



IMPLEMENTING THE MANDALA CONCEPT IN INTERSECTION LANDMARK PLANNING FOR SUSTAINABLE CITY DEVELOPMENT

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Abstract

A monument has become a stereotype for a landmark design at a road intersection in most cities in Indonesia. However, that stereotype only possesses symbolic value, overlooking other values such as spatiality and sustainability. This study proposes an alternative approach to designing a landmark at a road intersection. Mandala, as local wisdom, becomes a basic principle that later develops into the general concept of landmark design. Through literature studies of landmarks and spatial experience of architecture, and also supported by design experiments through case studies, this study suggests the Mandala concept as one of the best solutions for the landmark at a road intersection design. Through design case study of Babalayar intersection in Sidoarjo, the design result offers varied and explorative designs. By the Mandala design concept, a landmark design at a road intersection not only possesses symbolic value but also environmental and better spatial experience values.

Keywords: landmark, monument, mandala, sustainable, city

1. Introduction

The roundabout intersections in most cities often serve as landmarks for the neighborhood and even the cities themselves. A single vertical structure is typically erected with a symbolic value reflecting the cultural significance of the city or region (Fig. 1). As Lynch states in his book, a monument can be a primary characteristic that establishes a city's landmark status because it stands in contrast to the surrounding environment (Lynch 1960). However, a landmark is not limited to monuments; Lynch also notes that landmarks can vary in scale, whether small or large, narrow or wide. Even small-scale objects can become landmarks if they create a contrasting appearance compared to their surroundings.

Furthermore, roundabouts face challenges related to traffic management and circulation. According to GDCl, roundabouts struggle with managing speed and traffic conflicts. They do not allocate road space evenly among various transportation modes, particularly for pedestrians and cyclists. Pedestrians and cyclists require longer routes to cross roads safely. Some research on roundabouts suggests alternatives, such as closing them or converting them into regular intersections to reduce traffic conflicts (Marza, Burhanuddin, and Usrina 2023; Aulia and Abduloh 2023). This situation has also resulted in a disconnected spatial experience between the sidewalks and the roundabout or intersection (Fig. 2). For a landmark or monument to qualify as architecture, it must be experienced rather than merely viewed from a distance (Rasmussen 1959). Otherwise, it remains just a piece of artwork. Intersection landmarks should be considered architecture because streets cater not only to drivers but also to people utilizing the space.



Fig. 1 Several roundabout designs with monuments in Indonesia's cities
Source: Compilation from google.com

In addition to the spatial experience, the environmental aspect of the typical design of landmark monuments in roundabouts is often overlooked. The landmark serves primarily as a symbol that enhances the city's aesthetic. In contrast, urban experts emphasize the importance of a convenient outdoor area for fostering social activities. Trees, as green elements, play a vital role in creating a pleasant outdoor space by providing shade and fresh air (O₂). The green element in outdoor spaces is referred to as green infrastructure (Briz, Kohler, and Felipe 2019). This infrastructure benefits the city and enhances people's well-being, both physically and psychologically. Therefore, street infrastructure design, particularly for landmarks at road intersections, must take into account not only the visual aspects but also the green and environmental considerations.

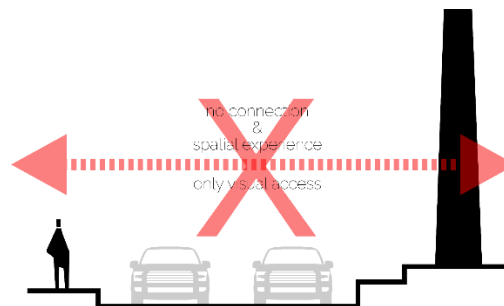


Fig. 2 Spatial experience issues in landmark design at a roundabout
Source: Author's analysis, 2024

Based on the observation above, road intersections are often linked with landmarks and roundabouts, especially in most Indonesian cities. This study aims to determine if this association remains relevant today when developing urban road infrastructure amid climate change and sustainability concerns. Through a case study of Babalayar intersection, it explores the potential for landmark design at road intersections, suggesting that a landmark does not always have to be a roundabout with a monument at its center. Consequently, this article proposes an alternative approach for intersection landmark design, emphasizing local wisdom as a core architectural principle. It highlights the importance of spatial experience and sustainability considerations.

2. Literature Review

Landmark design and Spatial Experience

Kevin Lynch describes a landmark as one of the images that the city uses to orient its people. Monuments in cities usually become landmarks because they stand out significantly in height within their context. Indeed, height is one characteristic of a landmark, as Lynch states in his book “The Image of the City”. However, it is not the only characteristic; landmarks can vary in scale, being large or small, and local or global. One of the most prominent ways to become a landmark is by contrasting with its surroundings (Lynch, 1960). Another view suggests that any urban feature with inherent or manifested attributes that is physically or spiritually unique, influential, impressive, and generally contrasts with its context can serve as a landmark (Lamit, 2004). Therefore, a landmark designed as a single vertical structure in its center is not the only approach to creating a landmark in a city.

Apart from the typological aspects of landmarks, a monumental vertical structure also has disadvantages in shaping the spatial experience. According to Rasmussen (1959), architecture is not only a visual object but also needs to be experienced as a space. Shapes and forms impact the space they generate. A horizontal plane can create space above or below, whereas a vertical plane creates space around it. Regarding form, a monument with a single vertical structure impacts space similarly to a column, serving as a focal point or circulation axis (Ching, 2014). The spatial experience created by a single vertical monument is weaker than that produced by horizontal or vertical planes, such as walls, roofs, or floors.

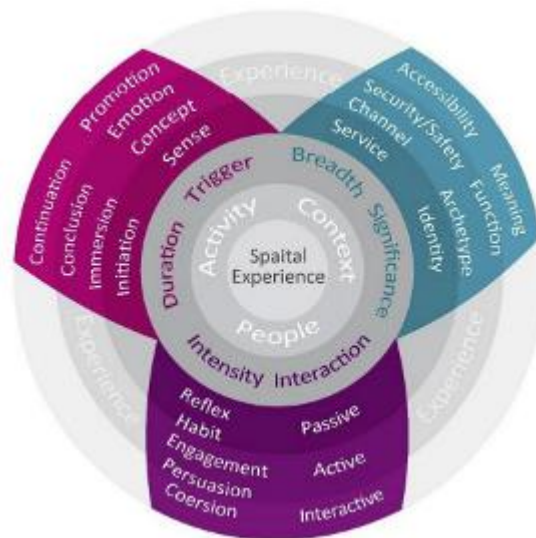


Fig. 3 Essential components, dimensions, and elements of an experience.

Source: Rahimi, Levy, Boyd, & Dadkhahfard, 2018

Rahimi (2018) provides an in-depth study on how to create a strong spatial experience in architecture. In their article, the spatial experience is defined as an engagement with space involving humans in specific activities and contexts. From this definition, they identify three key components for a compelling spatial experience: human, activity, and context (Rahimi, Levy, Boyd, & Dadkhahfard, 2018). These components encompass various dimensions of spatial experience, including duration, triggers, breadth, significance, interaction, and intensity, as illustrated in Fig. 3. Considering these dimensions is essential in architecture to create and improve meaningful spatial experiences. Therefore, this review suggests that a landmark can take many forms beyond a single vertical structure to foster a strong spatial experience involving human activity within a specific context.

Mandala as design approach

According to Sanskrit, Mandala means a circle. Sanskrit defines various meanings associated with Mandala. It states that Mandala is synonymous with the word "Chakravala," which means disc. Mandala manifests as a complex geometry that centers and disperses into nine directions. The center is called "Bindu," symbolizing the universe and the highest reality (Shakya 2000). However, the Mandala is not only horizontal but also vertical, possessing several stages of cosmic qualities; a higher stage has a higher value (Jazuli 2005).

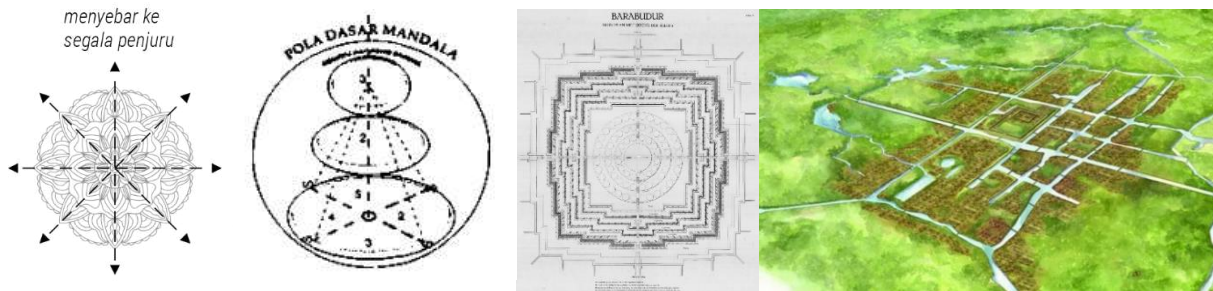


Fig. 4 2-dimensional Mandala philosophy (left), 3 3-dimensional Mandala philosophy (middle-left), the implementation of 2-dimensional of Mandala order in Borobudur temple (middle-right), the implementation of Mandala order in Trowulan City (right)

Source: Various sources from google.com

The Majapahit Kingdom uses the Mandala order as the foundation for its religious activities and the development of the city and its architecture (Untoro and Johan 2012). The Majapahit town square is called "Watangan" and is located near the city hall (the King's residence) and the Buddhist and Hindu shrines (Rozi, Munir, and Maulidia 2019). Watangan is a sacred space that symbolizes the vertical value of the Mandala order, as stated by Jazuli (2005), where the center holds the highest cosmic significance. Additionally, the Mandala order serves as a fundamental concept for architecture in Bali, Indonesia. In architectural terms, the Mandala is reflected in the design of Denpasar's city hall (Faiq F, et al. 2020). Regarding the arrangement of buildings, the Mandala order facilitates the entry and circulation of natural light and ventilation within the rooms (Sabrina, Pribadi, and Rosnarti 2019). Thus, the Mandala order provides not only symbolic value to city planning and architecture but also positively influences the environment and the community.

Based on the previous discussion, the Mandala order can be further adopted as a design strategy in architecture. It provides significant symbolic and environmental benefits for the community. According to the research by Sitinjak (2020), the Mandala concept is an integral aspect of Balinese architecture still reflected in numerous buildings and public spaces (Sitinjak, Wardani, and Nilasari 2020). Hence, this study aims to evolve the Mandala concept into a unique landmark design for road intersections, serving as an innovative alternative to conventional monument designs.

This implementation of the Mandala order as a design concept incorporates the principle of landmark characteristics, as outlined by Lynch. One of the key features of landmarks is their contrast with the surrounding environment. Therefore, in developing this Mandala concept, the typical vertical structure found in landmark designs is transformed into a horizontal platform that is visually striking. Additionally, the vertical element, which is usually an inanimate object, is reimagined as a living ecosystem composed of plants, trees, and animals. The interplay of these living elements manifests the cosmic significance associated with the center of the Mandala. In essence, the application of the Mandala concept shifts the paradigm of infrastructure design from one that is often hard and cold to one that embraces a greener, more ecologically-minded approach.

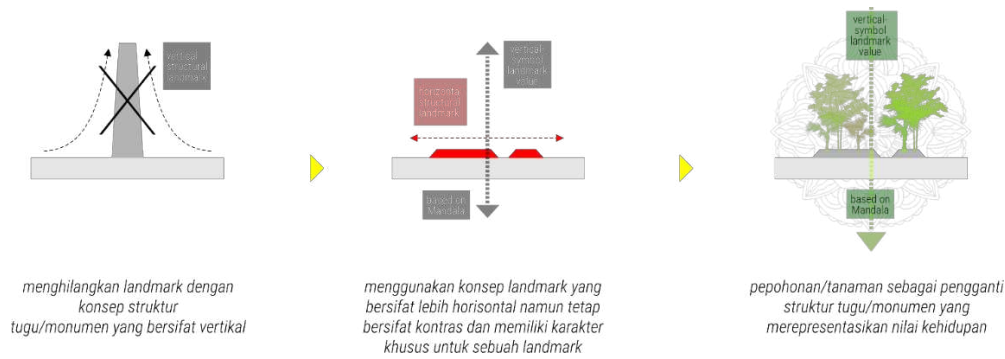


Fig. 5 The Mandala concept implementation on landmark design at an intersection
Source: Author's analysis, 2024

3. Methods

This study chose the Babalayar intersection, Sidoarjo, as the locus area because the authorities want to build a landmark there. So, this study first aim is to observe what kind of landmark is suitable for the area. So, we conduct a study that employs a qualitative approach that illustrated in the conceptual framework and design of this study in the image below (Figure 5).

Firstly, this study observes current landmark and intersection design practices in various cities in Indonesia through secondary data by photographs of completed projects to understand the current trend of designing landmark at intersection. Next, we conduct a literature review to understand the definitions of landmarks and the theory of spatial experience in architecture, allowing us to compare the practices adopted by designers and architects.

To conclude our study and preliminary findings about landmarks design in road intersections and spatial experience, we also examine the Mandala order, a form of local wisdom, as an alternative solution and design concept that addresses issues related to landmarks at intersection design. To integrate of all study phases, design experiment is conducted in the study location by applying the Mandala order as a landmark design at intersections to evaluate how effectively this concept addresses the issues identified in this study.

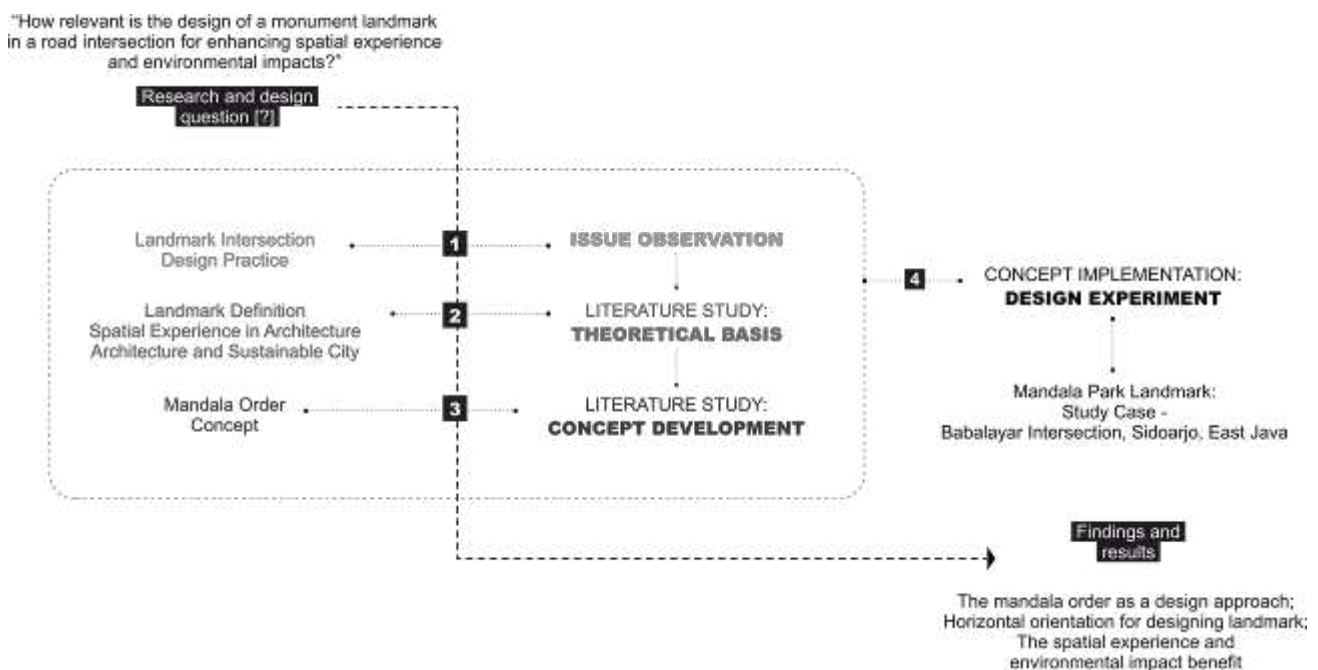


Fig. 6 Research and design conceptual framework
Source: Author, 2024

4. Results and Discussion

General Info and Site Analysis

The present case study examines the intersection known as Babalayar, situated in Sidoarjo, East Java. Local authorities intended to design and construct a new landmark in this location through a design competition open to professional architects from across Indonesia. This area is located less than 800 meters from two existing monuments: the Jayandaru Monument and the Sidoarjo Monument, which are both positioned in the town square. This context raises an important inquiry regarding the necessity of additional monuments in the city to serve as landmarks.



Fig. 7 Landmark case study location: Babalayar intersection, Sidoarjo
Source: Google maps

Sidoarjo, known as the "city of temples," has a distinctive architectural character shaped by traditional clay bricks. Widely used in temples across East Java, these durable bricks provide a strong visual identity for landmark designs. Additionally, Sidoarjo is known as the "delta city" due to its geographic characteristics. The delta is recognized for its fertile land and ecological significance, featuring a rich diversity of plant and animal life (Evers, 2025). These natural advantages should be taken into account when designing infrastructure that integrates natural systems with traditional grey infrastructure, such as roads.



Fig. 8 Delta and temple character in Sidoarjo
Source: Various sources on google.com

Design Result

A. Shape and Form

The Mandala order has evolved into a design concept for a landmark at a key intersection. This landmark is conceived as a basin, delineated by a platform that functions as a perimeter wall. The configuration of the park is informed by the underutilized spaces created by the roadways that are frequently traversed by vehicles, which often contribute to traffic congestion. These areas have been repurposed into a park that is positioned one and a half meters below the road surface. The design will incorporate a diverse array of plants and trees to enhance the Mandala concept and the environmental quality of the space.

According to earlier studies, changing the roundabout into a standard intersection can minimize conflicts. Consequently, since the final design is not a roundabout, the park will play a role in managing traffic indirectly. The layout of the park will encourage vehicles to remain in their lanes

and travel in the correct direction. Thus, the park's ultimate design will focus on not only fostering a positive environmental impact but also improving traffic flow.

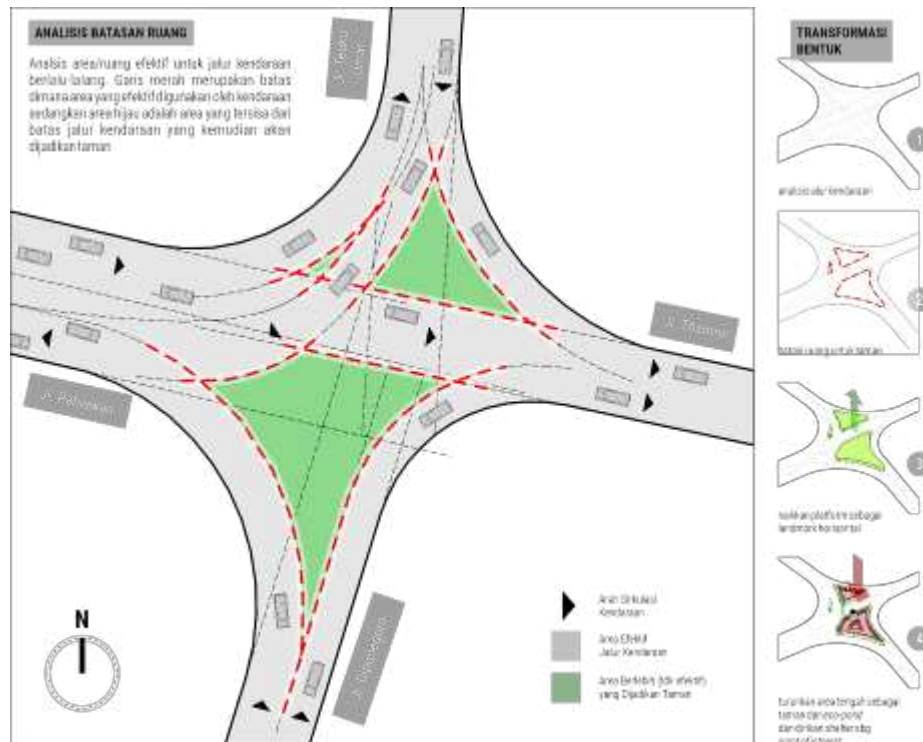


Fig. 9 Analysis and Synthesis of design shapes

Source: Author's analysis, 2024

The platform design at the park's perimeter features a terraced layout that serves as steps leading to the park basin. In contrast to the surroundings, the intersection area from the platform to the adjacent sidewalks is designed with bricks. Bricks were chosen as the primary material to align with the local architecture of Sidoarjo and East Java. By utilizing the same material, a strong spatial experience will be created between the intersection park and the sidewalks. This connected spatial experience will also be enhanced by the trees in the middle, providing shade. The shelter integrated with the platform is a transformation of the existing police post, serving as a focal point for the entire intersection area.



Fig. 10 Design result; aerial view
Source: Author, 2024

B. Implementation of the Mandala concept in the environmental aspect

Based on the study and design exploration above, the mandala order puts a high value on mother nature. As a result, the implementation of the mandala order creates a green, open space in the center, providing space for nature to flourish. The green and blue aspects of the space positively impact the surrounding environment, not only people but also the whole ecosystem. In order to integrate the blue system, the basin park is designed as a retention pond. During heavy rain, the water that floods the main road will be redirected to the park, filling the basin. Once the water reaches a certain level, any excess will be channeled into the city's sewer system. This means that in the wet season, the park may be flooded, which can support more wildlife, while during the dry season, people will have access to the park for various activities. Thus, the landmark at the intersection can have a positive impact on the environment by effectively managing rainwater.

Then, to integrate a green system, the park is designed with a variety of plants and trees that attract local wildlife. These plants, particularly flowering species, can invite insects such as butterflies, grasshoppers, and ladybugs. Additionally, the park will feature fruit trees that serve as food sources for granivorous and frugivorous birds, as well as trees that provide shelter for animals. By attracting insects, the park will also draw in insectivorous birds. The trees selected include several types of palm trees (*Arecaceae*), which will offer shelter and nesting sites for birds. The park will also include "kersen" trees (*Muntingia calabura*) and "trembesi" trees (*Albizia saman*) to provide food. These trees will attract various bird species, such as "cabai jawa" birds (*Dicaeum trochileum*), "cucak kutilang" birds (*Pycnonotus aurigaster*), "erasia church" birds (*Passer montanus*), "tekukur" birds (*Streptopelia chinensis*), and "layang-layang asia" birds (*Hirundo rustica*.) (Hutami, et al. 2022).

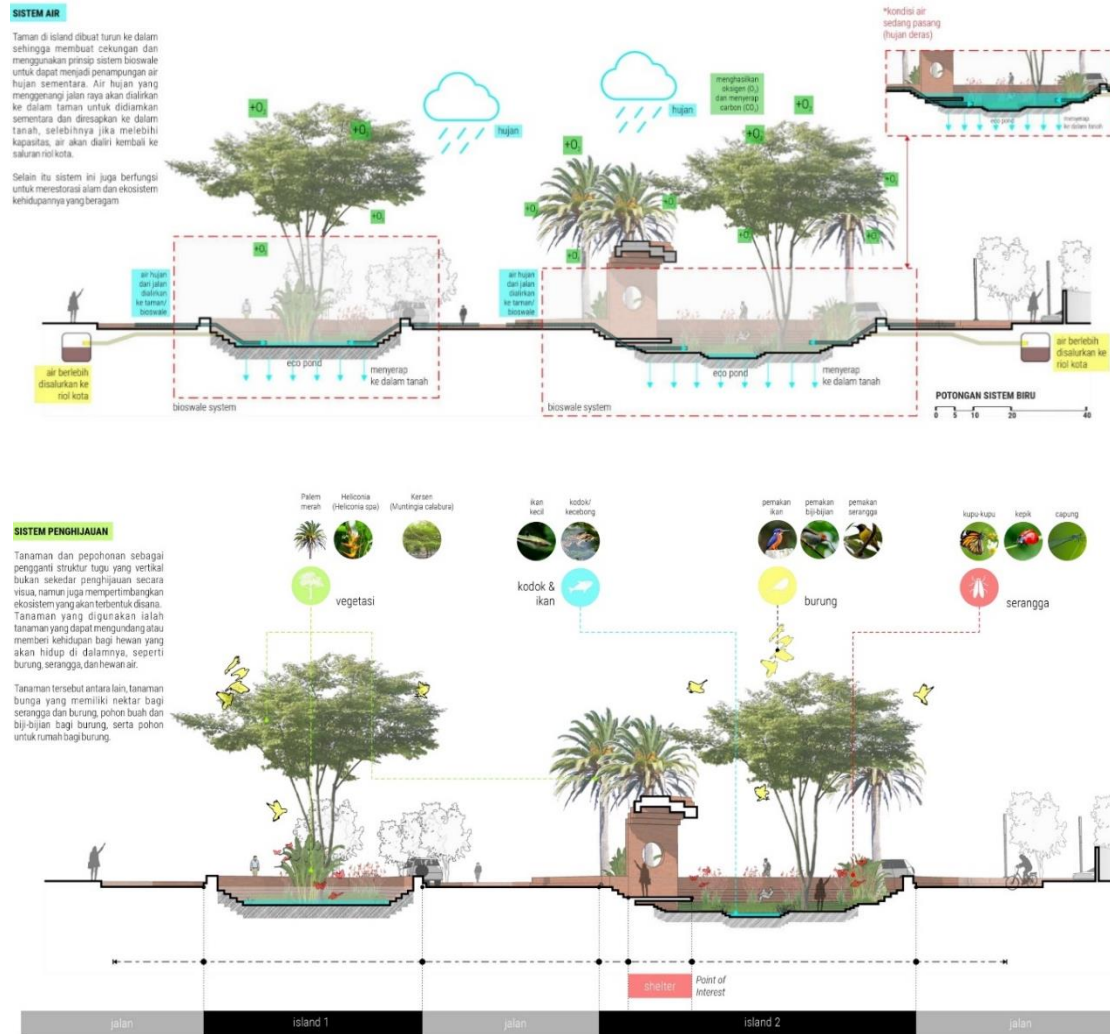


Fig. 11 The design's green and blue system

Source: Author, 2024

C. Mandala concept and spatial experience

The mandala design concept transforms the center of the intersection into a park, rather than simply featuring a single structural monument. The park's perimeter is constructed with terracotta bricks, and the surrounding area, including the sidewalks, is also designed with bricks to enhance the overall spatial experience. The combination of trees for shade, the platform, and the sidewalks creates a vibrant environment for both residents and passersby at the intersection. Additionally, the experience is enriched by the fresh air provided by the trees and the presence and sounds of various animals, including insects, birds, and small mammals.



Fig. 12 The spatial experience created by the design

Source: Author, 2024

The experience we aim to create extends beyond daytime into the night through the use of artificial lighting. Indirect lighting is installed around the perimeter, helping to define the platform after dark, as shown in the image below (figure 11). Within the park, spotlights are strategically placed to illuminate pathways, minimizing overall light exposure throughout the area. This approach ensures that artificial lighting does not disrupt nocturnal wildlife, thereby protecting the park's biodiversity.



Fig. 13 The night situation of the final design
Source: Author, 2024

5. Conclusion

The common design of landmarks at intersections has become a repetitive practice lacking justification. Furthermore, this typical design often overlooks environmental impacts and the spatial experience aspect of the architecture. The Mandala concept has emerged as an alternative for designing infrastructure at city intersections in Indonesia, rooted in local wisdom while preserving the characteristics of a landmark. Beyond its symbolic value, the Mandala concept provides broader benefits for cities and communities, such as: 1) enhancing spatial experience by creating a cohesive and interconnected visual design for the area, 2) improving air quality in the surroundings by capturing carbon emissions from vehicles and supporting local fauna, and 3) managing the water system by establishing basins or retention areas.



Fig. 14 The advantages of the implementation of the Mandala concept
Source: Author, 2024

This study presents the Mandala concept as a viable alternative for implementation in similar contexts, specifically regarding landmark design at intersections in Indonesian cities. The Mandala concept is designed to enhance the area by promoting greenery, diversity, and exploration. It is anticipated that this concept will inspire all stakeholders involved in urban development and city planning.

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