

**INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH
TECHNOLOGY****SUSTAINABLE HOUSING CONCEPT IN SLUM AREA
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ABSTRACT

Krajan Kampung, Krian - Sidoarjo is one of the settlement areas affected by the development of the surrounding area, mainly due to its proximity to the center of activity and trade services in Krian District. In addition, these areas are also affected by industrial activities that provide employment opportunities. These settlements have the potential to develop into densely populated areas and degraded the quality of settlement that tends to be slum.

This paper aims to find out the concept of settlement area based on sustainable development. This research is conducted by field observation-case study method that is descriptive, in accordance with aspects of sustainable development.

The implementation of Sustainable Housing concept in Krajan Kampung consists of environmental, economic, social and cultural aspects. Handling on environmental aspects involves the provision and improvement of basic infrastructure of settlements. The economic aspect covers the arrangement of street vendors, skills training, and the formation of creative economy groups. The social aspect consists of improving community participation in village development and optimization of available facilities. While the cultural aspect, consists of the development of villages that are able to accommodate the concept of mutual cooperation and the preservation of local cultural values.

KEYWORDS: sustainable housing, kampung, quality of settlement, slum, Sidoarjo**I. INTRODUCTION****Background**

Along with population growth in urban areas, the need for housing and the provision of housing infrastructure and facilities will increase as well. The increasing demand for housing and the development of settlements will also be more rapidly. According to Aluko (2011), the phenomenon of increasing urbanization caused large cities to grow rapidly and unplanned, downtown area decreased quality and developed into slums. This condition is in line with the level of rural-urban migration (urbanization) that has triggered high demand for housing, employment, and pressure on existing urban infrastructure which is related to the emergence of slum settlements (Joshua and Glanda, 2016).

Slums can arise because residents or local communities are unable to meet basic infrastructure needs in residential environments. These conditions are associated with low income levels. In addition, urban slum areas are emerging as one of the less successful impacts of urban settlement construction and limited land on urban area (Wijaya, 2016).

On the other hand, slum areas have advantages or positive values for the inhabitants, like to provide shelter, jobs and livelihood, especially for low income communities. Elrayies (2016) states that slum areas are still attractive for people to stay and find work. In developing countries, slums are often home to an abundance of labor in city. Krajan Kampong is located near the center of activity and trade services in Krian District. In addition, Krian areas are also affected by the development of Surabaya and Sidoarjo cities. All this provokes the occurrence of urbanization because of employment opportunities due to industrial activities and trade-services.

Krajan Kampong is located in Krian – Sidoarjo, near the center activity of Krian District, and consists of 3 groups of neighborhoods: Western, Central, and Eastern Krajan, which are impacted by trade and services area

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activities including Krian's Market. There are street vendors behind the market. Most of the community houses are located around the back of the market and used for trading and services. The area of about 8.48 hectares is prone to flood, and has 703 households, with population density of about 3.369 people/km².

Slum must be dealt so that bad impacts are not increasing. Handling of slums has become an international issue, as stated in SDG's (Sustainable Development Goals), NUA-HIII (New Urban Agenda-Habitat III). Newman and Thompson (1997) point out that slum clearance has therefore become a major social issue, and numerous approaches have been taken to improve the quality of life of urban residents whose resource in the past have limited their housing choice. Further, the characteristics of the urban slum settlements are influenced by the origin of the settlers, the economic level, and the social and cultural life of the urban settlements (Turner in Sela, 2016). It can be seen that the character of slum settlements also have links with economic, social, and cultural conditions. In other words, the handling of slums is not only focused on improving the physical condition of the environment, but also concerning social-cultural and economic sustainability. Therefore, the concept of sustainable development is needed on handling the slum, with a development concept that not only focuses on the physical environment, but also on the economic and socio-cultural aspects.

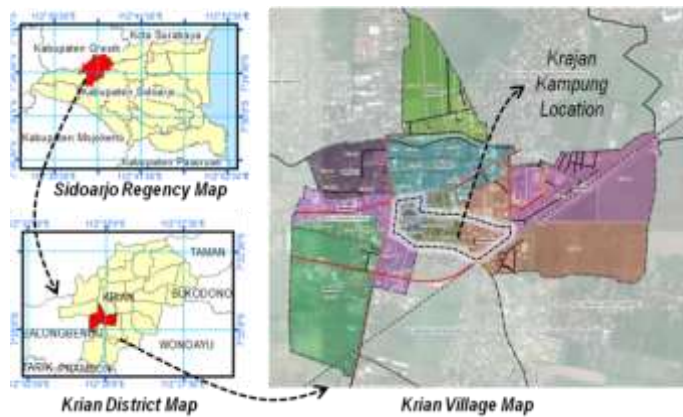


Figure 1. Orientation of Krajan Kampung Location in Krian – Sidoarjo
 (Source: by author based on Google Earth, 2017)

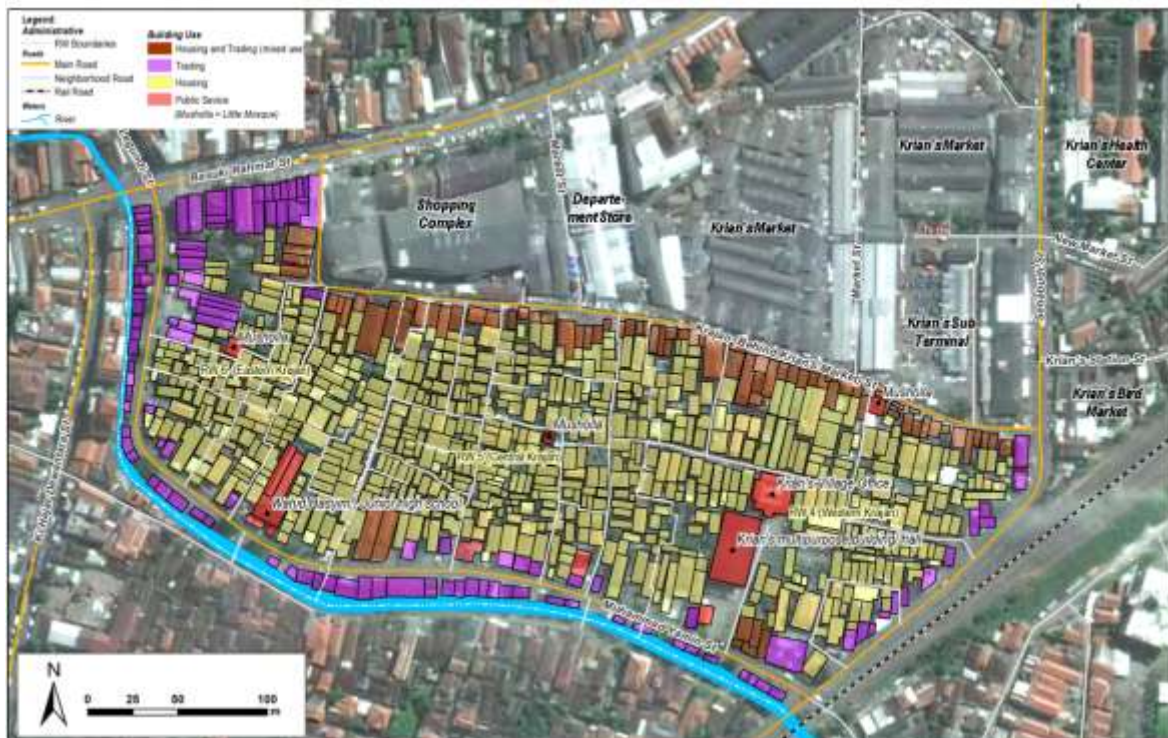


Figure 2. Krajan Kampung's Map
 (Source: by author based on Google Earth, 2017)

II. LITERATURE STUDIES AND METHODS

Target of Sustainable Development

According to Niser in Aluko (2011), the concept of sustainable development can be divided into three parts, namely: environmental, economic, and social sustainability. In addition, sustainable development can be defined as development that meets the needs and aspirations of today's generations without compromising the ability to meet future generations. Sutamihardja in Rahadian (2016) stated that sustainable development targets include efforts to realize the occurrence of:

- Equity sharing of intergeneration equity results meaning that the utilization of natural resources for the sake of growth needs to consider reasonable limits in ecosystem or environmental systems control and is directed to replaceable natural resources and emphasize as low as possible the exploitation of natural resources that are un-replaceable.
- Safeguarding or safeguarding the preservation of existing natural resources and the environment and preventing ecosystem disturbances in order to ensure a good quality of life for future generations.
- Utilization and management of natural resources for the sake of pursuing economic growth for the sake of equitable distribution of sustainable natural resource utilization between generations.
- Maintaining the welfare of the people (community) that is sustainable both present and future (inter temporal).
- Maintain the benefits of development or management of natural resources and the environment.

Sustainable Housing

Habitat III-New Urban Agenda

In Habitat III-New Urban Agenda, Sustainable Housing becomes one of the important issues, especially on Sustainable and Inclusive Urban Prosperity and Opportunities for All and Planning and managing urban spatial development (Quito Implementation Plan for the New Urban Agenda).

- (Point 106) We will promote housing policies based on the principles of social inclusion, economic effectiveness and environmental protection. We will support the effective use of public resources for affordable and sustainable housing, including land in central and consolidated areas of cities with adequate infrastructure, and encourage mixed-income development to promote social inclusion and cohesion.
- (Point 107) We will encourage the development of policies, tools, mechanisms and financing models that promote access to a wide range of affordable, sustainable housing options, including rental and other tenure options, as well as cooperative solutions such as co-housing, community land trusts and other forms of collective tenure that would address the evolving needs of persons and communities, in order to improve the supply of housing (especially for low-income groups), prevent segregation and arbitrary forced evictions and displacements and provide dignified and adequate reallocation. This will include support to incremental housing and self-build schemes, with special attention to programs for upgrading slums and informal settlements.
- (Point 108) We will support the development of housing policies that foster local integrated housing approaches by addressing the strong links between education, employment, housing and health, preventing exclusion and segregation. Furthermore, we commit ourselves to combating homelessness as well as to combating and eliminating its criminalization through dedicated policies and targeted active inclusion strategies, such as comprehensive, inclusive and sustainable housing first programs.
- (Point 119) We will promote adequate investments in protective, accessible, and sustainable infrastructure and service provision systems for water, sanitation, and hygiene, sewage, solid waste management, urban drainage, reduction of air pollution, and storm water management, in order to improve safety against water-related disasters, health, and ensure universal and equitable access to safe and affordable drinking water for all; as well as access to adequate and equitable sanitation and hygiene for all; and end open defecation, with special attention to the needs and safety of women and girls and those in vulnerable situations. We will seek to ensure that this infrastructure is climate-resilient and forms part of integrated urban and territorial development plans, including housing and mobility, among others, and is implemented in a participatory manner, considering innovative, resource efficient, accessible, context specific, and culturally sensitive sustainable solutions.”

Source: *Habitat III-New Urban Agenda* (2016)

Sustainable Development Goals (SDG's)

In the target SDG's several points related on Sustainable Housing are; no poverty (point 1); good health and well being (point 3), clean water and sanitation (point 6), decent work and economic growth (point 8), sustainable cities and communities (point 11).

Furthermore, in Sustainable Development Goals, point 11 is explained about the target of realizing cities and sustainable settlements, with the following targets.

- “By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums
- By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons
- By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries
- Strengthen efforts to protect and safeguard the world’s cultural and natural heritage
- By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water related disasters, with a focus on protecting the poor and people in vulnerable situations
- By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management
- By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities
- Support positive economic, social and environmental links between urban, peri urban and rural areas by strengthening national and regional development planning
- By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels
- Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials.”

Source: *Sustainable Development Goals (2015:26)*

UN Habitat 2012

The issue of sustainable settlements is also contained in UN Habitat 2012 which is emphasized on 4 (four) dimensions, namely environmental, social, cultural and economic.

Table 1. Key Issues to Consider for Affordable Housing within the Four-Dimensional Sustainability

Dimension	Micro (Neighborhood, House Hold)
Environment Dimension	<ul style="list-style-type: none"> ▪ Ensure energy efficiency, micro/ generation, water and resource efficiency ▪ Green design, using sustainable local construction and material ▪ Sanitation preventing hazardous and polluting material ▪ Affordable use of resources ▪ Improving resilience and adaptation of homes
Economic Dimension	<ul style="list-style-type: none"> ▪ Ensuring housing affordability for different social group ▪ Providing adequate residences to raise labor productivity, ensuring housing is integrated with employment ▪ Supporting domestic economic activities and enterprise ▪ Promoting petty landlordism and self-help housing ▪ Housing management and maintenance ▪ Strengthening resilience and future proofing of homes
Social Dimension	<ul style="list-style-type: none"> ▪ Empowering people and ensuring public participation ▪ Ensuring health, safety, well-being in residences ▪ Creating sense and community, ‘sense of place’ and identity ▪ Meeting specific needs and want in housing (including those relate to gender, age, and health)

Dimension	Micro (Neighborhood, House Hold)
Cultural Dimension	<ul style="list-style-type: none"> ▪ Providing access to infrastructure and public spaces
	<ul style="list-style-type: none"> ▪ Culturally responsive settlement and house planning and design
	<ul style="list-style-type: none"> ▪ Improving aesthetics diversity and cultural sophistication of the built environment and residence
	<ul style="list-style-type: none"> ▪ Helping community creativity (i.e via amenities affordable sporting, cultural and entertainment facility)
	<ul style="list-style-type: none"> ▪ Assisting peoples transition from rural and slum area to decent housing or multifamily housing

Source: UN Habitat (2012)

Based on the literature studies review above, it is known that dimension in sustainable housing include, can be grouped into;

- Environment Dimension
 - ✓ adequate, safe and affordable housing (resilient buildings, utilizing sustainable local construction and materials)
 - ✓ infrastructure and basic service; transport (road), drainage, clean water, sanitation (sewage), waste management, disaster protection (based on the potential disasters that will occur in the region), and green open spaces
- Economic Dimension
 - ✓ create conditions that can support and improve the economy of the community (including in providing adequate housing)
- Social Dimension
 - ✓ increase community participation in settlement development
 - ✓ providing access to infrastructure in an effort to improve health, safety, or well-being in residence
- Cultural Dimension
 - ✓ development of settlement promotes local culture and wisdom

Methods

The strategy in this research is case study or descriptive field research. Case study or field research is intended to intensively learn about the background of the current situation, and position of an event, as well as the environmental interaction of a given social unit of a given nature. According to Yin (1993), case studies can be exploratory and descriptive. In addition, Yin (1993) argues that case studies focus more on trying to answer the questions, how and why, and to some extent also answer what questions.

Based on these explanations, it is compatible with this research, especially to knowing the conditions of the settlement in accordance with the criteria of sustainable housing. In this case, the specific causes of slum settlements can be identified by observing, understanding and interpreting in accordance with the condition of the research location.

III. ANALYSIS

This section describes the existing conditions in the Krajan Kampung (potential and problem) and analysis of the handling and prevention of slum areas in accordance with sustainable housing aspects

Table 1. Key Issues to Consider for Affordable Housing within the Four-Dimensional Sustainability

No.	Dimensi on	Potential	Problems	Alternative for Handling	Alternative for Prevention
A. Environment Dimension					
1.	House building		<ul style="list-style-type: none"> ▪ Most settlement areas have been dominated by high building density, of 9.556,82 building/ Km². ▪ There are still building houses with unfit conditions either on the base, floor, or wall of the 	<ul style="list-style-type: none"> ▪ Rehabilitation of unfit house ▪ Demolition / eviction of buildings in the river border ▪ Normalization of channels in 	<ul style="list-style-type: none"> ▪ Enforcement of building permit ▪ Socialization of spatial plan of the region ▪ Socialization to the community regarding the



No.	Dimension	Potential	Problems	Alternative for Handling	Alternative for Prevention
			<p>building. Total of households has unfit building is 13 (2.56%).</p> <ul style="list-style-type: none"> ▪ There are still some of residential areas that are prone to flooding. ▪ In areas of flood-prone, most of the houses had raised/elevated their floors or constructed embankments in the house in order to avoid puddles. ▪ There is still a building / housing on the river border 	flood-prone residential areas	<p>rules for the building and the environment, especially the physical residential building.</p> <ul style="list-style-type: none"> ▪ Simple healthy home environment campaign
2.	Road on neighborhood		<ul style="list-style-type: none"> ▪ There are still streets with broken pavement (paving, concrete) and ground. ▪ Roads are not yet equipped with street lighting ▪ There is a street that is not equipped with drainage ▪ Most of the road consists of narrow alleys (with dimension about 1-2 meters 	<ul style="list-style-type: none"> ▪ Improvement of Road ▪ Provision of public street lighting ▪ Construction of drainage 	<ul style="list-style-type: none"> ▪ Regular inspection for accessibility /traffic of street ▪ Socialization of streets
3.	Drainage		<ul style="list-style-type: none"> ▪ Most of the drainage has sedimentation and garbage accumulation so that runoff water cannot flow smoothly. ▪ There are still drainage that have been damaged, and not equipped with a cover (concrete plate), or not yet built. ▪ There is drainage that not connected with the others, or the residential areas do not have drainage. ▪ In the market area, drainage is not managed properly. There is a trench that covered by garbage. This condition cause the water runoff, thus overflowing into the residential area Krajan Kampong especially when the rain is not fully accommodated and well channeled. ▪ Runoff flow from secondary drainage are 	<ul style="list-style-type: none"> ▪ There is a proposal to build a pump house as an alternative to the handling of inundation that occurs due to the runoff. The location of the pump house building is at the eastern side of the area (Krajan Stasiun Kampung) ▪ Rehabilitation of market's drainage that expected to be equipped with embankments, especially on the door / access in-out which is adjacent to the market of Krajan Kampung. It aims to prevent 	<ul style="list-style-type: none"> ▪ Periodic inspection for proper drainage function ▪ Socialization and counseling how to maintain and repair drainage ▪ Creation of river care community ▪ Assistance in community-based drainage management

No.	Dimension	Potential	Problems	Alternative for Handling	Alternative for Prevention
			<p>hampered due to narrowing and silting of drainage in the market area of birds. Further, this condition is exacerbated by the existence of shops/stalls above the drainage so that the dredging is difficult.</p>	<p>runoff from the market to the Krajan Kampung</p> <ul style="list-style-type: none"> ▪ Normalization of secondary drainage that located around the bird market 	
4.	Clean water	Clean water condition from drilling / artesian well is adequate for consumption (cooking / drinking).	<ul style="list-style-type: none"> ▪ Only a small percentage of households use clean water from pipeline network of local water company. ▪ At the rainy season, the water from draw well fall in less adequate conditions, such as turbid, colored, or smelly, especially in residential areas which is prone to flooding / puddle. ▪ Some people objected if required to install / use pipeline network of local water company. The condition is related to the amount of customers' monthly fee which is considered to burden the citizens. 	<ul style="list-style-type: none"> ▪ Most people use gallon water/refill for consumption purposes (cooking / drinking) ▪ Development of HIPPAM (Population Water User Association) in areas that are not yet served by pipeline network of local water company ▪ provision of individual / communal water tanks 	<ul style="list-style-type: none"> ▪ Optimizing the coverage of drinking water services ▪ Periodic examination of the feasibility of function and the quality of drinking water ▪ Establishment of HIPPAM community ▪ Mentoring the community-based drinking water management
5.	Sanitation/ sewage management		<ul style="list-style-type: none"> ▪ There are still some households that do not have sanitation facilities namely private toilet and septic-tank. ▪ The number of households without toilet is 55 households (6, 54%) and without septic-tank is 188 households (22,35%). ▪ In high density settlement areas, the construction of private septic-tank / each house is less feasible to do. This is due to lack of land in the plot of houses. ▪ Residents who are in the nearby of the secondary drainage, utilizing the drainage as a sanitation disposal site mixed with domestic waste from households. 	<ul style="list-style-type: none"> ▪ Development of communal wastewater treatment plant 	<ul style="list-style-type: none"> ▪ Improving the regulatory system to the compliance of Minimum Service Standards, rules and technical standards of waste water management ▪ Mentoring the realization of healthy environmental sanitation ▪ Socialization of clean and healthy life & the importance of private toilet, septic tank, and wastewater

No.	Dimension	Potential	Problems	Alternative for Handling	Alternative for Prevention
			<ul style="list-style-type: none"> In the event of inundation / flood, sanitation and domestic waste overflow and mixed with running water 		treatment plant are eligible.
6.	Waste management	<ul style="list-style-type: none"> There is the development of Integrated Waste Disposal Site which is located in east of Krajan Kampung. In the area of Krian's Market there is a temporary dump site that manages market waste. 	<ul style="list-style-type: none"> Infrastructure and facilities for the operation of Integrated Waste Disposal Site are still inadequate, considering that currently available facilities are still only the building, without a complete infrastructure. Integrated Waste Disposal Site has not functioned in the waste management process There is no regular waste collection/ carriage The main means of supporting the garbage is not yet available, especially garbage bins, garbage transport vehicles, and janitor. Existence of temporary dump site contained in Krian's Market still not optimal, considering there is still a lot of garbage that have not been handled and located around the market so that surrounding settlement area are impacted. In settlement area around the river / drainage, there are still residents who throw garbage into the river/ drainage. 	<ul style="list-style-type: none"> Provision of some Infrastructure and facilities of Integrated Waste Disposal Site, especially; garbage transport vehicles, incinerator, garbage disposal, conveyor, janitor, fence, etc. Provision of waste Infrastructure garbage for the community, such as garbage bins, garbage transport vehicles, and janitor. Implementation of 3R (Reuse, Reduce, Recycle), waste bank system. 	<ul style="list-style-type: none"> Periodic Inspection Function of garbage facilities and infrastructure Socialization of the realization of a healthy environment The formation of community care waste Socialization on waste management (sorting, 3R, Waste Bank) Cooperate with Krian Market's Management about waste management
7.	Fire Protection		<ul style="list-style-type: none"> In residential areas, fire infrastructure, such as hydrants, Fire Extinguishers, pumps, fire hoses are not yet available High degree of vulnerability to fire. This condition is related to the lack of fire infrastructure and inadequate accessibility (road dimension about 1-2 meters) 	<ul style="list-style-type: none"> Provision of fire protection infrastructure in residential neighborhood Formation and training of community of firefighters 	<ul style="list-style-type: none"> Training of community of firefighters Socialization of evacuation route and location (Krian's Village office)

No.	Dimension	Potential	Problems	Alternative for Handling	Alternative for Prevention
8.	Green open space	<ul style="list-style-type: none"> Land around the river border can be utilized as green open space 	<ul style="list-style-type: none"> In residential areas with high density the presence of Green open space public or private is still small utilization the green line around the river border is inadequate 	<ul style="list-style-type: none"> Planting of vegetation by potted plants in each house as an alternative to greening on limited land Re-structuring the river as a green open space 	<ul style="list-style-type: none"> Socialization of spatial plan of the region Prevent functional shift of Green open space area with the enforcement of licensing rules
B	Economy	<ul style="list-style-type: none"> The location of settlements adjacent to Krian's markets and commercial areas 	<ul style="list-style-type: none"> The existence of street vendors are not organized and managed. These conditions create a chaos, especially during the morning hour of market activity and lead to waste that is not managed properly. Withdrawals of retribution by the Krian's Market management to street vendors are not balanced with the arrangement and management of street vendors. There are still poor households 	<ul style="list-style-type: none"> Development of Karajan Kampung which capable of supporting people's livelihoods Structuring street vendors Empowering merchant of street vendors (formation of community, capital assistance, place to sell) Skills training 	<ul style="list-style-type: none"> Enforcement of trade rules against street vendors, like; not littering around and tidying up stall after trading Order the street vendors Formation of creative economy groups Creative economic training (recycling crafts, bird cattle, food-beverage industry, etc.)
C	Social	<ul style="list-style-type: none"> Most residents work in the trade and services sectors, such as; merchant and entrepreneurs Community participation in the development / arrangement of the village is quite good and active. Educational, worship, and health facilities have been served / accessible. 	<ul style="list-style-type: none"> Social – culture facilities is still inadequate, multipurpose building/ hall in a broken condition (in the Krian's Village Office). 	<ul style="list-style-type: none"> Increasing community participation in village development, like labor, funds, places, etc. Optimizing the use of facilities already available Repair of multipurpose building/ hall 	
D.	Culture	<ul style="list-style-type: none"> Most residents still hold the value of gotong royong (mutual 			<ul style="list-style-type: none"> Village development process directed able to

No.	Dimensi on	Potential	Problems	Alternative for Handling	Alternative for Prevention
		cooperation), communality. ■ Good social interaction ■ Traditional cultural values are still maintained, such as selamatan (salvation) and clean village (traditional ceremonies), regular recitation, etc.			accommodate concept of gotong royong (mutual cooperation), communality. ■ Preserving cultural values.



Figure 3. a. building houses with unfit conditions; b. high building density (Source: photograph by author,2017)



Figure 4. a. With drainage and not yet equipped with drainage; b. Roads with broken pavement (paving, concrete) and ground (Source: photograph by author,2017)



Figure 5. a. Drainage have sedimentation and covered by garbage; b. Utilizing the drainage as a sanitation disposal site mixed with domestic waste (Source: photograph by author,2017)



Figure 6. a. Draw well , pipeline network , gallon water/refill; b. Infrastructure and facilities for the operation of Integrated Waste Disposal Site are still inadequate
 (Source: photograph by author, 2017)



Figure 7. a. Planting of vegetation by potted plants; b. Utilization the green line around the river border is inadequate, and there are buildings in the river border
 (Source: photograph by author, 2017)



Figure 8. a. Vulnerability to fire; high density of buildings and inadequate accessibility (road dimension about 1-2 meters); b. Trading area - around Krian's market
 Source: by author



Figure 9. a. Krian's Bird market; b. Street vendors behind the market
 (Source: photograph by author, 2017)

IV. CONCLUSION

Based on the analysis results it can be seen that Sustainable Housing Concept in Krajan Kampung include environmental aspect: provision and improvement of basic infrastructure of settlements, that involve house building, road on neighborhood, drainage, clean water, sanitation/ sewage management, waste management, fire protection, and green open space. Economic aspect covers handling of street vendors (structuring and control, empowering merchant, enforcement of trade rules) and formation and training of creative economy groups. Social aspect consists of improving community participation in village development and optimization of available facilities (include repair of multipurpose building/ hall). While cultural aspect consists of the development of villages that are able to accommodate the concept of mutual cooperation, and the preservation of local cultural values.

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