



Fitness Center Design with Natural Shapes and Forms Approach in Surabaya

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Abstract—Density of Surabaya city affects the physical and psychological health of the people. Productive activities accompanied by a dense environment mean that people rarely have time to exercise. To increase the awareness and interest of the people of the city of Surabaya to exercise, it is necessary to have a sports facility with a special approach. Biophilic theory, especially the natural shapes and form approach, can be a solution to these problems. The return of nature's essence into the building can provide positive benefits for human physical and physical health. Previous research has discussed the determination of fitness center design criteria with the natural shapes and forms approach in Surabaya. In this follow-up journal, we will discuss the final result or application of the design criteria into an architectural work. The design method used is the force based framework method. The force in the design of this building in addition to the surrounding natural environment is the natural perception of the community which is transformed into architectural forms. It aims to increase interest in training and restoring the user's physical and psychological health without having to go far out of town to look for nature.

Keywords: Biophilic; Design; Fitness Center; Forms; Natural; Shapes

I. Introduction

Surabaya is the capital city of East Java Province with a fairly high density (RPJMD, 2016). This fact has resulted in the high level of stress in the people of the city of Surabaya. High stress levels will affect people's lifestyle, especially physical and psychological health. There are also facts that people are lazy to maintain physical health by exercising so that it has not become a priority for the Indonesian people and the people of Surabaya (Prasetyo, 2013). According to the UUD 36 of 2009, health is an important component in the formation of quality resources. Therefore, there is a need for efforts to increase the interest of the people of Surabaya to exercise.

The government has made efforts to build several sports facilities, both free and commercial, to support the health of the community. There are several green spaces in the corners of the city to minimize air pollution and enhance the beauty of

the city. It aims for the physical and physical health of the people of Surabaya. Every holiday season or weekend, the people of Surabaya release their fatigue from the hustle and bustle of the metropolitan city of Surabaya to areas that are more beautiful and thick with natural elements such as Malang, Lamongan, Pobolinggo, and its surroundings. This means that there is a surge in vehicles on the Surabaya border toll road (Edgar, 2019). These facts become an indicator that the community's need for environment-based facilities is very high. This gap can be an opportunity for planning a fitness facility with an approach of natural elements which is expected to increase people's interest in actively exercising.

Natural Shapes and Forms is one of 6 Biophilic Design elements that represent and simulate nature that is often found in building facades and interiors. It also explains one of the biophilic principles, namely "Biophilic Design Encourages Engagement and Immersion in Fear and Natural Processes". This principle states that an

environment that responds to human biophilic needs to use interesting and repetitive experiences, learning, and social support to become an integral and beneficial part of human life (Kellert, 2018). The application of this principle to objects can also be done through basic shape and design using materials derived from nature such as wood, stone, soil and others (Romadhani & Suryawan, 2017).

Based on the above facts, it states that it is important to maintain the physical and psychological health of the people in big cities like Surabaya. The development of an increasingly modern era provides further distances between buildings and nature. In fact, many facilities, especially fitness facilities, tend to be closed to cut the relationship between humans and the environment directly related to limited land in the Capital City. Provision of fitness facilities with a natural form and shape approach is a solution to building a building that is environmentally friendly and user friendly. However, each community has different interests based on where they live, such as cities and villages, which tend to be different. Therefore, the importance of environmental perception theory is to find out the perceptions of the Surabaya community regarding the natural elements of interest. Analysis of the collection of facts, theories, data has been formulated into a design criterion in a previous journal that was published in The 6th International Seminar on Science and Technology (ISST 2020) Sepuluh Nopember Institute of Technology, Surabaya. However, how these planning criteria can be applied as an approach in design. This will be answered in this journal, which explains more detail the process to the final result of designing a fitness center using the Force Based Framework. With the natural shapes and forms approach as the basis for designing a fitness center, it is hoped that it can become a new attraction for cities and attract people to visit and exercise so that it can improve the physical and psychological health of the people of Surabaya.

II. Method

The design of the fitness center with the natural shapes and forms approach in Surabaya uses the design process by Plowright (2014) which is a force-based framework. This framework becomes the guidelines and limits of the designer in creating optimal and targeted design. In general, this process is the process of analysis, synthesis, and evaluation. In a force-based framework, the process of analyzing context, culture, and needs is the first step in determining the idea or issue to be raised. After that the determination of design criteria is based on contexts, cultures and needs analysis. The second stage is the synthesis where there are propose forms, refine, and assemble system processes until the proposal is created as the final result of the design process. The green box is a second stage that is always repeated to get the most optimal analysis results. This stage is the focus of research in this journal. The following is a diagram inspired by the

power-based framework design process (Plowright, 2014):

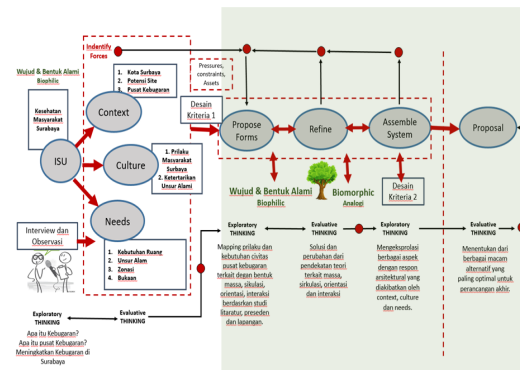


Figure 1. To get proposal or design on force-based framework

Based on the discussion or results from previous journals regarding the determination of fitness center design criteria with the natural shapes and form approach in Surabaya. Which has been published in the journal The 6th International Seminar on Science and Technology (ISST 2020) Sepuluh Nopember Institute of Technology, Surabaya. Then it has the results of the design criteria that are the basis for producing the final design results, which is:

1. Fitness center is categorized as fitness center category 3 with a natural perspective approach that accommodates various ages, both productive age (16-30) to non-productive age.
2. The design approach uses the theory of Biophilic, Natural Shapes and Forms. So the design concept is not only limited to connections with natural elements but also created from artificial natural elements.
3. Sports activities are divided into 2 attractive and calm categories. Both of these categories have the closeness of natural elements according to the perception of the Surabaya people. The design concept was applied to the indoor and outdoor elements of the building. The theory used in the formation of design is Biomorphic.
4. It is important to pay attention to the placement of fields, views, orientation and arrangement of vegetation related to the advantages and disadvantages of the site. So that all the natural potentials around the site are able to give a positive impact in the building related to the theory of Natural Shapes and Forms specifically.

III. Results and Discussion

A. Propose Form

The second stage in the force based framework is the propose forms. This stage is an activity to design the mass shape of the building based on the design criteria, theory, force identification, space needs and organization that have been described in the previous sub-chapter. In determining the most optimal mass form, a

braintrouming process is needed to find the most optimal alternatives in the design of a fitness center with a natural shapes and forms approach in Surabaya. The following is an analysis of the propose forms process:

B. Biomorphic

Biomorphic theory does not only focus on the form of living organisms but also looks at their structural and behavioral qualities (Feuerstein, 2002). Biomorphic functions as a guide in determining the shape of the mass, the process uses an analogy method to extract natural elements into architectural elements.

Based on the natural shapes and forms approach, it is part of the Biophilic theory where this theory states that humans love and want to be integrated with their natural environment (Kellert, 2007). The facts about the Surabaya government are increasing environment-based facilities, the people of Surabaya who have an interest in natural elements and Surabaya's relatively hot temperature characteristics. These natural elements are identical to plants so that these natural elements are transformed into an idea, namely trees. Therefore, the shape of the building mass will be analogized based on tree characteristics in order to represent the function, approach, quality and benefits to be achieved (physical analogies).

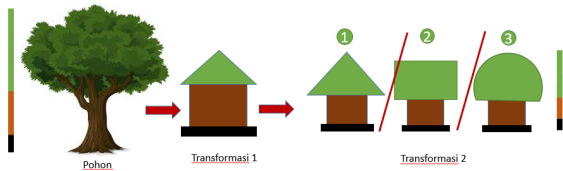


Figure 2. Transformation of Tree Forms into Building Mass Forms

In principle, a tree has large-scale shady foliage with a tree trunk with a slimmer scale and tree roots with the smallest scale of appearance. Then these characteristics are analogous to mass-forming elements such as roofs, walls and foundations. The second-stage transformation yields several alternatives to the combination of the basic mass forms. So that the overall transformation results in the characteristic shape of the mass, namely that the roof or the mass of the building above will be greater than the mass below.

C. Mass Form Against Forces

Forces are the main demands that must be taken into account in designing the forces based framework. Various types of forces will affect the quality of space, including the shape of the mass of the building. This is in accordance with the principle of Louis Sullivan's form follow function. At this stage there will be several alternative forms of mass vertically and horizontally.




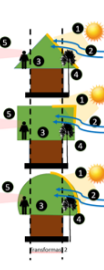

Idea	Transformation 1	Transformation 2 (Alternative)	Forces	Application
			<ol style="list-style-type: none"> 1. The direction of the sun 2. Wind 3. Space Requirements 4. Vegetation View 	
Consideration Alternative number 2 is the most effective form of building mass. This is motivated by the forces at the site. Here are a few considerations: 1. The shape of the box has an angle that can minimize the heat of light that will enter the room compared to the oblique and curved shape facing the sun. So that the thermal temperature can be controlled properly. 2. The shape of the box can be a good medium for cross ventilation applications. 3. Space utilization can be more flexible and broad. 4. There is sufficient space for shade vegetation or trees to develop. 5. The flat plane is the most effective area for laying openings so that the solid view is well visible.			Result:  Form the mass of a square where the mass at the top is greater or bigger.	

Figure 3. Transformation of the Concept of Vertical Mass Forms

D. Refine and Assembly System

In the force based framework method, after the proposal form stage, it is continued with the refine and assembly system stages. This stage is the stage of evaluation and exploration of thinking to determine decisions on the design before entering the proposal stage. The evaluation phase is carried out in various ways, including literature review, precedent study, review of potential building users, process assistance and review of design criteria. The exploration stage is a development stage based on data, forces and input of information regarding the quality of the design for design improvement. This second stage process is always iterative or reviewing back to the theoretical approach, analogy, space magnitude, forces on site or generally called design criteria.

E. Exterior Design Concept

Fitness center with a natural shapes and forms approach in Surabaya is a fitness center that provides a direct or indirect connection between humans and nature. Various kinds of vegetation are arranged as elements of landscape area design. But not only the use of natural elements as design elements. The concept of building mass form is analogous to the characteristic shapes of trees or physical analogies of trees. The shape of the building has a larger mass volume at the top than at the bottom, so that the shady tree covers a tree. This serves to protect the lower mass from direct sunlight. Some of the mass of the building is open so that light and wind can freely enter the building. In controlling excess solar heat that enters the design space, sun shading is optimized by analogizing the shape of a tree (Figure 4). Sun shading with the shape of a tree when exposed to direct sunlight will form artistic foliage shadows (Figure 4). This concept is inspired by physical analogies-control or the bias of sunlight on forest branches as shown in Figure 5. Therefore natural forms are not only applied to vegetation

arrangement, building mass shapes but also shadows from sunlight.

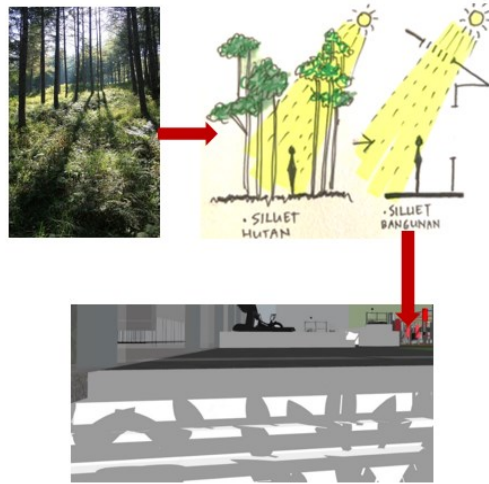


Figure 4. Transformation of Sun Shading Forms

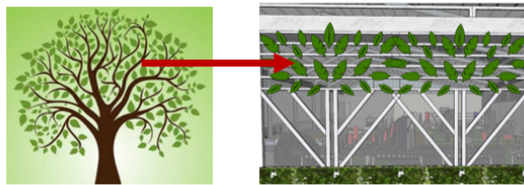


Figure 5. Analogy of Sun Shading Forms to secondary skin

F. Interior Design Concept

This natural shapes and forms approach includes representations and simulations of the natural world that are often found in facades and in the interior (Kellert, 2007). Based on the interview results, it was found that the perception of the people of the city of Surabaya related to what natural elements had an effect on their feelings, behavior and psychology. In the interview results, it was found that the perception of natural elements from the people of Surabaya City was mountains and beaches for attractive sports, while water and rocks, Malang were for calm sports.

G. Design Concept of Attractive Sports Space

In applying the natural shapes and forms approach, the first step is to analogize these natural elements into architectural elements (Figures 6 and 7). The results of this analogy will become a reference in designing each room based on the impression to be conveyed.

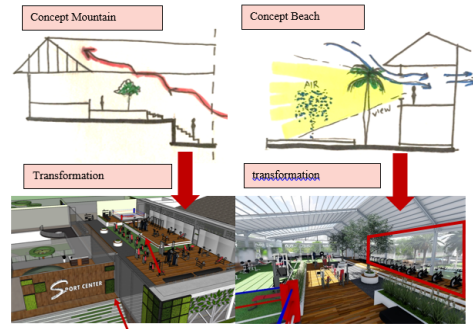


Figure 6. Transformation from concept to design

The picture above is a spatial perspective with an attractive atmosphere. The analogy used is physical analogies, the characteristics of the natural elements of mountains and beaches are not only visible from the shape of the mass but also the impression conveyed by the room. Mountain climbing activity, an activity that stimulates adrenaline, is analogous to designing a trip for the community to the GYM facility. By applying the stairs to the lobby, the stairs leading to the lockers and the steps in the GYM area are a movement to a higher place and ending with a triangular view of mountain shapes that will strengthen the impression of the community by climbing the mountain. Besides that, the activity of walking and enjoying the hot sea view is analogous to the cardio area in the GYM room. The cardio area is adjacent to the opening so that direct sun exposure can come into contact with the community. The cardio area also faces outwards with a view of the pool with palm tree veins reinforcing the atmosphere of the beach element in this area.

In addition to the partial application of physical analogies, this room applies a combination of physical and organic analogies from the elements of mountains and beaches. The following is an explanation of each application.

Point 1 is geometric shapes. Geometry shape teaching aids can improve children's creativity and cognitive abilities to learn to solve problems, train reasoning, think critically and creatively (Artini, Marhaeni, & Lasmawan, 2014). This suggests that geometric shapes provide an attractive impact in thinking and acting. The geographic form is dynamic. Meanwhile, abstract forms have a dynamic character (Chressetianto, 2013). However, in terms of designing an attractive space in the fitness center, it does not use abstract shapes to create an attractive impression. Because abstract shapes can distort the view of the civitas so that the concept of nature that you want to show cannot function optimally. Therefore, regular geometry forms are applied to the design elements to provide an attractive atmosphere. This can be seen in the application of geometric shapes to roof shapes and floor patterns.

Point 2, the wide, high and wide space scale can be seen from the absence of partitions in the room, glass walls, high roofs with openings as a

medium for light to enter the space.

Point 3, this room has an open area or terrace that is directly connected to the surrounding environment so that it can become a space for natural air circulation.

Points 4 are applied to patterns and types of floor finishing, various textures, variations in floor levels so that movement occurs, and the use of bright colors. So that it can stimulate the community to be more active in their activities.

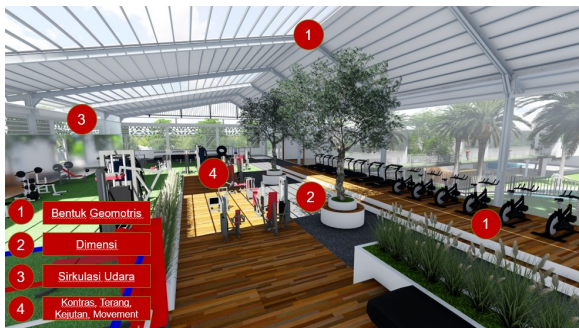


Figure 7. 4 Points analogues of attractive character

H. Design Concept of Calm Sports Space

The spaces with calm exercise characteristics are a yoga studio and a pilates studio. These spaces have shapes and forms from the characteristics of natural elements which are analogous to natural elements that are of interest to the community.

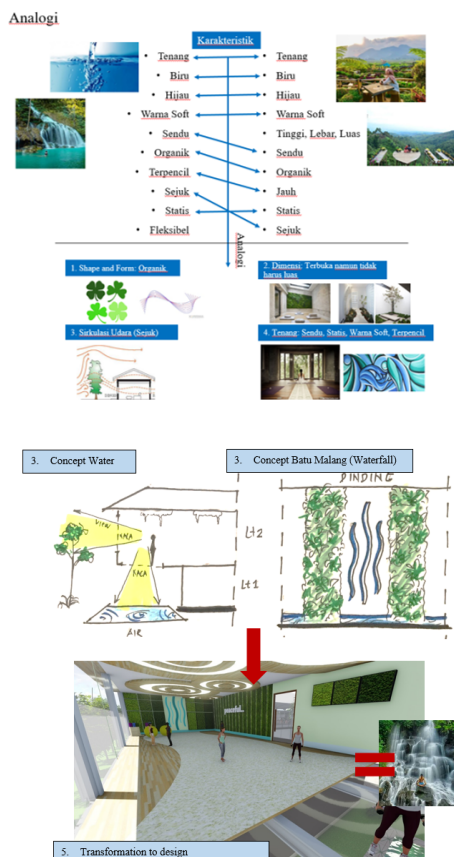


Figure 8. Transformation from concept to design For zoning all rooms that have calm

characteristics will be placed in remote areas and far from the crowd (Point 4). This is inspired by the characteristics of the trip to Batu, Malang, which is far from the city of Surabaya. This room applies points of combination of physical and organic analogies from the elements of water and the atmosphere of Batu, Malang. The following is an explanation of the application of the points of the analogy. In creating a calm impression in the room, the use of soft colors is associated with calmness, is considered more pleasant, less inspiring and less dominant than dark colors (Majidah, Hasfera, & Fadli, 2019). In addition, the use of curved lines gives a soft, twisted feeling, this line gives the impression of grace, calm and peace in a room. However, the application of the natural shapes and forms approach utilizes the analogy of natural elements based on interview data as stimulation in giving a calm impression. The application of the theory of natural shapes and forms can be seen in several design elements, among others, the application of organic forms. The roof element uses a concrete plate roof with white paint finishing with an organic ornament resembling a water drop shape (Point 1). Wall elements are divided into two types, namely walls with light bricks, finishing with vertical vegetation and walls with glass finishing. Both of these finishes have their respective functions, namely to give the impression of privacy but also to stay connected to nature outside the room. The dimensions of the room are designed not too broad to have an intimate impression (Point 2). The floor elements in this room are divided into two types, namely the wooden parquet finishing floor with soft colors and the glass finishing which is directly connected to the pool below (Point 4). Apart from the use of artificial ventilation for close connections to trees, soft colors and the element of water give the room a cool impression (Point 3).



Figure 9. 4 Points analogues of calm character

Not only applying a combination of physical and organic analogies of the water element and the atmosphere of Batu, Malang. The room with calm characteristics tries to bring out the atmosphere of the water and Batu, Malang directly. Batu, Malang is famous for its beautiful waterfalls, which are analogous to being an element in the design of wall ornaments. On the walls there is vegetation flanking the wall with a wavy line ornament downward symbolizing the downward movement of water. On the lower side of the wall there is a blue wallaper with an organic shape as the embodiment of the pool water estuary. The floor element is made of

glass, where under the yoga studio there is a fish pond. This is like the community meditating in a waterfall. This concept is intended to give the impression of calm and relaxation while doing sports.

I. Proposal

The proposal is the final stage or the result of the force based framework design process. The result of this proposal is a schematic design of a fitness center with a natural shapes and forms approach in Surabaya. In perfecting the design results and making it easy for the reader to understand, the writing is translated through images such as autocad and sketchup. The following is a detailed description of the schematic design of a fitness center using the natural shapes and forms approach in Surabaya.



Figure 10. Perspective fitness center design with natural shapes and form approach in Surabaya

IV. Conclusion

The conclusion of this journal is the answer

to design problems. The following is a brief description of the results of the design problem.

Aspects that affect the design of a fitness center with a natural form and shape approach in Surabaya with the force based framework method are the interests of natural elements and are supported by aspects such as land use, sun direction, wind direction, vegetation, views, community habits, space requirements, zoning and openings.

The design criteria are obtained from the results of literature studies, observations, interviews that have the results that the fitness facility is classified as a category 3 fitness center which accommodates various classes. Both approaches to the forms and forms of nature are not limited to the relationships of the universe but are created from the elements of artificial nature. The three fitness facilities are divided into two types of space, namely attractive and quiet spaces which are transformed based on natural elements related to the analogy method of biomorphic theory. Finally, take advantage of the site's potential that has a positive role for the building.

The concept of the mass of the building is analogous to the characteristic shape of a tree with a square base that takes into account the forces at the site. There are also design principles that arise from analogies to related natural elements. The concept of indoor space with attractive activities is geometric shapes, light colors, air circulation and spacious, high room dimensions. One example of its application is the placement of a sports room on the second floor so that the community is required to climb stairs which are analogous to the characteristics of mountain climbing. Meanwhile, the concept of space with quiet activities is zoning of space, application of young colors, organic forms, close to the element of water. One example of its application is the placement of space in a quiet zone by maximizing openings in walls and floors in the orientation of trees and water.

The general objective of the combination of biophilic and environmental perception theory is that the community can feel a close relationship again with nature in big cities and have a positive effect on the physical and psychological health of the people of Surabaya.

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