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Planning and Design of Transit Mall at Yogyakarta International Airport Using Eco - Culture Architectural Approach

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ABSTRACT

The purpose of this study is to examine the needs of a transit mall site in the Yogyakarta International Airport area and to plan and design a transit mall according to an eco-culture architectural approach. This planning and design uses the Kurtz architecture programming method. The subject of this planning and design is the Yogyakarta International Airport transit mall. Sources of data come from field observations and documentation. The design of the Yogyakarta International Airport transit mall building uses an eco-culture architectural approach which consists of five principles, viz. Space image, Environmental Knowledge Resources, Ideal Place Concept, Building Image, Technology. The result of this final project study is location determination. which meet the needs of transit malls at Yogyakarta International Airport as well as planning and designing transit malls at Yogyakarta International Airport in the form of shopping centers and commercial zones, hotel zones, and recreation zones with an eco-cultural architectural approach.

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1. INTRODUCTION

Community needs for the use of transportation are derivative needs of an economic, social and cultural activity (Marsitningsih, 2017). In the transportation system, service modes of transportation are influenced by integration between networks. The purpose of the transportation system is to provide a facility that is able to provide movement of passengers and goods from one place to another. The need for transportation modes in the current era has an important urgency in carrying out activities. We can see this phenomenon from data on increasing the capacity of users of transportation modes that occur on holidays. Transportation activities will run easily if supported by good infrastructure.

Yogyakarta Province has a trend of continuous and non-stop flow of visitors at the location of modes of transportation. The Central Statistics Agency for 2022 indicates that in 2021-2022 there will be a surge that will come when the tourism route has been opened and the pandemic has begun to recede (Figure 1). Increase in the number of arrivals of air transport passengers. However, Yogyakarta International Airport does not have supporting facilities in the form of commercial, transit and entertainment. so planning and designing media to accommodate these activities is needed. The transit mall is an idea to make it easier for the public, both passengers, tourists and business people, which is a facility that is integrated at Yogyakarta International Airport.

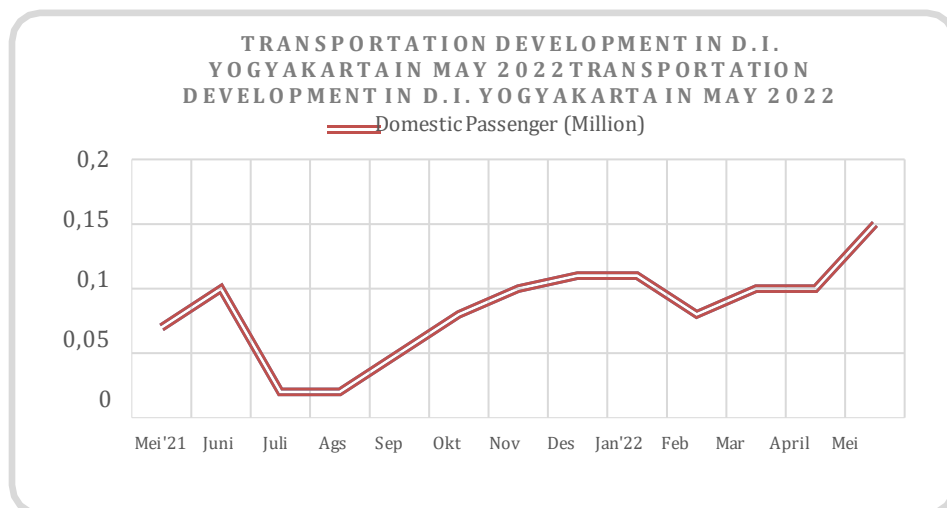


Figure 1. YIA Airport Visit Data
Source : (Badan Pusat Statistik, 2021)

Transit Mall Planning and Design refers to the Provincial Government Regulation of the Special Region of Yogyakarta No.4 of 2011 concerning Yogyakarta Cultural Values Article 8 Paragraph 1 which stipulates that the community supports and maintains and develops Yogyakarta's cultural values, in this case, customary and traditional values. with a value system that is used as a focus (orientation), reference (reference), inspiration, and a source of guidance for cultural behavior. In reality, based on the results of a survey conducted in 2022, only one out of nine malls, in other words, only 11% of mall buildings in D.I.Yogyakarta implement Yogyakarta decoration as an application of the regulation. The survey results agree with (Zainuddin, 2015) The crisis of building identity in the city begins to move slowly with the change in the face of city buildings in a more modern direction without regard to local cultural conditions. So that an eco-culture architectural approach can solve this problem. This approach answers the challenges regarding objects of cultural preservation in the modern

era. The application of eco-culture architecture will be applied to the selection of facades, materials and mass forms.

The planned transit mall complies with the D.I.Yogyakarta Provincial Government's plan regarding the aerotropolis concept. namely city infrastructure whose topology and economy are covered by airports or what can be called city airports and are predicted to improve the economy and make airways not only for tourism but also used for business travel and shipping goods. Transit malls can be interpreted as transit locations with integrated world center-based tourist destination facilities and have direct access with stops of public transportation modes such as buses, taxis, trains, planes, and simplified pedestrian accents (Solihin, Setyaningsih, & Suastika, 2018). Transit malls can also be an idea to make it easier for the public, both passengers, tourists and business people, which is a facility that is integrated at Yogyakarta International Airport. The transit mall is planned to become a tourist destination. In particular world center-based tourist destinations and recreation which are one of the points of development of Yogyakarta International Airport (Table 1).

Table 1. Benefits of New NYIA Airport Development

Benefits of NYIA Airport Development.	
1.	Accelerate the realization of DIY's vision as a leading tourist destination in Southeast Asia by 2025.
2.	Opening trade, tourism and investment transactions towards a new civilization of the 21st century.
3.	Increase the number of foreign tourists.
4.	Opened many jobs and new business fields.
5.	Speed up traffic, passengers, goods, and services.
6.	Increase the number and length of stay of visits to tourist destinations.
7.	Giving a domino effect of high economic growth

Source: (BAPPEDA D.I.Y, 2018)

All the problems on this background can be identified into two main things that underlie this planning and design. First, the selection of a transit mall building was based on the condition of Yogyakarta International Airport which did not yet have a place to accommodate retail and transit activities, so an idea emerged to make it easier for visitors, both tourists and business people, namely a new facility integrated with the airport. Second, the application of the eco-culture architectural approach is based on the identity crisis of buildings in the city and the Yogyakarta Special Region Provincial Government Regulation No. 4 of 2011 concerning Yogyakarta Cultural Values Article 8 Paragraph 1 which stipulates that society plays a role in preserving and developing Yogyakarta cultural values in the context of architecture and land use. With various problems and deficiencies that exist, this final project is carried out to provide a solution to the problems and deficiencies described in the background.

2. RESEARCH METHOD

Architectural programming method according to Herbert Mc Laughlin in (Ir. Ahmad Saifullah MJ & Ir. T. Yoyok Wahyu S., 2013) is the concept of a project that is oriented towards the use of space/residence/occupancy, while programming begins by defining a design problem or as a starting point for problem solving. The architectural programming method used in the design of the transit mall at Yogyakarta International Airport with an eco-culture architectural approach is an architectural programming method developed by Kurtz. According to (Palmer, 1981) this method consists of four stages:

- 1) Orientation
- 2) Base Program
- 3) Interactive Program
- 4) Design

Planning and design begins with data collection which is processed through analysis. The data is then processed into a planning concept. Primary data collection is carried out by explaining the background of the needs of mall facilities, local climate data and identification of site conditions which are the planning and design locations. Site selection is determined based on shopping center criteria (Table 2). A good site has the opportunity to support the function and be profitable for the building. The criteria for site selection according to (Rukayah, 2012) include:

Table 2. Site Selection

No	Criteria
1	Tread has the potential of the airport area.
2	The site has easy accessibility.
3	The site has an integrated environment.
4	The site has a large area.
5	The site has an optimal topology.

The next stage is the collection of secondary data obtained from literature studies related to the functions of shopping centers, comparative studies of similar functions, eco-culture theory and principles of traditional Javanese architecture (Yogyakarta). The planning concept that has been obtained is then transformed into graphical form so as to obtain design drawings that apply the eco-culture approach in the design of the Yogyakarta International Airport transit mall.

3. RESULTS AND DISCUSSION

3.1. Orientation

According to (Guy & Farmer, 2001) in the journal *Reinterpreting Sustainable Architecture: The Place of Technology*, there are 5 design criteria in the idea of eco-culture architecture. Image of space is defined as the impression of space which in its formation includes the mass layout of the building. Source of environmental knowledge is learning natural phenomena in the environment to get to know local culture. Building image is related to the identity and visual impression of the building. Technology is a science related to creation, methods and engineering materials and their relation to life, society and the environment. The idealized concept of place is the establishment of a sustainable relationship with the surrounding environment & culture. The development of logic about architecture with an environmental and cultural perspective is needed in the orientation process. The development of these principles is based on local wisdom values and the surrounding environment. Transit mall planning and design is oriented towards (Table 3).

Table 3. Eco-culture Architecture Orientation

Principle	Orientation
1. Image of space	Zoning division, which divides the commercial zone and the service zone
2. Sources of Environmental Knowledge.	Natural ventilation and energy can be maximized at locations around the site.
3. Idealized Concept of Place.	Synchronization is carried out by creating and positioning buildings according to the site and providing spaces that

Principle	Orientation
	encourage human interaction.
4. Building image	Forms of buildings that contain elements of Javanese architecture (Yogyakarta)
5. Technology	The use of the latest technology in accordance with the needs of the building

3.2. Base Program

Site Selection, the planned Transit mall is located in the Yogyakarta International Airport area. Alternative site locations are shown in Figure 2 number one (yellow) and two (purple). The selection of the site location is based on the function of the building and the planning background. The building that will be integrated with the transit mall is also a consideration for site selection. Transit mall design is carried out at the location (Figure 2). The location is close to other airport facilities. Based on the results of interviews with representatives of the Yogyakarta International Airport, when this design was made, the new Kepanewon Temon Spatial Plan (RTRW) for the airport city had not yet been published. Some regulations that are still relevant will refer to the old regulations, but only in part because the old regulations are no longer relevant to use in the airport area. Some regulations that are not obtained will refer to the context of the airport itself. The reference is to buildings that are in the temple space area or refers to buildings that have been built in the airport area. The height of the building itself refers to KKOP (Airline Operations Safety Zone) and will not exceed the height of the main airport building.

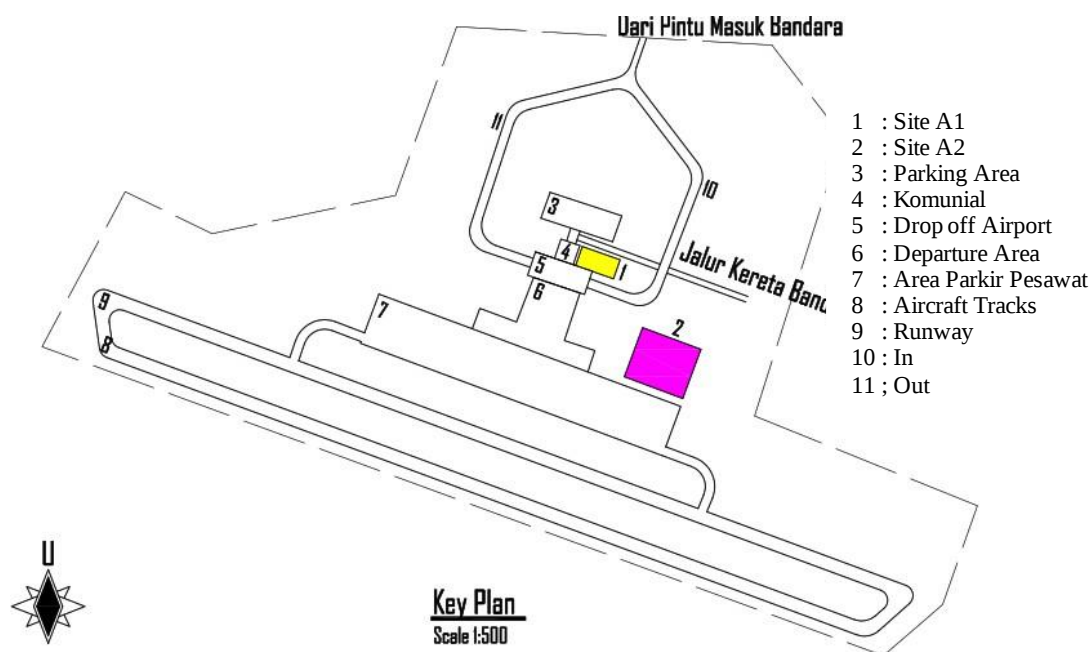


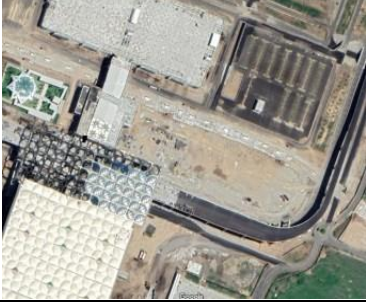
Figure 2. Key – Plan Site Planning and Design

There are two alternative sites in planning and designing a transit mall at Yogyakarta International Airport with an eco-culture architectural approach. The alternative sites reviewed are as follows:

- Site A1 : Located within the Yogyakarta
 Coordinate : (-7.897059631082866, 110.06051724462753)
 (-7.898431787264021, 110.06240222819636)

Site Area	:	10.000 m2
Site A2	:	Located within the Yogyakarta International Airport area
Coordinate	:	(-7.899823929003361, 110.06228957543699) (-7.90203182260418, 110.06301025146614)
Site Area	:	18.000 m2

Table 3. Alternative Site

No.	Site	Advantages	Deficiency
1.	Site A1 	• Has a large area. • Located in the core area of the airport. • Has a wide street circulation.	Do not get direct lighting in the afternoon Noisy.
2.	Site A2 	• No sound disturbance • Has a large area • Be in an open environment.	Difficult accessibility Relations with the surrounding buildings are far away.

Site location (Table 3) is one of the factors that determine the success of a design. A good site has the opportunity to support the function and be profitable for the building. Site criteria are adjusted to the function of the facility itself. The criteria for site selection according to (Rukayah, 2012) include:

- 1) Site is located in the airport core area
- 2) Site has easy accessibility
- 3) The site has buildings integrated around it
- 4) Site has a large area of land
- 5) Site has an optimal topology

Assessment of the site can be facilitated by providing value limits on the following criteria (table 4):

Table 4. Site Criteria Value Limit

No	Criteria	Limit			
		1	2	3	4
1.	Area Potential	No Potential	Less Potential	Enough Potential	Potential
2.	Accessibility	Very difficult to achieve	Difficult to achieve	Easy to achieve	ery easy to achieve
3.	Integration	Less supportive	Sufficiently Supporting	Supporting	Strongly Supporting
4.	Area	inadequate	Less adequate	Adequate	Very adequate

No	Criteria	Limit			
		Less Optimal	Enough Optimal	Optimal	Very Optimal

Calculation of alternative site values is carried out based on the site selection criteria in table 5. The two alternative sites above are given an assessment in table 4.3. and selected based on the highest score.

Table 5. Alternative Site Assessment

No	Criteria	Batas Nilai							
		Alternatif 1				Alternatif			
		1	2	3	4	1	2	3	4
1.	Area Potential	-	-	-	√	-	-	√	-
2.	Accessibility	-	-	-	√	-	√	-	-
3.	Integration	-	-	-	√	-	√	-	-
4.	Area	-	-	-	√	-	-	-	√
5.	Topology	-	-	√	-	-	-	-	√
Total		0	0	3	16	0	4	3	8
		19				15			

Description:

Limit	=	1 - 4	0 – 6	=	It is not in accordance with
Number of Criteria	=	5	7 – 14	=	Suitable
Minimal	=	0 x 5 = 0	15 – 20	=	Very Suitable
Maximal	=				

Based on the assessment above, it can be concluded that the selected site for planning and designing a transit mall at Yogyakarta International Airport with an eco-culture architectural approach is alternative 1.

Circulation and Achievement Analysis, Achievement to the Site can be done by using private vehicles and also by public transportation. In regulating the circulation and access of buildings, it is necessary to have public spaces that are lively and attractive and allow for achievement, service and personal activities.

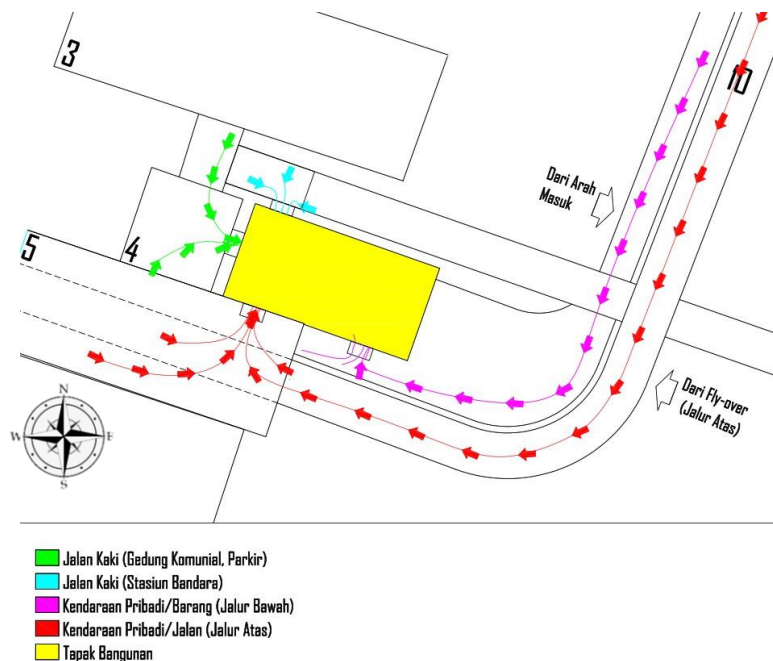


Figure 3. Circulation Access to Building Site Location

Visitor activities and goods in and out can run well if the circulation paths for visitors and managers are separated by making their own paths. Figure 4.6 describes the flow of entry to the transit mall building. The entry point for visitors can be reached through the communal building which is located west of the building site which will be integrated with the transit mall via a connecting bridge (red). The airport drop off area will also be provided with a connecting bridge (red color) to make it easier for visitors who have just got off their private vehicles or are about to take a flight. Passengers arriving by train can also enter via the bridge (red color) connected to the transit mall. Visitors who come using private vehicles can get off at the parking building and walk through the communal building or from the entrance they can drop off at the main entrance (green) (Figure 3).

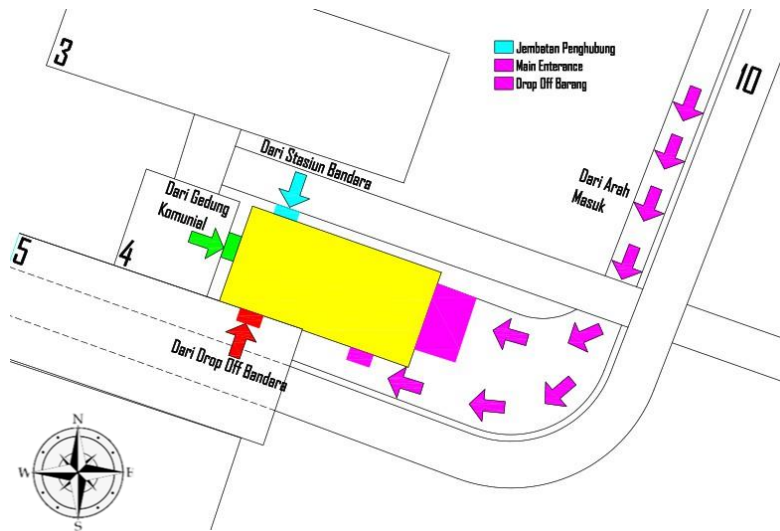


Figure 4. Building User Circulation

The main entrance is designed in the transit mall building in front of the visitor drop off area. The entry and exit route for goods is on the ground floor of the building (Figure 4). This location is suitable for use as an area for goods in and out in the form of loading and other needs, because the ground floor around the Site does not have many visitors and is close to the main route to the airport and can easily enter and leave via the main route. The exit route of the building can be accessed through a connecting bridge except for the airport station bridge and the main entrance which is explained in Figure 4.



Figure 5. Building Exit Flow

Solar Movement Analysis (Figure 5), Solar analysis is needed in the planning and design of transit malls. In the design process later sunlight can be maximized according to the needs of the building prepared for each room. The direction of the sun's rays is slightly tilted in March - May, September - November and tends to be parallel in June – August.



Figure 6. Solar Orientation
Source: (Google Earth, 2021)

Site conditions that do not have contours so that the sun can be captured directly by the Site, but at certain hours where sunlight can be affected by surrounding buildings, especially in the afternoon. Problems will arise at $\pm 15.00 - \pm 17.00$. The site location does not get direct sunlight from the west because it is covered by surrounding buildings so that the incoming light is less than optimal. In this case there are several technological uses that can be utilized to maximize the available light (Figure 6). Among others:

Laminated glass is glass consisting of 2 or more layers with one or more transparent layers with the addition of polyvinyl butyral plastic material. Applications for using laminated glass include office buildings, banks, museums, etc. It is used for building parts such as roofs, floors, skylights, animal observatory rooms, aquariums, protection against earthquakes and high wind speeds and acoustical purposes. Laminated Glass (Figure 7) provides a good barrier against noise, and can block ultraviolet radiation by 99% (Lestari, 2014).



Figure 7. Laminated Glass
Source : (Riot Glass, 2022)

The use of dome light technology (Figure 8) can be an alternative to the use of natural light in large building conditions. The use of this technology can be applied in small to medium sizes but in large quantities or placed in the middle of a large building so that it can be an alternative for building lighting.

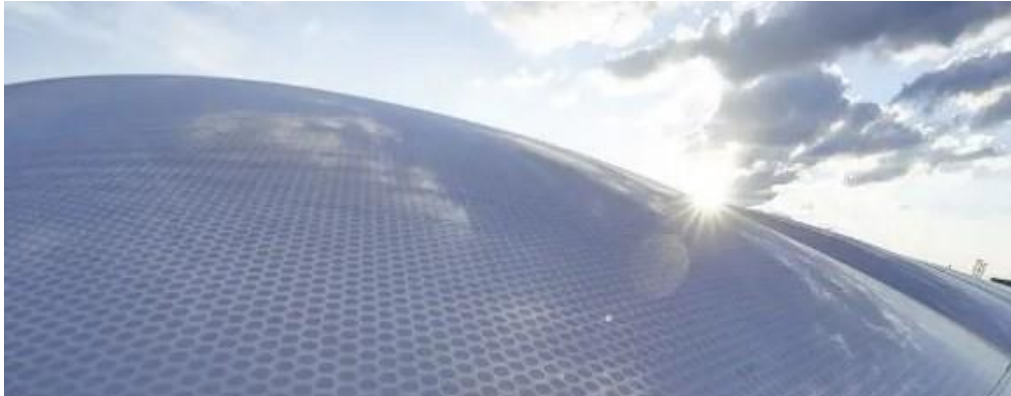


Figure 8. Dome Light
Source : (PT. Adas hightex Indonesia, 2022)

Noise analysis, the noise level in a building can affect the comfort of visitors. Noise around the Site location can interfere with activities in the building when it enters the building. At the design location the highest noise level is in the northern part which is the airport station besides that in communal buildings it has a lower noise level, then in the southern part of the site it has the lowest noise level which is the fly-over bridge. There are several considerations after seeing the condition of the site which will be resolved as a response to these conditions:

- 1) The hotel and retail section is placed in a part that is far from the noise source so that comfort is maintained.
- 2) Provide a double facade and also vegetation for filtration and block direct sunlight (Figure 9)
- 3) Provide sufficient distance from the main source of noise. Which can be used as an open area.



Figure 9. Utilization of Double Facade and Vegetation

Building Functions, The main functions are hotels, shopping centers and entertainment. must be fulfilled and prioritized before giving other minor functions. The function of the transit mall building will be divided into two functions, namely commercial and service functions. These functions are categorized in (Figure 10).

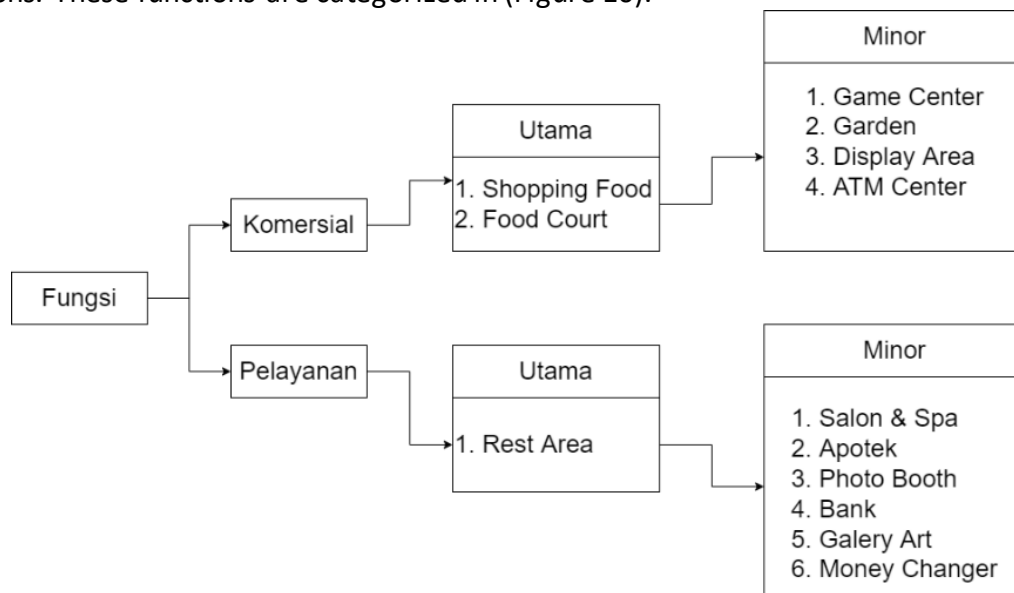


Figure 10. Classification of Building Functions

3.3. Design

The design of the transit mall will refer to its functionality as a building that is directly integrated with the airport and fulfills the eco-culture architectural approach. In designing transit malls, convenience and ease of accessing these facilities must be considered, so that visitors feel at home and are interested in coming.

By using the concept of a transit mall that is directly integrated at Yogyakarta International Airport which is oriented towards (Table 2) so that it can produce a room and area that will be interrelated. The zoning division aims to group visitor and manager activities so as to facilitate user circulation. Each zone (Figure 11) facilitates visitors who have been adapted to the analysis of space requirements. This is related to the eco- culture architectural approach which carries the concept of Image of space. So that the layout of the building mass is considered for the comfort and convenience of users.



Figure 11. Building Zoning

The zoning concept on the Site is adapted to the existing functions and activities on the Site. Zoning planning pays attention to visitor activities which are mostly related to circulation and achievement, mass planning, and site green planning. Based on the analysis that has been carried out, the division of the Site area or zoning in Transit is divided into three areas. This is related to the approach taken, especially the application of spatial planning as a response to the environment and the demands of space requirements. These areas are (Figure 12).



Figure 12. Building Zoning

The transit mall design utilizes an elongated land site. Layout or layout, can indirectly affect the interest of visitors psychologically. The definition of layout according to (Rustan, 2009) is the layout of design elements in a field on a particular media to support the concept or message that is created. the use of linear organization in Figure 13 has several advantages, namely a simpler and more dynamic shape so that space can be maximized and can be combined with other shapes easily.

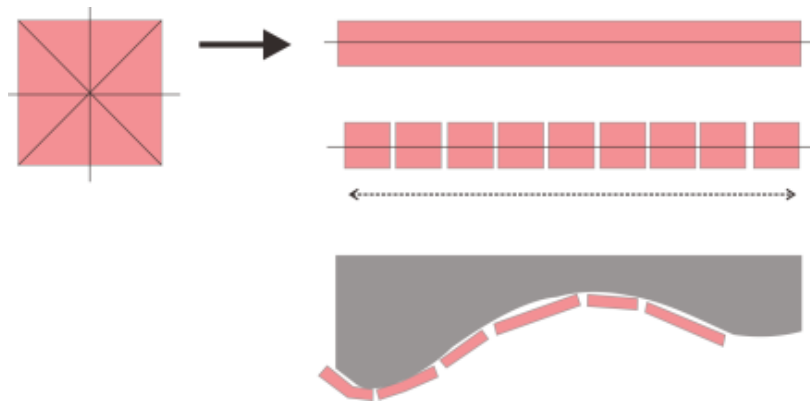


Figure 13. Linear Layout of Building

Source: (Ching, 2007)

The eco-culture transit mall design concept contains the various needs and activities of building users, besides that the appearance of the building must be in accordance with the orientation of the eco-culture architectural approach. The concept is contained in (Figure 14).

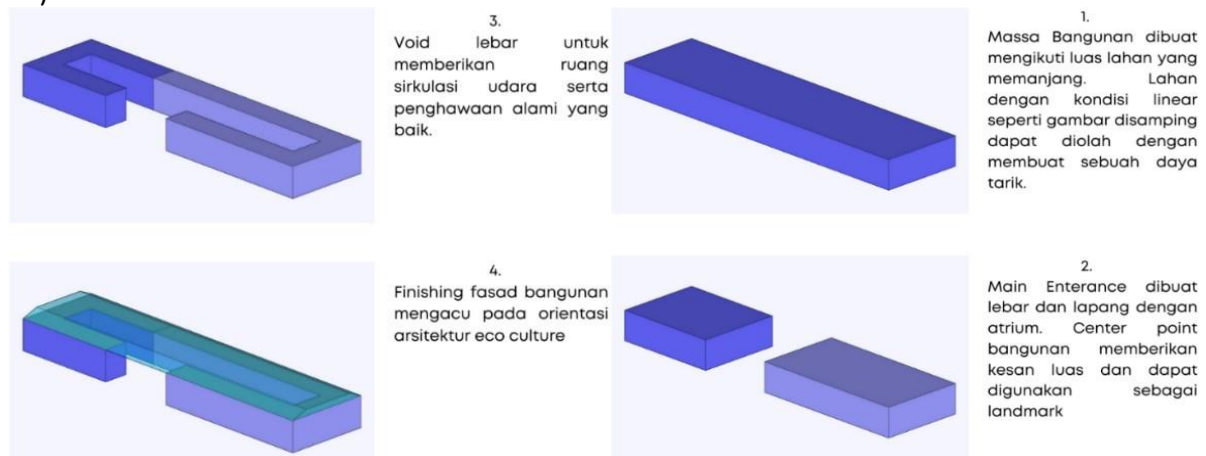


Figure 14. Building Massing Concept

The embodiment of the concept, image of space or the impression of space is generated in an eco-culture approach that is in line with the cultural and regional context. Eco-culture can emerge through the establishment of a building mass order. The implementation of image of space in the Yogyakarta International Airport transit mall has the context of Javanese architectural culture through the arrangement of Site zoning, building zoning, mass layout patterns, and circulation. Through an analysis of its functionality, an elongated floor

plan is obtained to suit the site. Zoning is made based on the grouping of activities to make it easier for activity actors and to provide space that can stimulate social interaction (Figure 15). The study of the impression of in-depth space which includes the layout of the building masses in the form of the arrangement of building masses in accordance with the surrounding environmental & cultural context.



Figure 15. Image of Space Application

Eco-culture studies natural & environmental phenomena in the form of responses or adjustments to building designs to local climatic conditions. According to wind speed measurements on sites that tend to be fast, the building is made of minimal insulation both walls and ceilings and provides wide voids. The role of the landscape outside the building is like using vegetation with a wide and tall title. The high intensity of sunlight in the city of Yogyakarta requires a filter to optimize sunlight into the room. On the roof the light is filtered through the laminated glass material used, creating an indoor garden and a rooftop garden to present a fresh atmosphere and a natural impression on the building (Figure 16). Creating a secondary skin to inhibit air and light from penetrating directly into the building as well as creating natural lighting and ventilation to support building functions.



Figure 16. Environmental Concept Implementation

Application of technology in the form of utilizing local technology that makes eco-culture buildings look attractive and efficient. In the Yogyakarta International Airport transit mall building, natural materials are used, including wooden parquet as the floor of the building, teak wood for the aesthetic elements of the columns, bricks as the wall covering material, wooden decking for the theater stage floor andesite natural stone at the main entrance. While the artificial materials used include laminated glass as a visual element of the facade which provides protection against ultraviolet rays, white sandstone carvings used in the main entrance, concrete with brown paint finishing on the walls and stairs (Figure 17).



Figure 17. Technology Implementation

Technology is a principle that studies the creation, methods and engineering materials and their relationship to life, society and the environment (Widiarso, Ir. Heru Sufianto, & Beta Suryokusumo, 2016). The application of the Idealized Concept of Place criteria in the transit mall building is applied to the overall design which aims to give a visual impression in the form of Javanese architecture.

In designing the Yogyakarta International Airport transit mall that is in line with the cultural context and environmental climate is to build connections with the region. Physically, the building in the Yogyakarta International Airport transit mall applies a passive design strategy that is in line with local technological concepts, namely decoration. Decoration is a form of additional artwork in a building that is in the form of the artist's imagination and emphasizes aesthetics without affecting its function (Iswanto, 2008). sloped roof that concentrates the flow of rainwater for reuse, dampens noise through vegetation elements on the site & building facades and maximizes green elements in the form of a green replacement concept. Non-physically, the connection to the Yogyakarta International Airport transit mall building is through cultural values. These values are in the form of the use of the kawung design as an introduction to Javanese culture, its integration with other buildings that symbolize community social relations (Figure 18).



Figure 18. Idealized Concept of Place Implementation

Building image is related to the identity and visual impression of the building. form of building appearance. Building image can be applied to building facades in the form of decoration. the use of materials can also affect building image. (Figure 19). In achieving harmony with the environment, the building style is also combined with ecological architecture which is achieved by using natural materials, roof gardens on the mass of Mount Batur, maximizing green land by 30% which has passed the minimum ecological requirements.



Figure 19. Building Image Implementation

4. CONCLUSION

The design of the Yogyakarta International Airport transit mall is a response to the cultural and natural environment around it. Coupled with the application of an eco-culture approach, this design becomes a process of instilling cultural values in a design for the Yogyakarta International Airport transit mall building. Yogyakarta International Airport's transit mall as a shopping center-based tourist destination is responded to through an eco-cultural approach that integrates each cultural value through 5 design criteria. The influence of eco-culture on the design of the Yogyakarta International Airport transit mall has implicitly connected aspects of traditional Javanese (Yogyakarta) architecture, demands for building functions and building regulations.

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