

DESIGN EXPLORATION OF LOCAL BAMBOO MATERIALS FOR AN ECO-FRIENDLY PHOTO SPOT BRIDGE IN *KAMPOENG BOENGA GRANGSIL*

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ABSTRACT

Kampoeng Boenga Grangsil (KBG) is a developing rural tourism destination located in Malang Regency, East Java Province, with its main attractions rooted in the natural landscape and community-based floriculture. The transformation of the KBG tourist destination has been conceptualized as a Master Plan for advancing KBG from 2020 to 2030. The KBG Development Masterplan for 2020-2030 constitutes a Long-Term Development Strategy (10 Years) for KBG, delineated into two distinct phases of development. As tourism activities grow, the demand for attractive and environmentally responsible support facilities becomes more urgent. One of the key challenges is the absence of iconic photo spots that can enhance the site's visual identity and visitor experience. This study aims to design a *photo spot bridge* using local bamboo material, integrating environmentally friendly architectural principles and a participatory approach involving local stakeholders. The research and design process adopted a community-based participatory method facilitated by a Community Service Program (Partner Village Development) team. The process involved collaborative ideation, material exploration, and co-construction with residents. Bamboo was selected as the primary material due to its local abundance, sustainable characteristics, and cultural relevance within the community. The design outcome is a bamboo photo spot bridge prototype that aligns with the site's natural aesthetics, supporting environmental sustainability and strengthening the destination's visual identity. Community participation throughout the planning and construction phases contributed to a strong sense of ownership and local capacity-building. The study recommends adopting similar participatory and material-conscious approaches for future facility development within *Kampoeng Boenga Grangsil* and other rural tourism destinations. It also highlights the importance of incorporating eco-education elements and sustainable construction techniques in long-term tourism development strategies.

Keywords: participatory design; local bamboo; environmentally friendly architecture; photo spot bridge; *Kampoeng Boenga Grangsil*.

INTRODUCTION

Background

Kampoeng Boenga Grangsil is a community-based tourism destination currently developing in Malang Regency. This area is known for its rich floriculture, managed independently by residents, and its pristine rural atmosphere. These characteristics make this area attractive to tourists looking for an authentic, natural, and local value-laden tourism experience (Mankong, 2021; Shang, Qiao, and

Chen, 2020; Wikantiyoso et al., 2021). The potential for organically developing floriculture is the main attraction, with various types of ornamental plants and flowers that are not only economic commodities but also essential elements in the aesthetics and identity of the area. Along with the increasing enthusiasm of tourists, both from local and outside the region, *KBG* has begun to transform into a potential agro-tourism location. The tourism activities offered are no longer limited to enjoying the flower garden's beauty but have also started to lead to more profound experiences, such as educational tours, floriculture training, flower craft workshops, and cultural activities based on local wisdom (Khoir & Dirgantara, 2020; Sosa, Aulet, and Mundet 2021). This concept aligns with the experiential tourism approach, which emphasizes the active involvement of tourists in authentic activities that reflect local life (Rasid et al., 2013).

The potential of *KBG* as a tourist destination lies in its natural and floral attractions and the community's active involvement in the area's management and development (Wikantiyoso, 2020; Wikantiyoso et al., 2020). Community-based tourism (CBT) has proven effective in improving local welfare without sacrificing social and cultural values (Seprillina et al., 2021). Through CBT, residents become the leading actors in the tourism sector and have the space to maintain their cultural identity while gaining direct economic benefits (Wikantiyoso, 2021).



Figure 1: Master Plan for the Development of Kampong Boenga Grangsil 2020-2030 (Wikantiyoso et al. 2022)

The development of the *KBG* tourist destination has been realized as a Master Plan for developing *KBG* 2020-2030. The *KBG* Development Masterplan 2020-2030 is a Long-Term Development Plan (10 Years) of *KBG* in 2 development stages (Figure 1). The First Development Stage (2020-2025) is strengthening the Physical Facilities of the *KBG* tourist destination for an area of 16,244 m². This area is the main area, covering 10 residents' houses and two citizen participation areas. The Phase II area (2026-2030) covers an area of 7,430 m², so the total development area reaches 23,674 m². This Master Plan is a product (output) of the Partner Village Development Program (PPDM 2020) in *Grangsil* Hamlet, *Jambangan* Village, *Dampit* District, *Malang* Regency. The area of 16,244 m² in the first phase of development is a participatory land, combining 10 home yard landowners, who together formed a unified tourist destination (park), *Kampong Boenga Grangsil*. Based on brainstorming with residents, in the first phase, it was agreed to develop *Grangsil* Spot Photo, which utilizes unproductive residents' land, as a form of resident participation in developing this tourist destination.

In addition, a participatory approach in developing tourist areas is key to ensuring social and ecological sustainability. In the context of *KBG*, community involvement in the planning and

implementation tourist facilities is an important part of an inclusive and resilient development strategy. Building a visual identity for the area through local architectural elements, such as bamboo photo spots, is one concrete step to strengthen the destination's image while maintaining harmony with the local environment and culture.

Based on data from the Malang Regency Tourism and Culture Office, throughout 2023, around 3.1 million tourist visits were recorded in the Malang Regency area. The tourism sector has enormous economic potential and has the potential to become one of the main drivers of regional development. However, increasing the number of visits also brings new challenges, especially in providing adequate supporting facilities and sustainable area management. As Su et al. (2023) stated, the growth in tourist visits needs to be balanced with a development strategy oriented towards economic benefits and social and environmental sustainability.

Developing planned tourism infrastructure based on local needs is crucial in this context. Functional facilities that reflect cultural identity and are environmentally friendly will provide added value to the destination. According to Gössling and Hall (2006), a sustainable and adaptive planning approach can minimize pressure on local resources due to increased tourism. In addition, community participation in decision-making and implementation of tourism projects is also a key factor in creating a resilient tourism area. As Surya (2020) explained, local community involvement can strengthen a sense of ownership of tourism assets and encourage collective resource conservation.

Tourism Destination Facility Design Problem

The development of physical facilities to support tourism activities in *Kampoeng Boenga Grangsil* is still relatively limited. Although the main attraction of this area lies in floriculture and the natural rural atmosphere, the lack of iconic visual elements makes the tourism experience feel incomplete. One of the urgent needs is the presence of photo spots or landmarks that have aesthetic value and can become symbols of the area and strengthen local identity. The presence of iconic visual elements is significant in creating a deep impression for tourists and increasing the potential for promotion through social media, which is now one of the most effective tourism marketing tools (Gupta et al., 2021).

Tourist landmarks have a dual function: as spatial orientation in the regional landscape and as a representation of local values that can strengthen the destination narrative. According to Ratten et al. (2019), creating a distinctive visual space can improve the image of a destination and create differentiation amidst global tourism competition. In addition, visually strong architectural or landscape elements also have an emotional impact, encouraging personal visitor involvement with the places visited (Urry & Larsen, 2011). Currently, the problem of *Kampoeng Boenga Grangsil* is that it has no prominent visual focal point or landmark that genuinely reflects the local cultural and natural identity. Therefore, planning an iconic photo spot based on local potential, such as bamboo, is a strategic step in developing the area's appeal.

In developing a nature and culture-based tourism area, it is important to design facilities that have aesthetic value, are also environmentally friendly, and are based on local potential (Deffinika et

al., 2022; Jugmohan et al., 2016; Prasetyo et al., 2024). This principle is important to ensure that development does not damage the area's original character while providing sustainable benefits to the local community. One strategic approach that can be taken is architectural design sourced from local materials and reflecting local cultural wisdom. Materials such as bamboo, in addition to being easily obtained locally, are also known as materials with a low carbon footprint and are easily renewable (Luis et al., 2013; Sharma & Sarmah, 2021).

The discussion in this article aims to develop the process of designing a bridge that also functions as an iconic photo spot in *Kampoeng Boenga Grangsil*, based on an ecological and participatory approach. This bridge will be a physical facility connecting tourist areas and will have a symbolic function as a regional landmark representing local identity. However, the design process faces several challenges, especially in balancing aesthetics, safety, material durability, and the ability of the structure to attract tourists visually. Another problem is designing a unique form that can still be built in a participatory manner and is easy for the community to maintain.

The design process is carried out in a participatory manner, involving residents in every stage from planning to implementation (Wikantiyoso et al, 2021). This approach aligns with the principle of participatory design, which emphasizes collaboration between designers and local communities to create contextual and sustainable results (Hoanh, Yen, and Trung 2018; Wikantiyoso et al., 2019). By involving the community directly, it is hoped that the resulting design reflects local needs, values, and aspirations and can survive socially and ecologically in the long term (Wikantiyoso et al., 2021).

LOCATION DESCRIPTION

Kampoeng Boenga Grangsil is located in *Grangsil* Hamlet, *Jambangan* Village, *Dampit* District, Malang Regency, East Java. Located on the slopes of Mount Semeru, this area offers a charming natural landscape in the form of green hills, neat flower gardens, and cool mountain air. Its location is easily accessible from the central district road (Figure 2). It is equipped with basic infrastructure such as parking areas, tourist kiosks, and pedestrian paths, making it a potential destination for future development.



Figure 2: Location of Kampoeng Boenga Grangsil Tourism Destination (Source: Author, 2020)

The area chosen for the construction of the photo spot bridge is in the center of the flower garden with gentle topography and open visuals towards the valley and forest, making it a strategic point to display visual landmark elements of the tourist area. The development of *Kampoeng Boenga Grangsil* results from collaboration between local communities and academics, primarily through mentoring by a team from the University of Merdeka Malang in the Partner Village Development (PPDM) program (Wikantiyoso et al., 2020). The PPDM team has taken a structured approach to physical and non-physical development, from providing tourism facilities to strengthening local community institutions and socio-culture. This approach shows the importance of academics in encouraging the transformation of villages into tourist destinations that are visually appealing and have a strong social foundation.

As applied in the development of *Kampoeng Boenga Grangsil*, the participatory approach is very relevant to the principle of community-based tourism (CBT), which emphasizes community empowerment as the leading actor in tourism management. Community-based tourism increases community involvement in the local economy and maintains cultural and environmental sustainability (Ballard et al., 2007; Fajarudin et al., 2024; Wardhani et al., 2021). In this context, using local materials such as bamboo and strengthening the technical capacity of residents are important steps in creating a sustainable design identity while making the photo spot bridge a unifying element between design, nature, and community.

THE SITE ANALYSIS

Site analysis in the photo spot bridge design project in *Kampoeng Boenga Grangsil* was done through an observational and participatory approach. Direct observation was carried out to identify the physical condition of the site, visitor activity patterns, and visual potential from various vantage points. The site has a relatively gentle slope, with a natural elevation that supports the construction of light structures such as bamboo bridges without requiring primary intervention to the land contour. Site accessibility is also considered good because it is on the main visitor route surrounding the flower garden (Figure 3).

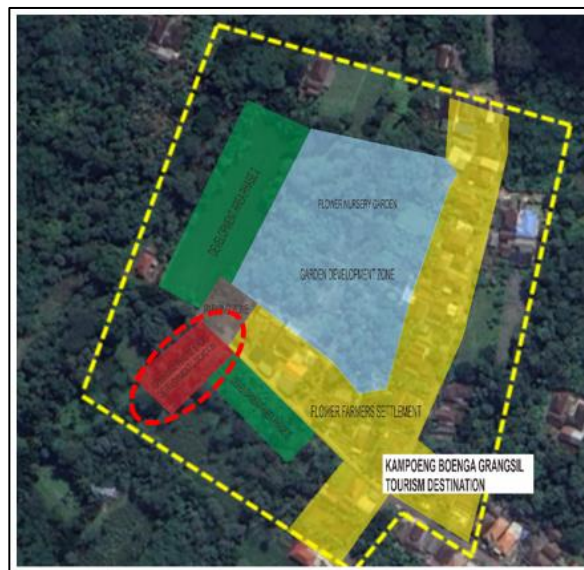


Figure 3: Grangsil Bridge Photo Spot Site Location (Source: Author, 2025)

In addition to physical factors, sociocultural aspects are also considered in site analysis, which aligns with the community-based planning approach that places the community as the primary source of local information (Strake & Simonds, 2013). In the context of outdoor space design, Lynch's theory regarding imageability or visual readability is applied to select the most visually powerful point to be used as a focal point (Al-Kodmany, 2001). The open site area with a background of vegetation and mountainous landscapes creates a high vista in visual value, making it ideal as a place for a landmark structure such as a photo bridge.



Figure 4: Annual Flowers vegetation, and ornamental plants as a potential location (Source: Author, 2019)

Around the area, there are annual flower vegetation and ornamental plants developed by the community, so the structure must pay attention to the aspect of visual integration so as not to interfere with the natural aesthetics of the site (Figure 4). In addition, visual mapping is carried out to analyze the visitor's line of sight, the position of the sun, and the direction of the wind to ensure comfort and material resistance to weather exposure. An ecological approach is also used to maintain the sustainability of the site environment. One is considering the wind's direction and the sunlight's intensity to reduce the impact of natural bamboo weathering (Figure 5). Ecological design emphasizes the importance of the reciprocal relationship between the built environment and the surrounding nature, including reducing ecological impacts through designs that blend with the landscape (Yeang, 2007).

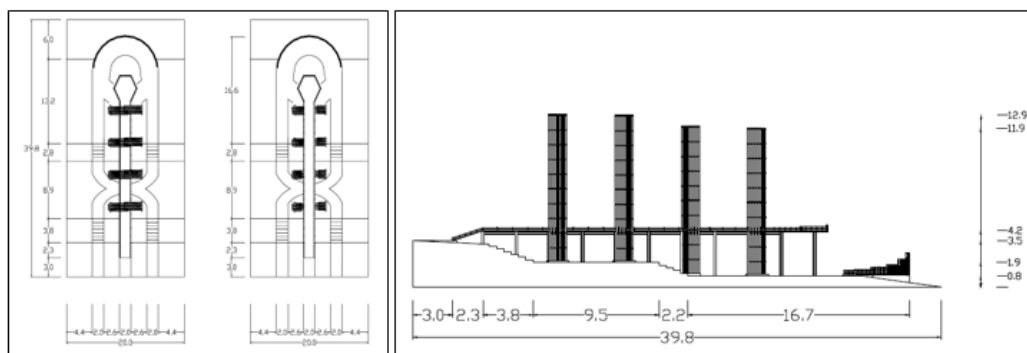


Figure 5: Site Plan and Section of Grangsil Photo Spot, as Contur Respon Design (Author, 2020)

With this approach, the bridge design is not only an architectural element, but also an integral part of the ecological and social system in the tourist area. The participatory approach also involves the community in analyzing needs and interpreting space, making the design results more adaptable and sustainable in the local context. The design of the Grangsil Photo Spot is also part of the development of the *KBG Destination* in the 2020-2030 Master Plan, which aims to strengthen and improve tourism infrastructure and sustainably promote local identity (Figure 6).

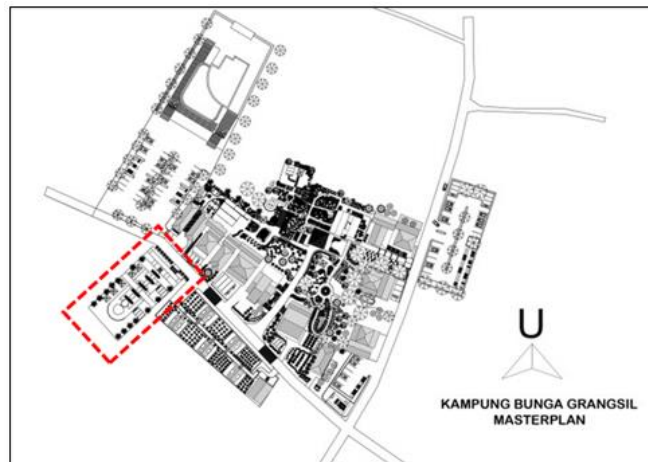


Figure 6: Grangsil Bridge Photo Spot Site in Kampong Boenga Grangsil Masterplan (Source: Author, 2020)

CONCEPTUAL APPROACH AND DESIGN THEME

A conceptual approach is key to producing contextual and sustainable designs for public facilities in nature-based tourism areas such as *Kampoeng Boenga Grangsil*. The approach in this context is interpreted as identifying core problems, collecting data, and developing systematic design solutions. The photo spot bridge was designed using an ecological approach as the primary basis, considering the hilly environment's sensitivity on Mount Semeru's slopes (Figure 7).



Figure 7: The bridge's light, open, and contour-following form reflects the strong principle of spatial legibility. (Source: Author, 2020)

This approach emphasizes the importance of harmony between the built environment and the existing ecological system by considering material, vegetation, and visual sustainability (Mycoo 2014; Scarano, 2017; Zölch, Wamsler, and Pauleit 2018)

In the context of outdoor space design, Kevin Lynch's (1960) concept of spatial legibility or imageability is used to identify the potential of space that can be a visual orientation. The bridge, as an architectural object in an open space, is intended not only for the function of the path but also as a visual focal point (landmark) that has a meaningful attachment to visitors. The bridge's light, open, and contour-following form reflects the strong principle of spatial legibility—easily identified, remembered, and inviting visual interaction (Figure 8).



Figure 8: Bamboo material considers availability, low carbon footprint, and culturally relevant construction techniques. (Source: Author, 2020)

As a supporter of the ecological concept, selecting local materials such as bamboo not only considers availability but also its low carbon footprint and culturally relevant construction techniques. According to Jain (2012), bamboo as an architectural material offers structural efficiency and strong local symbolism, making it an ideal solution for a sustainable design approach in tropical areas. The processing and construction carried out manually by residents using traditional methods also strengthens the value of social sustainability. This leads to creating a design that is not only vernacular in form but also in process.



Figure 9: Theme development in bridge design and environmental planning (Source: Author, 2020)

Furthermore, integrating local potential such as flowering plants and ornamental vegetation enriches the ecological and aesthetic aspects of the design (Figure 9). These local plant species are incorporated into the landscape through the addition of garden elements and environmental arrangements, creating spaces that are not only visually appealing but also ecologically harmonious. Using native ornamental plants supports biodiversity, reduces maintenance needs, and reinforces the sense of place, strengthening the connection between architecture, nature, and local identity.



Figure 10: Application of the theme of "sustainable contextual architecture" in design (Source: Author, 2020)

Considering these ecological, participatory, and spatial approaches, the design theme is "Sustainable Contextual Architecture." This theme emphasizes the harmony between form, function, and process, which are rooted in local culture and environmental ecosystems (Figure 10). The design of the photo spot bridge is not only present as an aesthetic visual object but also as a result of the synthesis of collective ideas and ecological responses to the site. In this project, these approaches do not stand alone; they reinforce each other by creating a design that is adaptive, meaningful, and long-term useful.

In addition, this design also applies a participatory approach, which, in the context of the architectural design of a tourist village, functions as a bridge between community needs and architectural ideas. This approach involves the community in decision-making, analyzing needs, construction, and managing design results. Sanoff (2000) states that participation in design and implementation is not just technical involvement but an educational process that forms spatial awareness, culture, and collective responsibility (Figure 11). Through this approach, the community is an object and a subject in the design implementation.



Figure 11: Community involvement in design and implementation (Source: Author, 2020)

CONCEPT ELABORATION IN DESIGN

The design of a bamboo bridge as a photo spot in *Kampoeng Boenga Grangsil* results from a synthesis of various conceptual approaches explained previously. Construction uses modular joinery techniques with natural Palm Fiber Rope and tie systems to symbolize sustainability and connectedness with nature (Figure 12), using metal or concrete elements to increase and support the strength of the bamboo, which must support the weight of many visitors (Jain, 2012).

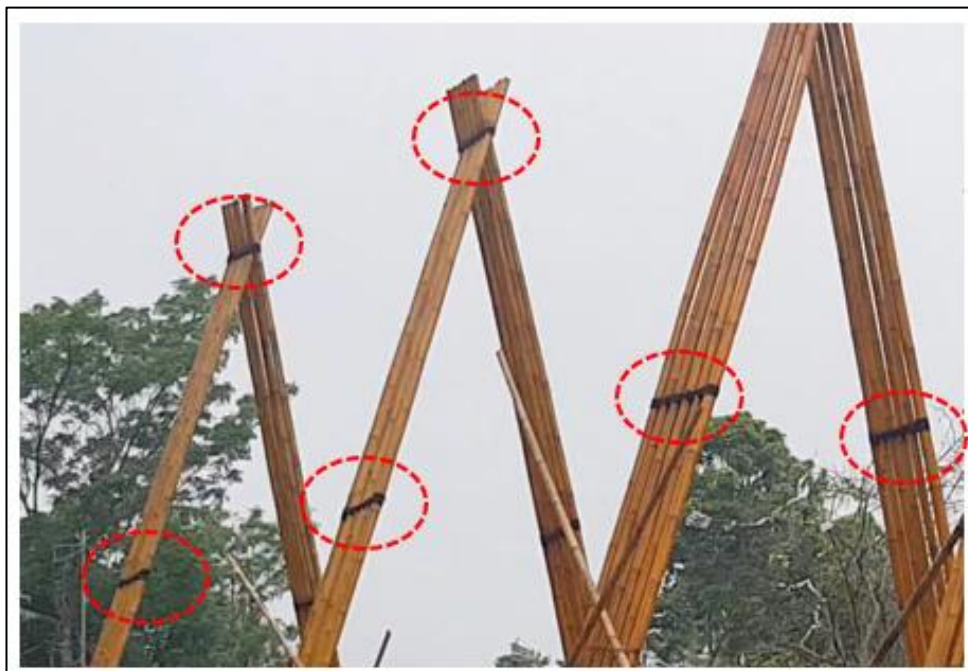


Figure 12: Natural Palm Fiber Rope and tie systems to symbolize sustainability (Source: Author, 2020)

Spatially, this bridge is placed strategically with an open line of sight towards the valley and the forest background, making it an attractive element in the landscape. This placement is based on the principle of visual readability (imageability) from Lynch (1960), which states that objects with a distinctive shape, strategic position, and connectedness to other elements in space can create a strong visual orientation for users. Therefore, the bridge is designed not only as an aesthetic object but as part of a spatial narrative that helps visitors understand and appreciate the character of the *Grangsil* tourist space (Figure 13).



Figure 13: The bridge design, an aesthetic object as part of a *Grangsil* spatial narrative (Source: Author, 2020)

The design visualization is realized as a lightweight bridge structure that blends with the land's natural contour, using local bamboo materials from around the area. The shape of the bridge follows the triangular lines to create a contrast form of the flower garden landscape, creating a visual narrative that is not only functional as a path but also as an architectural composition that invites visitors to interact (Figure 14).



Figure 14: Technical discussion of the development and evaluation of implementation with the community (Source: Author, 2020)

Ecological aspects manifest not only in the selection of materials but also in the construction system and post-construction impacts. The bridge design is arranged by considering wind direction, natural lighting, and rainwater flow (Figure 15). The bridge surface is coated with a natural protective material from environmentally friendly linseed oil that does not damage the bamboo structure. The structure is designed to be open, minimizing hard shadows and optimizing natural day lighting. This approach aligns with the idea of bioclimatic design by Rahmadiyah (2019), which emphasizes the importance of adapting the design to local microclimate conditions as part of ecological sustainability.



Figure 15: The structure is designed to be open, minimizing hard shadows (Source: Author, 2020)

At the social level, the bridge design is realized through a co-design process with the community, especially in determining the shape, bamboo carving motifs, and local symbolic elements included in the design. This process implements the participatory approach, where community participation is physical and involves strengthening local values and symbols (Grêt-Regamey et al. 2017; Putra and Silfiana 2019; Wikantiyoso et al. 2019). The community itself named the bridge, and this strengthens the emotional bond and sustainability of the social function of the facility. Thus, this project produces space and strengthens the narrative of togetherness, pride, and ecological education based on architecture.

In line with the customs and traditions of the local community, the construction process of the Grangsil Bridge also follows established cultural rituals. Before the physical work began, a traditional ritual ceremony (*selamatan*) was held to mark the start of the construction process. This ritual serves as a spiritual request for safety and smoothness in the building process and reflects the community's hope that the bridge will benefit society broadly. Integrating these cultural practices into the project reinforces the sense of ownership, respects local wisdom, and ensures that the development aligns harmoniously with the social and spiritual values of the local context (Figure 16).



*Figure 16: Joint prayer and laying of the first stone for the construction of the Grangsil Photo Spot
(Source: Author, 2020)*

As part of the meaning of outdoor space architecture, the visual aesthetics of the bridge are aligned with the principle of vernacular expression in tropical architecture. The structure uses local bamboo, chosen not only for their structural strength but also for their visual character that reflects local identity (Widiana & Wikantiyoso, 2018; Wikantiyoso et al., 2022). The knot and woven motifs found on the bridge's railings are inspired by traditional craft patterns, symbolizing unity, togetherness, and the intergenerational continuity of local wisdom. This aligns with Moughtin's (2003) perspective that outdoor space design can communicate cultural identity explicitly through form, texture, and spatial configuration—turning architecture into a storytelling medium rooted in the local context.

Beyond its function as a circulation element and visual landmark, the Grangsil Spot Photo also plays a strategic role as a multifunctional outdoor space. Its open setting, integrated with natural scenery and landscape elements, makes it an ideal space for spontaneous and programmed social activities. It serves as a public node that encourages gathering, interaction, and informal engagement—supporting the needs of both residents and tourists. The presence of locally cultivated ornamental plants enhances the environmental quality, creating a more comfortable and immersive spatial experience that reflects the village's ecological values.

In addition, the space has evolved into a venue for community-based activities such as outbound events and collective morning exercises, especially during group visits or community celebrations (Figure 17). These activities demonstrate the flexibility of the site in accommodating various uses—from recreation to physical wellness and education. The inclusive nature of this space encourages a sense of ownership and belonging among the local community while providing visitors with meaningful and participatory experiences. This multifunctional use reinforces the role of outdoor architecture not only as a passive backdrop but as an active agent in shaping social and cultural dynamics in rural tourism development.



Figure 17: Flexibility of the site in accommodating various uses (source: <https://bit.ly/GrangsilActivity>)

In summary, the design of this bamboo bridge is a tangible manifestation of the concept of contextual participatory ecological architecture. This bridge is a solution to the need for sustainable and meaningful tourism facilities through a design approach responsive to nature, rooted in local cultural values, and implemented with the community. It solves the space problem functionally and symbolizes the harmonious interaction between humans, culture, and the environment (Figure 18).



Figure 18: Design success; used by destination visitors for pre-wedding photos

CONCLUSION AND SUGGESTIONS

The design of the bamboo photo spot bridge in *Kampoeng Boenga Grangsil* is a comprehensive architectural response to the need for tourist facilities that are not only functional and visually appealing but also contextual, sustainable, and rooted in local culture. The main problem of the absence of iconic visual elements representing the area's identity has been answered through a mutually reinforcing ecological and participatory design approach. Through local materials such as bamboo, traditional construction techniques, and active community involvement in all stages of design and construction, this project presents a solution that is not only environmentally friendly but also empowers the local community socially and economically. The ecological architecture concept is realized as a lightweight structure that blends with the contours and landscape of the surrounding nature. At the same time, the design theme that emphasizes harmony, continuity, and cultural expression has succeeded in strengthening the area's appeal as a community-based agrotourism destination. The combination of spatial, ecological, and social

approaches makes this bridge more than just a tourist attraction, but also a symbol of collaboration and ecological awareness of the village community. The suggestions that can be given are the importance of implementing a similar approach in the development of other tourism facilities in rural areas, as well as the need for ongoing support in the form of technical training and strengthening local institutions, so that the success of this design can be replicated and continue to develop.

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