Universitas Katolik Widya Mandira

ARTEKS : JURNAL TEKNIK ARSITEKTUR MEDIUM OF SCHOLARLY PUBLICATION

***p*ISSN** 2541-0598 (Print)
***e*ISSN:** 2541-1217 (Online)
DOI: 10.30822/arteks

https://journal.unwira.ac.id/index.php/ARTEKS/index
Telp: (0380) 8041884 / 085239151912
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08.08.2025 CODE PAPER: ARTEKS #4267

Paper acceptance letter

to: **T. Endangsih, Hakim, Sri Kurniasih**
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Dear Authors,

We are pleased to inform you that your paper entitled **"Exploring hybrid architecture in the Jatinegara Barat public housing complex as a model for urban housing"** was reviewed by 2 reviewers and got positive opinion. This paper has been accepted for publication at the peer-reviewed "**ARTEKS : Jurnal Teknik Arsitektur**", to be published in December, 2025 (volume 10, issue 3).

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Exploring Hybrid Architecture in the Jatinegara Barat Public Housing Complex as a Model for Urban Housing

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Abstrak

Perkembangan kawasan perkotaan merupakan tantangan besar dalam penyediaan hunian yang terjangkau dan berkualitas. Salah satu solusi inovatif untuk mengatasi permasalahan ini adalah penerapan konsep arsitektur hibrida, yang menggabungkan berbagai fungsi dan elemen dalam satu desain untuk menciptakan ruang yang lebih fleksibel, multifungsi, dan berkelanjutan. Studi ini mengkaji penerapan konsep arsitektur hibrida pada Rusunawa Jatinegara Barat, sebuah proyek hunian vertikal di Jakarta yang dirancang untuk masyarakat berpenghasilan rendah. Melalui pendekatan kualitatif, studi ini menganalisis bagaimana integrasi ruang publik dan privat, serta elemen komersial dan residensial, dapat meningkatkan kualitas hidup penghuni dan memenuhi kebutuhan ruang perkotaan yang terus meningkat. Selain itu, studi ini menggunakan Visual Graph Analysis (VGA) sebagai alat untuk menganalisis hubungan spasial dan fungsional dalam desain Rusunawa, guna mengevaluasi efektivitas sirkulasi dan konektivitas antar ruang. Hasil studi menunjukkan bahwa penerapan arsitektur hibrid pada Rusunawa Jatinegara Barat dapat menciptakan ruang yang lebih inklusif, dinamis, dan responsif terhadap kebutuhan sosial dan ekologis, serta memberikan kontribusi positif bagi hunian perkotaan yang berkelanjutan.

Kata Kunci: Arsitektur Hibrid, Rumah Susun Sewa, Jatinegara Barat, Space Syntax, Visual Graph Analysis

Abstract

The development of urban areas poses a major challenge in providing affordable and quality housing. One innovative solution to overcome this problem is the application of the hybrid architecture concept, which combines various functions and elements in one design to create a more flexible, multifunctional, and sustainable space. This study examines the application of the hybrid architecture concept in Rusunawa Jatinegara Barat, a vertical housing project in Jakarta designed for low-income communities. Through a qualitative approach, this study analyzes how the integration of public and private spaces, as well as commercial and residential elements, can improve the quality of life of residents and meet the growing need for urban space. In addition, this study uses Visual Graph Analysis (VGA) as a tool to analyze the spatial and functional relationships in the Rusunawa design, in order to evaluate the effectiveness of circulation and connectivity between spaces. The results of the study indicate that the application of hybrid architecture in Rusunawa Jatinegara Barat can create a more inclusive, dynamic, and responsive space to social and ecological needs, as well as make a positive contribution to sustainable urban housing.

Keywords: Hybrid Architecture, Rental Flats, Jatinegara Barat, Space Syntax, Visual Graph Analysis

Introduction

The existence of slums and the low accessibility of decent housing are major problems facing large cities worldwide, including Jakarta. The attractiveness of cities as centers of economic activity, trade, and services has led to increased migration from villages and small towns to large cities, but this has not been matched by the growth of decent housing in these cities(Sisy Tiara 2024). Low-income groups are marginalized by this problem. Due to the limited availability of adequate housing, low-income communities are slowly starting to inhabit and settle in undesirable urban spaces, resulting in resulting in the emergence of settlements with inadequate physical quality,

which are then referred to as slums (Silalahi 2020).

This problem is not merely a physical or spatial one; it also has a social dimension that needs to be analyzed and resolved. Efforts to revitalize or rehabilitate slums in urban areas often involve gentrification(Az-Zahra, Rahman, and Kautsary 2023). Gentrification often occurs with the influx of middle, and upper-class people into an area, causing the poor to become "displaced" from their original, improved neighborhoods. Government revitalization of densely populated slum areas aims to improve the physical quality of the area, including improving the living conditions of residents so they can live in more suitable housing. However, despite good intentions and actions, the revitalization process often does not go as planned and can create new impacts or problems.

Gentrification is the process of shifting ownership of residential areas previously designated for the urban poor to those of the upper-middle class. This occurs due to pressure experienced by low-income communities. Gentrification is a transformation of land use followed by changes in residential areas for low-income communities. This process ultimately results in the area being replaced by higher-income communities. Based on this definition, it can be concluded that the phenomenon of gentrification arises as a result of the improvement of an area that successfully attracts the attention of the wealthy, creates regional dynamism, and stimulates rising property prices. These price increases are often beyond the reach of the original community, making them vulnerable to displacement from their residential areas. Gentrification is clearly a phenomenon that threatens the existence of a community, because with the elevation of an area's status to a high-value area, the community in that area is often unable to adapt to the changes that occur((Medha and Ariastita 2017)(Aurunnisa and Rochani 2024)).

The Jatinegara Barat Rental Flats (hereinafter referred to as Rusunawa) are housing units provided by the Jakarta Regional Government to accommodate residents relocated from the Kampung Pulo area who were displaced by the Ciliwung River Normalization project. The Rusunawa are intended to provide replacement housing for Kampung Pulo residents displaced by the river normalization project(Silalahi 2020). This Rusunawa covers an area of 7,460 m^2 and has two towers (towers A and B), each with 16 floors. The Rusunawa has 518 residential units(Ainurrofiq 2018). Social and public facilities available at the Jatinegara Barat Rusunawa include public healthcare, education, places of worship, and businesses. Each unit at the Jatinegara Barat Rusunawa has an area of 30m2 and consists of two bedrooms, one bathroom, a living room, a kitchen, a balcony, and an exhaust fan. In addition, public facilities at the Jatinegara Barat Rusunawa include a clinic, a dental clinic, a community health post (Posyandu), a mosque, a garden, a preschool (PAUD), a library, a PKK (family welfare) room, a hall, a sales area, a motorcycle parking area, and an ATM(Ainurrofiq 2018).

This Rusunawa is intended for low-income residents (MBR) from Kampung Pulo. In addition to its residential function, the Rusunawa is equipped with other functions to support the sustainability of the Kampung Pulo community. Therefore, the Jatinegara Barat Rusunawa building can be considered a hybrid or mixed-use building. Fenton (1985) argues that there is a difference between a hybrid building and a mixed-use building, namely the relationship between the intensity of one spatial program and another(Fenton 1985). Fernández explains that hybrid buildings are cosmopolitan buildings that welcome complexity, diversity and various programs(Fernández Per A 2011). Fernández provides a definitive description of the various elements that make up a hybrid building. Mozas believes the ideal hybrid benefits from the symbiosis of public and private spaces, and that the hybrid's permeability is its greatest strength. Hybrid architecture is a design approach that combines different elements, styles, and functions within a single building or environment. In the residential context, hybrid can mean combining public and private spaces, commercial and residential functions, and considering the integration of technology for building sustainability.

Figure 1. Axial Map of the Integration Value of the Area Surrounding the Jatinegara Barat Flats
Source: Author, 2024

Through a connectivity analysis from a macro scale (DKI Jakarta), the Jatinegara Barat area has a relatively high integrity score within the Jakarta city structure, indicated by its red-

colored axial map. Being in an area with a high integration score has both advantages and disadvantages(Leepel, Utomo, and Suganda 2017). The advantage of this location is its potential to be developed into a vibrant economic zone due to its strategic location. The downside is that land values in the area are also high, leading to higher property prices. High property prices make low-income residents less able to afford rent and taxes in the area. Conversely, economically strategic areas often attract higher-income residents to acquire existing properties, making them vulnerable to gentrification.

From the description of the existing conditions and problems at the research locus, the research question arises: how does the Jatinegara Barat Rusunawa look through the lens of hybrid architecture? This research was conducted by observing and analyzing the application of hybrid architecture to increase the effectiveness of the spatial relationships of the Jatinegara Barat Rusunawa building. Then, how can the problems and potential findings be resolved and optimized? The purpose of this research is to determine the value of spatial integration of space and identify problems related to mobility in the building, so that these problems can be minimized with design recommendations.

The spatial program maps spaces based on groups of spatial functions as well as the intensity of the relationship between one space and another. This is done to see the permeability between spaces which is the main problem in seeing the function of buildings in the hybrid architectural theme.

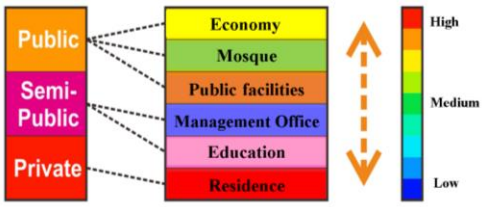


Figure 2. Relationship between Zonification, Spatial Program, and Visual Graph Analysis
Source: Author, 2024

Research methodology

This research was conducted using quantitative methods with a modeling and simulation research strategy. The simulation process was conducted using a spatial syntax approach with the assistance of Depthmap software. Depthmap is the official Space Syntax platform developed by the Space Syntax Laboratory. This application is used to analyze human movement within a space and circulation according to analysis needs(Sa'diyah, Nugroho, and Purwani 2019). Space Syntax theory assisted by the Depthmap application can operationally analyze connectivity and integration in simple to complex spatial structures(Jaya et al. 2025). The spatial syntax approach can display graphical mapping in several different techniques such as axial maps, convex maps, social space maps, and visibility maps(Gierlang Bhakti Putra 2022).

Space Syntax Theory offers several techniques for analyzing various aspects of the built environment in terms of use, spatial configuration, visuals, and programming. One of the most complex approaches to space syntax theory is Visual Graphic Analysis (VGA)(Sunoto 2023). Visual Graph analyzes how far each point in a spatial network is visible from the others(Yaseen and Mustafa 2023). Where points are not immediately visible, the graph size of the point matrix can be calculated to test how many intervening points are needed for one point to see another(Desyllas and Duxbury 2003). Visual Graphic Analysis is used to examine visibility and permeability as dynamic components in spatial organization. This analysis will help reveal the hierarchy of spaces from public to private and identify locations that remain visible or invisible directly through a color-coded diagram. Colors ranging from orange to blue indicate low connectivity, and yellow to red indicates high connectivity(Hegazi et al. 2022).

This approach presents a quantitative analysis of visual properties within the built environment, offering modeling and understanding of how spaces can be used and perceived by their occupants(Barada and Mutiari 2013). Like other spatial syntax techniques, VGA is based on a graphical representation of the gross geometry of the built environment. To create a representative graph, the space is articulated into a fine grid (usually with units in the size of a human footstep or a stair). Following the graph construction, it is possible to calculate general spatial syntax measures. Among these measures, connectivity and depth are the most fundamental.

The integration value is the most important value that determines the mobility of an area. The integration value is a mathematical result that exclusively covers the physical formation of space without considering issues such as land use or density(Askarizad, Lamíquiz Daudén, and Garau 2024). Integration values are numerical values, however, specialized

software converts these values into a color-coded graphical presentation called a spatial integration map. The most integrated axes are automatically displayed in red, followed by orange, yellow, and green. The least integrated axes are displayed in blue and dark blue(Sunoto 2023). The key point of the graphical presentation is that one can immediately understand the potential mobility and potential changes that arise under these conditions. In addition to classification based on integration values, zoning is carried out to classify spaces based on their nature, namely public, semi-public, and private spaces.

The first stage of this research is field observation, to collect data that functions by classifying spatial functions, both in terms of spatial zoning (private, semi-public, and public spaces), as well as spatial functions such as residential, economic, educational, spiritual, public facilities, and management. We also use the Space Syntax method to examine the integration value between spaces((Indrawan and Yaniawati 2017)(Sugiyono 2017)). The first stage of this research is field observation, to collect data that functions by classifying spatial functions, both in terms of spatial zoning (private, semi-public, and public spaces), as well as spatial functions such as residential, economic, educational, spiritual, public facilities, and management. We also use the Space Syntax method to examine the integration value between spaces. ((Dursun 2007)(Sailer and Koutsolampros 2021)(Gierlang Bhakti Putra 2022)). Technical analysis through Visual Graph Analysis (VGA) is a method used to analyze and visualize spatial and functional relationships between elements in architectural design(Muyasarah and Sarwadi 2023). In the context of low-cost apartments (rusunawa), VGA can be used to analyze how spaces within a building are interconnected, both visually and functionally. Visual analysis uses diagrams or visual maps to show circulation flows, functional zones, and interactions between spaces within a building.

We discussed these two methods to produce findings in the form of a list of problems and potentials of the Jatinegara Barat Rusunawa, in order to answer the first research question, namely regarding the effectiveness of the space program. We used these findings to build arguments regarding solutions to problems and accommodation of space potential, which in this paper take the form of design recommendations. We also retested these recommendations using space syntax to observe changes in integration values before and after the implementation of spatial changes through design recommendations. For more details, please see the following research flowchart:

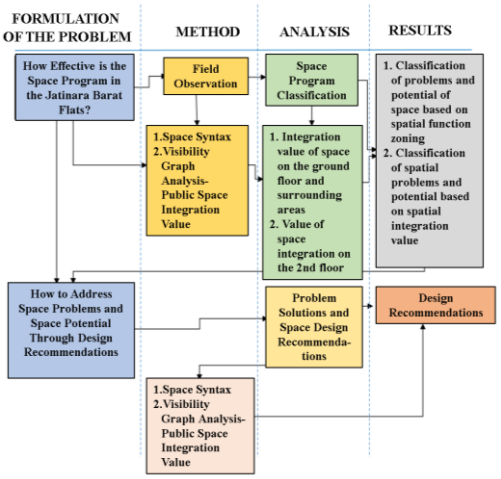


Figure 3. Research Flowchart
Source: Author, 2024

Existing Data

The Jatinegara Barat Rusunawa is located in an area with a high integration value, namely in the center of Jakarta, surrounded by major roads. The support of several attractions in the surrounding area also has a significant impact. These include the Kampung Melayu Morning Market, the Kampung Melayu Terminal, Premier Jatinegara Hospital, the Jatinegara Mester Market, and Jatinegara Station. Jatinegara Barat is located in an area surrounded by Jakarta's busiest roads. Furthermore, the support of several attractions in the surrounding area also has a significant impact.

In terms of its location, Jatinegara is a strategic area and has experienced significant development. This is influenced by its proximity to the core structure of Jakarta. In terms of distance and location, this area is directly connected to the surrounding urban structures. Furthermore, this area is connected to the nearby Ciliwung River. This area is home to several attractions that contribute to or support the city's presence. The basic features of the Jatinegara Barat Rusunawa area are as follows:

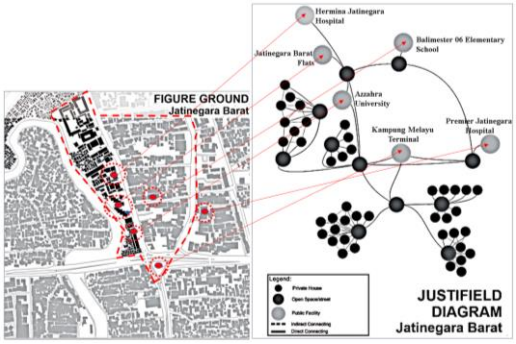


Figure 4. Justifield Diagram of the Jatinegara Barat Flats Area, Radius 500 m
Source: Author, 2024

Based on the results of the network diagram analysis (justifield diagram), the relationship between residential units within a complex and their surrounding environment can be seen from the direct connection of the residential area to the presence of outdoor space or road accessibility. This area lacks transitional space from the outdoor space. Transitional space exists only in non-private units within a complex, typically serving as a yard or parking area.

The connectivity between private and non-private residential units is not directly or separately connected, even though they are located within the same area. Private residential units have both direct and indirect connectivity. Space limitations lead to indirect connections, resulting in private spaces ultimately transforming into public spaces, forming a single, strong social community system.

The results of observations that emerged during the field visit have clearly shown that Rusunawa Jatinegara Barat serves the function of the building as a high-rise residential building occupied by families who live at a low cost. This multi-storey residence has an integrated space with six functions: a commercial area, a spiritual area, a community area or open space, an office area, an educational area and a residential area. Rusunawa Jatenegara Barat consists of 16 floors, two floors from the ground floor are used as public space on the second floor from the ground floor. And they use the other 14 floors as private space (residential). Like the facilities in the Rusunawa Jatinegara Barat master plan, there is a commercial area (food court) and a spiritual area (mosque) in the North, parking areas in the North and South, open space (green area) and the main way of entry and exit in the East. On the ground floor, there are mixed-use functions such as an administration area at the front followed by the entrance, a community area or indoor open space mixed with a small commercial area in the center of the building, and a kindergarten area at the back of the building. The existing minimarket which is considered a commercial area has been placed near the community area hall and the mosque. Observations of the minimart during the field visit revealed it was not functioning properly. Near the minimarket, there is a community area used for various purposes, such as an indoor play area for children, a gathering place for residents, cultural events, and a reserved space for Friday prayers. Meanwhile, the kindergarten has been placed in a public area at the very rear of the building near the public parking area. This is a risky location for a kindergarten in a public area that is free to access. The primary concern is the safety of the children.

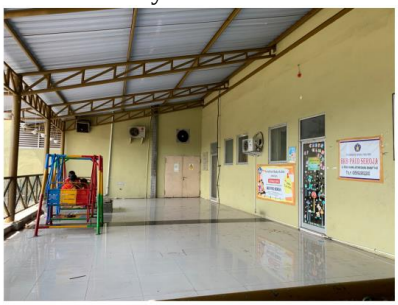


Figure 5. Children's Playground and Parking Facilities
Source: Author, 2024

The second floor offers a mixed-use commercial, community, and spiritual space. The commercial area is occupied by several food stalls located near the elevator and stairs. The existing food stalls are not functioning as commercial establishments. Most are closed, and only a few are open.

Figure 6. Commercial Facilities (food court)
Source: Author 2024

The third to 16th floors are used for a single function, namely residential areas. Each floor has the same number of units. Tower 1 has 20 units, while Tower 2 has 19 rooms. The two towers are connected by a shared lobby on the ground floor and second floor, as well as a roof terrace on the third floor. From the researcher's perspective, the roof terrace on the third floor of the Jatinegara Barat Flats should be used for other purposes, not just as a dead space for the roof.

Analysis and Discussion

Analysis of the Effectiveness of the Space Program

The Jatinegara Barat Rusunawa was built as part of a relocation program for riverbank residents in order to organize slum areas and reduce the risk of flooding in DKI Jakarta. The Rusunawa design applies the concept of vertical housing with shared spaces as part of a strategy to improve the quality of life of residents socially, economically, and ecologically. The purpose of the spatial effectiveness analysis is to see the extent to which the spatial program (including residential and shared spaces) in the Jatinegara Barat Rusunawa is effective in supporting the functional needs of residents; increasing community social interaction; supporting economic empowerment and public services; and providing an adaptive and sustainable residential environment.

a. Changes in the Function of Residential Space
Most units underwent functional changes, particularly the living room and kitchen, which were converted into business spaces (shops, salons, and laundries). These changes reflect the inconsistency of the initial design with the needs of residents, particularly those seeking additional income. This is related to economic conditions, family size, and the lack of formal commercial space. The functional changes in the living space resulted in low spatial effectiveness in maintaining the residential function, but demonstrated the residents' adaptive flexibility in relation to the space.

b. Utilization of Shared Spaces
The hallways, plazas, playgrounds, and lobbies are intensively utilized for social interaction, children's play, and leisure activities. During holidays or in the evenings, the intensity of space use increases significantly. Not all spaces are optimally designed for interaction, but residents still adapt the available spaces to interact with each other. The highly effective utilization of shared spaces is evidenced by social interactions and strengthened community ties. The above indications demonstrate the high effectiveness of empowering residents and making shared spaces a center of community activities.

c. Social Activities, Empowerment, and Services
Many economic and social empowerment activities are held in shared spaces, such as skills training, health services, and community activities. Shared spaces are used for collective activities such as exercise, tutoring, training, socialization, and community service. These activities increase community participation and strengthen social cohesion.

d. Service Quality & Resident Satisfaction
Based on a service quality study, the majority of residents assessed the services provided by the Rusunawa (low-cost apartment) as adequate (cleanliness, management, and security). Shared facilities such as elevators, open spaces, and places of worship support comfortable vertical living. However, improvements in the maintenance and management of shared spaces are needed. Based on the service quality study, the majority of residents assessed the effectiveness of Rusunawa services in supporting the sustainable use of shared spaces.

The effectiveness of the space program and the use of shared space in the Jatinegara Barat Rusunawa can be concluded as follows:

Table 1. Assessment of the effectiveness of the spatial planning program and the use of shared spaces in the Jatinegara Barat Rusunawa

Analysis Aspects	Effectiveness Assessment	Information
Function of living space	Low - Moderate	There are many functional modifications due to non-

Analysis Aspects	Effectiveness Assessment	Information
		adaptive design.
Utilization of shared spaces	High	Actively used as a social and family interaction space
Social/economic activities	High	Space supports community empowerment and participation
Quality of service and facilities	Good Enough	Providing a basis for comfort for the use of shared spaces

Source: Author's Analysis, 2024

Visual Graph Analysis of Existing Conditions

A visual graph analysis of the current conditions on the ground floor of the Jatinegara Barat Flats is as follows:

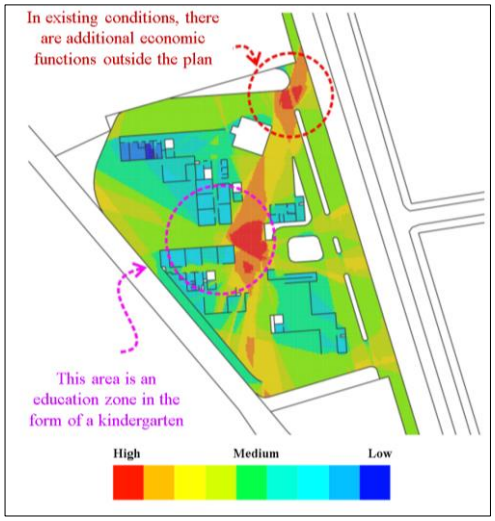


Figure 7. Integrated Value of the First Floor
Source: Author's Analysis, 2024

Figure 7 explains that the results of the visual graph analysis on the first floor show that the maximum integration value is in the northern part of the area (red circle) and in the central part of the area (pink circle). The concentration of the red zone as the zone with the highest Integrated Value is divided into 2 areas with the central part of the area having a higher value with a wider scope, even though the area functions as an educational zone in the form of a Kindergarten. The educational zone should be in an area with a moderate Integrated Value, namely in a semi-public zone, where the zone still includes spaces that make children interact with their peers, but is also in a safe zone because it is supervised by residents and Rusunawa managers.

Meanwhile, the Visual Graph Analysis on the second floor of theJatinegara Barat Rusunawa is as follows:

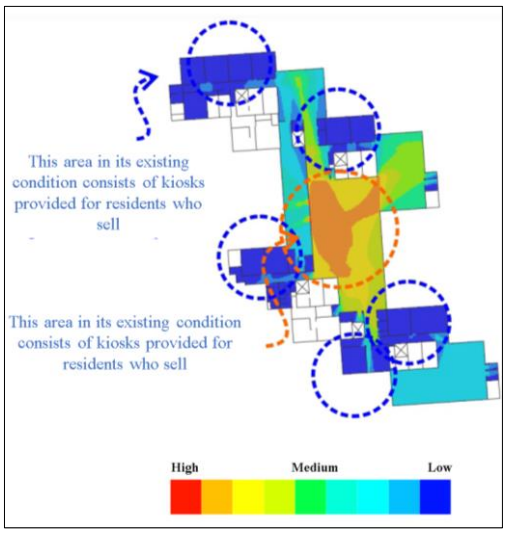


Figure 8. Integrated Value on the Second Floor
Source: Author's Analysis, 2024

Figure 8 explains that the results of the visual graph analysis on the second floor show that the spaces designated as economic spaces (in the form of kiosks, marked with blue circles) are actually in the zone with low Integrated Value, this supports the findings in the field regarding the quietness of the kiosks on the second floor. Although in the middle part (marked with an orange circle) has a fairly high Integrated Value, these spaces are not supported by adequate kiosk facilities, plus the spaces that are less strategic for the economic function are rented at prices that are not commensurate with their conditions, as a result on the second floor the function of Rusunawa as an economic zone does not run optimally.

Design Engineering Based on Visual Graph Analysis Results on the First and Second Floors

From the previous analysis, the author tried to create a spatial engineering to maximize the potential integrated value of the existing condition of Rusunawa. This engineering is to create a concentration of zones with high Integrated Value in the center (pink circle) in the education zone which should have a medium integration value, moved to the north (red circle) to increase its value as an economic zone. The engineering we did was to remove the mosque space on the first floor (moving it to the second floor) and add a Pedestrian Bridge that connects the pedestrian area with the pedestrian

across the street, to increase the integrated value.

The results were in line with the research team's expectations, namely reducing the Integrated Value in the education zone (pink circle) to the economic zone in the north of the region (red circle). This approach is expected to optimize the functioning of economic zones requiring high Integrated Value, while also optimizing the functioning of educational zones requiring moderate Integrated Value.

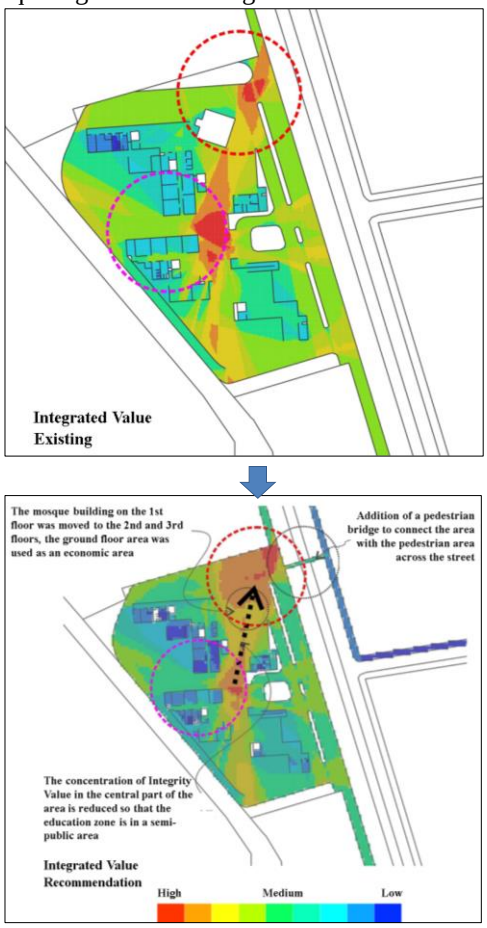


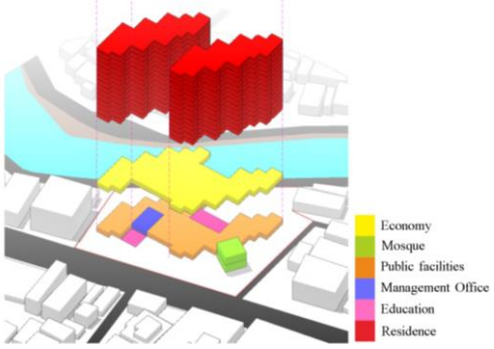
Figure 9. Integrated Value Engineering Design
Source: Author's Analysis, 2024

Design Recommendations

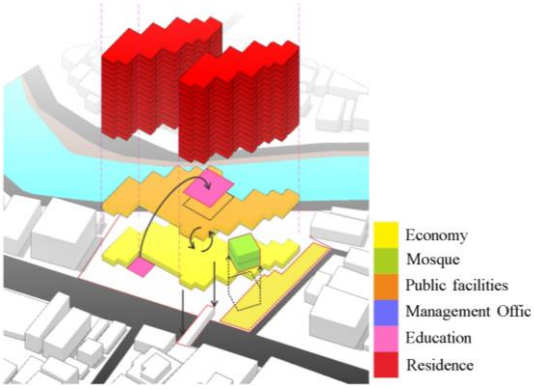
In response to the building issues, the Jatinegara Barat Rusunawa should transform from a multi-story residential building to a hybrid architecture. The architectural and fabrication design are the primary concepts for the Jatinegara Barat Rusunawa's function as a hybrid architecture.

Our design recommendations included major changes. The Economic Zone, located on the second floor, was moved to the ground floor to maximize the potential of the public space on that floor. The mosque's activities, located on the ground floor, were also moved to the second and third floors. The mosque was elevated so that the ground floor became part of the community's economic activity spaces. The area to the north of the area was developed into a zone to accommodate economic functions, within which kiosks could be built with affordable rents for the residents of the Rusunawa. So that the Jatinegara Barat Rusunawa area not only functions as a residence for low-income residents, but also functions as a generator of the local economy, increasing the economic income of the Rusunawa residents. So that if property prices increase in the area, the community can still survive. This is also expected to prevent the Rusunawa residents from gentrification, namely the takeover of land from low-income residents to high-income residents.

The second floor is converted into an educational and spiritual activity zone, where these activities can be integrated, the transfer of educational functions is not only to maximize the spaces on the ground floor for economic activities, but also to place the educational space in a semi-public zone, so that students' activities can be supervised by parents and the village community because it is close to the residential zone, but on the one hand students can still interact and play with their peers in the area. Design recommendations by applying hybrid architecture to increase the effectiveness of spatial relationships are as follows:



First Alternative Design Recommendation



Second Alternative Design Recommendation

Figure 10. Design Recommendation
Source: Author, 2024

Conclusion

Overall, the spatial planning program in the Jatinegara Barat Rusunawa has undergone functional changes since the units were occupied, particularly the conversion of residential spaces into commercial spaces. Factors such as resident needs, activity patterns, the environment, family size, and economic conditions have driven these changes. The program has been effective in providing social interaction and community, despite frequent modifications to domestic spaces. Shared spaces have been successfully utilized by residents and have fostered social interaction and productive activities. However, there is a mismatch between the initial design and the needs of residents within the units, which has led to changes in the function of domestic spaces.

The spatial planning program in the Jatinegara Barat Rusunawa is quite effective in supporting social interaction and communal activities, but less effective in accommodating residents' needs in private spaces. This underscores the importance of an adaptive design approach and space management that is responsive to the social and economic dynamics of residents. Therefore, it is necessary to improve the program for providing structured shared spaces to support residents' social and economic activities, as well as strengthen management services to ensure the sustainability and comfort of space use. The Jatinegara Barat Rusunawa, as a model of urban housing with a hybrid architecture, shows great potential in creating multifunctional and inclusive spaces.

Acknowledgements

We would like to thank the Director of Research and Community Service and the Dean of the Faculty of Engineering, Budi Luhur University, for their full support. The research team also expresses its gratitude to all parties who have strongly supported our research activities.

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