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Pandemic Resilient Sustainable Settlement Model in Makassar City

Ninik Dwi Resky[1], Mimi Arifin[1], Shirly Wunas[1]

Email: mimiarifin@yahoo.com, mimiarifin@unhas.ac.id, shirly_wunas@unhas.com

[1]Department of Urban and Regional Planning, Hasanuddin University, Indonesia
[2]Lecturer of the Master's Program in Urban and Regional Planning, Hasanuddin University, Indonesia

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Abstract

A pandemic is one of many types of disasters that must be considered in emergency response planning. Currently the Covid-19 pandemic is sweeping the world, including Indonesia, so there is increasing concern about urban settlements that have high density and vulnerability to Covid-19 because housing is one of the important factors during the pandemic. Based on this, it is deemed necessary to conduct a study on a sustainable urban settlement model that is resilient to pandemics so that it can facilitate and overcome pandemic cases that have or will occur. Resilient housing is a residential area or residence inhabited by people who are ready to face any threat, including Covid-19. The research location is a residential real estate located in the city of Makassar. This research aims to analyze the conditions of urban settlement which viewed from the ressilience toward pandemic and analyze the socio-cultural and economic conditions against vulnerability of pandemic transition to obtain a sustainable model that is resilient to the pandemic. The research method used is multiple regression, t test and f test. As a result, the most influential factor on the security of housing residents during the pandemic is supervision, while the most influential factor in increasing the transmission of Covid-19 is the vulnerability of socio-economic mix, both of which are the most dominant variables in increasing housing resilience to the pandemic. There are various control strategies with a pandemic resilient sustainable housing model, namely increasing supervision, limiting socio-economic mixing, principles of resilience and sustainability.

Keywords: Covid-19, Pandemics, Tough Housing

Introduction

Since the first case of Covid-19 in Indonesia, many things have been done in response to both the government and various parties in dealing with the virus on a global scale. The government's policy to deal with Covid-19 by reducing the intensity of leaving the house is something that is difficult to avoid. The consideration is space constraints and ineffective physical distance so that the spread of the virus is very likely to occur quickly (Snyder & Tormala, 2017). The Covid-19 pandemic is a significant risk. If not controlled, it can kill hundreds of millions of people with huge social and economic costs. If Covid-19 had followed the pattern of previous pandemics, controlling it would require limited travel and months of physical interaction, giving rise to various health, social and economic problems. To increase resilience, communities need effective responses including control of transmission, safe access, adequate housing and physical and mental support for isolated people, and affordability (Litman, 2020). Covid-19 is not the first pandemic facing the world community. According to Centers for Disease Control and Prevention or CDC (2019), before the Covid-19 outbreak there were Asiatic Flu (1889), Spanish flu (1918), Asian flu (1959), SARS (2002), and MERS (2012).

According to Law Number 24 of 2007 concerning Disaster Management (2007) that pandemics are included in the category of non-natural disasters, namely disasters caused by non-natural events or series of events, which include technological failures, failed modernization, epidemics, and disease outbreaks. Currently, South Sulawesi (18 August 2021) is in fifth place in the provincial classification with the highest number of Covid-19 cases in Indonesia (Makassar City Government Corona Info 2020). In Makassar City, the spread of the Covid-19 virus is increasing every day.

Transmission of SARS-CoV-2 can occur through direct contact, indirect contact, or close contact with an infected person through secretions such as saliva and respiratory tract secretions or respiratory droplets released when an infected person coughs, sneezes, talks, or sings. . Person-to-person transmission can occur through direct contact or through droplets spread by coughing or sneezing from an infected person (Rothan & Byrareddy, 2020). Meanwhile, Vulnerability is a "loss" that can be expressed through damage and loss due to a certain hazard for a certain area and for a certain period. Based on mathematical calculations, risk is the product of hazard and vulnerability (Beck, 1992). According to a Covid-19 spokesperson, settlements are the cluster of the highest spread of the Covid-19 virus. The reason is the negligence of residents of residential areas in complying with health protocols. The existence of the Covid-19 pandemic affects government policies in determining various efforts to be able to carry out activities both in various sectors, both economic, social and cultural by making regulations in accordance with health protocols by implementing IMR (adaptation of new habits) in the neighborhood. So that the results of this study are expected to contribute to housing providers to offer sustainable settlements that make residents feel resilient and the spread of Covid-19 can be overcome. The concept of urban resilience is a concept that has a correlation with the concept of sustainable development. This concept is not encouraged but held with the support of innovation, mitigation, and adaptation. Resilient housing can prevent disease transmission in residential areas (Neiderud, 2015).

In this study, the condition of urban settlements will be seen in terms of the resilience variable to face the pandemic. Then it will reveal the socio-cultural and economic conditions of the residents of the settlements against the vulnerability of pandemic transmission. Finally, this study reveals how a sustainable settlement model is resilient to the pandemic.

Figure 1. Map of the spread of Covid-19 in Makassar City

Source: Infocoronamakassar.go.id

Methods

Administratively, the research location was conducted on residential real estate in Makassar City. The research data was obtained from direct observation (observation), documentation,

and questionnaires to residents of the housing that became the research location. In this study using a quantitative descriptive method and the variable measurement scale is carried out using a Likert scale. This data uses multiple regression analysis, T test and F test to see how far a variable affects other variables. The sampling technique used in this study is part of the non-probability sampling technique, namely purposive sampling. Purposive sampling is a sampling technique with certain considerations in (Sugiyono, 2016).

Population and Sample

The research population is residential residents spread across Makassar City with the criteria that they have been infected or there are other family members who live in the same house who have contracted the Covid-19 virus and are self-isolating at home. Hypothesis testing will not hit the target if the data used to test the hypothesis is unreliable data and does not accurately describe the concept being measured (Sunyoto, 2013). Therefore, the questionnaire was distributed to 30 respondents in each sub-district to see the validity of the questionnaire. This study took samples according to research conditions whose population was unknown, the minimum number of samples to obtain good results was 30 (Sunyoto, 2013). So that the grouping is carried out per sub-district in Makassar City, then in each sub-district 30 samples are taken each to be measured and observed. If the total number of samples is 420 respondents

Research variable

Urban Settlements and Variable Resilience in the Face of a Pandemic

Table 1. Criteria for Assessment of Urban Settlements and Resilience Variables (Sintesa, 2021)

Concept	Variable	Dimension	Indicators
Urban Settlements	Access control (X1) This principle regulates the entry and exit of visitors / residents *(Zahm, 2007)*	Access control	1. Housing location 2. Access in and out of residential neighborhoods 3. Use of portals or fences in and out 4. Checking, monitoring in and out of housing 5. Use of limiters with the surrounding environment *(Munggaran, Bayu & Ardy Maulidy Navastara, 2018)*
	Surveillance (X2) The principle of natural surveillance refers to the capacity of the environment to provide opportunities for people to supervise each other *(Johnson et al., 2014).*	Supervision	1. The physical condition of the housing that is easy to monitor 2. Additional facilities that assist with surveillance *(Munggaran, Bayu & Ardy Maulidy Navastara, 2018)*

Concept	Variable	Dimension	Indicators
	Territorial strengthening (X3) Distinguishing a private area from a public space *(Crowe & Fennelly, 2013)*	Territorial strengthening	1. Means of joint activities between residents 2. A sense of belonging to the environment *(Munggaran, Bayu & Ardy Maulidy Navastara, 2018)*
Tough Variables	Settlement Toughness (Y) Resilient housing can prevent the transmission of disease in residential settlements (Neiderud, 2015).	Settlement Resilience	1. In terms of access control 2. In terms of supervision 3. In terms of territorial strengthening *(Munggaran, Bayu & Ardy Maulidy Navastara, 2018)*

Socio-Cultural, Economic Vulnerability and Pandemic Transmission Vulnerability

Table 2. Criteria for Assessment of Socio-Cultural, Economic Vulnerability and Vulnerability of Pandemic Transmission (Syntesa Pustaka, 2021)

Concept	Variable	Dimension	Indicators
Socio-Cultural Vulnerability	Socio-Cultural Vulnerabilities (X1) The place where the process of socialization takes place in an individual is introduced the norms and customs of customs that prevail in a society. *(Eko, 1998)*	Socio-Cultural Vulnerability	1. Household Structure 2. Interaction between residents
	Economic Vulnerability (X2) The intensity of interaction and the movement or movement of human beings from one space to another.	Economic Vulnerability	1. Mobility 2. Livelihood imperatives
	Infrastructure Vulnerabilities (X3) Basic facilities or structures, equipment, installations built and necessary for the functioning of the social	Infrastructure Vulnerabilities	1. Clean Water 2. Toilet/ sanitation 3. Waste *(Wilkinson et al., 2020)*

Concept	Variable	Dimension	Indicators
	system and economic system of society *(Grigg & Darrel, 2000).*		
Transmission Vulnerability	Transmission Vulnerability (Y) Includes vulnerabilities associated with socioeconomic mixing, housing and infrastructure, where conditions can drive increased transmission. *(Wilkinson et al., 2020)*	Transmission Vulnerability	1. Physical 2. Social 3. Economics 4. Milieu *(Bizimana, 2015)*

Results and Discussion

Test Instrument Items

Hypothesis testing will not hit the target if the data used to test the hypothesis is unreliable data and does not describe exactly the concept being measured (sunyoto, 2013).

Validity and Reliability Test

The validity test decision-making criterion for each question is the *Corrected Item-Total Correlation* value or the $_{calculated}$ r value must be above 0.3 (Sugiyono, 2016).

Table 3. Validity Test (SPSS output, 2021)

Urban Settlement Conditions and Resilience Variables facing the Pandemic				
Variable	Indicators	Corrected Item-Total Correlation	Minimum r	Decision
Access Control (X1)	X1.1	0.551	0.3	Valid
	X1.2	0.727	0.3	Valid
	X1.3	0.700	0.3	Valid
	X1.4	0.318	0.3	Valid
Surveillance (X2)	X2.1	0.776	0.3	Valid
	X2.2	0.776	0.3	Valid
Territorial Strengthening (X3)	X3.1	0.736	0.3	Valid
	X3.2	0.646	0.3	Valid
	X3.3	0.670	0.3	Valid
Toughness Variable (Y)	Y1	0.824	0.3	Valid
	Y2	0.871	0.3	Valid
	Y3	0.856	0.3	Valid
Socio-Cultural, Economic, Infrastructure and Transmission Vulnerability				
Variable	Indicators	Corrected Item-Total Correlation	Minimum r	Decision
Socio-Cultural Vulnerabilities (X1)	X1.1	0.633	0.3	Valid
	X1.2	0.543	0.3	Valid
	X1.3	0.646	0.3	Valid
	X2.1	0.544	0.3	Valid

Economic Vulnerability (X2)	X2.2	0.544	0.3	Valid
Infrastructure Vulnerabilities (X3)	X3.1	0.817	0.3	Valid
	X3.2	0.914	0.3	Valid
	X3.3	0.864	0.3	Valid
Transmission Vulnerability (Y)	Y1	0.663	0.3	Valid
	Y2	0.744	0.3	Valid
	Y3	0.628	0.3	Valid
	Y4	0.682	0.3	Valid

Reliability is a tool for measuring questionnaires that are indicators of variables (Imam, 2011), In this study, reliability measurements were carried out using the cronbach's alpha method, where the questionnaire was said to be reliable if the value of cronbach's alpha > 0.6. A reliability test is performed against a valid question.

Table 4. Reliability Test (SPSS output, 2021)

Urban Settlement Conditions and Resilience Variables facing the Pandemic			
Variable	Cronbach's Alpha	0.6	Decision
Access Control (X1)	0.766	0.6	Valid
Monitoring (X2)	0.874	0.6	Valid
Territorial Strengthening (X3)	0.823	0.6	Valid
Toughness Variable (Y)	0.927	0.6	Valid
Socio-Cultural, Economic and Vulnerable Transmission			
Variable	Cronbach's Alpha	0.6	Decision
Socio-Cultural Vulnerabilities (X1)	0.760	0.6	Valid
Economic Vulnerability (X2)	0.699	0.6	Valid
Infrastructure Vulnerabilities (X3)	0.934	0.6	Valid
Transmission Vulnerability (Y)	0.841	0.6	Valid

Urban Settlement Conditions and Variable Resilience to Face the Pandemic

Multiple Regression Analysis

This analysis is used to calculate the magnitude of the effect of access control, surveillance, and territorial strengthening on the resilience variables facing the pandemic can be seen through the regression equation in the following table:

Table 5. Multiple Regression Analysis Results (SPSS output, 2021)

Coefficients[a]						
Model	Unstandardized Coefficients			Standardized Coefficients	t	Sig.
	B		Std. Error	Beta		
1	(Constant)	1.968	0.533		3.694	0.001
	Access Control	-0.435	0.180	-0.431	-2.424	0.023
	Supervision	0.843	0.179	0.971	4.718	<0.001
	Territorial Strengthening	-0.008	0.188	-0.008	-0.041	0.968
a. Dependent Variable: Resilience Variables In Response to the Pandemic						

Based on the table, the value of the access control coefficient (X1) is -0.435, supervision (X2) is 0.843 and territory strengthening (X3) is -0.008. Thus, the value of the calculation result of the regression analysis is formulated into the following equation:

$$Y = 1.968 + (-0.435)\ X_1 + 0.843\ X_2 + (-0.008)\ X_3$$

Multiple Regression Test (F Test)

Table 7. Multiple Regression Test (F Test) (SPSS output, 2021)

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.697	3	4.566	11.352	<,001[b]
	Residual	10.457	26	0.402		
	Total	24.155	29			
a. Dependent Variables: Variables of Resilience in The Face of a Pandemic						
b. Predictors: (Constant), territorial strengthening, access control, surveillance						

Based on the results of data processing, the significance value is smaller than 0.05 (<0.001 < 0.05) and F > F table (11,352 > 3), it can be concluded that the variables of access control, supervision and strengthening of territory affect the variables of resilience to face the pandemic in the city of Makassar.

Partial Hypothesis Test (T Test)

Table 8. Partial Hypothesis Test (T Test) (SPSS output, 2021)

Variable	t_{count} : t_{table}		Prob Sig		Information
	t_{count}	t_{table}	Sig	α = 0,5 %	
Access Control	-2.424	2	0.023	0.05	Significant
Supervision	4.718	2	<0.001	0.05	Significant
Territorial Strengthening	-0.041	2	0.968	0.05	Insignificant

The Effect of Access Control on the Variables of Resilience to Face the Pandemic

Based on the results of the t-test hypothesis testing, where the t-count value is smaller than t-table and the significance probability value is less than 0.05. This shows that the access control variable has no but significant effect on the resilience variable to face the pandemic.

The Effect of Supervision on the Variables of Resilience in the Face of the Pandemic

Based on the results of the t test hypothesis, where the calculated t value is greater than the table t and the p-value of the significance probability is less than 0.05. This shows that the surveillance variable is influential and significant to the resilience variable in the face of a pandemic.

The Effect of Territorial Strengthening on the Variable of Resilience to Face the Pandemic

Based on the results of the t test hypothesis, where the calculated t value is smaller than the table t and the significance probability value is greater than 0.05. This shows that the variable of territorial strengthening has no effect and is not significant to the variable of resilience to face the pandemic.

Coefficient of Determination (Adjusted R2)

Table 9. Coefficient of Determination Result (SPSS output, 2021)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.753[a]	0.567	0.517	0.63419
a. Predictors: (Constant), territorial strengthening, access control, surveillance				

Based on calculations, the adjusted value of R2 of 0.517 means that independent variables consisting of access control, supervision and strengthening of territories contribute 75% to the resilience variable facing the pandemic, so there are independent variables outside this regression model that affect the resilience variable facing the pandemic in the city of Makassar by 25%.

Analysis of Urban Settlement Conditions Reviewed on Resilience Variables Facing the pandemic

Access control, supervision and strengthening of territories affect spatially on the variables of resilience to face the pandemic in Makassar City

Access control is a principle that regulates entry and exit or limits the number of people entering and leaving so as to prevent unauthorized persons from entering the environment (Zahm, 2007). In line with Crowe & Fennelly (2013) that access control can be done by limiting the number of entrances and exits to the residential environment, a maximum of two accesses in and out. Based on the results of the study, it showed that access control had a tcount value of -2.424 with a significant value of 0.023 less than 0.05 (0.023 <0.05), the results of multiple regression analysis had a negative value of -0.435. Then the value of the hypothesis, namely "access control (X1)" shows that it has no effect but is significant. According to Crowe & Fennelly (2013) that this is a good concept because only one entry and exit makes it easy for both security officers and residents to monitor who enters their environment so that the spread of Covid-19 can be prevented or minimized.

Supervision refers to the capacity of the environment to provide opportunities for people to monitor each other (Johnson et al., 2014). Based on the results of the study, it showed that supervision had a tcount of 4.718 with a significant value of <0.001 less than 0.05 (<0.001 <0.05), the results of multiple regression analysis had a positive value of 0.843. Then the value of the hypothesis, namely "supervision (X2)" indicates that resilience to face a pandemic will increase if supervision also increases. Peltzman, (1998) revealed a theory which states that people are more likely to engage in risky behavior when security measures have been taken. This security perception then increases risk appetite or the tendency to take risks after feeling safe.

Territorial reinforcement is a territorial element that allows owners to determine personal property and restrict access using physical barriers or symbolic barriers (Armitage 2000). Based on the results of the study, it showed that territorial strengthening had a tcount of 2.192 with a significant value of 0.968 greater than 0.05 (0.968 > 0.05), the results of multiple regression analysis had a negative value of -0.008. Then the value of the hypothesis, namely "territorial strengthening (X3)" shows that it has an effect but is not significant. According to Crowe & Fennelly (2013) that territorial strengthening identity can distinguish private areas and public spaces. This can also prevent the transmission of vulnerable Covid-19 in housing.

Access Control, Monitoring and Strengthening of Territories Stimulantly Affects the Resilience Variable in Facing a Pandemic in Makassar City

Based on the results of data processing, the significance value is less than 0.05 (<0.001 < 0.05) and F > F table (11,352 > 3), it can be concluded that the variables of access control, supervision

and territorial strengthening have a simultaneous effect or effect if combined together on the variables resilience to face the pandemic in the city of Makassar and contributed 75%, while the remaining 25% was influenced by other variables.

Supervision is the Most Dominant Variable of the Resilience Variable in Facing a Pandemic in Makassar City

Based on the partial test (t test) between the variables of access control, supervision and territory strengthening, the t-value of access control is -2.424 with a regression coefficient of -0.435, a significance of 0.023, a t-value of supervision is 4.718 with a regression coefficient of 0.843, a significance of 0.001, and a t-value of reinforcement. territory of 10.297 with a regression coefficient of -0.008 and a significance of 0.968.

The results of this study prove that monitoring of resilience in facing a pandemic is greater than access control and territorial strengthening. Therefore, more attention must be paid to monitoring resilience in the face of a pandemic so that the sense of security of housing residents continues to increase and can make housing resilient so that it can prevent the spread of Covid-19 in housing in the city of Makassar. Each settlement has physical characteristics that make movement of people (inside and outside) more or less possible (e.g. number of entry points, physical barriers, road network, housing density), and actions need to be determined by local residents (Wilkinson et al. 2020) . Density makes physical distancing and quarantine activities ineffective, so the spread of viral infections is very likely to occur quickly (Snyder & Tormala, 2017).

According to Arifin (2020) that the perception of the occupant's sense of security is low where of the 7 assessment indicators, there are only 2 indicators with scores above the standard, namely the housing security boundary condition indicator and the patrol system with a value of 61% - 64%. This indicates that improvements need to be made, especially in indicators that support security or surveillance systems.

Socio-Cultural, Economic, Infrastructure and Transmission Vulnerability

Multiple Regression Analysis

This analysis is used to calculate the magnitude of the influence of socio-cultural vulnerability, economic vulnerability and infrastructure vulnerability to the vulnerability of pandemic transmission can be seen through the regression equation in the following table:

Table 10. Multiple Regression Analysis Results (SPSS output, 2021)

Coefficients[a]						
Type		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.206	0.631		0.327	0.746
	Socio-Cultural Vulnerability	0.613	0.207	0.547	2.970	0.006
	Economic Vulnerability	0.015	0.192	0.015	0.079	0.937
	Infrastructure Vulnerabilities	0.271	0.135	0.303	2.016	0.054
a. Dependent Variable: Pandemic Transmission Vulnerability						

Based on the table, the value of the coefficient of socio-cultural vulnerability (X1) was obtained at 0.613, economic vulnerability (X2) at 0.015 and infrastructure vulnerability (X3) at 0.271. Thus, the value of the calculation result of the regression analysis is formulated into the following equation:

$$Y = 0.206 + 0.613\ X_1 + 0.015\ X_2 + 0.271X_3$$

Multiple Regression Test (Test F)

Table 11. Multiple Regression Test (F Test) (SPSS output, 2021)

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.582	3	5.527	10.402	<,001[b]
	Residual	13.816	26	0.531		
	Total	30.399	29			
a. Dependent Variables: Pandemic Transmission Vulnerability						
b. Predictors: (Constant), Infrastructure, Socio-Cultural, Economic						

Based on the results of data processing, the significance value is smaller than 0.05 (<0.001 < 0.05) and F > F table (10.402 > 3), it can be concluded that the variables of infrastructure vulnerability, socio-cultural vulnerability, and economic vulnerability affect the vulnerability of pandemic transmission in the city of Makassar.

Partial Hypothesis Test (T Test)

Table 12. Partial Hypothesis Test (T Test) (SPSS output, 2021)

Variable	t_{count} : t_{table}		Prob Sig		Information
	t_{count}	t_{table}	Sig	α = 0,5 %	
Socio-cultural vulnerabilities	2.970	2	0.006	0.05	Significant
Economic vulnerability	0.079	2	0.937	0.05	Insignificant
Infrastructure Vulnerabilities	2.016	2	0.054	0.05	Insignificant

The influence of socio-cultural vulnerability on the vulnerability of pandemic transmission

Based on the results of the t test hypothesis, where the calculated t value is greater than t of the table and the probability value of its significance is smaller than 0.05. This shows that socio-cultural vulnerability variables have an effect and are significant to the Vulnerability of Pandemic Transmission.

The effect of economic vulnerability on the vulnerability of pandemic transmission

Based on the results of the t test hypothesis, where the calculated t value is smaller than the table t and the significance probability value is greater than 0.05. This shows that the variables of economic vulnerability have no effect and are not significant to the increase in Covid-19 transmission.

The effect of infrastructure vulnerabilities on pandemic transmission vulnerabilities

Based on the results of the t test hypothesis, where the calculated t value is greater than the table t and the significance probability value is greater than 0.05. This shows that the variable vulnerability of infrastructure has an effect but is not significant to the vulnerability of pandemic transmission.

Coefficient of Determination (Adjusted R2)

Table 13. Coefficient of Determination Result (SPSS output, 2021)

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

1	0.739[a]	0.54	0.493	0.72897
a. Predictors: (Constant), Infrastructure, Socioeconomic Mixing, Housing				

Based on calculations, the adjusted value of R2 of 0.493 means that independent variables consisting of infrastructure vulnerability, socio-cultural vulnerability, and economic vulnerability contribute 54% to the vulnerability of pandemic transmission, so that there is an independent variable outside this regression model that affects the vulnerability of pandemic transmission in the city of Makassar by 46%.

Analysis of Socio-Cultural, Economic, Infrastructure and Vulnerability of Pandemic Transmission

Socio-Cultural Vulnerability, Economic Vulnerability and Infrastructure Vulnerability Affect Spatially the Vulnerability of Pandemic Transmission in Makassar City

Socio-cultural vulnerability is the intensity of interaction and the movement or movement of human beings from one space to another in meeting socio-cultural needs. This is a concern for the government by limiting the interaction and dynamics of human movement in groups. Based on the results of the study showed that socio-cultural vulnerability has a calculated value of 0.327 with a significant value of 0.006 smaller than 0.05 (0.006 < 0.05), the results of multiple regression analysis have a positive value of 0.613. So the hypothesis value of "socio-cultural vulnerability (X1)" shows that the vulnerability of pandemic transmission will increase if socio-cultural vulnerability also increases.

Housing has a high risk of Covid-19. In Law no. 1 of 2011 which is meant by housing is a collection of houses as part of settlements, both urban and rural, which are equipped with infrastructure, facilities, and public utilities as a result of efforts to fulfill livable houses. Based on the results of the study indicate that economic vulnerability has a tcount value of 2,970 with a significant value of 0.937 greater than 0.05 (0.937 > 0.05), the results of multiple regression analysis have a positive value of 0.015. Then the value of the hypothesis, namely "economic vulnerability (X2)" shows that it has no effect and is not significant.

The impact of the COVID-19 pandemic has resulted in reduced supply of labor, unemployment, reduced income, increased costs of doing business in every sector (including disruption of production networks in every sector), community vulnerability to disease and vulnerability to changes in economic conditions. The social restrictions imposed by the government have affected the entire community, especially the lower-middle income group and daily workers. Groups of people who previously were not poor have become poor because of this wide-scale restriction. In order to stabilize the economy, people will continue to move to the workplace so that the spread of virus infections is very possible.

Infrastructure is defined as the basic facilities or structures, equipment, installations that are built and needed for the functioning of the social and economic systems of society (Grigg & Darrel, 2000). Based on the results of the study, it shows that infrastructure vulnerability has a tcount value of 0.079 with a significant value of 0.054 greater than 0.05 (0.054 > 0.05), the results of multiple regression analysis have a positive value of 0.271. Then the value of the hypothesis, namely "infrastructure vulnerability (X3)" shows that it has an effect but is not significant. In the case of the Covid-19 outbreak, the role of supporting infrastructure for PHBS (Clean and Healthy Lifestyle) is very important to reduce the risk of spreading. Some examples of basic infrastructure in the form of toilets, hand washing facilities and the availability of clean water both at home and in public facilities, lack of public services can contribute to the stronger and faster spread of disease (Sommer et al. 2015).

Socio-Cultural Vulnerability, Economic Vulnerability and Infrastructure Vulnerability Affect stimultan to the Vulnerability of Pandemic Transmission in Makassar City

Based on the partial test (t test) between socio-cultural, economic and infrastructure variables, the socio-cultural t value is 0.327 with a regression coefficient of 0.613, a significance of 0.006, an economic t-value of 2.970 with a regression coefficient of 0.015, a significance of 0.937, and an infrastructure t-value of 0.079 with a regression coefficient 0.271, and significance 0.054.

Based on the results of data processing, the significance value is less than 0.05 (<0.001 < 0.05) and F > F table (10,402 > 3), it can be concluded that the variables of infrastructure vulnerability, socio-cultural vulnerability, and economic vulnerability have a simultaneous effect or have an effect when combined together. together to the vulnerability of pandemic transmission in the city of Makassar and contributed 54%, while the remaining 46% was influenced by other variables.

Socio-Cultural Vulnerability is the Most Dominant Variable to Pandemic Transmission Vulnerability in Makassar City

The results of this study prove that socio-cultural vulnerabilities to pandemic transmission vulnerabilities are greater than economic and infrastructure vulnerabilities. Therefore, socio-cultural vulnerabilities to the vulnerability of pandemic transmission must be paid more attention so that the transmission of Covid-19 in housing can be prevented or minimized so that housing becomes resilient to pandemics in Makassar city settlements.

The entry of transmission of Covid-19 to the smallest social sphere, namely family, is increasing. Transmission usually occurs because of an infected family member from activities outside the home such as work or going on vacation, or guests who are positive for the Corona virus come to visit. The number of family clusters is 10 times that of other clusters. According to data from the DKI Jakarta Provincial Office, 45 percent of the total increase in cases in January 2021 came from family clusters.

Family clusters occur as a result of the difficulty of implementing health protocols at home. When a family member is exposed to Covid-19, not a few cannot be disciplined to undergo self-isolation. Apart from the lack of adequate facilities at home for family members to self-isolate.

In addition, community activities that have made the spread of the pandemic even more massive are letting children play together in a complex/housing environment without a strong health protocol and VDJ (Ventilation-Duration-Distance) protocol. Children can act as carriers of the virus. Understanding of health protocols for children is not as strong as that of adults. Children are also 3 times more likely to touch things than adults.

In addition, the transmission will be very massive because the social culture of Indonesians prioritizes face-to-face friendship, namely community gathering activities, such as: visiting each other's homes, social gathering, community gathering events, citizen meetings, celebrations of state/religious holidays, music activities, joint sports activities, outreach activities, etc. In addition to taking vacations, picnics or walks to crowded public places. So that it has the potential to carry the virus when it returns to the home environment or residents. Family activities should still be carried out at home, which is safer and healthier.

The most dangerous, the emergence of fear because of the stigma that is around. This can exacerbate the 3T (Tracing, Testing, Treatment) process for fear of being ostracized by the surrounding community. In a more severe situation, people who are exposed will act as spreaders in the environment around their homes. Based on a survey conducted by Lapor

Covid-19 in August 2020, survivors experienced some bad treatment due to stigma in society. 55.3 percent of them are discussed by the surrounding environment, 33.2 percent are ostracized, and 24.9 percent are dubbed as spreaders or carriers of the virus.

The case study in New York explains that 66% of the total COVID-19 cases in New York come from family clusters. According to the Governor of New York (United States) Andrew Cuomo, based on a survey taken from 1,200 New Yorkers who were hospitalized, 66% of patients contracted COVID-19 from their own households.

Public health experts conclude that the high family cluster is due to the fact that most patients live with family or friends who often leave the house, and also live in congested apartment buildings so that exposure increases.

Prolonged exposure to family members, living in multi-generational households (grandparents, mothers, fathers, children, or babies) and living in dense environments have a very high risk of COVID-19 transmission. Mobility within and between cities is frequent as urban residents frequently travel between urban and rural settings for work and social reasons. Also generally traveling when sick and at risk of spreading Covid-19 to rural areas so it needs to be considered in control strategies. In addition, socio-cultural vulnerability when children are often cared for by grandparents or older family members and this increases the risk of transmission. Restrictions on mixing will certainly reduce the risk of transmitting Covid 19. The risk of transmitting Covid-19 will also increase if physical distancing is not implemented.

Pandemic Resilient Sustainable Settlement Model

The Covid-19 pandemic has caused a lot of discomfort for most people. The pandemic situation puts its own pressure on each individual, communally, and in the community (Carvajal-Miranda et al., 2020). In his research, Azhari (2021) reported on the psychological pressure felt by informants related to government regulations during the Covid-19 pandemic. As for the handling model, China is the country most used as a reference considering that Covid-19 first appeared in Chinese territory where the government imposed a strict regional quarantine policy in almost all affected cities. The next model is South Korea, which chose a partial regional quarantine but accompanied by mass testing, accompanied by contact tracing, isolation and quarantine of those who were positive for Covid-19 with very strict monitoring.

Settlements face considerable challenges around Covid-19 control, but the strategies developed can mitigate the worst outbreaks as long as action is taken quickly. Preparedness and early action by local governments and communities is critical. Once an outbreak occurs, escalation can be rapid, leaving little room for further planning. Vulnerability to pandemics is greatest in settlements, but control measures risk further harm so mitigation of both must begin by involving residents and their realities in planning.

Suharso (2020) said that currently, disaster resilience in Indonesia only includes natural disasters. Learning from the Corona Virus (Covid-19) pandemic, in 2021 it is necessary to have a non-natural disaster resilience system, in order to anticipate if events repeat themselves. Planners use the term resilience to describe a system's ability to absorb shocks, i.e., sudden economic, social, or environmental changes (Resilient Cities n.d.).

The sustainable pandemic resilient settlement model can be applied to residential areas that are already inhabited and residential areas to be built. Because this model is applied continuously and continuously. In the housing area to be built, it becomes easier to implement because the basic requirements of a simple Healthy Home can be applied when designing and building the housing area. But in the context of residential areas that are already inhabited, the application of the sustainable pandemic Tangguh settlement model is implemented by making changes and

adaptations to the behavior of residents in living in the area. The sustainable pandemic Tangguh settlement arrangement is applied to the physical and non-physical components of housing.

The sustainable pandemic resilient settlement model is easier to apply to small-scale residential communities such as a single neighborhood. However, if this model is successfully applied to small housing communities, it will directly affect the quality of the housing environment on a larger scale. It is hoped that all levels of the housing community are involved in achieving sustainable housing.

Creative Problem Solving or CPS is a process, method, or system for approaching problems in an imaginative way and producing effective actions for a sustainable pandemic Tangguh settlement. CPS is a proven method for approaching a problem or challenge in an imaginative and innovative way. Caswell (Samson, 2015) describes creative problem solving as an approach to finding applicable answers to problems that exist in real life. Treffinger, et al (Samson, 2015) define CPS as a way of building a circular framework involving four central components which include: understanding challenges, generating ideas, preparing for action and planning approaches.

Improving the P of Supervision

Physical; (1) Main entrance in housing must be clear and airy to allow for supervision activities to take place over the implementation of health protocols; (2) Housing patterns that support the position of public spaces can be accessed evenly by residents so that there is no public space that exceeds the capacity of visitors and facilitates supervision in public spaces; (3) In the PP and Presidential Decree, it is regulated regarding the government's strategy in dealing with the spread of the Covid-19 virus in Indonesia. In principle, these restrictions only apply to certain activities in an area suspected of being infected with COVID-19. This aims to prevent the possible spread of Covid-19 so that the community can still carry out daily activities with certain restrictions.

Non-Physical; (1) Institutionalize inherent supervision (mutual supervision/reminding each other between housing residents); (2) The authority should continue a transparent and informative attitude with the aim of preserving and enhancing social trust, and the media should broadcast taking into account the psychology of socio-land information should be provided or action should be taken to enhance social trust; (#) Mobilizing the participation of housing residents as supervisors by forming disaster mitigation organizations without stigma and description.

Reducing Socioeconomic Mixing with Social Distancing

Physical; (1) Creating a clear boundary on housing between private, semi-private and public spaces; (2) The width of the road allows interaction between citizens with a distance of at least 1 meter; (3) Housing with stable internet facilities that support socioeconomic interaction can run online; (4) Creating a healthy home comfortable and conducive to Work and worship; (5) Health protocols must be implemented in each office accompanied by strict controls to ensure that the established protocols are adhered to by every employee who is active in the office.

Non Physical; (1) Each house is the smallest disaster mitigation organization in a housing estate; (2) Institutionalizing in a 4 M household is mainly the habit of keeping a distance in interacting; (3) There is government interference in making policies that can reduce socioeconomic interactions without making people lose their livelihoods or are unable to meet the needs of their families.

Principles of Resilience

Physical; (1) Housing infrastructure must be guaranteed to be strong and flexible such as sanitation, clean water, waste and especially a stable telecommunications network to provide residents' comfort in interacting online; (2) The resilience of residents in carrying out activities throughout the day in the house requires a space area, ventilation and lighting that is in accordance with standards. According to Poon (2020) To reduce the stress of isolation, the house needs adequate space with light and ventilation, plus outdoor areas such as balconies, courtyards or rooftop gardens; (3) Each house has a room that is conducive to being an isolation room. Good for family members who are being exposed or residents who are vulnerable / *comorbid* (comorbidities); (4) Housing must be equipped with health facilities that provide counseling, understanding and awareness to the community and provide emergency services that are always on standby.

Non Physical; Establishment of disaster mitigation organizations run by residential residents with the support of local governments.

Sustainable Principles:

Physical; (1) Planning housing equipped with various facilities that can be used as an economic revival space for every productive house in the vicinity, especially those with low incomes, physical disabilities or other special needs and these facilities can be reached even on foot; (2) Provision of RTH according to the standard number of residential residents

Non Physical; Applying local wisdom of mutual cooperation in realizing housing resilience With high tolerance social capital realize inclusive, safe, resilient and sustainable housing

Conclusion

The results of this study prove that supervision greatly affects the resilience variable in facing a pandemic in Makassar City housing. Supervision has a greater impact than access control and territorial strengthening. Therefore, more attention must be paid to supervision so that the resilience variable in facing the pandemic of housing residents continues to increase so that housing becomes resilient to the spread of Covid-19 in housing in the city of Makassar. Socio-cultural vulnerability to pandemic transmission vulnerability is greater than economic and infrastructure vulnerability. Although overall all three support each other. Therefore, the three types of vulnerabilities must be considered so that the transmission of Covid-19 in housing can be prevented or minimized so that housing in Makassar City becomes resilient to the pandemic. There are various control strategies/considerations with a pandemic resilient sustainable housing model, namely increasing supervision, limiting/reducing socio-cultural and economic mixing, principles of resilience and sustainability.

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