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THE EFFECTIVENESS OF HOUSING AND SLUM SETTLEMENT PROGRAMMES (CASE STUDY OF INDRAGIRI HULU REGENCY, RIAU PROVINCE)

Dwi Widiarsih[1], SE., M.Sc

[1] *Riau Muhammdiyah University, Pekanbaru, Indonesia*

Email: mailto:mdwiwidiarsih@umri.ac.idailt

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Abstract

Along with the high population growth and inequality in the provision of employment opportunities between rural and urban areas, it ultimately has an impact on the increasing rate of urbanization. Migration of population from rural to urban areas causes an increase in the need for land for housing in urban areas. The high price of land in urban areas has an impact on the emergence of uninhabitable areas.

The Indragiri Hulu Regency Government settled 7 locations as settlements and slum housing areas with an area of 137.29 hectares. In 2017, the Indragiri Hulu Regency Government made a revision by setting 8 locations as residential areas and slum housing with an area of 122.77 hectares. The addition of this number of locations assumed that there are areas that were not originally slum areas based on indicators set by the Ministry of Public Works and Public Housing, developing irregularly so that in 2017 it became a slum area. Then the reduction in the area of slum areas from 137.29 hectares to 122.77 hectares indicates the success of handling slum areas, although the condition has not decreased significantly.

Based on the results of data processing, it is known that the logit model estimation consists of 4 significant variables that affect the effectiveness of the housing and slum area handling program (p-value is smaller than 0.05), namely building condition, building density, environmental road services and settlement quality of Street.

The impact of the housing program and slum areas using PSM with the Nearest-Neighbor (NN) method, noted that variables that do not affect the effectiveness of the housing program and slum areas, namely wastewater management and fire protection are excluded as covariates in calculating ATT.

The housing and settlement program in this slum area has not been able to improve facilities and infrastructure building (SPS), after the program was implemented, the implementation of the housing and slum area handling program had an impact on improving road conditions and the environment, but the program actually does not have an impact on improving environmental drainage conditions.

Keywords: Policies, Housing programs, Slum area, Propensity Score Matching (PSM), Average Treatment on Treated (ATT), infrastructure building (SPS).

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Introduction

Rural and urban areas ultimately have an impact on the increasing rate of urbanization. This area then continues to grow and develop into a densely populated and densely built area and has minimal supporting facilities for residential areas, such as road networks, drainage networks, waste infrastructure facilities, drinking water infrastructure facilities, wastewater infrastructure facilities, and fire protection facilities. fire. The government is committed to eradicating slum areas as a manifestation of the implementation of the mandate of the 1945 Constitution that the state guarantees the fulfillment of citizens' needs for decent and affordable housing.

In 2014, the Indragiri Hulu Regency Government settled 7 locations as settlements and slum housing areas with an area of 137.29 hectares. In 2017, the Indragiri Hulu Regency Government made a revision by setting 8 locations as residential areas and slum housing with an area of 122.77 hectares. The addition of this number of locations assumed that there are areas that were not originally slum areas based on indicators set by the Ministry of Public Works and Public Housing, developing irregularly so that in 2017 it became a slum area. Then the reduction in the area of slum areas from 137.29 hectares to 122.77 hectares indicates the success of handling slum areas, although the condition has not decreased significantly.

Residential areas and slum housing in Indragiri Hulu Regency based on the Decree (SK) of the Regent of Indragiri Hulu No. 167/III/2017 concerning Amendments to the Decree of the Regent of Indragiri Hulu number 556 of 2014 concerning the Determination of the Location of Slum Housing and Slum Settlements in Indragiri Hulu Regency. Slum residential areas in Indragiri Hulu Regency are spread in 7 locations in 7 subdistricts and 4 subdistricts. Identification of these slum settlements is spread in urban settlements in Indragiri Hulu Regency, namely Rengat, Pasir Penyu, Peranap and Seberida. The distribution of slum settlements is illustrated in the following map 1.

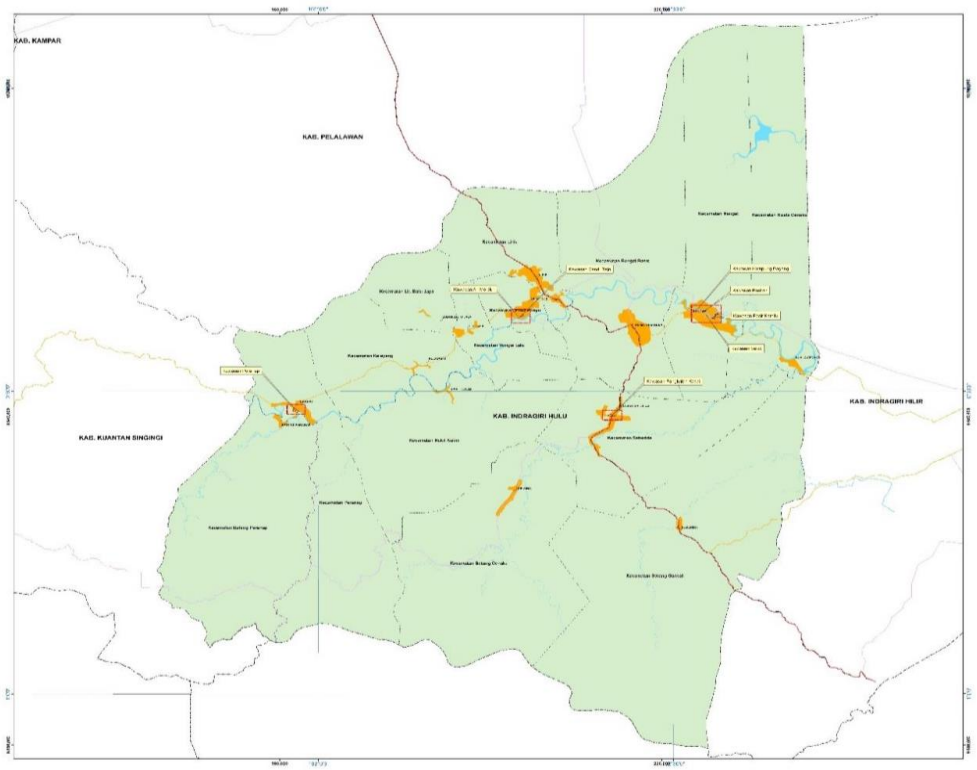

Figure 1. Map of the Distribution of Slum Locations to Urban Areas in Indragiri Hulu Regency

Source: People's Housing and Residential Areas of Indragiri Hulu Regency, 2023

The Indragiri Hulu Regency Government seeks to achieve the fulfillment of alleviating slum areas through various programs, one of which is through the provision of supporting infrastructure facilities for residential areas including environmental road networks, environmental drainage networks, waste infrastructure facilities, wastewater infrastructure, drinking water infrastructure, and infrastructure fire protection.

Literature Review

A residential area is part of an urban or rural area, functioning as a place to live, a residence, and a place for activities that can support life and livelihood. Residential areas can affect the direction of development of a city that can provide all activities and supporting factors (Law No. 1 of 2011).

Residential areas are divided into: a) well-organized and well-planned areas and b) areas that form the basis for population growth and development and their activities. This residential area is vulnerable to uncontrolled development which has an impact on the emergence of unorganized areas, disparities in welfare and public health.

Slums are areas that are unfit for habitation caused by several factors, including a) high levels of building density with irregular building conditions, b) lack of availability of residential infrastructure. Slum housing is a housing area that has a declining quality condition of residential function (Law No. 1 of 2011).

Slum areas are areas with housing conditions or community housing and infrastructure facilities that are very inappropriate and not in accordance with applicable standards such as building density, criteria for healthy houses, minimum water needs, sanitation, environmental roads, open spaces and other social facilities (Putro, 2011, p. 19-34.).

The government as a policy maker should pay attention to the quality of services for providing housing and residential infrastructure facilities through the implementation of the management of slum areas based on non-governmental organizations so that the community gets the functional unity of the physical space of residence, economic life, and socio-culture. This goal is in line with the spirit of regional autonomy and the openness of a sustainable social order.

The problems that characterize slum settlements (Sri & Fitri, 2014, p. 244-253) include:

a. The road network is not adequate.

b. A network of waste that is managed independently by the community (burned, buried, dumped, or thrown into the river) which causes the environment to be damaged.

c. Sanitation is septic tank waste which is dominated by damaged conditions or discharged into ditches or rivers.

d. Inadequate drainage, pooling due to high tidal waves, stagnant flow, flat land slopes making it difficult for water to flow.

e. The density of buildings with building conditions is dominated by semi-permanent buildings, densely spaced buildings.

The handling of urban slum areas can be done through 2 main programs, physical and non-physical, namely (Resa, Suardi & Zulfan, 2017, p. 117-127):

a. Physical programs include: construction of supporting infrastructure for settlements (inhabitable houses, roads, drainage, solid waste, sanitation, drinking water, fire protection facilities)

b. Non-physical programs include socialization, household economic development, disaster mitigation education (floods and fires), healthy housing education.

Analysis Method

A. Place and Time of Research

The research was conducted in Indra Giri Hulu Regency, Riau Province. The research began in 2023 and the data was reprocessed in May-June 2023. The distribution and extent of slum settlements in Indra Giri Hulu Regency are in four sub-districts, namely Rengat, Turtle Sand, Peranap and Seberida. In all of these sub-districts, there are seven distribution areas of slum settlements in seven sub-districts, namely; Sekip Hulu, Pasir Kemilu, Kampung Besar Kota, Air Molek, Candi Rejo, Peranap and Pangkalan Kasai.

B. Sampling Method

This study uses a stratified random sampling method for areas participating in the housing management program and slum areas. In areas that are not included as areas of the housing management program and slum areas are determined using purposive sampling, this area is an area that is in one area of Indra Giri Hulu Regency. The number of regions participating in this program consists of 86 Neighborhood Associations. For the number of samples to be balanced, the number of non-programmed regions also uses 86 sample areas.

C. Data Analysis Method

1. Logit Regression

Analysis of the impact of the housing and slum area management program uses logit regression analysis. Regions that have participated in the program are binary with values of 0 and 1, where regions that have participated in the program are given a value of (1) and regions before participating in the program are given a value of (0), and regions that have not participated in the program are also assigned a value of (0). Logit function model, using the general form of logit regression as follows (Hosmer & Fagerland, 2012, p. 447-448);

$$Pi = ln\frac{Pi}{1-Pi} = \alpha + \beta_1 X_1 t + \beta_2 X_2 t + \beta_3 X_3 t + \beta_4 X_4 t + \beta_5 X_5 t + \varepsilon t \quad (1)$$

Pi is the Dummy variable of the effectiveness of the implementation of the housing and slum settlement program (1= after the program was implemented, 0= before the program was implemented). In this study, the model of the effectiveness of handling housing and slum areas is determined by seven groups of variables, namely; building conditions, building density, environmental road services, quality of road settlements, drainage construction, waste and wastewater management and fire protection.

2. Propensity Score Matching (PSM)

To estimate the effectiveness after the program is implemented in the conditions of Facilities and Infrastructure (PSM) and Infrastructure (KJL) the Propensity Score Matching (PSM) method is used, which is a method of estimating the impact of a treatment on a particular research subject. The division of observations was divided into two groups, namely the group that received treatment (treatment) and the control group (Khandker, Koolwal & Samad, 2010).

The treatment group in this study is the area after participating in the housing management program and slum area and the control group is the area before participating in the housing management program and slum area. Both treatment and control groups were then regressed using logit regression analysis.

Furthermore, the PSM test was carried out to reduce the amount of research involved, because generally observational research has problems in decision-making due to the potential for cofounding, where this cofounding problem can enlarge or reduce the actual relationship. If cofounding occurs, then the adjustments that have been made at the regression stage still provide the potential for biased results (Haryanto & Suharno, 2019, p. 139-152; Sulistyaningrum, 2016, p. 36-62).

$$ATT = E(\Delta|P(X), D=1) = E(Y_1|P(X), D=1) - E(Y_0|P(X), D=0) \quad (2)$$

ATT is the Avarage Treatment on Treated value of the impact of the effectiveness of the housing and slum area handling program. D=1 is the treatment group, and D=0 is the control group. Based on the explanation above, the estimation steps of the PSM procedure can be summarized as follows;

1. Estimated Propensity Score

This step is a technique for estimating the Propensity Score, namely choosing the model and variables that must be included in the model. The selection of the model must be based on economic theory or previous research. This study uses the logit model.

2. Choose a Matching Algorithm

The trade off that can occur between bias and variance in the ATT estimation causes the matching algorithm to not be able to justify the best technique. So there are 5 choices of matching methods, namely Neraest Neighbor (NN), Caliper and Radius, Weighting, Kernel and Local Linear and Stratification and Interval.

3. Identify Common Support

Based on the assumptions that must be met in this PSM Analysis Technique, Common Support is one of the assumptions that must be fulfilled so that it is useful in matching estimates. The overlap between the treatment group and the control group will be identified by this Common Support. So that a match for the intervention group and the non-intervention group can be found.

4. Assessing Matching Quality

Matching quality test is a step to assess the quality of matching. This matching quality test consists of a standard bias test, a difference test before and after matching known as the t-test and a quality test for combining variables in the matched sample (F-test / Hoteling Test).

If the results of the data processing show that there are no differences, it means that the samples used in the study have good matching quality. This means that the research accepts Ho. On the other hand, if the matching quality is known to be poor and there are still differences, then the next step must repeat the same steps until the matching quality stage gives satisfactory results.

5. Estimation of Standard Error and Sensitivity Analysis.

PSM sensitivity analysis stage must be repeated so that we can conclude that the findings are free from bias (Rosenbaum & Rubin, 1983, p. 41-55). The source of this bias can come from other variables outside the model (not included in the model) but it turns out to have an influence on the variables in the model. This step is known as the standard error test and the sensitivity analysis of the PSM model using the Wilcoxon's signed-rank test (Rosenbaum, 2005, p. 1809-1814).

Results and Discussion

A. Factors that determine the effectiveness of housing and slum settlement programs

The analysis of the effectiveness of the housing and slum area management program in Indragiri Hulu Regency, Riau Province uses logit data. The factors that determine the effectiveness of the program consist of the dependent variable, namely the effectiveness of program implementation with a dummy variable, where 1 is the condition of housing and slum settlements before the implementation of the program/non-treatment (NT) and the condition of housing and slum areas after the implementation of the program/treatment (T).

The independent variable consists of seven variables, namely; Building conditions, building density, environmental road services, quality of road settlements, drainage construction, wastewater management system standards, and fire protection services. Parameters with determining factors for the effectiveness of housing programs and slum areas can be seen in the table below;

Table 1

Factors that affect the effectiveness of housing and slum settlement programs in Indragiri Hulu Regency, Riau Province

No.	Variable	Coefficient	Z	P > | Z |
1	Constant	-24,561	4,386	0,000
2	Building Condition	6,482	0,449	0,011
3	Building Density	-1,960	0,383	0,030
4	Environmental Road Service	7,643	0,161	0,010
5	Quality of Road Settlements	4,736	0,161	0,006
6	Drainage Construction	0,090	3,10	0,076
7	Waste and Wastewater Management	0,032	0,160	0,310
8	Fire Protection	0.006	0.372	0,406

Source: Primary Data Processed (2023)

Based on Table 1, it is known that the logit model estimation consists of 4 significant variables that affect the effectiveness of the housing and slum area handling program (p-value is smaller than 0.05), namely building condition, building density, environmental road services and settlement quality of Street.

The condition of the building has an important impact on the effectiveness of the settlement program and slum areas, because the p-value of the condition of the building is 0.011 with a confidence level (significance) of 5%. The coefficient of estimating the condition of the building is positive 6.482, meaning that the better the condition of the building, the more effective the implementation of housing programs and slum areas in Indragiri Hulu Regency, Riau Province.

Building density has a p-value of 0.030 with a significance level of 5%. The estimated negative value of the building condition parameter (-1.960) can be interpreted that the denser the building will not have an impact on the implementation of the housing and slum area management program which is increasingly ineffective. This is based on the fact that this program is intended to regulate the level of building density so that it does not become a slum settlement.

The p-value for environmental road services is 0.010 so that the results of data processing can be concluded that there is a significant effect of environmental road service variables on the effectiveness of housing programs and slum areas with a significant level of 5%. The estimated parameter value is positive 7.643 meaning that the better the environmental road service, the better the effectiveness of the housing and slum settlement program.

The quality of road settlements has a p-value of 0.006 with a significance level of 5%. The estimated coefficient for the quality of road settlements is positive at 4.736, meaning that the better the quality of the road settlements, the better the housing and slum area management program will be.

B. Impact of the settlement program and slum areas

The impact of this housing and slum area program uses a Propensity Score Matching (PSM) analysis. PSM estimation is done using SPSS. In the matching procedure, the variables used as covariates are variables that significantly affect the effectiveness of housing programs and slum areas based on the results of logit analysis. The variables in question are building conditions, building density, environmental road services and the quality of road settlements.

Outcomes that will be compared between treatment groups in the control group are infrastructure, environmental roads, drinking water supply, environmental drainage, wastewater management, waste management, and fire protection. The first step is to determine the value of the propensity of the treatment

group and the control group with logit regression on the covariate variables. The results of the logit regression to determine the propensity score can be seen in the table below

Table 2

Logit regression for the propensity score

No.	Variable	Coefficient	Z	P > | Z |
1	Building Condition	0,6577053	0,51	0,612
2	Building Density	-0,0853428	-0,20	0,002
3	Environmental Road Service	0,5103129	2,066	0,140
4	Quality of Road Settlements	0,383786	0,64	0,523

Source: Primary Data Processed (2023)

The impact of the housing program and slum areas using PSM with the Nearest-Neighbor (NN) method. NN is a method by indicating the closest propensity value for each respondent in the treatment group (the condition after the program is implemented/T) with the control group (the condition before the program is implemented/NT) with one match. After matching, the Average Treatment Effect on The Treated (ATT) can be obtained. ATT is the difference between the Treatment group and the control group. In other words, ATT is a different value between the treatment group and the control group.

Variables that do not affect the effectiveness of the housing program and slum areas, namely wastewater management and fire protection are excluded as covariates in calculating ATT. The table below shows the differences in the outcome of the treatment group and the control group.

Table 3

Measuring the impact of housing and slum area management programs using the Nearest Neighbor (NN) method

Variable	Sample	Treatment	Non Treatment	Difference	SE	T-Stat
SPS (Building Infrastructure)	Unmatched ATT	1,053	0,970	0,083	0,021	0,617
KJL (Road and Environment)	Unmatched ATT	6,891	0,743	6,2461	0,568	0,051
KDL (Environmental Drainage)	Unmatched ATT	1,094	0,097	1,000	0,090	1,094
KPP (Waste Management)	Unmatched ATT	1,026	0,987	0,039	0,06	1,006

Unmatched = before matching
ATT= Average Treatment on Treated

Source: Primary Data Processed (2023)

Based on the Table 3, it is known that the impact of the housing program and slum areas on the building infrastructure variable (SPS) is seen in the difference. After matching, the ATT SPS value has a difference of 0.083. The impact of the program on road and environmental conditions (KJL) has a difference before matching of 0.743 and after matching the difference increases to 6.891. The impact of the program on environmental drainage (KDL) is seen in the difference value of 0.097 and after matching the difference it becomes 1.094.

The Nearest Neighbor (NN) method can conclude that housing and settlement programs in slum areas can improve the condition of building facilities and infrastructure (SPS), road and environmental conditions (KJL), and environmental drainage conditions (KDL).

Table 4

The Common Support Covariates in the matching process

Treatment	Covariate used	Discarded Covariates	Total
Treatment	43	0	43
Non Treatment	43	0	43
Number of Covariates	86	0	86

Source: Processed Data (2023)

Based on Table 4, it is known that the balancing test is a process to determine whether or not there is a bias from each variable used in the process of matching or balancing the treatment group (T) and non-treatment (NT) group. The results of the process after the balancing test can be explained as follows;

Building Facilities and Infrastructure (SPS)

In Tables 3 and 4 above, it can be explained that the difference between the SPS variables before the implementation of the Non-Treatment (NT) program and after the implementation of the program/Treatment (T) before matching was 0.970 and after matching it was 1.053. Based on the results of t-stat shows that before matching and after matching, the SPS (NT) and SPS (T) variables show a significant difference of 0.617 (Z < 2), so that with the housing and settlement program this slum area has not been able to improve facilities and infrastructure building (SPS).

Road and Environmental Conditions (KJL)

In Tables 3 and 4 above, it can be explained that the program implemented had an impact on improving road and environmental conditions of 0.743 before the program was implemented and after the program was implemented it was 6.891. Based on the t-stat value, it can be concluded that before the program was implemented it was 2,066 showing results (t-stat >2), so the calculation concluded that basically after the program was implemented the implementation of the housing and slum area handling program had an impact on improving road conditions and the environment.

Environmental Drainage (KDL)

Based on Tables 3 and 4 above, it can also be explained that prior to program matching, it had an impact on improving environmental drainage conditions (KDL) which was significant. After matching, the program has an impact of improving environmental drainage conditions by 1,000 but with a t-stat value of 1.094 (t-test<2), so that the program actually does not have an impact on improving environmental drainage conditions. The results of the data processing also show that the environmental drainage conditions after the program were implemented were 1% better than the environmental drainage conditions before the housing and slum area management program was implemented.

Waste Management (KPP)

Furthermore, based on Tables 3 and 4 above, it can also be explained that prior to program matching, it had an impact on improving the condition of solid waste management (KPP) by 0.039 with a t-stat value of 1.006. It can be concluded that prior to program matching has an impact on improving the conditions of solid waste management (KPP). However, after matching, the program actually had an impact on improving the solid waste management condition by 1.026, but with a t-test value of 1.006 (t-test <2), so the program actually had no impact on improving the solid waste management condition. The results of the data processing also show that the environmental drainage conditions after the program were implemented 0.03% better than the environmental drainage conditions before the housing and slum area programs were implemented.

Conclusions

1. Factors of building conditions, building density, environmental road services and the quality of road settlements significantly affect the effectiveness of program implementation. The impact of the housing and slum settlement program has resulted in significant improvements in the quality of building facilities and infrastructure (SPS), road and environmental conditions (KJL), environmental drainage conditions (KDL) and solid waste management (KPP).

2. The Program for Drinking Water Supply Conditions, Waste Water Management (KPAL) and Fire Protection (KPK) has not received special attention from the community. The provision of drinking water is indicated to have no impact on the program because it has been fulfilled by the local community through the availability of refilled drinking water and dug wells and bore wells. KPAL and KPK also showed the same results because it was indicated that the community did not yet have an understanding of the importance of good sanitation (wastewater), as well as the availability of firefighting protection facilities (such as the availability of public hydrants, hoses and fire pumps). Meanwhile, the availability of this program is very important to support the creation of livable residential areas.

Suggestions

1. This program for handling housing and slum settlements is the government's obligation to fulfill the needs of livable settlements for the community. This need is a basic need that must be met by everyone. This program is constantly evaluated so that the goals and objectives of this program can be achieved as expected.

2. The housing and slum area baseline data collection program should be updated regularly as needed, so that the housing and slum area management program can be achieved and on target.

3. Increasing public understanding of the importance of sustainable housing and slum area management programs means that this program is from the community, by the community and for the community. So, it is better for the community to have a high sense of belonging and awareness to realize the goal of the housing and slum area handling program.

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Conflict of Interest. None.

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