Sukabumi Airport Design With Environmental Sustainability And User Movement Approaches

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ABSTRACT
The growth of air transportation needs in Indonesia has spurred the development of airport terminals, including in potential tourist areas such as Sukabumi City, West Java. Sukabumi, with its natural attractions, cultural tourism and special interests, requires adequate airport facilities. This project aims to design Sukabumi Airport Terminal that able to accommodate the needs of facilities and users with a sustainability architecture approach. The design method involves several stages. Started with literature and precedent study, and ended up with analysis of the site and user. Based on this data, the concept of Eco-Technic and Eco-Culture is established as the responds. In addition, the principles of user or people-focused movement are applied to ensure an easy and efficient transition for users, creating a successful and well-functioning airport terminal.

Keywords: Airport Terminal, Sukabumi, Eco-Technic, Eco-Culture, Movement

INTRODUCTION
The increasing need for air transportation in Indonesia, driven by societal growth and high mobility, necessitates efficient airport terminals. Sukabumi, West Java, is identified as a potential area for airport development due to its growing tourism sector and the Cikembar Industrial Area, enhancing regional economic development.

The proposed Sukabumi Airport aims to support regional mobility and access in Cimanggu and Cikembar Villages. (Decree of the Minister of transportation of the Republic of Indonesia number KM 75 of 2019, 2019). Positive impacts include regional development, public facility construction, and job creation, while negative impacts involve loss of agricultural land and environmental issues from land conversion.

To address these challenges, the airport design will prioritize environmental

sustainability, energy efficiency, and social responsibility, utilizing Guy and Farmer's sustainable architecture concepts, specifically the Eco-Technic and Eco-Culture logics. This approach integrates modern technology with local culture to create a harmonious and sustainable building.

Furthermore, effective airport design will focus on smooth passenger movement, avoiding disorientation and ensuring operational efficiency. Key criteria such as easy orientation, minimal walking distance, and separate arrival and departure areas are essential.

The theory of airport urbanism suggests that a people-focused design outcome is necessary to achieve a successful airport terminal (Hirsh, Airport Urbanism : Infrastructure and Mobility in Asia, 2016). Output design required for this approach needs to be planned in such a way since the beginning of the design phase. A user-focused design will result in a successful and visually appealing airport terminal.

LITERATURE REVIEW

1. Airport Terminals

The airport Terminal connects ground transport with air, providing facilities for the transition of movement from ground to aircraft and vice versa. The Terminal serves as the center of interaction between airlines, airport authorities, and passengers.

The main functions of the airport terminal are:

a. **Operational:** Passenger and freight services, land and air transportation, ticketing, and baggage.
b. **Administration:** Terminal management.
c. **Commercial:** Transaction and buying and selling areas (shops, restaurants, tourist agencies).

Terminal facilities must comply with international and national standards, including passenger departures and arrivals, passenger comfort, and added value, taking into account airport service capacity (International Airport Transport Association, 2019).

2. Airport Terminal Movement System

Airport terminals prioritize time efficiency with fast movement flows for passengers and luggage, which move outward (towards the aircraft) and inward (towards the terminal). The design of the terminal must accommodate this rapid movement with a good circulation strategy and space marking elements. According to the Modern Airport Terminal (Edward, 2005), ways to realize an efficient movement system include:

- **Space**: the terminal space serves as a hub for activities and markers, making it easier for passengers to find the main routes through a good space hierarchy design.
- **Structure**: structural elements such as columns, beams and walls direct the psychological perception of passengers and support aesthetics and visual navigation.

- **Light**: the utilization of light helps to direct passengers to the main routes.
- **Object**: a solid Volume as an orientation element or reference point helps to direct the flow of passenger movement, establish navigation points and create an image of the terminal space.

3. Sustainable Architecture

Sustainable Architecture is a design concept that supports environmental sustainability by minimizing damage to natural resources during the design and construction process. Eco, or architectural ecology, blends environment and architecture by balancing natural and artificial environments.

In the journal "Reinterpreting Sustainable Architecture: The Place of Technology" Simon Guy and Graham Farmer propose some ideas that can be applied to buildings:

- Eco-Technic: Modern and futuristic design that integrates global environmental concerns, usually applied to high-tech buildings.
- Eco-Centric: Harmony between building and ecology with the use of renewable methods.
- Eco-Aesthetic: Design icons that change the perception of nature in the design.
- Eco-Culture: Adaptation of elements of the locality that reflect the physical and cultural character.
- Eco-Medical: The development of an environment that ensures the health and well-being of individuals.
- Eco-Social: Designs that focus on the social context, are flexible and participatory.

Through the ideas presented, there are two ideas that will be used in the design of this airport terminal which is aligned with the context of Sukabumi itself which has potential in terms of tourism and regional development. Both of these can be implemented into the design by reflecting the function of a modern airport terminal and combined with the context of the locality of Sukabumi itself. This can be combined between two ideas according to Guy and Farmer, namely the logics of Eco-Technic and Eco – Culture.

4. Eco-Technic & Eco-Culture

Eco-Technic is one of the logics that underpin the science of sustainable architecture as described in the book the six competing logics of sustainable architecture. It emphasizes the use of science and technology as methods and design responses to address environmental problems. Guy and farmer outline five design criteria, each with its own unique characteristics and differences. (Farmer, 2001) The elements of eco-technic design are summarized in Image 1.

Eco-Culture is a science that emphasizes or holds attention to environmental and cultural issues together to preserve the diversity of local cultures that can be applied to the design. The following are the five Eco-Culture design criteria proposed by

Guy and Farmer in Image 2.

Logic	Eco-Technic
Image of Space	• Global contect • Macrophysical
Source of Environmental Knowledge	• Technorational • Scientific
Building Image	• Commercial • Modern • Future • Oriented
Technologies	• Integrated • Energy Efficient • High-Tech • Intelligent
Idealized Concept of Place	• Integration of global environmental concern • Urban vision of the compact and dense city

Image 1 Element Criteria of Eco-Technic Design.

Logic	Eco-Culture
Image of Space	• Cultural Context • Regional
Source of Environmental Knowledge	• Phenomenology • Cultural Ecology
Building Image	• Authentic • Harmonious • Typological
Technologies	• Local • Low-Tech • Commonplace • Vernacular
Idealized Concept of Place	Learning to "dwell" through buidlings adapted to local and bioregioal phycical and cultural characteristics

Image 2 Element Criteria of Eco-Culture Design.

METHODOLOGY

The method used in this design involves several stages, starting with a literature and precedent study to establish the theme and concept. Next, site analysis is conducted, including site plan restrictions, climate, thermal data, wind rotation

using the Predesign app, and user analysis. Based on this data, the design concept is developed, covering the design concept, mass composition, and circulation. This approach is used to explore various environmental issues and sustainable architecture responds, as well as the concept of eco-technic and eco-culture. The result is a conclusion about how the concepts of eco-technic and eco-culture are related to environmental issues. Furthermore, design elements that follow the concepts of eco-technic and eco-culture are compared with the help of precedents and analysis to gain a deeper understanding.

RESULT & DISCUSSION

In the design phase of Sukabumi airport terminal, there are also design guidelines or design criteria that have been linearized with the concept used. The criteria for preparing this design include several contextual things that will be implemented in the building. This can be seen in detail in the design criteria table below which is presented in Image 3.

INDICATORS	COMPONENTS	DESIGN APPROACH	DESIGN CRITERIA
SITEPLAN	MASSING	Eco - Technic	Mass of airport terminal buildings that reflect elements of modern airports
		Eco - Culture	Using Batik Masagi pattern elements as a reference for mass processing
	CIRCULATION	User Movement	Dividing the circulation of the terminal area into areas departure and arrival
PROGRAMMING	ZONING	User Movement	Facilitate the direction of circulation with a linear room
STYLE	FACADE	Eco - Technic	Reflects a modern building
			Use of technology features such as Organic Photovoltaics on the roof and Solar Concentrator Window
		Eco - Culture	Conduct local cultural adaptation features implemented on a specific area of the facade
ACTIVITIES	PASSENGERS	Airport Urbanism	Providing facilities that can support all passenger activities outside the main area such as retail and supporting entertainment
	AIRPORT OFFICERS	Airport Urbanism	Provide convenience in meeting the needs of work activities in the terminal
	LOCALS	Airport Urbanism	Provide jobs in the retail area that can be filled by the public as a form of mutually beneficial development

Image 3 Design Criteria.

From the design criteria that have been mentioned, the implementation of the resulting design will be in line with the design criteria that have been set. This can be seen from the processing of the mass form of buildings that are synthesized from pieces of Batik Masagi form which represents the concept of Eco-Culture.

The characters raised will present the cultural elements of the city of Sukabumi itself with cultural elements that reflect the identity of the city of Sukabumi by including elements of Masagi Sukabumi Batik motifs and woven bamboo elements that are the traditional expertise of the people of Sukabumi in the design. (West Java Cultural Preservation Agency, n.d.). Which can be seen in Image 4 and Image 5.

Image 4 Batik Masagi. (Source: https://kebudayaan.kemdikbud.go.id/bpnbjabar)

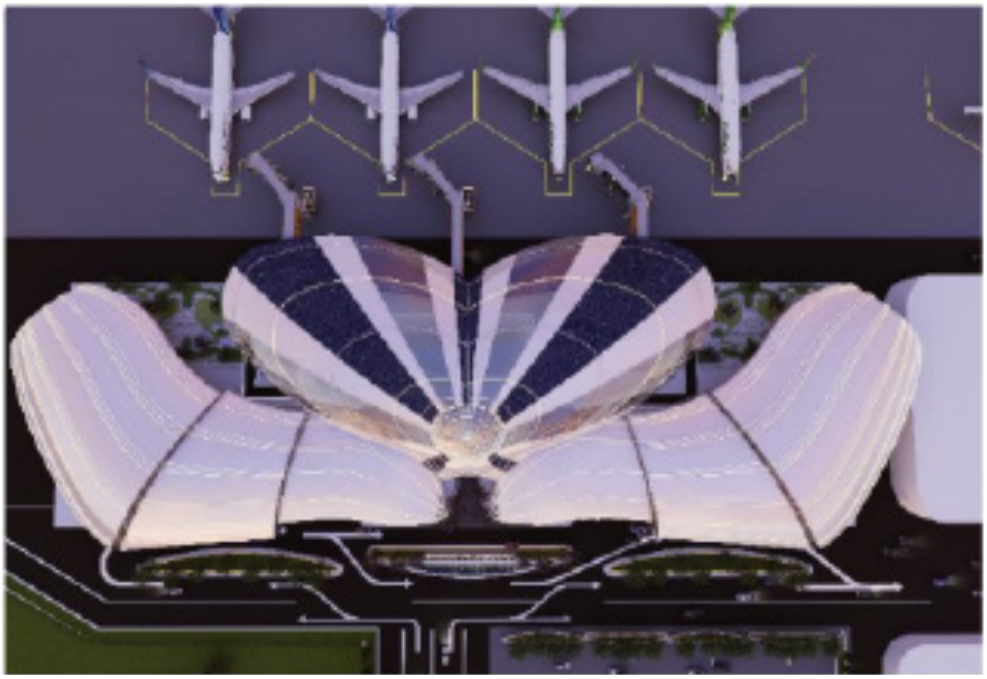

Image 5 Building Mass. (Source: Researcher)

Then after processing the form of mass composition that reflects the concept of

Eco – Culture, on the facade of the entire building there is also the use of features that reflect the concept of Eco – Technic with features that display modern buildings with the use of Low E-Glass around the building. In addition to the use of glass materials that respond to environmental sustainability, there is also the use of Solar Concentrator Window features that are useful in collaboration with Solar panels.

On the roof of this building design there are also skylights and the use of Solar panels that can be useful as features that can help to become a source of electrical energy in the building. In addition, to reduce the entry of excess sunlight around the building, secondary skin is also used that works as a Green Wall as well. The pattern used itself adapts from The Shape of the leaves in the form of batik Masagi. This can be seen in Image 6, Image 7, and Image 8.

Image 6 Eco Technic Concept – Façade. (Source: Researcher)

Image 7 Green Wall – Batik Masagi Pattern. (Source: Researcher)

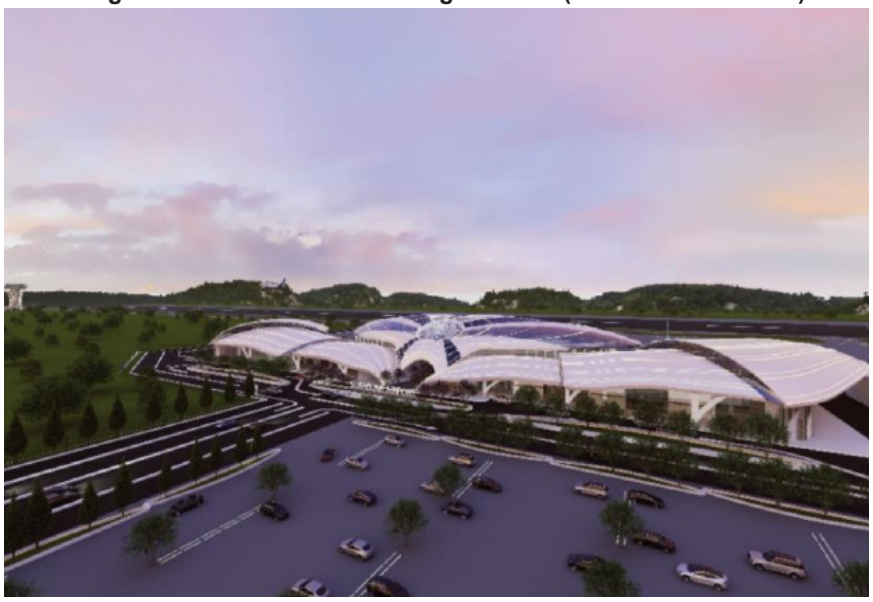

Image 8 Bird View. (Source: Researcher)

Apart from the shape and features used, another important thing about the design of this airport terminal is related to circulation. Circulation processing in the tread area has been adjusted to the needs that can be seen in Image 8. In addition, for circulation in areas within buildings that are made easy to access and made linear to facilitate users for quick achievement. Considerations related to this circulation also include the things that affect the processing of the mass composition is related to the distribution of user circulation both vehicle circulation and circulation in the building. This becomes important because the circulation itself becomes one of the components that affect the movement of users and the user experience in it. This can be seen in Image 9, Image 10, and Image 11.

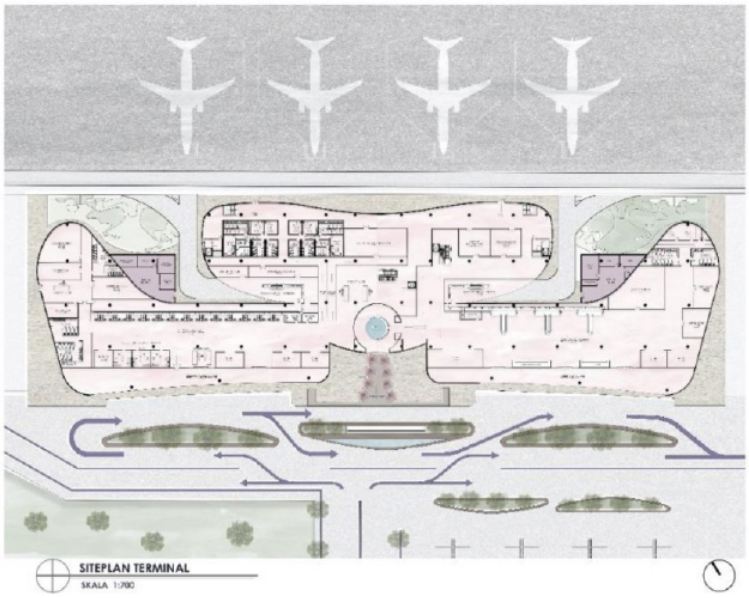

Image 9 Siteplan. (Source: Researcher)

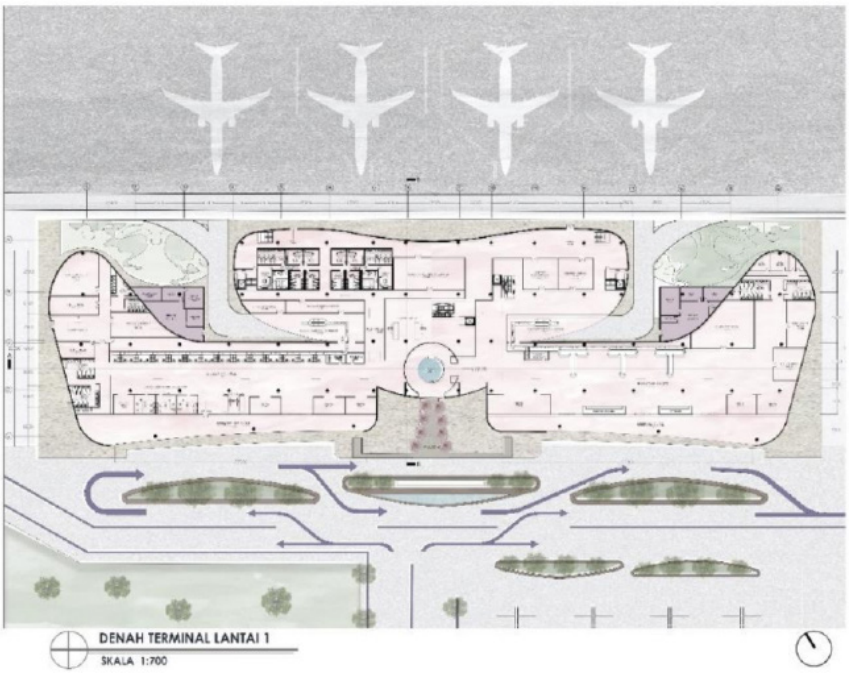

Image 10 Floorplan 1. (Source: Researcher)

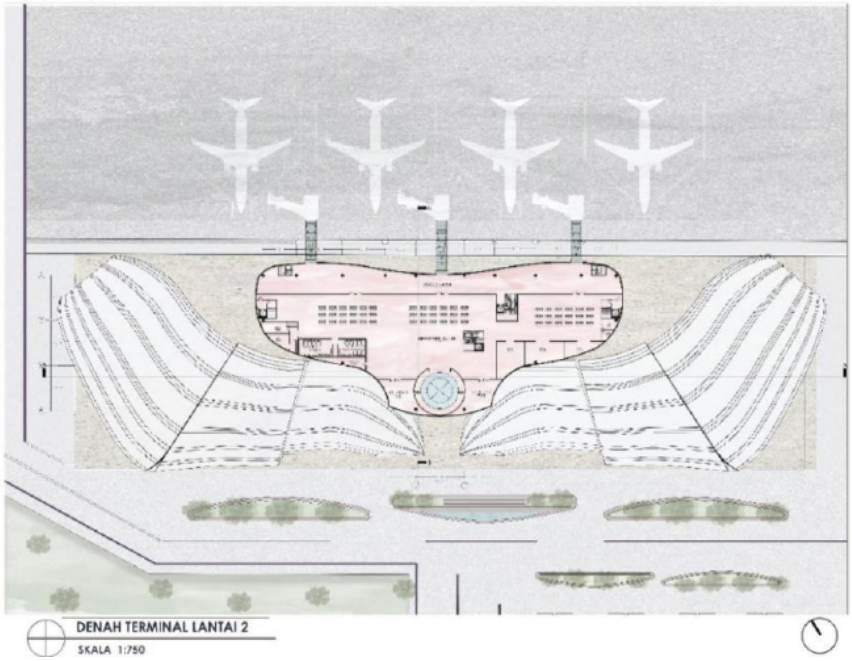

Image 11 Floorplan 2. (Source: Researcher)

The airport urbanism approach is applied in airport design to meet the needs of users. This approach includes a strategy for the development of the airport and the surrounding area, with a focus on passengers, workers and local residents. (Hirsh, airporturbanism.com, n.d.) This design facilitates passengers and workers, and provides retail areas for local residents in the arrival and departure zones. Hopefully, this will bring positive changes to areas affected by airport development.

CONCLUSION

After considering all aspects and conducting a literature study, the design criteria is generated that adapts the logic of Eco-Technic, Eco-Culture, and user movement. The result of this design is able to answer the issues raised for Sukabumi Airport Terminal, focusing on environmental sustainability through modern features and management of site area and resources. It is expected that this concept can be applied also to commercial buildings with large operational scales such as airports.

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