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# The Effectiveness of Vertical Housing Provision for Civil Servants: A Study of the Ministry of Public Works' Vertical Housing in Sleman Regency Indonesia

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**ABSTRACT:** The provision of housing for civil servants was crucial for bureaucratic stability and productivity, yet public housing literature predominantly focused on low-income groups. This study evaluated the effectiveness of State Civil Apparatus (Aparatur Sipil Negara/ASN) vertical housing provision by the Ministry of Public Works (Pekerjaan Umum/PU) in Sleman Regency, focusing on allocation targeting accuracy and residents' quality of life enhancement. Employing a mixed-methods design, data were collected from 71 respondents (68 residents and 3 managers) through questionnaires, in-depth interviews, and observations. The results indicated that the housing provision was functionally effective, characterized by high occupancy rates and proportional representation across administrative ranks. Quality of life also improved, as evidenced by increased commuting time efficiency, which enhanced work productivity and discipline. However, procedural effectiveness remained suboptimal due to offline quota allocation practices based on Working Units (Satuan Kerja/Satker), which distorted the integrated online registration system and neglected actual employee needs. Additionally, minimal communal social interaction raised concerns about neighborhood security. The study recommended abolishing the institutional quota system to reinstate objective digital selection and implementing community management programs to foster social cohesion.

**Keywords**: Public housing; civil servant vertical housing; policy effectiveness; quality of life; allocation targeting.

## 1. Introduction

The provision of decent housing had shifted from a mere welfare issue to a determining factor in the stability of the state bureaucracy. Decent housing served as a crucial component influencing the productivity of the government sector workforce. In both developed and developing countries, the relationship between housing certainty and civil apparatus productivity has received increasing research attention. In other words, the effectiveness of public services was highly influenced by the psychosocial well-being of service providers.

Housing uncertainty or financial pressure due to high housing costs could induce stress, lower motivation, and impair the cognitive capacity of the ASN, thereby potentially reducing the quality of public services delivered to the community [1]. Housing certainty provided a sense of security and psychological stability, enabling ASN to be more focused and motivated in carrying out their duties. Related studies indicated that physical environmental factors, including housing, contributed to improved performance through stress reduction and enhanced work-life balance [2]. Figure 1 illustrates the growth of Civil Servants (Pegawai Negeri Sipil/PNS) and Contract-based Government Employees (Pegawai Pemerintah dengan Perjanjian Kerja/PPPK) during the period from 2020 to July 2025.

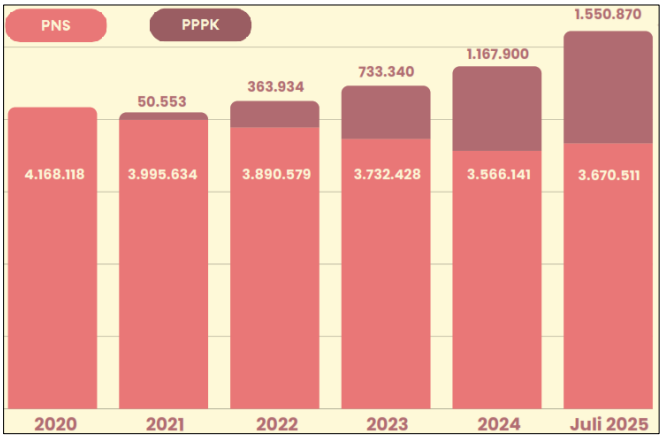


**Figure 1.** Growth of civil servants and contract-based government employees in the period of 2020 - July 2025.

This global context found strong and urgent relevance in Indonesia, particularly within the landscape of massive ongoing national bureaucratic transformation. The latest statistical data from [3] recorded a highly significant increase in the number of ASN, from 4,168,118 employees in 2020 to 5,221,381 employees in the first semester of 2025. The addition of 1,053,263 employees within this five-year period was not merely a statistical increase but a phenomenon with serious implications. This quantitative growth occurred alongside a paradigm shift in ASN management that increasingly emphasized national mobility as a unifying mechanism. The "Independent ASN" (ASN Merdeka) concept required employees to be ready for placement and rotation across the territory of the Unitary State of the Republic of Indonesia. Referring to Frederick Herzberg's motivation theory, working conditions and physical facilities, including housing, were classified as hygiene factors. The absence of these factors not only eliminated job satisfaction but also created dissatisfaction that could hinder performance [4]. Figure 2 presents Frederick Herzberg's motivation theory (1959).

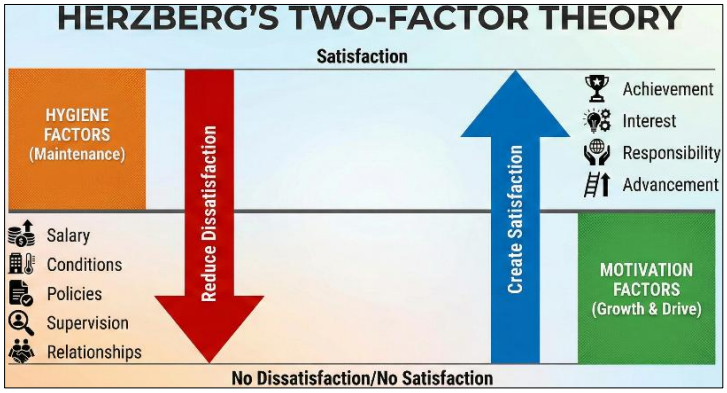


**Figure 2.** Frederick Herzberg's motivation theory (1959).

Without the guarantee of decent housing, ASN's energy and focus were likely to be diverted by domestic issues and financial pressures, thereby eroding professionalism, which is a key demand of bureaucratic reform. Psychosocial factors such as a sense of security, stability, and internal motivation served as important mediators in the relationship between housing certainty and ASN productivity [5]. Therefore, optimal job satisfaction could only be achieved if organizations not only managed hygiene factors to prevent dissatisfaction but also actively provided motivational factors to enhance satisfaction.

The logical consequence of intensive mobility and rotation policies was the emergence of an administratively nomadic ASN population. Assignment rotation, although essential for organizational renewal and equitable distribution of competencies, often caused significant disruptions to employees' personal lives [6]. The most prominent challenge faced by transferred ASN, particularly in densely populated urban areas, was the volatility of the housing market.

In this context, the development of vertical housing emerged as a strategic solution to overcome land limitations and improve the efficiency of urban space utilization, in line with national policies promoting vertical-based public housing for ASN and lower-middle-income groups [7]. Socially, ASN as residents had specific needs related to comfort, security, and spatial flexibility. Changes in work patterns, such as the adoption of hybrid work policies in the post-pandemic period, further increased the complexity of spatial needs and institutional support that had to be anticipated in vertical housing development [8]. The interplay of urbanization, policy dynamics, and environmental as well as social challenges positioned ASN vertical housing in a strategic yet complex context.

Within the Ministry of Public Works, ASN rotation and mutation had been implemented intensively to enhance organizational performance and efficiency. Previous studies showed that effective work culture and transformational leadership significantly influenced ASN performance in this ministry [9]. The selection of the Ministry of PU ASN vertical housing in Sleman Regency as a case study was highly relevant both regionally and nationally. Sleman Regency, as a rapidly growing peri-urban area, experienced increasing pressure on land availability and housing demand. The ASN vertical housing in Sleman reflected government efforts to provide housing integrated with spatial planning policies, infrastructure, and the specific needs of ASN as primary residents [10].

The existence of the Ministry of PU ASN vertical housing in Sleman Regency represented a unique and complex phenomenon. Out of a total of 27 vertical housing units constructed using the State Revenue and Expenditure Budget (APBN) funds in the province up to the end of 2023, only two units were specifically allocated for ASN, while the remainder were designated for Low-Income Communities (MBR), Islamic boarding school students, university students, and other groups. This limited supply, coupled with increasing demand due to ASN population growth, created intense competition for access and required effective governance. The Ministry of PU ASN vertical housing, classified as type 45 and equipped with complete facilities, had been effectively occupied since 2021. Therefore, evaluating its effectiveness became crucial for understanding how the state fulfilled its role in ensuring the welfare of its civil apparatus.

Despite the critical importance of providing vertical housing for government employees, the literature review revealed a significant empirical gap. Most previous studies in public housing focused primarily on functional evaluation and technical feasibility for housing

designated for Low-Income Communities (MBR). For instance, Prasesti et al. (2021) examined physical feasibility, functionality, and occupant behavior in rental vertical housing. Similarly, Gunandar et al. (2023) focused on the livability of subsidized commercial apartments, while Wati et al. (2024) analyzed the effectiveness of vertical housing policies in reducing housing backlog among underprivileged groups. However, these studies had not comprehensively addressed the effectiveness of vertical housing provision for state civil servants. ASN possess unique socio-demographic characteristics, stable income profiles, and high mobility demands, making their housing needs distinct from those of MBR groups. The lack of focused research on ASN housing effectiveness resulted in fragmented policy evaluation.

To address this gap, the framework of this study was developed based on a synthesis of public policy effectiveness theory and key parameters of housing provision. According to [14], effectiveness refers to the extent to which program objectives are achieved in accordance with predetermined targets. In the context of vertical housing provision, effectiveness was operationalized through targeting accuracy and the program's ability to maintain or improve residents' quality of life.

Based on these theoretical foundations and identified gaps, a critical issue emerged: the effectiveness of vertical housing provision in addressing the housing challenges of state civil servants remained insufficiently measured. Therefore, this study was designed with the primary objective of analyzing the effectiveness of the Ministry of PU ASN vertical housing provision in Sleman Regency, focusing on two key variables—targeting accuracy and its direct impact on improving residents' quality of life.

## 2. Materials and Methods

### *2.1. Research design.*

This study applied a mixed-methods research design. The combined analysis model was specifically structured such that quantitative data analysis functioned to support and deepen qualitative data analysis. This approach was chosen to provide a comprehensive understanding, whereby initial quantitative findings were further explored through a qualitative lens to capture the actual effectiveness of vertical housing provision. Figure 3 presents the research design diagram.

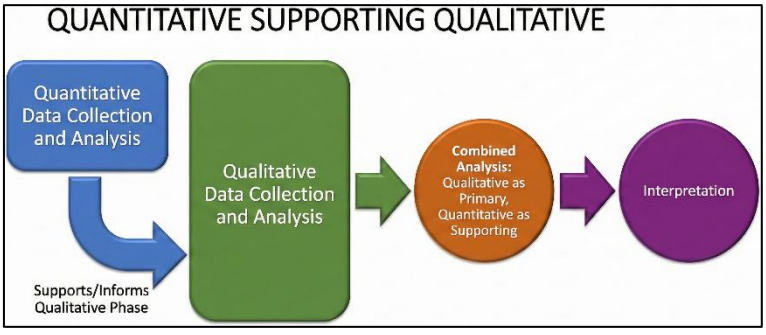


**Figure 3.** Research design diagram.

### *2.2. Population, sampling, and data collection methods.*

The population in this study included resident entities and vertical housing management. Sample determination was conducted using a proportional random sampling method drawn

from the target population, resulting in a total of 71 respondents, consisting of 68 resident representatives and 3 management representatives. This sampling method was selected to ensure that each population stratum was proportionally represented according to its respective weight, thereby enhancing representativeness, minimizing bias, and ensuring the validity of the findings in reflecting the overall population conditions.

Data collection was carried out through structured procedures using questionnaires and interviews as the primary instruments. Quantitative data were collected through the distribution of questionnaires to measure demographic variables, satisfaction levels, and aspects of housing needs fulfillment in a measurable manner. These numerical data were subsequently elaborated and enriched through qualitative data collection in the form of semi-structured in-depth interviews with participants to explore their perceptions and lived experiences in the vertical housing. In addition, observations of the building's physical conditions were conducted as supporting instruments to enable empirical triangulation. Figure 4 shows the location of the Ministry of PU ASN vertical housing in Sleman Regency.

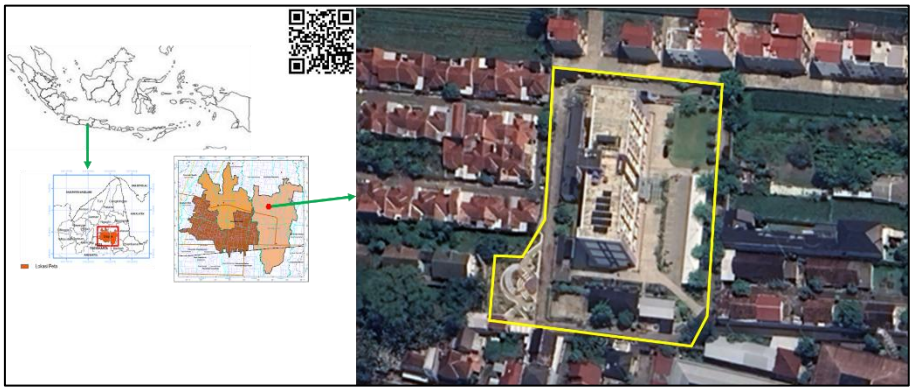

**Figure 4.** Location of the Ministry of PU ASN vertical housing, Sleman Regency.

The study was conducted after obtaining official permission from the relevant authorities. The research took place at the Ministry of PU ASN vertical housing located in Krodan, Sabo, Maguwoharjo Village, Depok Subdistrict, Sleman Regency, Special Region of Yogyakarta. The research was carried out over an eight-month period, from July 2025 to February 2026, covering phases of data collection, field surveys, and data processing and analysis.

### *2.3. Data analysis, validity and reliability.*

The data processing and analysis began with the quantitative recapitulation of questionnaire results using descriptive statistical analysis. These findings were then used as an empirical basis to guide and focus the transcription and analysis of qualitative interview data. Qualitative data were analyzed in depth through thematic grouping of variables into interrelated themes, which were subsequently integrated with quantitative findings through narrative discussion. This analytical approach ensured that qualitative insights were supported by statistically grounded evidence.

In the first phase, quantitative data from questionnaires (n = 71) were analyzed using descriptive statistics. The results were then used to purposively select key informants for the second, qualitative phase. Semi-structured interviews were transcribed and thematically analyzed. Integration occurred during the narrative discussion stage, where qualitative themes were mapped onto quantitative findings to explain, confirm, or contrast statistical patterns. A

joint display matrix was constructed to visualize convergence and divergence between the data strands.

The validity and reliability of the findings were ensured through cross-checking between questionnaire results, interviews, and field observations. Furthermore, the research instruments were tested for clarity and accuracy prior to distribution, and interview interpretations were re-confirmed with respondents to minimize misinterpretation.

A key limitation that could potentially affect the interpretation of the results was the presence of subjectivity bias, as the data were derived from self-reported responses. To mitigate this limitation, standardized procedures were applied in questionnaire administration, including clear instructions, consistent question sequencing, and uniform answer options, while avoiding researcher intervention that could influence responses. Additionally, subjective responses were cross-validated through direct observation of the building's physical condition and examination of management operational documents.

## 3. Results and Discussion

This section elaborated on two main variables used to assess the effectiveness of the Ministry of PU ASN vertical housing provision in Sleman Regency, namely targeting accuracy and its impact on improving residents' quality of life. The analysis was based on empirical findings obtained from the field.

### *3.1. Targeting accuracy.*

The concept of public policy targeting emphasized the importance of precise planning to ensure that policies reached the intended beneficiaries [15]. It also considered inclusion errors (benefits received by ineligible groups) and exclusion errors (eligible groups being excluded), allowing a comprehensive evaluation of equity, efficiency, and responsiveness [16]. In this study, targeting accuracy was assessed through three indicators: occupancy rate, proportional representation across ranks, and transparency of the selection process. The occupancy rate was categorized as high, although it had not yet reached full capacity. This indicated that the housing facilities had been effectively utilized, despite the presence of some vacant units. Such conditions were consistent with institutional housing patterns, where routine personnel rotation and relocation affected occupancy levels [17]. Qualitative findings confirmed strong demand, particularly among ASN originating from outside the region, as the housing reduced living costs and facilitated work assignments [18].

In terms of rank representation, the findings showed that residents were proportionally distributed across different grades without spatial segregation. However, qualitative evidence revealed concerns regarding the quota-based allocation system at the Working Unit level. This system was perceived as limiting access for employees with greater housing needs, as allocation depended more on institutional quotas than on actual necessity. Consequently, targeting accuracy was partially compromised, as allocation priorities shifted away from need-based criteria [19]. Regarding transparency, most residents perceived the selection criteria as clear, as illustrated in Figure 5. However, a minority reported a lack of clarity, which was linked to the coexistence of formal digital procedures and informal quota arrangements. Although the government had implemented an online registration system through the ARuS application, offline agreements among Working Units created confusion and weakened procedural

transparency. As a result, eligibility was influenced not only by objective criteria but also by quota availability, indicating a gap between policy design and implementation [20].

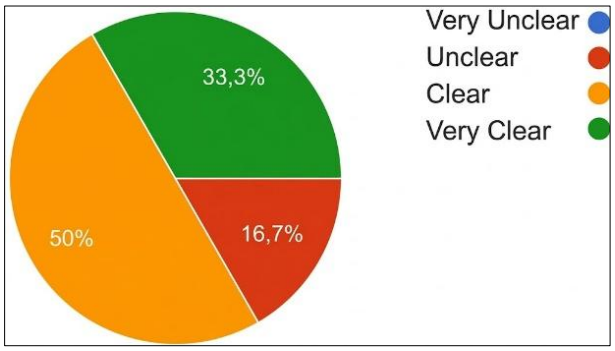


**Figure 5.** Information transparency on criteria and selection process for occupying the vertical housing.

As shown in Figure 5, the perception of information transparency varied among residents, reflecting inconsistencies in the implementation of the selection process. This lack of clarity was closely related to the dual selection system applied in practice. Although the ARuS application was designed to ensure transparency, offline quota agreements among Working Units undermined its effectiveness. One respondent stated that "there was already an agreement on the distribution of vertical housing units for each Working Unit, which violated the intended transparent application flow through the ARuS system." This situation indicated that the adoption of information technology had not been fully supported by consistent administrative compliance [20]. Consequently, an employee's eligibility to occupy vertical housing was determined not only by formal application requirements but also by the availability of quotas within their respective Working Units. Thus, the moderate level of transparency identified in the quantitative findings did not stem from a lack of information itself, but rather from the conflict between formal digital procedures and informal institutional practices.

Overall, targeting accuracy was considered functionally effective but procedurally suboptimal. As summarized in Table 1, the housing provision successfully maintained high occupancy rates and accommodated diverse ASN ranks. However, the quota-based allocation system reduced fairness and transparency, thereby limiting the overall effectiveness of policy implementation. Based on this analysis, the provision of the Ministry of PU ASN vertical housing in Sleman Regency was functionally effective but not yet optimal from a procedural perspective. Functionally, the housing successfully provided residential facilities with adequate occupancy rates and accommodated various ASN ranks without hierarchical segregation. This demonstrated that the state asset delivered tangible benefits to public servants, particularly those assigned outside their domicile areas. However, the effectiveness of targeting accuracy declined in procedural terms due to the internal policy of quota distribution among Working Units. This policy created a dual system that weakened the transparency of the official registration platform (ARuS). As a result, allocation became biased; employees with urgent housing needs could be excluded due to exhausted quotas in their Working Units, while unused quotas remained in others. To achieve full effectiveness, the management needed to evaluate and eliminate the institution-based quota system. The selection process should be fully centralized through a single digital platform that objectively prioritized applicants based on actual needs.

**Table 1.** Summary of results and discussion of the targeting accuracy variable.

| Evaluation Indicator | Quantitative Findings | Qualitative Findings | Analysis and Synthesis |
|---|---|---|---|
| 1. Occupancy Rate | Most management assesses the occupancy rate of units to be in the high category, although none have recorded occupancy reaching full or maximum capacity. | There is a very high urgency and need for vertical housings, particularly for employees (PNS/PPPK) originating from outside their assignment domicile area. | The utilization of the vertical housing has been functioning well and is responsive to the needs of employees on assignment outside the region. The capacity that is not fully occupied is due to the dynamics of periodic personnel mutations and rotations. |
| 2. Proportional Grade/Rank Representation | All management affirmed that the composition of vertical housing residents encompasses various rank grades evenly and diversely. | There are residents who complain about the practice of distributing unit quotas based on Working Units, which restricts access for employees who genuinely need housing more. | The grade representation that appears even administratively masks allocation inaccuracies in the field. The practice of Working Units quotas shifts the provision principle from "based on actual employee needs" to "based on institutional quotas," which risks creating access inequality. |
| 3. Transparency of the Selection Process | The majority of residents stated that the selection criteria information is clear. However, a small portion of residents still considers the registration procedures to be not transparent. | There is criticism regarding the selection process. Offline quota agreements among Working Units are considered to violate the official registration flow on the online system (ARuS application). | The transparency of the digital system established by the Government is hindered by informal administrative agreements among Working Units. This creates confusion and uncertainty, where resident eligibility is determined more by the Working Unit quota than by objective criteria in the application system. |

### *3.2. Improvement of residents' quality of life.*

Urban quality of life, according to [21], was measured by the extent to which residents felt subjectively prosperous, efficient in daily mobility, and able to carry out their social and professional functions effectively. One of the main indicators of this concept was residential satisfaction, which reflected an individual's overall assessment of their living environment. In relation to the jobs–housing balance theory [22], the reduction of travel time between home and workplace played an important role, as it reduced transportation costs, minimized commuting-related stress, and increased leisure time. For ASN, improvements in this balance were expected to create more stable psychological conditions, thereby positively influencing professional performance.

In this study, the improvement of residents' quality of life was evaluated through three main indicators: residents' subjective satisfaction with the built environment, commuting time efficiency (accessibility) between housing and workplace, and changes in productivity and work discipline after occupying the vertical housing. As shown in Figure 6, all residents reported satisfaction with the physical conditions and built environment of the vertical housing. The majority of respondents indicated that they were very satisfied, while the remainder reported being satisfied. From both physical and operational perspectives, the facilities and infrastructure were considered adequate. However, qualitative findings revealed issues related to limited social interaction among residents. This lack of interaction raised concerns regarding environmental security, particularly for residents with families. These findings suggested that the success of public housing depended not only on physical adequacy but also on the development of social cohesion among residents. Therefore, structured management programs,

such as routine community activities, were needed to foster interaction and create a harmonious residential environment [23].

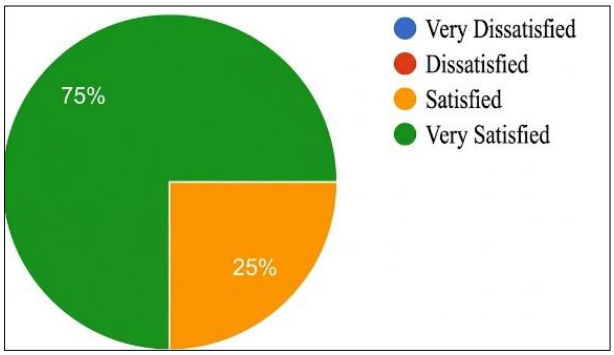


**Figure 6.** Residents' satisfaction level with quality of life in the vertical housing.

Regarding the second indicator, namely commuting efficiency, all residents reported that the location of the vertical housing facilitated access to their workplaces. Most respondents rated accessibility as good, while others rated it as very good. The proximity of the housing significantly supported the execution of ASN duties, particularly for those assigned from outside the region. For the third indicator, changes in productivity and work discipline, all residents reported improved performance after occupying the housing. The majority experienced increased productivity and discipline, while a smaller proportion reported substantial performance improvements. Reduced physical fatigue from daily commuting allowed residents to focus more effectively on their work responsibilities. In addition, residential stability contributed to stronger work discipline. These findings were consistent with previous studies indicating that proximity between housing and workplace positively affected public sector productivity [24].

As summarized in Table 2, the provision of vertical housing had contributed positively to improving residents' quality of life across all three evaluated indicators. Overall, the program had effectively met the fundamental residential needs of ASN, enhanced commuting efficiency, and strengthened work performance outcomes. These combined effects indicated that the vertical housing intervention was not only successful as a physical infrastructure project but also functioned as a supportive mechanism for improving administrative efficiency and human resource performance within the public sector. For the first indicator, subjective residential satisfaction, the findings showed that the majority of residents expressed a very high level of satisfaction with the physical condition of the building, while the remaining respondents reported being satisfied. This indicated that the built environment had met basic standards of habitability in terms of comfort, functionality, and infrastructure adequacy. Qualitative findings further confirmed that operational services, facilities, and building conditions were generally well maintained. However, despite this high level of physical satisfaction, limitations were identified in terms of social interaction among residents. The weak social cohesion raised concerns regarding environmental security, particularly in situations where units were temporarily left unoccupied by families. This suggested that while physical housing standards had been achieved, long-term residential comfort required stronger social integration mechanisms. Therefore, the sustainability of housing satisfaction depended not only on infrastructure quality but also on the strengthening of social capital through structured community engagement programs.

**Table 2.** Summary of results and discussion of the quality-of-life improvement variable.

| Evaluation Indicator | Quantitative Findings | Qualitative Findings | Analysis and Synthesis |
|---|---|---|---|
| 1. Subjective resident satisfaction level with the built environment of the vertical housing | The absolute majority of residents stated they are very satisfied with the physical condition of the building, while the remaining proportion felt satisfied. Overall, respondents received the built environment quality positively without any rejection. | Operations, facilities, and infrastructure are assessed as adequate. However, minimal social interaction among citizens raises concerns regarding environmental security, specifically when units are left by residents with families. | The physical feasibility criteria for housing have been optimally fulfilled. However, the sustainability of residential comfort needs to be supported by strengthening social capital through routine meeting programs to establish cohesion and a sense of security in the residential environment. |
| 2. Improvement in commuter time efficiency (accessibility) between the vertical housing and work locations | - | Residents assess that travel time efficiency is in the good category, and a significant portion of others rate it as very good. All residents confirm an optimization of daily travel distance and time. | The proximity of the vertical housing's location is empirically proven to facilitate the smooth mobility of the apparatus, especially for those from outside the region. This ensures that the housing function as supporting infrastructure for institutional duties proceeds according to plan. |
| 3. Changes in the level of productivity and work discipline of ASN post-occupying the vertical housing | The vast majority of the apparatus recorded performance improvement generally, while a fairly large remaining proportion reported a surge in productivity to a very high level after settling in the vertical housing. | Reduced physical fatigue from daily commuting enables the apparatus to focus more on working. The certainty and comfort of residence create stability that triggers better work discipline. | The provision of housing close to work locations correlates directly with enabling the apparatus's performance optimization. This leads to the improvement of work ethics and the enhancement of the apparatus's HR quality. |

For the second indicator, commuting time efficiency, the findings indicated a clear improvement in accessibility between the vertical housing and workplaces. Although this indicator was not measured quantitatively in detail, qualitative responses consistently showed that residents experienced reduced travel time and improved mobility efficiency. Most respondents categorized their commuting experience as good, while others rated it as very good. The proximity of the housing to workplaces significantly reduced daily transportation burdens, particularly for ASN originating from outside the region. This improvement contributed directly to time savings, reduced travel fatigue, and more efficient daily scheduling. Consequently, the vertical housing functioned effectively as supporting infrastructure for institutional performance by enabling smoother execution of official duties.

For the third indicator, changes in productivity and work discipline, the findings demonstrated a generally positive trend following residency in the vertical housing. The majority of ASN reported improved productivity, while a considerable proportion experienced a substantial increase in work performance. This improvement was primarily attributed to reduced physical fatigue caused by commuting and increased residential stability. The availability of comfortable and proximate housing enabled residents to focus more effectively on their professional responsibilities, thereby enhancing work concentration and discipline. These findings indicated that housing conditions had a direct influence on occupational performance, where improved living environments contributed to better human resource outcomes in the public sector.

## 4. Conclusions

Based on the analysis results, the provision of vertical housing for the Ministry of Public Works ASN in Sleman Regency had functioned effectively in a functional sense but was not yet optimal procedurally. This residential facility recorded a high occupancy rate and successfully accommodated residents from various rank groups proportionally. The provision of this institutional housing proved to be crucial in facilitating apparatus who came from outside the assignment domicile area. Nevertheless, the effectiveness of allocation targeting experienced a decline in quality due to an internal policy involving unit quota distribution based on Working Units agreed upon offline. This practice violated the registration flow, which should have been conducted transparently through an integrated online system (ARuS application). As a result, the provision principle shifted from a basis of real employee needs to an inter-agency quota agreement basis, thereby risking the rejection of apparatus who urgently needed housing simply because their work unit's quota had been exhausted. Regarding the fulfillment of quality of life, the presence of this vertical housing was proven to have had a comprehensive positive impact on the professional performance of the apparatus. The proximity of the housing location eased access to the workplace, reduced daily commuting time, and decreased physical fatigue. This condition created stability that led to a significant increase in ASN productivity and work discipline. The majority of residents also gave highly satisfactory ratings regarding the physical condition of the building and the surrounding facilities. However, qualitative findings identified an issue related to minimal social interaction among residents. This condition raised concerns regarding the assurance of communal environmental security, especially for apparatus residing with their families. This indicated that the successful provision of public housing depended not only on the functional viability of the building but also on the establishment of social interaction among residents. Referring to these findings, the recommendations focused on reforming administrative governance and strengthening community management. The vertical housing management needed to evaluate and eliminate the institution- or Working Unit-based quota allocation policy. The selection process had to be fully reverted to a single-entry point via an integrated digital system that objectively prioritized prospective residents based on the urgency of employees' real needs in the field. In addition, the management approach needed to be expanded by implementing structured social management programs, such as initiating regular resident meetings. This intervention was essential to build social capital, encourage interaction among residents, and foster a vertical housing environment that was harmonious, communal, and sustainably safe.

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## Author Contribution

Lukman Hakim was responsible for conceptualizing the research, collecting and analyzing data, writing the manuscript, and acquiring funding. Deva Fosterharoldas Swasto contributed to the development of the methodology, participated in data analysis, provided supervision throughout the study, and also secured funding.

## Competing Interest

The authors declared that they had no known financial, professional, or personal conflicts of interest that could have influenced the work reported in this study.

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