

Exploring Community Engagement: Neighbourhood Infrastructure Evolution in Sentani's Vernacular Settlements

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Abstract— In the era of rapid development, enhancing vernacular settlements is crucial for sustainability, particularly in preserving cultural integrity. The Sentani Tribe exemplifies this challenge with its distinctive cultural heritage deeply rooted in the shores of Lake Sentani. Originally fishermen, the tribe has transitioned to farming, prompting shifts in their settlements and infrastructure. This study focuses on Kehiran villages, where such shifts have necessitated settlement improvements. It investigates opportunities for enhancing vernacular settlements through community engagement, considering cultural adaptations resulting from these infrastructure changes. Through empirical research and analysis, the study follows the identified seven key habitus changes impacting the Sentani Tribe's habitat, influencing infrastructure like worship spaces, schools, roads, and public areas. These findings underscore the potential for participatory improvements in vernacular settlements amidst evolving cultural landscape.

Keywords—community engagement, habitus shift, infrastructure shift, Kampung Improvement Program, vernacular settlement

I. INTRODUCTION

In discussing city development, one of which is the improvement program, it is essential to discuss the use of both human and natural resources in an area. Effectively using resources ensures that no resources are wasted or used unnecessarily. This can be done by utilizing local community participation to use their local knowledge in making a more sustainable development. In previous research, improvement programs targeting villages in Indonesia have often been discussed [1], [2]. However, very few discuss the importance of improvement programs for vernacular settlements in Indonesia. Vernacular architecture includes construction aspects that are built or adapted to the daily needs of the inhabitants at a particular time and place, particularly in traditional contexts [3]. Participation from the local community in vernacular initiatives fosters the utilization of indigenous wisdom and local assets. It further advocates for a more enduring development strategy and fosters self-reliance within the community and a culture of responsibility. This method also advances gender equality by involving women, who are frequently marginalized from decision-making arenas [4].

A culture is a form of a mindset revealed through the

community's behavior and activities due to natural challenges that occur from generation to generation, impacting the physical form of buildings and settlements [5]. Lake Sentani, precisely in Sentani district, Jayapura Regency, is inhabited by the majority of the Sentani Tribe, who live on the land and shores of Lake Sentani. Sentani community settlements are mostly located on the shores of Sentani Lake, and in the process of development, the place has changed to support life [6]. However, due to resources and changes in modal (cultural, social, economic and symbolic), the Sentani tribe moved to the mainland to become farmers. This caused a change in the shape of the settlement, which was initially linear following Lake Sentani, becoming a grid-like settlement in general [7]. Another change targets ways of living in their habitat, which are changing belief in nature and ancestors (*mangnaro*) to belief in God, collectivistic social relations becoming individualistic, multiple family structures becoming nuclear families, the role of tribal chiefs (*Ondoafi*) being weakened, fishermen's activities become farmers, sacred traditional values decline, and gender equality in societal roles [7]. Those changes, called the seven habitus changes, will cause shifts in people's behavior, values, and social expressions. It can be seen in the architecture of the traditional settlements of the Sentani indigenous people, especially in their infrastructure. Based on the problems described above, the aims of this research are:

1. Identifying the affected infrastructure from the seven habitus changes (driving force)
2. Exploring the possibilities of participation in vernacular settlement's infrastructure improvement based on changes in cultural aspects in Kehiran village

II. LITERATURE REVIEW

A. Vernacular Architecture: The Product of Local Context

Vernacular architecture is an architectural concept that emerges from local society and context. It is an architectural category that emerged because it was built based on the needs of local communities [8]. People use their energy without the help of professionals (architects), so this concept is known as "architecture without architects". Therefore, vernacular architecture reflects local culture, traditions, and history so that

it can evolve to suit the surrounding conditions. In contrast to Indonesian and traditional architecture, vernacular architecture can physically evolve because it adjusts and adapts to current or contemporary conditions [9].

A residence is the smallest part of a residential and city structure/setting. Residential, domestic life is primarily centered in settlements, so settlements are understood as arrangements that function as a place for residents to carry out various activities to support and facilitate life within them [10]. Therefore, as an architectural concept that originates from community groups and brings local context, vernacular architecture is often realized, one of which is in the form of residential architectural objects [11]. This proves that housing is a cultural product of the local context because it influences the shape and characteristics of housing [12].

B. Infrastructure within Settlement

Cities and villages need infrastructure assistance for survival and economic sustainability. Furthermore, infrastructure is a key component of achieving prosperity or raising the standard of living in an area. Infrastructure is a facility supplied to better the lives of local residents [13], [14], [15].

Based on SNI (Indonesian National Standard), settlement management is regulated in standard facilities and infrastructure regulations under the name of sarana and prasarana. Sarana is supporting facilities that function to organize and develop economic, social, and cultural life. Such as government and public services facilities, educational and learning facilities, healthcare facilities, worship facilities, trade and commerce facilities, cultural and recreational facilities, and open spaces facilities. Meanwhile, prasarana is the essential physical equipment of the environment that allows the residential setting to function as it should. For example, roads, drainage, clean water, wastewater, waste, electricity, telecommunication, and local transport networks [16].

C. Participatory in Vernacular Architecture Improvement Program: Necessity and Possibility

In the context of Indonesia as a developing country, the rapid increase in population and urbanization significantly influences housing issues, thereby requiring settlements to continue to develop [17]. Insights into Indonesia's settlement distinctive characteristics are provided by Kampung, an indigenous urban settlement [18]. According to Silas in Hastijanti (2016), a village is a concept of informal, small, gradual, and indigenous development of settlements carried out by, for, and for the community itself so that it is identical to settlements for low-income communities (MBR) which are spread throughout the area in cities, including the most crucial city areas, to the most expensive land areas [19]. The government strives to improve the quality of settlements through various programs. One of the first successful and recognized programs was the Kampung Improvement Program (KIP).

The Kampung Improvement Program (KIP) is an environmental improvement program carried out in low-income areas, usually found in villages in various cities in Indonesia. It is a program to improve the physical condition of

the housing environment and the condition of facilities and infrastructure, especially in urban areas where the population is continuously increasing [20]. KIP is an inclusive policy based on community participation and local context [21]. The factor that influences the village improvement process is the ability of the village residents to work together to implement the process to maximize the program until it is officially completed [22].

According to Arnstein, participation can be equated with the concept of power, where the typology of participation is represented as a ladder that shows increasing levels of citizen agency, control, and power [17]. There are three levels on the ladder of participation, ranging from non-participation to complete citizen control. At the lowest level, non-participation is explained as people who do not have influence or power in decision-making processes. There is manipulation and tokenism, which do not position the community as participants but only as informants without real influence. Enter the next level, namely degrees of tokenism, where the community has nominal influence but lacks substantive power. At the level end is citizen power, where the community has complete autonomy and authority in determining the outcomes (Figure 1) [23]. However, based on this explanation, several limitations still exist in some contexts. Participation with the very poor will be more complex because the project will focus on the speed of time and outcome goals. Thus, community participation, which should be fully done by the community, becomes manipulated. Apart from that, there are also concerns from project organizers that participants only participate in returns for cash or food. This can affect participants' independence after the development project is completed. Local communities will become cell-reliant due to the lack of empowerment [4].

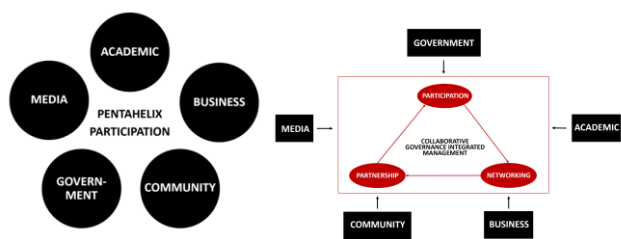


Figure 2. Penta helix participation diagrams in collaborative governance integrated management

Another explanation about participation is also given in the Penta helix participation diagram (Figure 2). The diagram explains that citizen participation in development will be successful if it involves the active role of media, academics, business (NGO), community/civil and government. The role they can play is not only participation but also partnership and networking. This Penta helix participation diagram can overcome the limitation problems explained above.

In short, the Kampung Improvement Program, vernacular architecture, and community participation are still interconnected. Engaging communities in development initiatives encourages leveraging local expertise and resources. It fosters a sustainable development approach, enhances local autonomy, and cultivates a culture of responsibility. It is not only the role of residents but also the role of academics, media, NGOs, and government continuously to monitor the progress of development projects. This is one of the goals needed to develop sustainable vernacular architecture.

III. RESEARCH METHODOLOGY

This research was conducted in the villages around Lake Sentani. The locus used in this research is the context of traditional fishermen and farmers' settlements as shown in Figure 3. The research location that is considered relevant for research is Kehiran Village. The reason for selecting the research location was based on several criteria;

1. The characteristics of the study area including the traditional indigenous settlements of the Sentani tribe are geographically, socially, culturally and ecologically

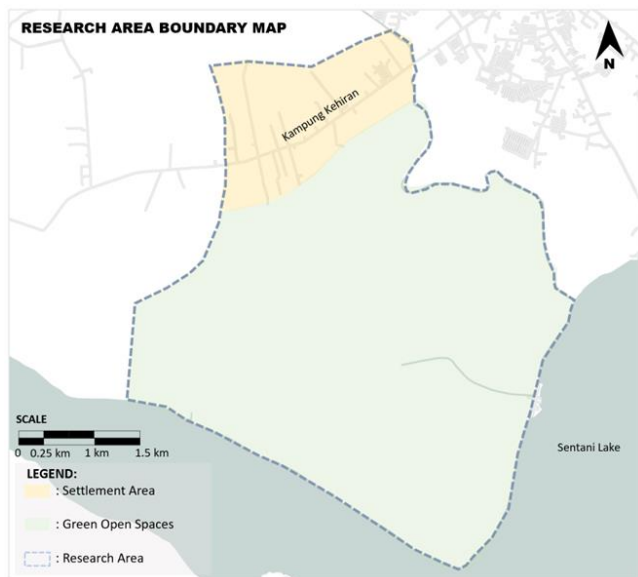


Figure 3. Research Area Boundary Map

distinctive and unique, and located in the Sentani customary conservation area in Jayapura district.

2. Kehiran village is the first (oldest) settlement of farmers who moved to the Sentani mainland in 1970 and live as farmers.

3. The village still has its own *Ondoafi*/traditional leader and traditional house in carrying out the customs in the village.

This research applied a qualitative approach, with desk study as one of the data-gathering techniques. The method is used to develop previous research results that have been carried out related to changes in infrastructure and vernacular settlements in villages around Lake Sentani, especially Kehiran Village, caused by the times and cultural shifts. It is a "systematic approach for answering specific types of questions" [24]. These inquiries are addressed "through gathering evidence under clearly defined and repeatable conditions". "Data" is used to describe the information gathered during empirical study.

For the first aim of the research, identifying changes in infrastructure and facilities that occurred after the seven habitus changes in Kehiran Village, observations, interviews, and desk studies were carried out as data collection techniques. In the first stage, observations were carried out to determine the entire research area and the infrastructure available in Kehiran Village. After that, interviews and desk studies were conducted with each community leader from 10 RW (Community Unit), which aimed to identify the cultural changes in Kehiran Village

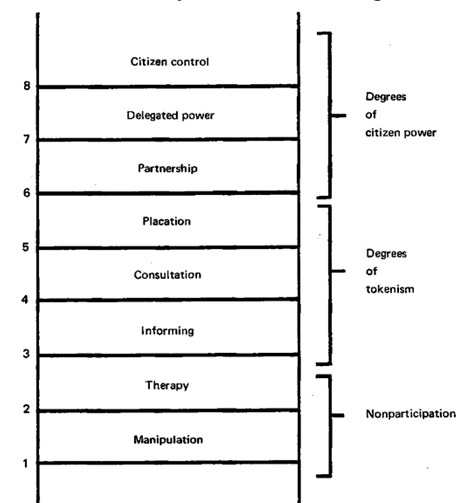


Figure 1. Ladder of Citizen Participation (Arnstein, S., 1969)

and possible infrastructure changes. After conducting interviews and desk studies, researchers confirmed the infrastructure changes by re-observing infrastructure changes based on the results of interviews and desk studies. From this first objective, we can determine what infrastructure elements are influenced by cultural changes.

In the second research objective, researchers explore the possibility of local community participation in the vernacular settlement's infrastructure improvement program based on changes in cultural aspects in Kehiran village. For this second goal, a desk study was carried out to explore the participatory process and its possibilities at Kehiran. The analysis were carried out using descriptive analysis techniques, which analyse the results of interviews and desk studies so that the implications of community participation in residential development can be identified at the end of the research.

IV. RESULT AND DISCUSSION

A. *Seven Habitus Changes: Cultural and Infrastructure Shift*

As mentioned in the previous chapter, seven habitus changes include changing belief in nature and ancestors (*mangnaro*) to belief in God, collectivistic social relations becoming individualistic, multiple family structures becoming nuclear families, the role of tribal chiefs (*Ondoafi*) being weakened, fishermen's activities become farmers, sacred traditional values decline, and gender equality in societal roles. These seven habitus changes cause cultural changes, which can affect changes in infrastructure in Sentani vernacular settlements. In this sub-chapter, we will discuss the cultural causes behind the seven habitus changes and what infrastructure is affected by those changes shown in Table 1.

1) *Changing Belief in Nature to Belief in God*

The change from belief in ancestral spirits (*mahe*) and natural forces (*seumoi*, *siburu*, and *siakhe*) as sources of blessings for farming communities to belief in God (*Arai Hubarho mando*), caused the identity of the sacred village and place of traditional ceremonies for the Sentani Tribe fishing community to change. This is demonstrated by the addition of worship facilities in settlements, which also act as landmarks. The changes were followed by the movement of collective storage and activities from the traditional community to play sacred flutes from *Khombo Imae* to the largest room in *Obe Imae*.

Based on this description, it was found that changes in beliefs in a traditional tribe can influence the addition or change of worship facilities.

2) *Collectivistic Social Relations Becoming Individualistic*

From the change in collectivistic to individualistic social relations, it can be seen that the driving force is the change in the livelihood of the Sentani tribe community, which has an impact on residential infrastructure, including the orientation of residents' houses. The orientation of residents' houses initially faced outside, then became self-contained homes due to individualistic social relations. Apart from that, changes in livelihoods have also resulted in the reduction of communal space, which was initially used to process the production of fish catches collectively.

3) *Multiple Family Structure becoming Nuclear Family*

Fisherman families are formed based on a multiple-family structure within the same clan, while farming families are formed based on a nuclear family structure. This is realized in the activities of fishing, making boats, cages, and fishing nets carried out collectively by all family members in fishing communities, which is not found in the lives of farming communities. In farming communities, they do the following activities: planting bananas, tubers, vegetables, and areca nuts, which is done individually per family. Those things happen because fishing communities are more dependent on living together in one clan (Multiple families) in their primary life, eating together, working together (*rokhobia*), and living together collectively, compared to farming communities that

live individually with more independent businesses (Nuclear family).

Changes in the type of family structure are still related to changes in social relations, where shifts in infrastructure can be found in the form of housing. When people were still working as fishermen, the rooms in the houses they owned were not integrated, whereas when they changed to farmers, their houses were more integrated because they were only occupied by nuclear families.

Table 1.
Seven habitus changes and the affected infrastructure

Seven Habitus Changes	Before Changes	After Changes	Affected Infrastructure
Changing belief in nature to belief in God	<ul style="list-style-type: none"> • Have faith in nature and ancestors (<i>mangna ro</i>) • Customary symbols removed • Collective storage and activities of traditional communities (playing wind instruments/ sacred flutes) are carried out in houses of worship (<i>khombo imae</i>) 	<ul style="list-style-type: none"> • Have faith in God (<i>Hubharo Mando</i>) • The church emerged as a landmark • Change of sacred instrument/flute storage room to large <i>obe imae</i> room 	<ul style="list-style-type: none"> • Worship facilities (church)
Collectivistic social relations becoming individualistic	<ul style="list-style-type: none"> • Orienting the house towards the outside • There is a communal space for processing the catch together 	<ul style="list-style-type: none"> • Oriented into a self-contained home • Changed job to farmer, so communal space was eliminated 	<ul style="list-style-type: none"> • Housing (orientation and room structure) • Open / communal space
Multiple family structure becoming nuclear family	<ul style="list-style-type: none"> • Traditional fishermen's houses are structured based on a spatial structure that is not integrated. 	<ul style="list-style-type: none"> • The house's structure becomes integrated because the only family members who live in the house are members of the nuclear family. 	<ul style="list-style-type: none"> • Housing (structure and room structure)
The role of <i>Ondoafi</i> is weakened	<ul style="list-style-type: none"> • The tribal leader (<i>Ondoafi</i>) is strong and central to the fishing community 	<ul style="list-style-type: none"> • <i>Ondoafi's</i> influence is weakening and is not central, leaning more towards society. 	-
Fishermen's activities change to farmer's activities	<ul style="list-style-type: none"> • The settlement pattern is grid-shaped and oriented towards the lake • Type of house on water stilts with woods • The practice of fishermen to hunted products is directly regulated by the traditional leader / chief (<i>Ondoafi</i>) • The <i>isosolo</i> ritual is performed above the water 	<ul style="list-style-type: none"> • The settlement pattern becomes linear following the lake shoreline and grid-shaped following the road. • House types change to permanent with stilt and non-stilt forms • <i>Ondoafi</i> gives freedom to expand fields • <i>Isosolo</i> ritual activities are carried out in an open space / communal space 	<ul style="list-style-type: none"> • Road and Settlement • Housing (structure and construction) • Farm field • Open / communal space
Sacred traditional value decline	<ul style="list-style-type: none"> • Traditional rituals are performed periodically • Cultural education by parents or traditional leaders "<i>khoselo</i>" 	<ul style="list-style-type: none"> • Traditional rituals performed during certain moments • Formal cultural education 	<ul style="list-style-type: none"> • Open / communal space • Educational and worship facilities (School and Church)
Gender equality in societal roles	<ul style="list-style-type: none"> • Activity restrictions and restricted areas for women 	<ul style="list-style-type: none"> • Equality in domestic to public roles 	<ul style="list-style-type: none"> • Lake, Farm field, and Housing (space zoning/structure)

4) *The Role of Ondoafi's is Weakened*

Ondoafi's position, according to customary provisions, is validated by a lineage drawn in a straight line to the founder of the village and is the eldest son of the previous *Ondoafi*. So, this position is based on the principle of patrilineal primogeniture. A person who holds the position of *Ondoafi* has extensive authority because it covers all aspects of life in his village, including the fields of religion, economy, social welfare, security, and justice. When the Sentani tribe changed their livelihood to become farmers, the role of the "*Ondoafi*" tribal chief became weak and less central, reducing *Ondoafi's* authority to the economic and social welfare sector. This caused the orientation of the Sentani traditional settlement to change from traditional fishing communities to a welfare orientation for farming communities. This change in leadership impact does not result in a shift of infrastructure.

5) *Fishermen's Activities Changes to Farmer's Activities*

Settlements, jobs and activity centers of the Sentani community are centered on the lake. Based on history, the initial settlement pattern was grid-shaped and oriented towards the lake. Over time and changes in activities, people's lives shifted to land areas and became farmers. This formed a settlement in the lake coastal area with a linear shape. Settlements on land are grid-shaped, adjusting to the position of the road. In the past, all houses were made of wood and were in the form of stilts that stood on the water. However, now that the settlement has spread to the mainland, many houses have become permanent, either in the form of stilts or attached to the ground.

Previously, livelihoods as fishermen were highly regulated by the tribal chief (*ondoafi*) with various cultural rules and rituals that must be carried out. The chief (*ondoafi*) would give amulets to get a lot of results. Currently, the activity of working on agricultural fields is adjusted to the ability of the farmer's family. Farmers who are successful in farming will be given

freedom by the chief (*ondoafi*) to expand their farm fields. But on the other side, farming activities also do not leave ancestral traditions such as performing rituals. The thing that distinguishes between fishermen and farmers is that fishermen are still very obedient to customary rules and *ondoafi*, while farmers have experienced a cultural shift with the entry of Christianity that believes in God. One of the traditional rituals that is still performed today is *Isosolo*. The *Isosolo* dance is performed as a form of gratitude for the abundant yields of fields and hunting. In the past, the *Isosolo* dance was performed on the water, but now it has turned into an activity that is carried out in an open space or shared space.

6) Sacred Traditional Value Decline

Every activity undertaken by the Sentani community is closely tied to cultural rules and rituals. One of those is when going hunting or catching fish. In the past, prayers and the use of magic by the *ondoafi* were used to ensure a good catch of fish. But nowadays, the farming community will only pray and surrender to God for all the results obtained. Traditional rituals such as the *Isosolo* dance, which used to be performed regularly every year, will now only be carried out when there is a traditional ceremony, specifically the inauguration of a new tribal chief or traditional activities on the orders of the *ondoafi*.

In terms of cultural values, the changes that occurred in the Sentani indigenous community from fishermen to farmers caused the habitus to change. In the past, traditional education was taught formally in the traditional house "*obe imae*". But now it is only done indirectly through parents, teachers, and tribal chiefs "*khoselo*" based on traditional teaching in Christian religious norms.

7) Gender Equality in Societal Roles

Sentani communities, especially women, used to have many limitations in public roles (social and cultural) due to the patriarchal social system. Women were only tasked with preparing food and drinks. Women's activities were limited to the outside of the building and were not allowed to enter the traditional house (*obe imae*). The change from a fisherman habitus to a farmer habitus affects the role of women in daily activities. Currently, women's roles cover all aspects of life, from domestic roles (household) to public roles (social). This role has caused women today to be dubbed as *kani* (earth).

B. Possibilities for Participatory Improvement

Based on the findings, seven aspects have changed, three of them having the possibility of community participation from cultural aspects. These three aspects are: collectivistic social relations becoming individualistic, the weakening role of *Ondoafi*, and gender equality in societal roles (Figure 4). The change in social relations to more individualistic can be seen from the tendency of people to be more courageous in expressing their thoughts so that participation can also play a role. Then the decline of the role of *ondoafi* or tribal chiefs can be seen from the opinions of the community who began to be listened to, not only based on tribal leaders alone. This is

contrary to the opinion of limited community participation, which states that more people with a role in participation will limit the ease of the program development process. This can happen due to differences and changes in culture and context. In this context, having opinions from communities that rarely provide opinions will be very helpful in implementing development programs, especially regarding local knowledge unique to those communities alone (vernacular architecture). The subsequent seven habitus changes that can increase the possibility of participation is gender equality. With the existence of gender equality in the current role of the community, women's involvement will be higher and the involvement of women in the improvement process. In this way, the development of a region will be more inclusive because there will be equality in societal roles.

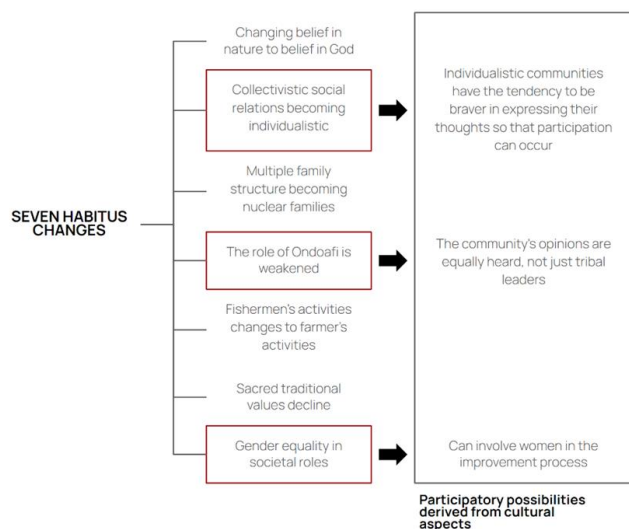


Figure 4. Participatory possibilities derived from cultural aspect

Of the three changes that allow for the participation of the community in the development of settlements and infrastructure in Kehiran Village, they can be implemented using a participatory approach. Based on the results of the desk study analysis, the Penta helix participation diagram, it was found that the participants who should be involved in program development are not only the public/communities, but also the government, academics, media and NGOs. In this case, the Penta helix participation diagram can be used in dividing ongoing program development tasks. There are four stages in the participatory process that can be adapted to the conditions of the village, which are; initiation, planning and designing, implementation, and management [25] (Figure 5). The initiation stage can be played or implemented by the government or researchers. *Ondoafi* and the community both play a role in planning and designing. It is intended that these stages remain in the corridor. In the implementation stage, the role of the government and private stakeholders is to provide goods and services during the project. Meanwhile, researchers and the community serve as supervisors and can be empowered as actors. In the management stage, the initiator monitors the sustainability of the program. Communities from all

backgrounds and genders play a role in maintaining sustainability and maintenance of improvements results.

V. CONCLUSION

Improvements in vernacular settlements are essential in the development era. In practice, improvements in the vernacular settlement must be carried out by adapting cultural aspects, such as the seven habitus changes in Kehiran Village. Based on the analysis results, it was found that:

1. Cultural changes have major influence in the form of housing, as evidenced from settlement on the banks of the Sentani Lake to living on the mainland
2. Each cultural change called the seven habitus changes, impacts infrastructure changes in the new settlement—worship and education facilities, housing structures, and open/communal spaces.
3. The possibility of participative improvement in vernacular settlement is increasing due to cultural changes (changes in social relations, the weakening role of traditional leaders, and gender equality).

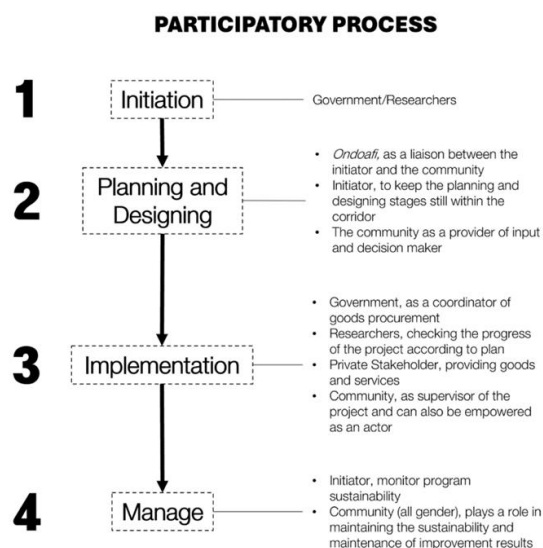


Figure 5. The role of participatory actors in vernacular settlements improvement

4. The limitations of community participation conveyed by Mubita contradict the results of the analysis of participatory possibilities in Kehiran Village. This happens because of differences in culture and context. In this case, more participants (community, NGOs, media, academics, and government) would make the development program more sustainable because these participants can act as supervisors.

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