

Housing Conditions in Flood Prone Areas of River Valley Regions

Case Study : Benjeng Sub-District, Gresik District

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Abstract— Climate change is an important topic, especially since the various impacts, one of which flood. In Indonesia, the frequency, intensity, and the height of the flood is increasing every year due to the phenomenon of climate change and increasing population density. It occurs mainly in the Bengawan Solo river basin which is the longest river through 20 counties and cities in Java, including Gresik. Gresik is one through which the DAS Kali Lamong which is a fraction (sub-basins) from Bengawan Solo river basin, a subscription seasonal flood victims. The floods have a major impact on the value and condition of settlements in areas of the river valley watershed Kali Lamong in Gresik which is identical to its agricultural sector and continue to get major flooding from higher areas, thus causing a problem in the housing around DAS Kali Lamong the. In identifying the problems that arise within the housing, can be measured by the value of housing (*Housing Value*). The value of housing will be measured through the actual value that occurs in a household and weighed with the applicable standards in response to non-monetary and monetary factors such housing. This study will try to measure the value of housing in one of the villages located in District Benjeng, Gresik who never missed getting flood when the flood season, the Village Kedung Rukem. This study is the paradigm of post-positivism, using mixed-methods research methods, with qualitative-quantitative approach. The results of this study indicate that the construction needs to be applied in order to exploit the potential and solve the problems on non-monetary factors and monetary factors, are: (i) Harnessing the power of the social aspects of access in the form of closeness with the family and the proximity of the scope of the implementation of the citizens association; economic access in the form of proximity to the place of the agricultural sector non-agricultural maupon which allows it to diversify; security and strong ownership by the legality of ownership of houses and land; for berstrategi in the repair and improvement of the physical standard of dwelling house, and (ii) Leveraging the value of holdings of fixed assets in the form of agricultural land as well as land and residential buildings as input funds to support basic needs and reduce operational costs through the sale in part or in its entirety can also obtain capital to try in agriculture and non-agriculture in order to increase the income for household needs.

Keywords—Adaptation; housing; settlement; preferences; flood prone; river valley

I. INTRODUCTION

Background

Climate change and rapid population growth could affect the increase in the level of risk of disasters (Ranger and Fisher 2012). Climate change caused by global warming, industry, resource utilization of petroleum and coal, as well as forest fires. Increasing the incident also occurred as a result of the rapid rate of human population growth, so that global warming continues to grow. Climate change and rapid population growth affects the rate increases the risk of floods is inevitable.

Flooding is defined as the temporary closure of the ground water that is usually not covered or inundated with water (CEC in Kundzewicz 2014). Floods have plagued many cities and regions of countries in the world, and not immune Indonesia. The cause of floods in this country include floods overflowing rivers and an abundance of rain (*run-off*) from higher ground, and flooding due to tides in coastal areas, flooding of the sewage system, and discharge high local rainfall in a short time (Kodoatie and Sugiyanto, 2002, Carter, etc., 2015).

The risk of disaster in the residential area increased in developing countries because of high population density. To respond to this increased risk, adaptation efforts should be made in all sectors and should work together with the community to reduce the risk and vulnerability, and strengthen livelihoods, especially in developing countries, such as Indonesia (Moediarta and Stalker, 2007).

Subdistrict Benjeng are in the stream of time Lamong which is a tributary of the Bengawan Solo, has great potential for agriculture. Subdistrict Benjeng including the river basin area has potential as areas prone to flooding due to the flood. Starting at about 20 years ago (1996), began to attack the District Benjeng flooding, overflowing of rivers Kali Lamong body, leading to its tributaries, which previously only a small puddles and shallow at some point. Gradually, the floods hit many villages in these districts, with floodwaters varied.

The existence of regulation Indonesian Government Regulation No. 38 Year 2011 on the River is set the demarcation line for the size of a small river bertanggung is 50 m from the highest water level of the river, in fact, well not quite able to avoid settlements beyond the border of the river from flooding attack. Even the flood was attacked settlements within more than 1 Km from water bodies. Residential community flood-prone areas in the river valley have opted to remain at this location from the beginning of the flood to be able to have a positive value in living.

From this background, the purpose of this research in order to provide information about housing problems that lasted for use in conceptualizing a housing improvement in the study sites, through several stages of research objectives.

Research Goals

1. Measuring the housing problem by Turner methods
2. Develop a concept based on measurements of housing improvement housing problems

II. CONCEPT OF HOUSING AS A PROCESS

Concept of Housing and Settlements

Turner, etc. (1972) through the expression *What it does versus what it is* define the difference between the meaning of which is designated as *human values* (non-physical) and form designated as *market values* (physical) from a house. *What it does*, refers to the meaning of home as a living process. While *what it is*, refers to the form of the house as a residence (building a house). Thus, the house is an integral part of the process of living, and not the result of physical once so alone, but is a process that continues to evolve and is linked to socio-economic mobility of inhabitants in a time series. The house has a value of impact given to the inmates and not form or on physical standards.

Function of House

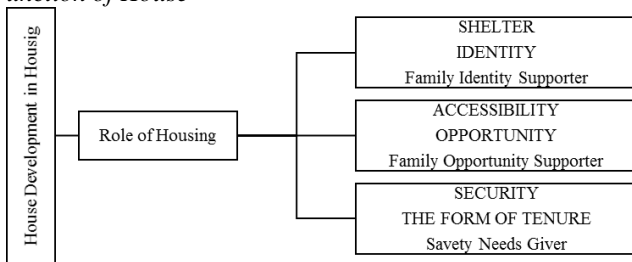


Figure 1. The function the dwelling (house) (Turner, etc., 1972)

1. *(The quality of shelter provide by housing)*

The house as a supporter of (*identity*) family's identity, which is manifested in the quality of residential or protection (*shelter*) given the house as a residence or shelter.

2. *(Opportunity)*

House as a supporting for the family an opportunity to thrive in social, cultural, and economic or development functions family. This function is realized in the location where the house is established, oriented to accessibility (*accessibility*).

3. *(The form of tenure)*

The house serves as a supporting safety (*security of tenure*) in the sense of ensuring the future of family life after getting home, security climate occupied housing as well as

security guarantees in the form of ownership of the house and land.

Housing Problem: Moneytary and Non-Moneytary Accounts of Housing Problem

Turner (1977) noted that to measure the housing problems are based on the following criteria of: factor for the monetary value (i) *Income* (income net.), (ii) *Price* (house operational), (iii) *Cost* (biaya pembangunan rumah), (iv) *Fixed Assets* (aset tetap). Faktor untuk nilai non-meneter (i) *Social access* (akses sosial), (ii) *Economic access* (akses ekonomi), (iii) *Physical standars* (standar fisik), (iv) *Tenure security* (keamanan kepemilikan).

III. RESEARCH METHODS

This research is a field survey and survey intansional to know the issues, information and data at the sites. Sampling taken from populuasi that exist in the study area using questionnaire as a tool to collect data with random sampling techniques. Analysis of the results of research carried out quantitatively and qualitatively based on data from the questionnaire. Method of analysis used in the study are:

1st Goal (Measure the housing problem by Turner methods) and 2nd Goal (Construct the concept of housing improvements based on measurements housing problems)

The method of analysis for both these goals is done with quantitative analysis such as the method of measurement scale by Turner (1977), which states that the measurement of the existence of housing problems can be measured on indicators on non-monetary factors and monetary factors and quantified defined as below:

TABLE 1. HOUSING PROBLEMS VARIABLE IN FLOOD PRONE AREAS

FACTOR	VARIABLE	OPERATIONAL DEFINITION	
		very low (1)	very high (5)
Non-Monetary Factors	<i>Sosial Access</i> (Access of social support)	in the same street	> One day to commute
	<i>Economic Access</i> (Geographically access of the workplace)	in the same street	> 2 hours using public transport
	<i>Physical Standards</i> (Modern residential building and environment standards)	non-permanent building	permanent building more than the minimum standards of modern housing
	<i>Tenurre Security</i> (Security of tenure and freedom of transfer (sale / leasing))	<1 month	life time of the building
Monetary Factors	<i>Income</i> (Net. income after expenses of basic needs such as food and transportation)	<1.5 times the minimum expenditure (for food and fuel)	>10 times the minimum expenditure (for food and fuel)
	<i>Price</i> (Network installation and operational cost housing)	<5% net.income	>30% net.income
	<i>Fixed Assets</i> (The market value of fixed assets investment in the form of houses and land).	< 1 year netincome	> 5 years net income

Sources : Author, 2017

In the non-monetary factors for low income people, requires ease of geographical access to workplace (*economic access*) and also access to social support (*social access*) in the form of a relative or family life and is close so as to obtain all kinds of assistance. Quality of physical standard in environmental of the housing reflects the adjustment with the ability to pay. Security of tenure (*tenure security*) reflects the freedom to stay or pengoperannya (sales / tenanted).

While the monetary factor for low income people, has low charge (*price*) of operational payment capability, thus the value of the fixed asset investment is likely to be small, in order to balancing the net income (*income*). However, in relation to the charge of operational payment (*price*), which turned out to be greater than net income (*income*) they had, it will cause a problem in the monetary factor. Although there is a possibility that the value of house building and land (*fixed assets*) was very high, but this has not been a priority. While the cost of construction of residential houses (*cost*) are not included in the study variables for housing construction cost data that is done in stages and difficult to identify.

Setelah dilakukan analisis kuantitatif dilanjutkan dengan pendeskripsian dengan analisis deskriptif kualitatif. Jika terjadi ketidaksesuaian skala kuantitatif di atas dengan tuntutan dan kemampuan penghuni, maka perumahan tersebut menjadi masalah bagi penduduknya. The population used is the community in Kedung Rukem troubled at risk of flooding, while sampling previously used random sampling and forwarded by sorting data to measure *housing value* of low-income communities those were residents of livelihood as farmers with low incomes (<Rp 1,500. 000,00) with little environmental underserved urban infrastructure.

IV. DISCUSSION

1st Goal: Measure the housing problem by Turner methods.

Based on the measurements *Housing Value* conducted at research locations, obtained the following conditions:

priority is consistent with the fact that the majority (43%) of the population at a distance from the family home in a scale of 1 (located in one aisle) and the majority of the associations of citizens (54%) are often held on a scale of 2 (different gang still in a same sub-village). In detail, 29% of the population has the condition of proportion in a positive value, 11% of the population has a condition that is out of proportion in a negative value, and 60% of the population have the condition value in proportion. This situation reflects that people obtain social support from family and neighbors nearby, so there is no problem, because the conditions are in accordance with the priorities reality.

- Suitability access geographically to work (*economic access*) of low-income residents, found that residents of prioritizing the condition of the proximity to the workplace which can reduce the cost of transport with no need to use public transport on a scale of 2 (located in the sub-village), which can be reached by bicycle to walk. This condition is appropriate to priority and consistent with the fact that the majority (60%) of the population have incomes in the agricultural sector at a distance from agricultural land at a scale of 1 (located in one aisle) managed to offset the majority of the distance to the workplace population in non-agricultural sectors (40 %) on a scale of three (different sub-village still in the village) and suitability before it is reinforced by the distance to the workplace population in non-agricultural sectors of the others (29%) at a scale of 1 (being in a alley). In detail, 59% of the population has the condition is out of proportion to the value of positive, 3% of the population have a condition that is out of proportion in a negative value, 49% of the population have conditions suitable proportions. This situation reflects that residents obtain the balance and the benefits in terms of access to the workplace, so there is no problem, because the race conditions in fact are in accordance with the priorities.
- Suitability in terms of standard of physical buildings (*physical standards*) based on the criteria of non-permanent, semi-permanent, a mix of permanent, standards, standard finishing with a gorgeous, it is found that 49% are in the condition of scale 3 (mixed permanent) and 46% are in condition scale 2 (semi-permanent). Given the purpose of priority low-income people would need the opportunity to reside in the highest priority and strive to achieve improvements residence after these priorities are met that are in scale 3 (mixed permanent), then most of the suitability and most other discrepancies in negative values, because home improvements for people living in flood-prone research locations was not on the level of permanent, but rather on building height. Priority floor height of the building is on a scale of 3 scale 3 (± as high as existing flood) does not correspond to the reality in terms of the negative that the majority (57%) residents of floor height of the building is on a scale of 2 (a fraction lower than the existing flood) , This priority standards rising because once there is greater economic capability at of low-income residents, thus demanding to make improvements to the raised floor of the building in order to be safe from flooding. But when

TABLE 2. NON-MONETARY CONDITIONS

Social Access				Economic Access				Physical Standards				Tenure Security			
Item	Scale	Frequency	Percentage	Item	Scale	Frequency	Percentage	Item	Scale	Frequency	Percentage	Item	Scale	Frequency	Percentage
1	1	10	10.0%	1	1	10	10.0%	1	1	10	10.0%	1	1	10	10.0%
2	2	20	20.0%	2	2	20	20.0%	2	2	20	20.0%	2	2	20	20.0%
3	3	30	30.0%	3	3	30	30.0%	3	3	30	30.0%	3	3	30	30.0%
4	4	40	40.0%	4	4	40	40.0%	4	4	40	40.0%	4	4	40	40.0%
5	5	50	50.0%	5	5	50	50.0%	5	5	50	50.0%	5	5	50	50.0%
6	6	60	60.0%	6	6	60	60.0%	6	6	60	60.0%	6	6	60	60.0%
7	7	70	70.0%	7	7	70	70.0%	7	7	70	70.0%	7	7	70	70.0%
8	8	80	80.0%	8	8	80	80.0%	8	8	80	80.0%	8	8	80	80.0%
9	9	90	90.0%	9	9	90	90.0%	9	9	90	90.0%	9	9	90	90.0%
10	10	100	100.0%	10	10	100	100.0%	10	10	100	100.0%	10	10	100	100.0%

Sources: Author's Analysis, 2017

1. The state of the non-monetary terms:

- Suitability for the achievement of social support (*social access*) low-income residents, found that residents prioritize the proximity to the conditions of social support in inhabiting a dwelling house in a scale of 2 (different alley, still in the sub-village). Conditions appropriate to

the economic capability was back in normal conditions, the residents do not prioritize the addition ketiggian floor of a residential building, however let it be what the physical condition of the building and give priority to rescue goods that are temporer (temporary evacuation). In detail 14% of the population has the condition of proportion, 77% of the population have less than the proportion condition, 9% of the population have conditions suitable proportions. But this is not a significant problem for low-income public priority to repair their homes to be more secure is not the main one.

- Suitability security of tenure and freedom of transferring (sale / leasing) by a majority of the population wishes to remain a strong reason for the low-income communities. Reason correspondence between the fact that the majority (94%) are in a scale of 5 (own land and building) with conditions that prioritized the majority are at a scale of 5 (own land and building) is there because it is the existence of settlements in the study area already exists occurred several cross genenasi. This is so because with the lowest income levels, if a family has succeeded in achieving the form of residential equivalent to the ability level of income on it, then the family will try to make adjustments to maintain the condition. Similarly, where the homeownership accompanied legality of their homes and land ownership are prioritized by middle income people (IDR3,000,000.00 – IDR4.500.000,00) but it has been owned by low-income people such as the research sites. Then the population in the study area with low income will prioritize the security status as it supports access to outreach social and economic access. In detail 6% of the population have a condition less than the proportion and the balance of 94% of the population have conditions suitable proportions.

14% are in scale 2. Thus many there is any inconsistency in the negative terms in the acquisition 'net income.' If the review to the court, then this discrepancy also get a big contribution from the needs of the population for drinking water, which causes them to buy water refill water depot. Discrepancies in terms of 'net income' citizens enough to get relief from the acquisition of food, both plant and maintain their own or with the help of family This will have an impact on those aspects in other monetary factors.

- Suitability of operating a housing (rental and operational network service) in conjunction with the 'net income' Majority in fact be on a scale kuantifikasi 1, requires scale kuantifikasi operational cost of housing should be no more than a scale of 1 to avoid imbalance in terms of the negative. Conditions were obtained in the field of 'price' that takes into account the ratio of the net income in percent, obtained by strata that range from a scale of 1 (1-6%), a scale of 2 (7-11%), scale 3 (12-17%), the scale of 4 (18-22%), a scale of 5 (22-28%). Balance occurs in the majority (71%) of residents, while an imbalance in terms of negative happens in the rest (29%). Residents can obtain a balance in the 'price' is by pressing the expenditure on water use for toilets and irrigation, electricity expenditure burden-sharing with neighbors, to drape electricity expenditure burden on the family in the house next door, and chose not to be served solid waste services. Water use for sewage based on wells dug and drilled wells, as well as the storage and use of rainwater; whereas for irrigation harness the nearest water sources such as lakes and assured as from the river. Marasa enough for residents to use its own wells, it is not necessary to arrive to buy water. But for people who do not maraca enough to use its own wells, drilled wells should buy, which can increase the proportion of 'price' that must be removed, in addition unisex burden to pay for the electricity network. Paying more cause an imbalance occurs in the majority (3%) citizens who have dependents to pay the rent / boarding, which caused it must issue a 'price' on a scale of 4.
- Comparison of ownership of fixed assets (*fixed assets*) are there with reasonable obtained from the measurement of the value of agricultural land holdings and ownership of buildings and land dwelling house in the grounds, which are made without considering the inflation value of land and buildings are going to use the price of land and structure in the area of research is the average of IDR500,000.00/ m² for farmland, and an average of IDR1,500,000.00/ m² for land and residential buildings. In quantified scale, where the value of the ownership of assets remain majority of the population (91%) are on a scale of 5, and the rest (9%) are on a scale of 3, which arises because most already have agricultural land as well as land and building homes before they have a household itself coupled with the length of stay that affects the addition of both quality (repair materials and systems) or quantity (area). It can be seen from the majority of people who experience value addition in detail in rupiah nominal value due to the transfer of agricultural land to land and residential buildings. Transfer this value occurs because of an imbalance between expenditure with income derived

TABEL 3. MONETARY CONDITIONS

Kategori		Kategori				Kategori				Kategori				Kategori				Kategori			
Sub Kategori	Uraian	Uraian	Uraian	Uraian	Uraian	Uraian	Uraian	Uraian	Uraian	Uraian	Uraian	Uraian	Uraian	Uraian	Uraian	Uraian	Uraian	Uraian			
1			
2			
...			

Sources: Author's Analysis, 2017

2. The state of the monetary terms:

- Based on the amount of income in agriculture and non-agriculture as well as the determination of minimum requirements / person / month for food and transport is Rp 395,000.00, then by calculating the number of families, then obtained strata for indexing 'net income.' is ≤1.14 of minimum basic needs on a scale of 1 (≤IDR373,000.00) to >1.14 to 2.53 (> IDR373,000.00 – IDR1,075,000.00) of scale 2. But the conditions on the ground found that 86% had 'net income.' Lies in the scale of 1, and the remaining

from ownership of a vast wetland, so that residents prefer to sell most even entire agricultural land to make additions to land and buildings in terms of quantity (such as adding a building attached to the main building) and quality (increase the level of the majority, so the entire floor of a residential building) to be able to try in the business sector home and provide a sense of security against the risk of flooding. Likewise occurring kuantitatifikasi scale, agricultural land as well as land and residential buildings have an impact on the value of holdings of fixed assets where the whole (100%) of the population do not have a problem on the value of 'fixed assets' is. The existence value disproportionate to the value that is appropriately located in a scale of 1 for 'income' (net income) the majority of the population are on the scale 1. However this imbalance is a positive value because it can be used as capital to be able to strive in the livelihood sector.

2nd Goal: Construct the concept of housing improvements based on measurements housing problems

Based on the measurement results of *Housing Value* as at Goal 1, then the concept of improvements that can be drawn on non-monetary factors and monetary factors are:

- Harnessing the power on (i) the social aspect of access in the form of closeness with the family and the proximity of the scope of the implementation of the citizens association; (ii) access to the economy in the form of proximity to the place of the agricultural sector non-agricultural maupon which allows it to diversify; (iii) strong security and ownership by the legality of ownership of houses and land; for berstrategi in the improvement and enhancement (iv) the physical standard of dwelling house.
- Utilizing (i) the value of the ownership of fixed assets in the form of agricultural land as well as land and residential buildings as input the funds to support (ii) basic needs, and minimize (iii) operating costs through the sale in part or in its entirety can also obtain capital to try in the sector agriculture and non-agriculture in order to increase the income for their household needs.

V. CONCLUSION

Housing Value measurement method is a series of scales kuantitatifikasi to tell why the settlements in Kedung Rukem can still exist. This existence appears because the objective value settlement is supportive, namely in the response to non-monetary, such as: social access (proximity to family and neighbors), economic access (proximity to the area of work in agriculture (rice field) and non-agriculture (home industry, warung/ shop/ kiosk at house), and security of property rights not experience any problems and it has the potential to be used in handling the physical standards are problematic, especially associated with the floor height of the building as security against flood flooding, it was not too prioritized by of low-income residents. As well, people can take advantage of social access supportivity to overcoming the constraints due to the risk of flooding, one of which is as a place to evacuate during flooding, as well as *gotong royong* (mutual cooperation) and *kerja bhakti* (community service) assistance to repair and clean up the environment after the flood. While the monetary factors, the low price/ charge for housing needs,

contributing greatly to compensate for his small 'income' / net income which is owned by the local community, and maintain the value of ownership of 'fixed assets', and includes wetlands and house yard/ building. Ownership of fixed assets is often experienced transfer values, especially of wetlands (agricultural land) to dry land (land and residential buildings), because people need a certain amount of money cash with a nominal large enough to fix their house to be more secure when risk by floods.

In addition, there are directives drawn from the concept of improvements that can be made by low-income people in the river valley before has the power of the agricultural sector, but today is at risk of flood and overflowing rivers, namely the direction of improvement based on the concept of non-monetary factors and factors meneter, are as below:

1. Utilizing all gains obtained good social support from family and neighbors to help in all sorts of walks of life.
2. Income diversification both agriculture and non-agriculture (around house or outside house areas) so the revenues not only stem from one sector, while taking into account of the location with economically ability to travel.
3. Fixing house with raised floor and the re-use of material from the previous building and extended the building as a location for opening a home enterprices.
4. Utilizing high suitability in the security of tenure and freedom of transfer (sale / lease) which accompanied the legality of ownership of land and buildings to be able to freely berstrategi to secure from the risk of flooding, open a home-based business sector, and as a location for gatherings of residents.
5. Support the fulfillment of basic needs and housing opperasional through calculation
6. Pressing spending money for housing operations aboard the family home near the house.
7. The transfer of the value of agricultural land by selling it on the nearest person, the reliable person, or farmers skipper

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