

SUSTAINABLE USE OF LOCAL BUILDING MATERIALS ARCHIPELAGO RESIDENTIAL DESIGN

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Abstract

The limitations of environmental resources and settlers on the islands can be overcome by utilizing local materials in their residential buildings in a sustainable manner. This supports local environmental, cultural and traditional conservation programs in the region. The research was conducted to examine the relationship between conservation, development and environmental management efforts, through the form of residential units as a place to move and work on the islands. The results showed that the use of local materials in the design of island dwellings was very dominant in the use of 'faint' wood for poles/columns; boards and beams for building floor and wall components; silar/gebang leaves and boards for building wall components, as well as bamboo blades for floor components and building roof coverings. Domination of the use of local materials with consideration of adaptation to the environment, thermal comfort, and socio-economic conditions of the occupants. The principle of archipelagic dwelling design is related to the development of marginal rural areas on islands and small islands to realize the need for space to live and live with natural values. The continuity of the development of island dwelling houses using local building materials can be carried out with the method of community participation in order to suppress the financing needs of the wage component.

Keywords: sustainable, housing, archipelago, material, local.

Abstrak

Judul: *Aplikasi Penggunaan Bahan Lokal Pada Rancangan Rumah Tinggal Kepulauan Untuk Mendukung Program Pelestarian Lingkungan*

Keterbatasan sumberdaya lingkungan dan pemukim disiasati dengan memanfaatkan potensi bahan bangunan yang terdapat disekitarnya secara arif dan bijaksana. Hal ini sangat mendukung program pelestarian lingkungan, budaya dan tradisi lokal yang telah dan sementara berkembang. Penelitian ini dilakukan untuk mengkaji aplikasi bahan bangunan lokal pada rancangan rumah tinggal kepulauan sebagai upaya mendukung program pelestarian lingkungan. Pengkajian dilakukan terkait dengan upaya pelestarian lingkungan, pengembangan dan pengelolaan lingkungan, serta terbentuknya unit hunian rumah tinggal sebagai tempat beraktivitas dan tempat bekerja di kepulauan. Aplikasi penggunaan bahan lokal pada rancangan rumah tinggal kepulauan, yaitu penggunaan kayu 'pingsan' untuk tiang/kolom; papan dan balok untuk komponen lantai dan dinding bangunan; daun silar/gebang dan papan untuk komponen dinding bangunan, serta bilah-bilah bambu untuk komponen lantai dan penutup atap bangunan. Dominasi penggunaan bahan lokal dengan pertimbangan adaptasi terhadap lingkungan, kenyamanan termal, serta kondisi sosial ekonomi penghuni. Prinsip perancangan rumah tinggal kepulauan meliputi penataan unit rumah tinggal dan unit lingkungan permukiman, berkaitan dengan pembangunan perdesaan marginal di kepulauan dan pulau-pulau kecil Pulau Enam yang memasukkan unsur manusia, alam, dan kegiatan wisata untuk mewujudkan ruang tinggal dan bermukiman dengan nilai-nilai alami. Keberlanjutan program rumah tinggal menggunakan bahan lokal dapat dilakukan melalui pelaksanaan pembangunan dengan metode partisipasi masyarakat sehingga dapat menekan kebutuhan pembiayaan pada komponen upah.

Kata kunci: keberlanjutan, rumah, kepulauan, material, local.

Introduction

Background

Settlements in which community activities take place, are also reflected in the characteristics of settlements and residences in the archipelago with their uniqueness in their socio-cultural life. Limitations of environmental resources and settlers are dealt with by utilizing local building materials that are available around them in a wise and wise manner, so that they are very supportive of environmental, cultural and local conservation programs that have been and are temporarily developing.

Homes on islands are the main means of community life on water, as a representation of the existence and life of the Bajo tribe, serves to provide protection that is comfortable and safe for residents. In a broader sense, the house and environment will be able to open the way, fulfill the needs, aspirations and desires of humans towards improving their standard of living and welfare in their homes. Thus, the use of building materials plays an important role because of the vulnerability of natural factors that constantly change and affect the residential environment of 'communities over water' on the islands.

The Formulation Problems And Questions Research

Local materials are natural resources that are easily obtained around the living environment for use. Its utilization must be in line with efforts to conserve resources in a sustainable manner. The use of local materials is a form of community innovation in utilizing building materials in their homes. Archipelagic dwelling designs must be able to apply the use of local building materials in a sustainable, prudent and responsible manner in their development.

The research question is: a) What are the types of local building materials that can be used in alternative designs of island dwellings as a place for daily activities as well as a place to work; b) What are the stages of the preparation, evaluation and application of the use of local building materials on alternative design models of 'island residences' that can be developed in island settlements in a sustainable manner?

Literatur Review

Coastal Settlements and Houses In The Island

Coastal area is a meeting between the land of the sea and the boundary to the land and to the sea which is determined by the limit of influence between the two. A settlement or 'settlement' is basically a part of a region or place where residents (settlers) live, take part in work and business activities, relate to fellow settlers, and fulfill various activities in the life of a community (Sujarto, 1991). A home building can communicate the needs of residents who are colored by life such as culture, social, economic and psychology (Lang, 1987 in Mulyati, A., 2005).

Human interaction as a community can be viewed from the social and physical aspects. From the social aspect, the community is a community unit that is bound by the prevailing values in the community, can be in the form of kinship, neighboring, friends, or wider ties can be formal or formal. Where as from the physical aspect, the community is a particular geographical area in a settlement. In

a community environment over water (archipelago) in its development is still bound to the area where the settlement began to form historically (Nuryadin, L.T., 2010).

Architecture and Physical Environment Settlement Islands

Settlement as an architectural product cannot stand alone or be separated from other components, because it is very dependent, especially with humans as designers, making, building and utilizing it. The life phenomenon of the Bajo tribe community as 'community over water', forms 2 (two) types of environment in the relationship between humans and the physical condition of the environment. First, an environment that is familiar to the human being concerned, as well as the Bajo tribe known as boat people with marine life and their main livelihood in the sea. Their familiarity with their environment provides greater opportunities for achieving a state of balance (homeostasis), so that this type of environment tends to be maintained and familiar with their lives. Second, the environment is still unfamiliar with them, which allows the emergence of stressful conditions and forces them to make adjustments. This condition will also be very helpful in seeing how the Bajo tribe concept maintains life in the aquatic environment.

Orientation, the layout of traditional settlement units is usually arranged with something easily recognizable such as mountains, rivers, trees and rocks. Usually mountains and altitude places are considered sacred in terms of divinity, sea and places of humiliation as something evil, cruel, while the river is considered as a link between these two extremes. Regardless of the beliefs espoused by the community, generally these traditional settlement patterns in harmony with their physical character as an artificial environment have various uses.

The artificial environment conveys meanings, provides a framework of space and time for human action and appropriate behavior (Rapoport in Synder, 1989: 5-6). The formation of a residential unit is due to the existence of a residential formation process as a functional container based on the pattern of human activity and the influence of the physical setting or hue of the environment and non-physical (socio-cultural) which directly affect the pattern of activities and processes of the housing.

Houses for the Bajo people are symbolized as humans who have a life, so they must have three form conditions, both vertically and horizontally. The vertical direction is marked with aje (foot), watang (body), ulu (head), meaning that the foot is a dirty place, and surrounded by evil creatures. The body is a life that must be saved, as well as ulu symbolized as a high and holy place, and is believed to be a place for spirits to look after the house (Juhana, 2001).

The concept of space in the Bajo community is specifically divided into two. First, the place where they live is centralized and limited to a group (incarnation of life in leppa) which is now in the neighborhood / village. Second, at the same time he also deals with the places visited during the life of the mobile Bajo people, matters relating to their history and their similarity with the Bajo community in other villages/islands.

Methodology

The research area was chosen based on the potential and characteristics of the area as an archipelago settlement environment, namely in Enam island Village, Togean District, Tojo Una- Una Regency. Determination of the research area in accordance with the research objectives to develop the design of island dwelling houses using local building materials, as a residence as well as a place to work and strive.

The method and approach used in the study is a combination of phenomenological qualitative approaches (Groat, L and D. Wang, 2002). Data collection method uses complementary methods, namely: a) conducting discussions with settler groups, and b) conducting in-depth interviews with selected settlers as special samples. Settlers as informants were selected by purposive sampling, and the determination of respondents was done by stratified sampling.

Results and Discussion

Community on Water and Characteristics of Settlements in the Islands

Mulyati, A. et al., (2009) identified the typo-morphology of settlements of 3 (three) settlement groups that occupy land, coast and waters. Settlements that occupy the land consist of various ethnicities, with a variety of forms of residences that are no longer entirely stage-shaped. In the island settlements that occupy the coast and waters, which are generally inhabited by the Bajo tribe, the condition and form of residential houses are mostly in the form of stilts, using local building materials, simple systems and technology and using local labor. The form of the house is not only the result of physical strength or one factor, but the consequences of the overall socio- cultural factors. It is also a modification of climate conditions, construction methods, material use, and technology.

Bajo tribal settlements on Enam Island show clear patterns by forming groups according to their families. The pattern formed is to surround the small islands that exist, tend to be accommodating with the social, cultural and economic conditions of the settlers. In general, the concept of environmental structuring with a 'concentric linear' pattern on small islands by utilizing certain areas forms a basin area called 'hall'. They see that the most ideal place to live is one that is able to adapt and provide protection against natural factors, both physical and non-physical (Najib, M, 2016).

Enam Island village is one of the Bajo tribal neighborhood units (around 500 families) that inhabit several groups of islands from generation to generation (since 70 years ago) in the Tomini Bay region of Tojo Una - Una Regency. Their homes still use building materials and a very simple form. The community groups are mostly fishermen who live for days in the sea, the buildings of their homes are made as they are using existing materials according to their economic capabilities. The daily conditions of the Bajo community reflect more of a 'life full of limitations' economically and at the level of education.

Enam Island village has natural resource potential, namely bamboo, deep coconut

and palm trees, which can be used as building materials for residential houses. The condition of the settlement environment with the existence of residential building units that are without distance, garbage scattered, and children play in the remaining space of their home or environment. The condition of this limitation also caused many Bajo people to build their residential units by using building materials that were around the neighborhood. The choice of building materials for bamboo, wood, and thatch roofing becomes a natural building material that can be used for homes or parts of their homes.

Conditions of Housing and Community Settlers on Water

The life of the Bajo people as a 'community on the water' in forming a rural settlement environment unit on small islands is marginal, the majority depend on the potential of the sea to carry out main activities as fishermen. They garden when the season is 'strong winds' because it is not possible to do activities at sea. The sea is an important element as a source of family life (Najib, M, 2016).

A reflection of the attitude of the community as settlers is identified in terms of utilization or management of income that is still simple (sub-system) and less planned. The same is true for the development of traditional settlement patterns which have implications for the form of houses and residential units of the Bajo tribe.

Development of Settlement Environmental Unit Design

Through an understanding of the conditions and characteristics of residential environment units in Enam Island village, a vernacular design concept approach was taken from the building of Bajo tribal houses. The use of natural materials through the development of grid patterns in the arrangement of pedestrian paths in the form of bridges / walkways in new residential neighborhood units. Grid patterns are developed with consideration of the effectiveness and economic value of land with very limited availability.

Development of environmental units and settlement arrangement in shallow water areas by considering the ease of implementation of development and accessibility of existing settlers. Very traditional island settlements tend to focus more on function-based zoning, namely residential zones, public zones/ritual ceremonies, custom zones, and supporting zones (places of gardening, graves, places and or sources of springs and livelihoods). Therefore, the layout of residential units is developed following the 'coastal space', and tends to form 'concentric radial patterns'. The implementation of the development of residential neighborhood units on the islands is largely determined by the availability of circulation channels or tetean between residential units.

Development of Environmental Functions, Facilities and Infrastructure

In general, people in the archipelago build their houses using low quality building materials that exist and are located around the neighborhood. The building construction system is also simple with an air circulation system only in the form of makeshift openings or even completely without openings. The division of space in the house lives less considering the privacy aspect. Residential units are only

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functioned as a shelter, so that the house as a place to foster productive families is not yet known.

There should be a link between the house and the interests of the community. Ronald, A. (1988) views, in a residential environment means that a home or an artificial environment will be determined by the development of a series of interpersonal relationships, value systems, thinking patterns, attitudes, behaviors, and norms. Houses in the sense of place should have elements of real boundaries and atmosphere. The aspect that accompanies the formation of a house is life, time, and dimensions. The uniqueness of the island settlement environment in Enam island village can be developed with the aim of environmental conservation, presser- ving life, and to improve the welfare of the population.

Ideal settlements must be equipped with public facilities (public facilities) and social facilities (social facilities) as required. Judging from the require- ments of public facilities and social facilities, the facilities available in Enam island village are inadequate. Other public facilities that must be owned by a settlement are MCK (bath wash toilet). The social facilities found in Enam island village are educational facilities (elementary, junior high, high school), religious facilities (mosques), health facilities, while kindergartens have taken place educational activities but do not have a container/building so that later kindergartens will be built to accommodate learning activities for children early age, and addition to others.

For the development of residential neighborhood units, the arrangement of clean water pipelines is communal, as well as electrical cable pipelines (drawn from electricity or generator houses) to each residential unit that requires communal properties. The utility network system in general, includes the pipeline management plan from the electricity network, the clean water network system and the sewerage pipeline network. Assumptions for the needs of the public facilities for the environment are as many as 10 units of public toilets according to the standard facilities for public facilities housing 60 people/day.

Development of Residential Design in Islands

Bajo tribal settlement units 80% are in the waters and 20% are on land, so the development planning development plan should consider: 1) being on the water; 2) in shallow areas around the old settlement; 3) the development area still has equal access to old settlements; 4) remains a unit in the region; 5) can enjoy public facilities and social facilities together; and 6) taking into account the strength of wood materials used for construction of circulation lines (teteans) and building houses.

In general, island dwellings are always oriented in two directions, namely; 1) in the foreground which takes into account the land side of the island and or the presence of a circulation path or tetean; and 2) in the direction of the back of the house oriented to the sea. Natural elements, namely wind and solar trajectory, are not a major consideration. On the side of the sea- oriented residential unit has its own uniqueness in terms of functions which are always equipped with porches / terraces as a place to sit / rest in the afternoon and evening, also as a place to manage seafood.

Space organization is divided into 3 (three) groups of space, namely on the front and back as a public space consisting of; front, rear and living room terrace / veranda. The living room as a semi-public and private space consists of a multipurpose room as a family gathering / resting place, and the bedroom is a private space for resting and storing valuables. Natural aeration is designed through the flow of air from the outside into the living rooms of the house.

The opening system consists of doors, windows and ventilation, with placement on the front, rear and side of the building. The main door generally uses board / wood material and or sago leaf woven, while at the door in the room in the house generally without a cover, or usually only in the form of the use of fabric as a cover. The ventilation openings system specifically in residential buildings, stage construction can utilize the construction of the floor to drain air from the bottom of the building.

The planned house is a rectangular building with a structure module (1.50 x 2) m with a development process based on the local wisdom of the community in building their home. The construction system uses a system that is not continuous between the sub- structure (building foundation / pillar) and super structure (building walls). Stages of housing construction, namely; 1) Construction of sub-structures (foundation / house poles) using local materials round logs; 2) Construction of super-structures (building bodies), namely wall frames using local wood materials; and 3) Upper-structure construction (roof frame / hood) using wood and bamboo or a combination of the two materials. Residential housing units developed are designed as buildings that have 2 (two) orientation directions. One side of the residential building is oriented to the road environment on the mainland or to the 'tetaan' as a public space, and one side of the building is oriented towards the sea which is interpreted as the main orientation to 'source of life'.

Implementation of planning and design of island residential units, divided into groups; 1) residential units on land areas; 2) the housing unit lives on the edge of the water (part of the building in the water); and 3) residential units on water (all buildings are above the waters).

The building arrangement through renovation and the construction of new residential units can be done to re- function the 'tetaan path' that is already available by doing some improvements. The process of building a residential unit is carried out with procedures that are in accordance with local wisdom, namely; 1) preparation of unconscious wood poles/columns; 2) pile/column erection; 3) installers of lateral support and stiffeners; 4) making the framework of the house building; 5) installation of roof hoods and roof coverings; 6) installation of floors; 7) installation of walls and door/window openings.

The findings of the study of the use of local building materials in residential homes for 'communities on the water' of the Bajo tribe at Enam island were reviewed by comparing several reference designs for residences that had the agreement to strengthen the research findings. The basis of the designation of the 'design principle' of the residence in the archipelago by considering the socio-economic conditions of the (dominant) low income community as marginal people in coastal areas and small islands.

Conclusion

Use of local materials in the design of archipelagic dwellings, including; use of 'unconscious' wood on poles/columns; processed wood (boards and beams) for floor and wall components of buildings; silar/gebang leaves and boards for building wall components, as well as bamboo (in the form of blades) for floor components and building roof coverings.

The process of building a residential unit is carried out with procedures that are in accordance with local wisdom, namely; a) preparation of unconscious wood poles/ columns; b) erection of poles/columns; c) installation of support and lateral style stakes; d) the making of wall frames for house buildings; e) installation of roof hoods and roof coverings; f) installation of floors; and g) installation of walls and door/ window openings.

Program sustainability is carried out through building houses with a method of equitable community participation so that it can reduce the financing needs of the wage component. The form of an island residence is designed as a building that has 2 (two) orientation directions. One side of the residential building is oriented to the road environment on the mainland or towards the 'tetaan' as a public space, and one side of the other building is oriented towards the sea which is interpreted as the main orientation to the 'source of life'.

Acknowledgements

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