect. Nonetheless, it is important to note that any conceivable resolution

would undoubtedly be regarded as a remarkable achievement. The integrated public spaces in Salatiga will incorporate passive architectural techniques due to the successful implementation of sophisticated designs that have resulted in reduced environmental damage and energy consumption in buildings, while simultaneously enhancing indoor air conditioning comfort.

Passive architecture is primarily concerned with integrating the indigenous climate and environment into the design of buildings. This suggests that the configuration of a passive construction in a frigid, northern locality will differ from that in a balmy, equatorial region like Indonesia. The aim is to design a framework that is in harmony with its surroundings and utilises the existing natural resources to create a comfortable and sustainable space.

Passive architectural design focuses on using natural resources, such as sunshine, wind, and temperature, to create energy-efficient and pleasant environments. Passive architecture strives to lessen the reliance on mechanical systems, such as heating, ventilation, and air conditioning (HVAC), for temperature management and energy efficiency in residential and commercial structures. As seen in Figure 5, the passive solar design principles include five components: sun orientation, good insulation, high-performance windows, airtight enclosures, and balanced ventilation with heat recovery (Richard 2022).

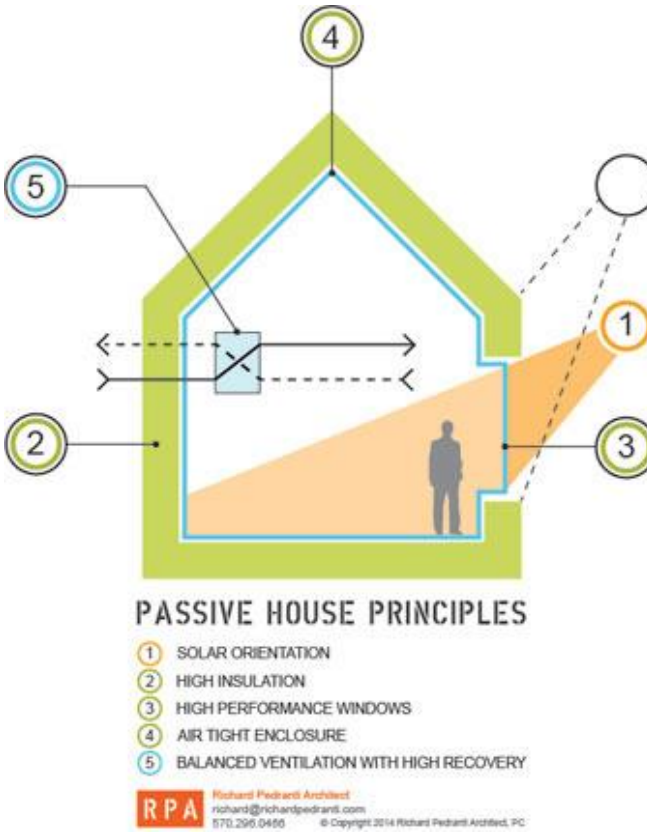


Figure 5 Passive Solar Design Principles (Richard 2022)

Some passive solar design concepts stay constant in all climates. A crucial component of passive solar design is that it takes use of the site-specific potential. So many key parts of passive solar design will rely on the environment in a small local region and even the characteristics of the construction site.

In previous studies by Stevanovi (Stevanović 2013) on passive design, the fundamental principles of a passive approach are categorised according to the local climate, where design strategies in hot and cold climates should differ with respect to heat transfer factors, ventilation systems, and solar radiation, as illustrated in Figure 6. Passive design strives to produce livable or workable spaces without requiring considerable energy input. Passive architectural design employs a number of measures, including as optimal orientation and insulation, to harness the power of the sun and other natural forces in order to attain the occupant comfort zone. For instance, a passive building may be planned to take use of the sun's warmth in the winter and to be shaded in the summer to maintain a cool interior.

Prior investigations conducted by Sigalinging et al. (Sigalingging, Chow, and Sharples 2019) emphasised that the elevated levels of humidity in residential areas of tropical regions, including Jakarta, Indonesia, can be attributed to factors such as ground surface temperature and building ventilation. A two-story masonry residence with a reinforced concrete framework serves as the setting. Consequently, elevated interior air temperature and relative humidity impede individuals' ability to attain a state of comfort.

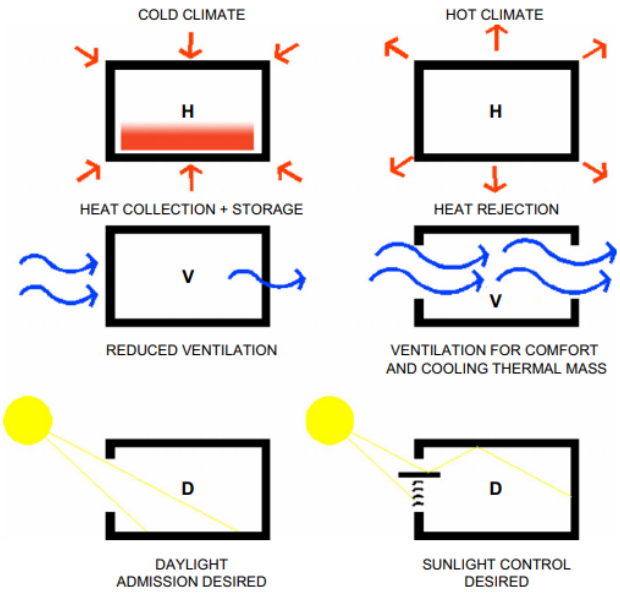


Figure 6 Some climatic building strategies for cold and hot climates (Stevanović 2013)

Figure 7 Indoor Air Quality (IAQ) investigation of traditional houses in Kerala, India (Dili, Naseer, and Zacharia Varghese 2010)

However, the aforementioned characteristics differ from those of traditional homes in Kerala, India. Dili's (Dili, Naseer, and Zacharia Varghese 2010) study revealed that the building system seeks to maintain a higher-than-required internal air temperature when the ambient temperature falls below the norm. Likewise, when the temperature outside is above normal, it is feasible to maintain a comfortable inside temperature at a lower level. The required level of thermal comfort is provided regardless of the season by maintaining balanced temperature and relative humidity levels as well as continuous and controlled airflow throughout the building.

RESULTS AND DISCUSSIONS

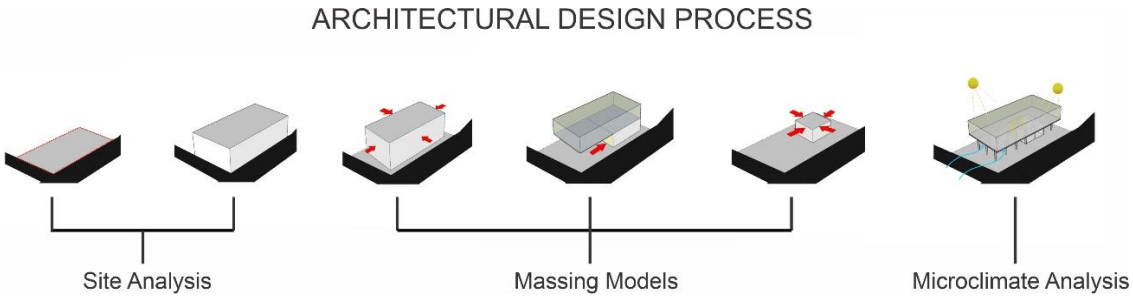


Figure 8. Stages of Architectural Design Process

Passive solar design solutions may dramatically cut energy consumption and increase occupant comfort in tropical climate buildings. In this research, we examined the efficacy of different passive solar systems and approaches in a variety of integrated public buildings in Salatiga to establish their applicability in comparable settings.

A. Building Design

As seen in Figure 8, seven design processes serve as a guide for converting design requirements and techniques to passive solar architecture. First, examine the site by orienting the building's orientation to maximise the view from all sides. Thus, every possible potential may be realised. The elongated layout of the structure is a consequence of the available land formation, which allows the spatial programme to use all available space.

Then, change the fundamental geometry of the building mass according to the site, producing the building mass to split it vertically into two buildings according to the projected space needs. In these three phases, the base height of the structure was increased by 80 centimetres above the entry road so that it may be seen more clearly from a distance, including from the toll road that runs south to east on the opposite side of the site.

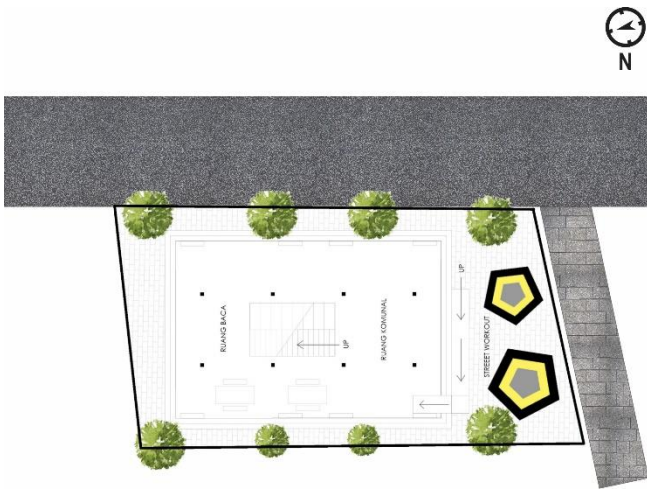


Figure 9. Integrated Public Space Site Plan

The mass is then offset into the land to create a symmetrical structure, hence reducing the building's mass. As a symbol of openness in kinship, the bottom level of the structure will be utilised as a public area without boundary walls. The bulk of the building's second level then used as a conference room, tiny library, and building administration room. After altering the building mass from its fundamental shape, the next phase is to adapt to the surrounding environment utilising microclimate data and the idea of passive solar architecture.

Figure 10. Adaptation of traditional stilt houses in architectural design

Due to the limited accessible site, the building's mass was designed with a simple rectangular form to optimise the spaces produced. Children's play equipment and sports facilities are located such that this integrated public area may accommodate the demands of inhabitants despite the non-parallel landforms. In addition, trees are placed around the structure as natural shade to deflect sun radiation from east to west.

B. Passive Design Strategies on Buildings

Several architectural element solutions are presented to address the question of why passive solar architecture should be chosen as a construction strategy. It begins with the use of a symmetrical, pyramid-shaped roof shield. This roof also exemplifies traditional Javanese architecture, preserving specific cultural values. Figure 11 is an expanded axonometric showing low-E glass holes in the roof components that let sunlight into the conference area to eliminate the need for artificial lighting. In addition, the shield roof has a 90cm offset, allowing it to be employed as a shade feature when the sun is facing the building wall. This overhang system may also expel rainwater that may enter due to the humid tropical environment.

The next step is to implement a natural ventilation system based on traditional Indonesian stilt homes, in which fresh air will ascend via gaps and wall apertures from the lower levels. This strategy considers Salatiga's chilly climate since it is in a mountainous region. Thus, the artificial ventilation conditioning system is abolished, and natural air exchange is used exclusively.

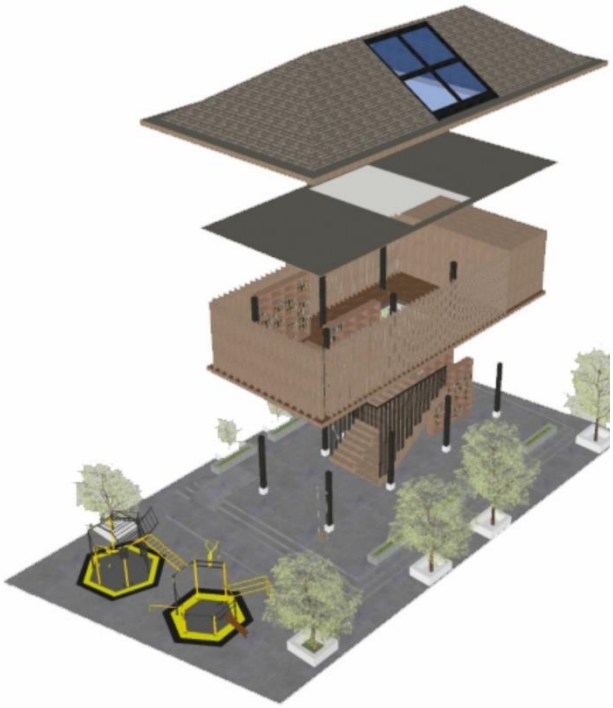
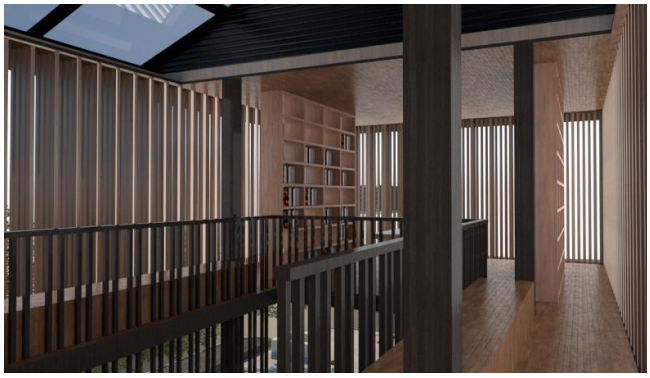


Figure 11. Exploded axonometric illustration

The last tactic is the choice of construction materials. As shown in Figure 12, several integrated public space construction features are dominated by wood in the form of columns, facades, and roof shingles. Only concrete constructions are used on concrete floors at the building's foundation. Using neutral hues as the building's dominant hue is meant to create a natural ambiance on the site.

(a)



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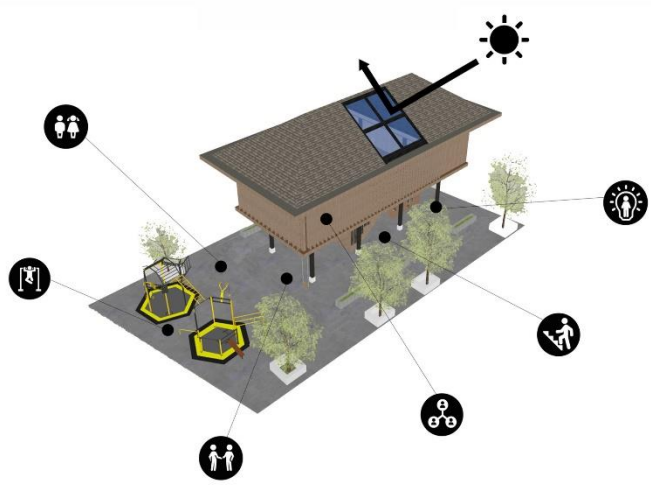

(c)

Figure 12. (a) the design of the ground floor of the building without any partition walls; (b) the atmosphere of the meeting room and mini library on the second floor; (c) architectural diagrams

When designing, public space concepts, including comfort, safety, security, and accessibility, are included. Detailed and relevant references are provided as a guide to bolster this strategy. Nevertheless, a more elaborate elucidation of the procedures involved in deriving conclusions from the study results will be included to improve the approach's comprehensibility. Furthermore, supplementary citations will be included to bolster and enhance the foundation of the used research approach.

To reduce the environmental effect of buildings, the design of integrated public spaces in Salatiga has accounted for issues arising from building criteria and climatic circumstances. The passive solar design may minimise greenhouse gas emissions and contribute to a more sustainable future by lowering energy usage.

CONCLUSIONS

In the Tingkir Sub-district, the design planning of an integrated public space aims to give various educational and motivational advantages to the community and the local government. The design aims to demonstrate to the community that it is possible to realise the cost-effectiveness of using passive architectural principles, such as natural lighting and ventilation, to provide a pleasant internal atmosphere inside a building.

In addition, the development of an integrated public space has the potential to become a new landmark building in Salatiga City and the Tingkir Sub-district. To highlight the possibilities of passive architectural approaches, the design of the Integrated Public Space may be used as a reference. Not only is it meant to promote establishing a more sustainable and resilient urban environment even within a neighbourhood, but it is also intended to inspire new ideas and efforts in this area. One of the

ultimate objectives is to promote the development of urban settings that are both sustainable and livable.

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