

Ecotourism Based Firefly Conservation Planning in Taro Village, Tegalalang, Gianyar

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Abstract— This research focused on the ecotourism-based firefly conservation planning in Taro Village, Tegalalang, Gianyar, Bali. The project is a collaborative effort between Warmadewa University and Journeyman International, aimed at conserving the declining population of fireflies due to rapid urban development and changes in natural ecosystems. Fireflies, recognized as environmental quality indicators, are crucial for biodiversity, and their conservation can also support local tourism and community development. The project identifies the lack of conservation facilities and planning as key challenges. The proposed solutions include designing environmentally-friendly structures that support firefly habitats, developing glamping facilities for ecotourism, and providing training to local communities on maintaining these habitats. The project follows a multi-phase approach: conducting initial surveys and observations, preparing schematic designs, engaging in focus group discussions (FGDs), and offering training on vegetation management for firefly conservation. Key outcomes of the project include the creation of 2D and 3D schematic designs for the conservation facility, the construction of mockup buildings for glamping, and the successful execution of community workshops aimed at enhancing knowledge about sustainable practices. This project not only aims to preserve the firefly population but also seeks to boost the local economy through sustainable tourism and community empowerment.

Keywords— Conservation, ecotourism, firefly, community empowerment, sustainable development.

I. INTRODUCTION

Fireflies are a unique part of the natural ecosystem. However, in recent decades, the population and distribution of fireflies have drastically declined due to rapid urban development, which has significantly altered natural forest ecosystem [1]. Fireflies are a reliable indicator for measuring environmental quality because their populations correlate with the availability of healthy habitats [2][3]. The habitat of mosquitoes is highly variable and is greatly affected by changes in landscape patterns and structures, such as the conversion of forested areas into open fields, residential gardens and agricultural fields [2].

The village of Taro, located in the Tegalalang District of Gianyar Regency, is an area that has a habitat for fireflies, which has now become a new attraction as a tourist destination. Tourists are invited to enjoy views such as rice fields and untouched forests, and at night, they can see the beautiful shimmering lights coming from fireflies. With that potential, conservation activities need to be carried out to maintain the firefly population, one of which is by creating

eco-tourism-based conservation facilities. Thus, this ecotourism activity aims to support conservation efforts both financially and operationally, and it can also provide access benefits for tourists and the community who wish to learn and understand the importance of fireflies for the ecosystem.

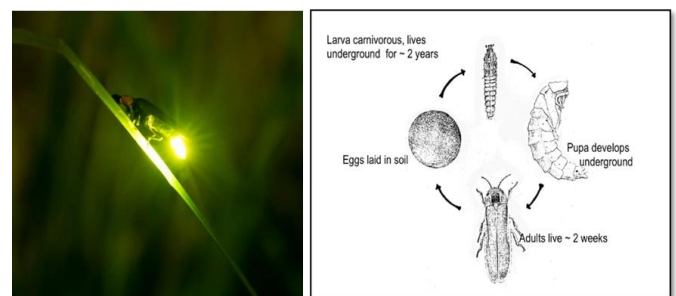


Fig. 1. Firefly (Lampyridae)

This situation has caught the attention of a partner, namely Journeyman International, which is an international nonprofit organization that provides services in the fields of architecture, engineering, and project management for international humanitarian and development organizations. Collaborating with Warmadewa University through the partner study program in Architecture, Journeyman International aims to plan a firefly conservation facility based on ecotourism in Taro Village, Tegalalang. This planning will involve volunteers from Journeyman International as well as a team of lecturers and students from the Architecture Department of Warmadewa University. The plan is for this conservation facility to accommodate volunteers, researchers, or visitors who wish to learn about the life cycle of fireflies. The concept for the design of this building is planned to draw inspiration from the growth process of fireflies from birth to adulthood. Eventually, this planning process will involve partner volunteers, a team of lecturers, and students working together to design a firefly conservation facility. The plan for this firefly conservation facility is expected to help preserve the population of fireflies in Taro Village, as well as provide a platform and workshops for volunteers, students, or researchers who wish to learn about fireflies. In addition, this firefly conservation facility based on ecotourism can enhance the economy of the community in Taro Village, particularly in the tourism sector.

II. PURPOSE AND BENEFITS

A. Purpose

The purpose of the research activity titled "Ecotourism Based Firefly Conservation Planning in Taro Village, Tegalalang, Gianyar" includes:

- Assisting partners in providing innovations in the development and planning of ecotourism-based firefly conservation facilities in Taro Village, Gianyar.
- Helping partners in preserving the habitat of fireflies in Taro Village, Gianyar.
- Improving the economy of the community in Taro Village through ecotourism activities.

B. Benefits

The benefits of implementing the research activity titled "Ecotourism Based Firefly Conservation Planning in Taro Village, Tegalalang, Gianyar" include:

1. Benefits for the Community:

- Providing assistance in innovation related to the planning of firefly conservation facilities based on ecotourism, so that partners gain an understanding of how to carry out the necessary schematic design concepts during the construction process later on. So that this firefly conservation facility can function well and have a design that meets the needs of users, in this case, partners and visitors of this ecotourism.
- It is hoped that the establishment of this ecotourism-based firefly conservation facility will enhance the economy of the partners and indirectly impact the economy of the surrounding community.
- Training and socialization in agriculture aimed at partners and the surrounding community to understand the vegetation that can protect the habitat of fireflies. So that the community knows which vegetation needs to be planted to increase the firefly population and improve the quality of its habitat.

2. Benefits for the University:

- Collaboration between KNWSA as a partner, stakeholders, and Warmadewa University to plan and provide a master plan design concept for a firefly conservation area based on ecotourism. (IKU 3 dan 6).
- The team consists of 5 lecturers with different expertise and responsibilities. This area of expertise includes Architecture Lecturers with skills in architectural design for buildings and facilities within the firefly conservation area. Additionally, there are Architecture Lecturers with expertise in urban design. The last one is an Agriculture Lecturer who will help provide socialization regarding vegetation that can support the conservation and sustainability of firefly species (IKU 5).

3. Benefits for Individuals:

- Individuals can develop new skills such as leadership, project management, communication, and interpersonal skills.

- Engaging in community service provides a sense of satisfaction and achievement as they can see the positive impact of their contributions.
- Community service activities open up opportunities to meet new people and build a broader social or professional network.
- Individuals involved in community service often become more aware of social issues and the challenges faced by the community.

III. METHODS

The implementation of the International Service activity takes the form of planning a firefly conservation facility based on ecotourism, consisting of several stages, namely:

A. Observation and Field Survey

Observation and field survey are conducted through direct observation at the site to assess the existing environmental conditions of the firefly conservation facility located in Tegaldukuh camp, Taro Village, Tegalalang, Gianyar. Observation is a method of collecting data by directly observing research objects or subjects in their environment. Researchers observe behavior, interactions, and other phenomena without manipulating the situation being studied [4]. Next, an initial mapping is conducted to determine the boundaries of the area and which points will be organized and planned. In addition, the research team conducted a survey through in-depth interviews with partners. These interviews were carried out to obtain detailed information about their experiences, perspectives, and understanding of a specific topic [5].



Fig. 2. Observation and site survey

This initial observation activity involved representatives from Journeyman International partners, namely Jaime Noriega and Carly Althoff. This observation activity concluded with the signing of a Partnership Statement by those willing to collaborate with the research team of Warmadewa University. At the observation stage and further surveys, the service team members with expertise in architecture led the data collection of potential issues and measurements in the field using laser and manual tape measures, which were then sketched for transcription into drawings. The sketches created consist of existing sketches and estimated design sketches from the master plan to the arrangement of the area's spots. In this follow-up survey, a deeper exploration was also conducted regarding the

boundaries of the area, the condition and contours of the land, as well as the condition and dimensions of the existing roads.

B. Preparation of Schematic Design Drawings for Firefly Conservation Facility Based on Ecotourism

Architectural schematic drawings are simplified visual representations of architectural designs that highlight the key ideas and structural elements. In the early phases of design, this picture is usually used to show the relationships between spaces, the building's orientation, and the arrangement of the primary functions. It does not include particular details like exact measurements, materials, or decorative components. Before going into any technical specifics, the goal of schematic drawings in architecture is to provide clients or the project team a basic knowledge of the design concept [6].

There are a few fundamental phases in making schematic drawings that are applicable to many disciplines, including electronics, engineering, and architecture. According to Smith [7], the following is a general guide for drawing schematic diagrams. Provide the following general guidelines for drawing schematic diagrams:

- Establish the Goal and Role: Decide whatever idea or purpose you wish to illustrate. This will serve as the schematic diagram's foundation.
- Determine the Principal Elements: Ascertain the essential elements that must be present in the picture. This might apply, for instance, to primary spaces and structural elements in architecture or to parts like resistors, capacitors, and other components in electronics.
- Utilize Standard Symbols: Schematic drawings in many domains utilize standard symbols. For instance, resistors, switches, and batteries all have standard symbols in electronics. Doors, windows, and other architectural elements are represented by conventional symbols.
- Relationships Between Components: Sketch the connections between the components. This might be lines in schematics for electronics that indicate electrical connections, or it could be the arrangement of buildings or spaces in architecture.
- Keep It Simple: Complex details are usually not included in schematic designs. Don't worry about adding ornamentation or exact measurements, just concentrate on straightforward illustrations that convey the essential ideas.

C. Presentation and Consultation with Partners (Focus Group Discussion)

Presenting the design outcomes to the Wana Segara Alaslinggah Fishermen Group comes next, following completion of the masterplan's design proposal. A Focus Group Discussion (FGD) was used in the presentation activity to facilitate talks and consultations on the masterplan design. The goal of the FGD is to thoroughly examine each participant's opinions, attitudes, experiences, and ideas in a participatory setting [8]. The FGD results will serve as a guide for refining the idea and design of this firefly conservation facility. At this point, all partner feedback and

recommendations will serve as inspiration for design changes so they may create the desired design.

D. Building design mockup

The next stage is to create a mockup following the FGD's final decision and design revisions. A building mockup is a tangible or digital model of an architectural plan intended to give a general idea of some building components prior to the start of construction. Typically, this model is used to test or showcase specific elements of a building, including the materials, lighting, construction, or aesthetics. A mockup in architecture can be a small-scale model or a portion of a full-scale architectural feature. Architects, customers, and contractors frequently utilize mockups to more accurately envision and assess design elements [9]. But in order to make the mockup easier to understand, it will be made in a 1:1 scale. This mockup will be reference for the actual construction.

E. Socialization of vegetation for firefly habitat

In order to propagate efficient techniques for growing vegetation that supports firefly habitat, an all-encompassing and instructive strategy is required. Various techniques for socializing can be employed, as stated by Evans et al. (2021):

- Counseling and Workshops: Organizing counseling sessions to educate the neighborhood on the value of firefly habitat and the plants that sustain it. These courses, which concentrate on caring for plants that attract firefly, can be conducted in community centers, educational institutions, or outdoor gatherings.
- Practical Training: This type of training covers real-world skills like how to grow the right kind of plants, make little green spaces all throughout the house, or design a garden only for fireflies.

IV. RESULTS

A. Schematic Design of Facilities for Ecotourism Based Firefly Conservation

This firefly conservation facility's schematic design incorporates biomimicry as a design concept. Especially in the context of sustainability, biomimicry design is a design method that uses natural processes, models, and principles to produce novel solutions to human challenges. Through the use of biomimicry, designers may produce more eco-friendly and efficient structures, systems, and goods by emulating natural techniques. In order to improve sustainability and efficiency, this idea is frequently used in technology, goods, architecture, and urban planning [10]. The idea of fireflies is used as the biomimicry subject in this design. This design idea aims to give guests a sense of the firefly life cycle. Furthermore, the building is made with natural materials such as bamboo so that fireflies are not disturbed by the presence of this conservation facility.

B. Mockup Building of Glamping Ecotourism Building Fireflies

In the early stages of the construction process, after conducting a focus group discussion with partners, it was decided to build a 1:1 scale mockup of the glamping building.

With the partner's approval, this mockup started to be developed in the ecotourism sector. The purpose of creating the mockup is to understand how the building is constructed and operates as a glamping facility. In addition, to assess the strength of the structure and the durability of the materials used in the building. If the mockup building is deemed successful, the overall construction process of the glamping building in the firefly ecotourism area will proceed.

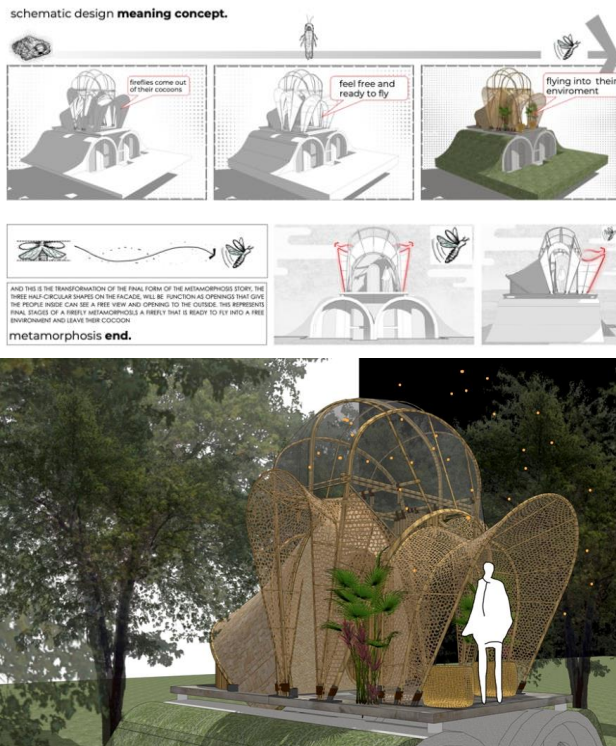


Fig. 3. Schematic design of the glamping for the firefly ecotourism



Fig.4. Mockup construction process

C. Socialization to partners regarding vegetation that can improve the quality of firefly habitat

To help improve knowledge, skills and also increase efficiency in savings and loan activities of fishermen group members. The research team conducted training on bookkeeping using computer software. This activity was welcomed by partners who hoped that this training could be developed further. Vegetation that can improve the quality of firefly habitat usually focuses on plants and environmental conditions that support a healthy ecosystem, high humidity,

and the right food sources. Some types of vegetation and conditions that can support firefly habitat include:

- Broadleaf Trees and Shrubs:** Trees that provide shade and maintain soil moisture are essential for fireflies. Examples of common trees include oak, maple, and willow. This vegetation helps create a humid microclimate, which is important for the life cycle of firefly larvae.
- Fertile Ground Cover Plants:** Ground cover plants such as ferns, ivy, and moss can maintain soil moisture and provide protection for firefly larvae. These plants also serve as a safe haven from predators and help maintain the humidity needed by fireflies.
- Wild Grasses and Herbs:** Wild grasses such as clover and herbs such as thyme can provide breeding grounds and add diversity to the firefly habitat.
- Flowering Plants That Attract Small Insects:** Adult fireflies need vegetation that attracts small insects to feed on, as well as flowers that produce nectar. Some examples of flowering plants are goldenrod, mint, and milkweed.
- Vegetation Near Water Bodies:** Fireflies are often found near water sources such as ponds, streams, or wetlands, as these provide a moist environment for larvae and a food source. Aquatic plants such as cattail, papyrus, and bulrush help maintain these ecosystems.

By combining these types of plants, and maintaining an environment that is moist, rich in organic matter, and free from excessive light pollution, an ideal habitat for fireflies can be created [11].

V. CONCLUSION

Based on the community service activities that have been carried out, several important points can be concluded from this report, namely:

- Main Problem:** The decline in the firefly population in Taro Village due to urbanization and changes in the natural ecosystem. This condition necessitates careful consideration in the design of conservation facilities that align with ecotourism principles.
- Proposed Solution:** The research team presents a solution by designing environmentally friendly buildings that promote the sustainability of fireflies, along with training and support to preserve their natural habitat. The main focus includes preparing conservation design drawings, constructing glamping facilities, and providing community training.
- Implementation Method:** This activity is conducted through several stages, including field observations and surveys, creating schematic designs, group discussions (FGD), and training related to vegetation that supports firefly habitats.
- Activity Results:** The team successfully compiled a master plan and design for ecotourism-based firefly conservation, constructed a mockup of a glamping building, and provided training to the community on environmental conservation.
- Project Benefits:** This conservation effort is anticipated to not only protect fireflies but also enhance the local economy through tourism and community empowerment.

Overall, this project has a positive impact on the environment and local communities through a sustainable ecotourism approach.

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