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Quality and Resilience of Subsidized Housing for Low-Income Communities in Disaster Prone Zone of Padang City: An Analysis of Residents' Perceptions

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ABSTRACT

Background: Subsidized housing for Low-Income Communities (LIC) in Indonesia continues to encounter significant quality challenges, particularly in disaster-prone regions. These challenges are primarily associated with the limited enforcement of technical standards, insufficient infrastructure provision, and inadequate policy support, which collectively undermine the resilience and habitability of such housing.

Aims and Methods: This study analyzes the quality and resilience of subsidized housing for LIC in Padang City, which are in disaster-prone zones. Using questionnaire survey methods and factor analysis, this study identified technical and non-technical variables that affect the feasibility of housing. The KMO-Bartlett test, validity, and reliability ensured the instrument's feasibility, resulting in 18 valid variables grouped into four main factors: the quality of infrastructure, facilities, and public utilities (IFP), housing development policies and support, technical quality and housing standards, and residential accessibility.

Result: The study results show that basic infrastructure, regulatory support, implementation of technical standards, and strategic location have a significant role in the quality of subsidized housing. These findings confirm the importance of synergy between technical and policy aspects in improving the quality and resilience of subsidized housing, especially in disaster-risk areas.

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1. Introduction

To improve the provision of livable housing services, it is necessary to build a livable housing supply system that meets the requirements in terms of quality and affordable quantity by Low-Income Communities (LIC) (Angriani & Syafri, 2025). The government targets increasing access to livable houses as part of the development program (Bappenas, 2020). In West Sumatra Province, the housing demand is projected to reach 1,341,112 units by 2035 (Perkim.Id, 2020).

Subsidized housing is a form of the government's efforts to provide livable and affordable housing for LIC (Aurilia *et al.,* 2023). Subsidized housing facilitation from the government is carried out through the Housing Finance Liquidity Facility (*Fasilitas Likuiditas Pembiayaan Perumahan (FLPP))* program (Sarayar *et al.,* 2022).

The Affordable Housing program still faces challenges related to the quality of subsidized houses and their supporting infrastructure, facilities, and public utilities (IFP) (Andalusia & Murniwati, 2024), besides that they are also related to the physical condition of house buildings that are not yet habitable/in need of renovation (Directorate of Evaluation of Housing Financing Assistance, 2017). LIC housing must at least have an adequate supply of clean water and sanitation, as well as affordable transportation access (Yap, 2016).

There are consumer complaints about the quality of residential houses that are not in accordance with those offered by housing developers related to housing facilities and infrastructure facilities that must be in accordance with government regulations (Aprilia *et al.,* 2020). This indicates that the problem of the quality of subsidized housing buildings and housing IFP that are not livable or not in accordance with technical standards affect the effectiveness of the Cheap Houses program (Bramantyo *et al.,* 2019).

The main problem related to subsidized housing in West Sumatra Province today is the low quality of buildings, as seen from the materials used, so that the buildings are not sturdy. However, all construction materials will experience a decline in quality and damage over time due to various factors, such as overload, extreme environmental conditions, and the aging process of materials (Yunas *et al.,* 2024). In addition, there are still LIC, housing that does not have adequate clean water and sanitation supply, transportation access that is not optimal, and housing locations that do not consider disaster risk (Andalusia & Murniwati, 2024). Much less Padang City, West Sumatra, is in an area with a high earthquake risk, based on SNI 1726:2019 (Yunas *et al.,* 2024). The city of Padang is highly vulnerable to earthquakes and tsunamis, with a record of a major earthquake in 2009 causing significant damage to the housing sector. This condition demands that subsidized housing not only meet housing affordability standards, but also have a design and construction considering disaster resilience.

The determinants of the quality of subsidized housing can be seen from two main dimensions, technical and non-technical, which complement each other to create decent, affordable, and sustainable housing. From a technical perspective, the quality of building materials, the proper construction methods, architectural design that is responsive to the needs of residents, and the availability of adequate IFP are the keys to ensuring the physical feasibility of the house. Consistent government supervision is needed so that quality standards are maintained. Meanwhile, from a non-technical perspective, strategic location, easy access to public facilities such as schools, health services, transportation, and public spaces, as well as the quality of the social environment, play a significant role in determining residents' comfort and quality of life. Supportive policies, such as simplification of licensing and financing subsidies, are also important to balance the interests of developers and consumers. The synergy of these two factors is an important foundation for the success of the subsidized housing program that focuses on affordable prices and ensures the quality and feasibility of housing (Syafri *et al.,* 2025).

The urgency in this study is to consider that the quality aspect of subsidized housing is still one of the main problems in the Cheap Housing Program, so it is necessary to study the quality of subsidized

houses sold by developers in the housing market. Then, considering that LIC is the program's beneficiary and the most affected party. In addition, disaster resilience is also a crucial factor in assessing the quality of subsidized housing, considering the number of disaster-prone areas in Indonesia, especially in the city of Padang, West Sumatra Province.

2. Methods

The research method is divided into several stages. The proposed research stage aims to identify a determining factor for the quality of subsidized housing. Phase I (Planning): Identify research problems, design research methods, and determine the population and sample. The research population is the LIC who have received subsidized housing in Padang. Samples were selected based on random sampling methods at the location of the case study. Phase II (Data Collection), Survey through questionnaires (in the form of technical and non-technical factors related to the quality of subsidized houses), respondents filled out questionnaires regarding their experiences and complaints related to subsidized houses they occupied. Phase III (Data Analysis and Discussion Stage), Quantitative data processing, questionnaire results were processed using descriptive statistical methods to see the tendency of LIC's perception of subsidized housing. The quality of subsidized housing is analyzed through the identification of both technical and non-technical factors, identify the factors that cause problems, and group the factors that determine the quality of subsidized houses based on the data obtained.

3. Results and Discussion

3.1. Kaiser Mayer Oiken and Bartlett's

To find potential causes as the main problem former, the **KMO (Kaiser Mayer Oiken) and Bartlett's tests** are carried out, which help determine the feasibility of each variable to be tested.

Table 1. KMO and Bartlett's Test Result

Kaiser-Meyer-Oikin Measure of Sampling Adequacy		0.873
Bartlett's Test of Sphericity	Approx. Chi-Square	810.926
	Df	153
	Sig.	0.000

The test results found that the value of the KMO and Bartlett's Test of Sphericity was 0.810, above 0.50, with a significant 0.000 below 0.05, it was stated that the sample had met the requirements and the analysis could be continued.

3.2. Variable Validity Test

In this study, the validity test of the research instrument was carried out by looking at the significance figures, namely comparing the value of r calculated (Corrected Item-Total Correlation) with the r table for the degree of freedom (Df) = n-2. The total number of respondents from the questionnaire is 70. With a total of 70 respondents, the value of r table 0.2352 was obtained.

Table 2. Validity Test

No	Variable	Calculated r value	Table r values	Significance	Decision
1	X1a	0.574	0.235	0	Valid

No	Variable	Calculated r value	Table r values	Significance	Decision
2	X1b	0.742	0.235	0	Valid
3	X1c	0.811	0.235	0	Valid
4	X1d	0.437	0.235	0	Valid
5	X1e	0.830	0.235	0	Valid
6	X1f	0.780	0.235	0	Valid
7	X1g	0.724	0.235	0	Valid
8	X1h	0.295	0.235	0	Valid
9	X2a	0.439	0.235	0	Valid
10	X2b	0.439	0.235	0	Valid
11	X2c	0.764	0.235	0	Valid
12	X2d	0.595	0.235	0	Valid
13	X2e	0.595	0.235	0	Valid
14	X2f	0.685	0.235	0	Valid
15	X2g	0.714	0.235	0	Valid
16	X2h	0.491	0.235	0	Valid
17	X2i	0.749	0.235	0	Valid
18	X2d	0.745	0.235	0	Valid
19	X2k	0.623	0.235	0	Valid
20	X2l	0.693	0.235	0	Valid
21	X2m	0.611	0.235	0	Valid

From the results of the validity test mentioned above, the variable is said to be valid if the calculated r value is greater than the r value of the table. A total of 21 variables were declared valid and could be tested further.

3.3.Variable Validity Test

A reliability test is a test that shows the extent to which these measurements can provide relatively different results. This test can only be done on valid variables; reliability testing uses the alpha formula or Cronbach's Alpha. An instrument is said to be reliable if Cronbach's Alpha is more ≥ 0.60. (Ghozali in Masril, 2014). The results of the reliability test in this study can be seen from the following table:

Table 3. Reliability Statistic

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.908	0.908	21

Based on the reliability statistics table above, it can be seen that Cronbach's Alpha value is 0.908 ≥ 0.60, so it can be said that the research is reliable.

3.4. Measure Of Sampling Adequacy (MSA)

The results of the factor analysis carried out were reported by the Measure of Sampling Adequacy (MSA) value on the anti-image matrix table. Of the 21 variables, 18 variables produced an MSA value above 0.50, and there were 3 variables below 0.50, namely X1a, X1h, and X2h. Because there were invalid variables, a second MSA test was carried out, and invalid variables were identified. The following can be seen in the table below:

Table 4. Measure of Sampling Adequacy (MSA) Value Recapitulation

No	Variable	MSA Value	Information
1	X1b	0.849	Variables worth using
2	X1c	0.872	Variables worth using
3	X1d	0.839	Variables worth using
4	X1e	0.896	Variables worth using
5	X1f	0.894	Variables worth using
6	X1g	0.896	Variables worth using
7	X2a	0.672	Variables worth using
8	X2b	0.740	Variables worth using
9	X2c	0.910	Variables worth using
10	X2d	0.868	Variables worth using
11	X2e	0.896	Variables worth using
12	X2f	0.933	Variables worth using
13	X2g	0.931	Variables worth using
14	X2i	0.884	Variables worth using
15	X2d	0.885	Variables worth using
16	X2k	0.770	Variables worth using
17	X2l	0.843	Variables worth using
18	X2m	0.894	Variables worth using

3.5.Communalities

The next stage of factor analysis is Communalities. Communalities is a model used to determine the factors that are first formed in explaining the variance of a variable. Based on the results of the analysis that has been carried out, a summary of the results is found as seen in Table 5 below:

Table 5. Communalities

	Initial	Extraction
X1b	1,000	0.691
X1c	1,000	0.773
X1d	1,000	0.607
X1e	1,000	0.744
X1f	1,000	0.768
X1g	1,000	0.672
X2a	1,000	0.789
X2b	1,000	0.776
X2c	1,000	0.793
X2D	1,000	0.697
X2e	1,000	0.719
X2f	1,000	0.735
X2g	1,000	0.665
X2i	1,000	0.537
X2d	1,000	0.766
X2k	1,000	0.839
X2l	1,000	0.747
X2m	1,000	0.677

Extraction Method: Principal Component Analysis.

The 18 tested variables were valid in the second communalities test, with a correlation coefficient value of > 0.50.

3.6.Total Variance Explained

Total Variance Explained is an analysis used to see how many factors are optimal in explaining the variance of 18 variable items. The contribution of the total factors formed will be classified in the analysis of total variance explained. Based on the analysis that has been carried out, a summary of the results is found as seen in Table 6 below:

Table 6. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.722	42.902	42.902	7.722	42.902	42.902
2	2.824	15.688	58.590	2.824	15.688	58.590
3	1.385	7.695	66.285	1.385	7.695	66.285
4	1.064	5.909	72.194	1.064	5.909	72.194
5	0.744	4.133	76.327			
6	0.680	3.776	80.103			
7	0.531	2.950	83.053			
8	0.485	2.693	85.746			
9	0.446	2.476	88.222			
10	0.379	2.107	90.329			
11	0.337	1.871	92.201			
12	0.317	1.758	93.959			
13	0.268	1.486	95.445			
14	0.212	1.179	96.624			
15	0.192	1.068	97.692			
16	0.148	0.822	98.514			
17	0.144	0.802	99.316			
18	0.123	0.684	100.000			

Based on the results of the analysis above, four new factors were obtained, each of which was named according to its constituent variables. The names of the four factors can be seen in Table 7 below.

Table 7. Clustering of New Factors Based on Factor Analysis

Factor	Variable Code	Variable
Factor 1: Quality of IFP	X1f	Availability of basic infrastructure such as roads, clean water, electricity, and drainage systems
	X2c	Effective use of construction technology and techniques
	X2d	Availability of public transportation and good road access

	X2g	Adequate infrastructure, facilities, and public utilities (IFP) support the physical feasibility of housing
Factor 2: Housing Development Policy and Support	X1d	Design tailored to the needs of residents
	X2i	Financing subsidies to ease the burden on consumers
	X2d	Simplification of permits to accelerate development
	X2k	Regulations/regulations that balance the interests of developers and the community
	X2l	Cooperation in maintaining a balance between commercial and social aspects
Factor 3: Technical Quality and Housing Standards	X1b	The construction process is according to technical procedures
	X1c	Effective use of construction technology and techniques
	X1e	Pay attention to comfort, natural lighting, ventilation, and layout
	X1g	Adequate infrastructure, facilities, and public utilities (IFP) support the physical feasibility of housing
	X2m	A shared commitment to meet decent housing standards
Factor 4: Residential Accessibility	X2a	Distance from the city center or center of economic activity
	X2f	The existence of public spaces, parks, schools, health centers, places of worship, etc.

From the table above, it can be concluded that four factors determine the quality of subsidized houses in the city of Padang, namely 1) Infrastructure quality factors and IFP, the importance of infrastructure quality factors and basic IFP such as roads, clean water, electricity, drainage, and adequate IFP are the foundations for the feasibility of a residence. Good infrastructure ensures that residents can move comfortably, safely, and efficiently. Without adequate infrastructure, housing will quickly experience a decline in function and value, even though the buildings themselves are of high quality. 2) Policy factors and support for housing development, the right policies, such as ease of licensing, financing subsidies, and balanced regulations, are critical to accelerate the provision of quality subsidized housing. This support helps developers provide affordable housing while maintaining quality and ensuring the community's interests are not neglected. 3) Technical quality factors and occupancy standards, the implementation of technical procedures, the use of appropriate construction technology, and the fulfilment of comfort standards (natural lighting, ventilation, spatial layout) ensure that the house is physically livable. This factor directly affects the structure's safety, the comfort of the occupants and the longevity of the building. Technical quality factors and housing standards must also consider the implementation of earthquake- resistant design and construction by SNI 1726:2019, considering the high potential for disasters in Padang City. 4) Housing accessibility factors, strategic residential location, proximity to the center of economic activity, and easy access to public facilities (schools, health centers, parks, public transportation) greatly determine residents'

quality of life. Residences that are difficult to access or far from important facilities will reduce the value of their benefits, even if the physical quality of the building is good.

An analysis of the quality of subsidized housing in Padang City identified four main factors influencing housing suitability: infrastructure and public utilities (PSU), housing development policies and support, technical quality and housing standards, and accessibility. These four factors are interrelated and have direct consequences for the quality of life of low-income communities (LIC) as beneficiaries of the subsidized housing program.

The first factor is the quality of infrastructure and public utilities (PSU). Basic infrastructure such as roads, clean water, electricity, drainage, and adequate infrastructure, facilities, and utilities (PSU) are the main foundation for the suitability of a residence. If these factors are met, residents can carry out activities comfortably, safely, and efficiently, and the value of the residence can be maintained in the long term. Conversely, if the infrastructure is inadequate, the house will quickly lose its function even if the building is of good quality. This finding aligns with research by Bramantyo *et al.* (2022) in Semarang, which showed that limited basic infrastructure was a major complaint of subsidized housing recipients and significantly influenced perceptions of housing quality.

The second factor is housing development policy and support. Appropriate regulations, streamlined permitting, and financing subsidies will accelerate the provision of quality subsidized housing. Policy support helps developers maintain quality while maintaining affordability, while also safeguarding the interests of low-income families (MBR). Conversely, without policy support, developers may be encouraged to reduce costs at the expense of construction quality, ultimately harming the community. These results align with research by Cahyaninghati *et al.* (2021) in Buleleng, which emphasized the crucial role of policy and financing subsidies in ensuring the livability of subsidized housing.

The third factor is the technical quality and standards of housing. Implementing technical procedures, meeting comfort standards, and using appropriate construction technology significantly impact the physical suitability of a home. Subsidized housing that meets standards for ventilation, lighting, spatial planning, and structural safety will be more livable, safe, and durable. In Padang City, implementing earthquake-resistant design in accordance with SNI 1726:2019 is crucial due to the high risk of disasters. If technical standards are ignored, the risk of premature damage and threats to occupant safety increases. Research by Anugraheni & Mutiari (2023) found that many subsidized housing units underwent premature renovation due to poor construction quality and design inconsistencies with occupant needs, further underscoring the importance of this technical factor.

The fourth factor is housing accessibility. Strategically located subsidized housing, close to centers of economic activity, and with access to public facilities such as schools, healthcare facilities, and public transportation, will improve the quality of life for residents and increase the value of the home. Conversely, subsidized housing that is far from public service centers or difficult to access will reduce interest, even if the building quality is good. This finding aligns with research by Luthfi (2016) in Jember, which emphasized that location and accessibility are dominant factors influencing demand for subsidized housing.

Taken together, these four factors demonstrate that the quality of subsidized housing is not solely determined by the condition of the building, but also influenced by infrastructure, policies, and accessibility. Neglecting any one of these factors can result in reduced housing affordability for low-income families. Therefore, the provision of subsidized housing in Padang City and other disaster-prone areas must integrate technical, policy, infrastructure, and spatial aspects to ensure it is not only financially affordable but also safe, decent, and sustainable.

4. Conclusions

Based on the results of this study, it can be concluded that four factors determine the quality of subsidized housing in the city of Padang, namely infrastructure quality factors and IFP which consists of 4 variables, policy factors and housing development support which consists of 5 variables, technical quality factors and housing standards which consist of 5 variables, and housing accessibility factors which consist of 2 variables.

This research has limitations, namely that the scope of the research is limited to Padang City, so that the findings obtained cannot be generalized to other areas with different social, economic and disaster risk conditions.

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6. Authors Note

The authors declare that there is no conflict of interest regarding the publication of this article and confirm that the paper was free of plagiarism.

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