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Green Building Design for a Modern Shopping Center in Bengkayang Regency, West Kalimantan

Iin Arianti [1]✉, Indah Harini [2], Muhammad Rafani [3], Nurul Fitriani [4]
(1,2,3,4) Department of Civil Engineering Politeknik Negeri Pontianak, Pontianak, Kalimantan Barat, Indonesia

Abstract: The rapid social, economic, and cultural development in Bengkayang Regency has accelerated the transformation toward a modern society, increasing the demand for integrated commercial and recreational facilities. This study aims to develop a design proposal for a modern shopping center located on Jalan Raya Sanggau Ledo, Bengkayang Regency, West Kalimantan Province, by applying green building principles and contextual architectural approaches. This research employs a qualitative descriptive method, involving literature review, site analysis, and evaluation of design criteria related to modern shopping centers and sustainable architecture. The analysis focuses on environmental aspects, spatial requirements, and the integration of local cultural elements into the design concept. The results indicate that the application of green building strategies, particularly through the use of sun shading systems, effectively optimizes natural lighting and enhances energy efficiency. The proposed design adopts the concept of Building as Nature, derived from Organic Architecture principles, emphasizing harmony between the built environment and natural surroundings. The use of local and natural materials, such as wood, further strengthens the environmental and cultural responsiveness of the design. The planned shopping center occupies an area of approximately 3.000 m^2 and consists of four floors and a rooftop, strategically located near Rumah Ramin Bantang, a traditional Dayak house, while maintaining appropriate distance from residential zones. In conclusion, integrating green building principles with organic architectural concepts contributes to the development of a modern shopping center design that is environmentally sustainable, culturally contextual, and functionally adaptive to community needs.

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INTRODUCTION

The development of trade in West Kalimantan has experienced very significant growth in line with economic and infrastructure progress. The population of Bengkayang tends to become a modern society, this is due to the social, economic, and cultural development in the area. Modern society in general adopts a more sophisticated lifestyle, is connected to technology, and is more open to changes in various aspects of life [1] [2] [3].

Modern shopping centers/malls are a favorite among people today, because they have sophisticated, modern, and luxurious facilities, so that they can provide significant added value for their visitors. With the existence of shopping centers, it is hoped that it will trigger the development of various social aspects, which can create new jobs, and increase people's purchasing power [2].

In an age marked by globalisation, contemporary design, and diminishing regional distinctiveness, particularly concerning its impact on climate, the integration of passive strategies and climate-responsive design emerges as a critical element in forward-thinking architecture that embraces the

✉ *Corresponding author:* ***iin_arianti@yahoo.com***
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unique climatic conditions of various locales. The energy consumption of buildings represents tangible progress in both architectural design and international policy [4].

Modern shopping centers/malls are designed by applying the concept of Building as Nature [3] [4] [5]. In the application of the building as nature concept, the design of modern shopping centers/malls is emphasized on the building to create a harmonious relationship between the building and its environment. Existing trees on the site are strategically placed to reduce the impact on nature. The application of this concept also involves the use of green roofs to create a sense of unity with nature [3] [4] [6].

A tool for research of contemporary and historical architecture is introduced a combined contextuality method, which enables the examination of the relationship between architecture and natural features of the place. This kind of research, which includes visual and sensory experience, is still rarely included in scientific analysis [7] [8] [9].

The efforts to implement sustainability ideas sometimes lead to very unusual designs that can even be provocative experiments, and may sometimes lead to conflicting assessments in the general public. This study investigates the architectural language of sustainable design and how the aesthetics of sustainable architecture are distinguished and psychologically accepted by people [10].

The buildings were selected using an observation checklist based on the form, type, material, construction, and ornamentation used on the building. This was done to examine the various philosophies expressed and communicated through the architecture of the building [11]. A knowledge of the fine arts as an influence on the quality of architectural design; an adequate knowledge of urban design, planning and the skills involved in the planning process; an understanding of the relationship between people and buildings, and between buildings and their environment, and of the need to relate buildings and the spaces between them to human need and scale [12] [13].

Architects often drew inspiration from past architectural styles, incorporating elements of historicism into their designs. Mansard roofs, characterised by a double-pitched structure, gave the buildings a distinctive silhouette. The architectural façades highlighted the lines of the eaves, visually separating the different floors and giving depth to the exterior [14] [15].

A structured interview was conducted to explore the various aspects of Yoruba vernacular architecture, including its unique features, cultural significance, and the challenges it faces in the modern era. The success of the reinforcement learning method in many artificial intelligence applications has given an explicit indication of how this method might be used to model and adjust occupant behavior in building control [17] [18] [19].

Displacement ventilation is used in industrial buildings because of its stratified air distribution and low cost. However, in case of accidental pollutant release, an enhancement is needed to minimize inhalation exposure. This study proposes a hybrid emergency ventilation system using localized push-pull ventilation to improve the installed displacement ventilation system of a representative workshop [20] [21] [22].

The explored buildings have concrete or timber structural framework and the analysis covered the production, operation and end-of-life phases. The analysis shows that the choice of structural frame material as well as building system has signifi- cant effect on the primary energy use and climate impact of buildings [23] [24] [25].

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In most developed economies around the world, the energy consumed by buildings accounts for more than 40% of the total energy, and in many developing and emerging economies, this proportion is still rising [26] [27].

RESEARCH METHOD

This research employs a combination of qualitative and quantitative methods to evaluate the effectiveness of passive strategies and climate responsive design [1] [2] [3]. What sets this approach apart is its unique focus on analysing renowned case studies, followed by an assessment of how they influence indoor thermal conditions [4] [5] [6]. A further limitation of the automatic implementation method is the inability to recognize curved surfaces, in contrast to the manual and semi automatic methods [6].

The visual expression of buildings usually remains on the margins of the definition of sustainability, while the concept of sustainable architecture emphasizes energetic, environmental and social aspects. A position contrary to such a provision has been presented by quite a few authors of architectural theory, highlighting the importance of the visual and somatic experience of architecture [7] [8] [9].

The design of a modern shopping center/mall on Jalan Raya Sanggau Ledo, Bengkayang Regency uses a qualitative descriptive method, by attaching explanations and descriptions related to the terms and conditions in the design of a modern shopping center/mall [10] [11]. Then the existing data is analyzed and conclusions are drawn. The conclusion of the discussion and analysis is in the form of basic concepts used in the design of modern shopping centers/malls on Jalan Raya Sanggau Ledo, Bengkayang Regency with the concept of Building as Nature [12] [13].

The style of the building contrasts strongly with the natural elements but is harmonious in color with the architecture of the adjacent town. The contrast of materials between the objects from the observation deck is almost imperceptible [14]. The fresh properties of the designed mix were focused on the flow table and green strength evaluation [15].

Modern building technologies are so advanced that simply just by choosing the structure of a building it will be built in a few days or weeks. The construction time has been significantly shortened, construction has become more sustainable [16] [17] [18]. Contemporary critical views on the nature and effects of industrialism, societal transformations, and awareness of the environmental crisis at the turn of the Twentieth century call for refocusing the architectural discussion regarding brownfields [19]. The rapid spread of digital technologies in the world has boosted growth, expanded opportunities, and improved services and, at the same time, has provided an excellent basis for employment [20] [21] [22].

Architecture is never neutral. It corresponds to the patron's ideals, intentions, and ideological orientation, communicated by the designer through his technical knowledge in artistic articulation of forms. In a larger scale, architectural identity can therefore be affected by those possessing power and can serve as tactile channel in redirecting society [23] [24].

Architecture is defined as the art and science of designing and building structures, communities, or open areas, in keeping with aesthetic and functional criteria of assemblies built in accordance with such principles. Discipline is widely recognized as an essential response to current circumstances [25] [26] [27][28].

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RESULTS AND DISCUSSION

Results

The result of the design of this modern shopping center (mall) is the use of sun shading or shading devices inside or outside the building in the shape of a rectangle with horizontal lines. The concept of building as nature with the principle of the materials in modern shopping center buildings (malls) is applied in the use of sun shading with traditional materials from the earth such as wood. There are hanging plants installed on the sun shading on the back and sides of the building that are exposed to sunlight. The use of sun shading can be an optimal shade or absorber of outside sunlight.

Discussion

Building as Nature is a natural building where nature is the main and inspiration for organic architecture. Organic forms and structures of an organic can be concepts and ideas that have no end in organic architectural design. Building As Nature is the basic concept of Organic Architecture and because of the concept of organic architecture, the theory of this concept has not yet been developed, and still uses the theory and understanding of organic architecture.

The purpose of designing shopping centers in Bengkayang Regency with a modern architectural approach is to design a forum for community activities in shopping activities. Therefore, it is necessary to consider the environmental impact which is the main factor in the selection of location and building site.

The purpose of designing shopping centers in Bengkayang Regency with a modern architectural approach is to design a forum for community activities in shopping activities. Therefore, it is necessary to consider the environmental impact which is the main factor in the selection of location and building site.

The site is located on Jalan Raya Sanggau Ledo, Rangkang Village, Bengkayang District, Bengkayang Regency, West Kalimantan. This location is close to Ramin Bantang (a traditional house of the Dayak tribe), and not too close to residential areas. This site has an area of approximately 3.000 m^2, where the area is considered sufficient to meet the needs of a shopping center. In this area of the site, the parking area that suits the needs of visitors has not been determined.

Figure 1. Location of Modern Shopping Center (Mall) Design

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Here are the site boundaries:
- East : River
- South : Ramin Bantang (traditional house of the Dayak tribe)
- West : Jalan Raya Sanggau Ledo
- North : Shophouse

The following is the site data:
Maximum BBC = GFA / Land Area x 100%
= 2.176 / 2.720 x 100%
= 80%
Maximum BFC = 8 Floors
Maximum GBC = Total Floor Area / Land Area x 100%
= 10.880 / 2.720 x 100%
= 40%
BBL Sanggau Ledo street is 7 m from ROW
Land Area = 40m x 75m
= 3.000 m^2
Land Area – BBL = 3.000 – (7 x 40)
= 3.000 - 280
= 2.720 m^2
GFA = Land Area x BBC
= 2.720 x 80%
= 2.176 m^2
Total Floor Area = Land Area x BFC
= 2.720 x 4
= 10,880 m^2
Number of Floors = BFC x Land Area/GFA
= 4 x 2.720 / 2.176
= 5 Floors
Basic Approach

A shopping center is a container that accommodates all shopping activities with several supporting facilities. The design of a modern shopping center (mall) is located on Jalan Raya Sanggau Ledo, Bengkayang Regency, West Kalimantan Province. The design of shopping malls is expected to play an important role in economic and social activities, including trade, recreation, and support for the local economy. These functions can create a shopping center as a center for economic, social, and cultural activities in Bengkayang district.

The design of a modern shopping center (mall) on Jalan Raya Sanggau Ledo, Bengkayang Regency will use the concept of building as nature. Building as nature building design is a concept that is integrated with nature. Thus, it can create a more environmentally friendly space, in line with nature, and make a positive contribution to human welfare and environmental sustainability. In this approach, it has the goal of being able to help to achieve optimal results and be able to meet the necessary aspects, which are as follows:

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a. Contextual Aspect Approach

The contextual aspect in the design of modern shopping centers (malls) in Bengkayang Regency involves analyzing the location chosen by considering various factors. The purpose of the analysis is to determine the ideal zoning, including the placement and organization of the space according to the specific needs and characteristics of the location.

b. Functional Aspect Approach

Functional aspects in the design of modern shopping centers (malls) in Bengkayang Regency include analysis of the activities of activity actors. The focus is to understand the space needs and the amount of space needed, as well as identify the flow of activities occurring in the shopping center.

c. Architectural Approach

The architectural aspect in the design of modern shopping centers (malls) in Bengkayang Regency will adopt an organic architectural approach that is part of modern architecture. The selection of environmentally friendly concepts will be the focus in designing building elements, with the aim of creating harmony between the building structure and the surrounding environment.

d. Technical Approach

The technical aspect in the design of modern shopping centers (malls) in Bengkayang Regency involves the analysis of structural technical specifications. The focus is to evaluate and determine the structural technical specifications that will be used in the design of modern shopping center buildings (malls), including the selection of materials and construction methods according to the needs and safety standards.

e. Performance Aspect Approach

Performance aspects in the design of modern shopping centers (malls) in Bengkayang Regency include an analysis of building utilities. The focus is to evaluate and analyze various aspects of utilities used in shopping centers, including electricity, water, lighting, as well as information technology and security systems, to ensure optimal performance, comfort for visitors, shopping center managers.

Application of Building as Nature Principles

Building As Nature is a natural building where nature is the main and inspiration for organic architecture. Organic forms and structures of an organic can be concepts and ideas that have no end in organic architectural design. Building As Nature is the basic concept of Organic Architecture and because of the concept of organic architecture, the theory of this concept has not yet been developed, and still uses the theory and understanding of organic architecture.

Organic Architecture which is an architectural concept where space and form are combined, organic architecture conceptually combines the concept of human dwelling or architectural buildings with the natural environment. Since the beginning of its design, organic architecture has been seen as a medium of various intensities of activities, has psychological characters, values and aims to raise the dignity of human activities.

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Building Shape Display Response

Using sun shading or shading devices inside or outside a building that is rectangular with horizontal lines. The sun shading used also applies the concept of building as nature with the principle of the materials, which uses traditional materials from the earth such as wood. Sun shading users are expected to be an optimal shade or absorber of outside sunlight.

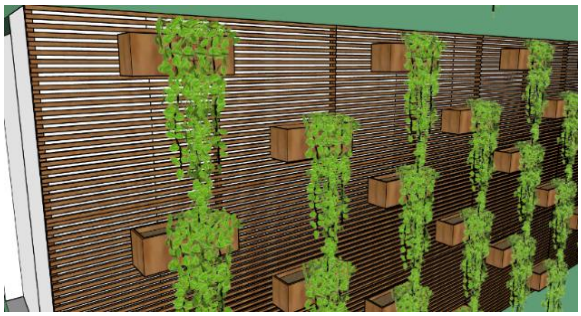

Figure 2. Sun Shading

Products Designed by Modern Shopping Center (Mall) on Jalan Raya Sanggau Ledo, Bengkayang Regency

The Modern Shopping Center (Mall) is located on Jalan Raya Sanggau Ledo, Rangkang Village, Bengkayang District, Bengkayang Regency, West Kalimantan. This location is close to Ramin Bantang (a traditional house of the Dayak tribe), and not too close to residential areas. This site has an area of approximately 3.000 m².

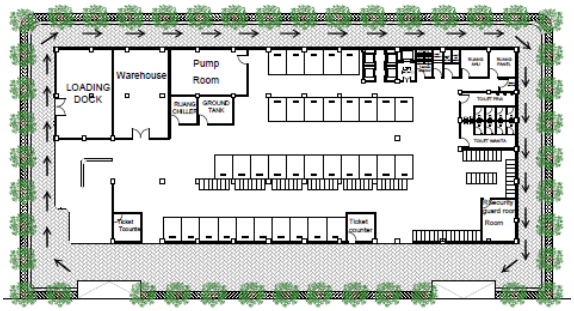

Figure 3. Site Plan

Figure 4. View of The Mall Perspective

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Figure 5. View of The Mall Perspective 2

CONCLUSION

From the results of the Design of a Modern Shopping Center (Mall) on Jalan Raya Sanggau Ledo, Bengkayang Regency, the next researcher is expected to be able to take into account sufficient parking locations according to the number of visitors and be able to estimate the position of the water tank on the rooftop and the next researcher is expected to be able to calculate construction management and planning of the building structure of a modern shopping center (mall).

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