



# Criteria For Classifying and Evaluating Environmentally Friendly Materials in Community -Based Tourism in Vietnam

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Date of Submission: 14-03-2026

Date of Acceptance: 27-03-2026

**ABSTRACT:** In the context of the transition toward sustainable tourism development, the selection and use of environmentally friendly materials play a critical role in community-based tourism models in Vietnam. This study aims to develop a scientifically grounded set of criteria for classifying and evaluating environmentally friendly materials that are appropriate for local ecological, economic, and cultural conditions. Drawing on theories of sustainable development, green materials, and Life Cycle Assessment (LCA), the study proposes two main groups of criteria: (1) classification criteria and (2) criteria for evaluating the effectiveness of material use. The findings provide a scientific basis for material selection across the planning, design, implementation, and operational phases of community-based tourism, thereby contributing to sustainable direction.

**KEYWORDS:** Materials; environmentally friendly materials; community-based tourism; sustainable development; LCA; Viet Nam.

## I. INTRODUCTION

In recent years, community-based tourism in Vietnam has expanded significantly and become a key direction in the national strategy for sustainable tourism development. This form of tourism is

## II. THEORETICAL BASIS OF THE NIGHT-TIME ECONOMY

### Theory of Sustainable Tourism Development and Community-Based Tourism

Sustainable tourism is one of the key theoretical foundations guiding the development of community-based tourism in the current context. According to the World Tourism Organization (2005), sustainable tourism refers to the development of tourism that meets the needs of present tourists and host communities while protecting and enhancing opportunities for the future. This approach

particularly prevalent in mountainous, rural, and ethnic minority areas, where rich cultural traditions and distinctive natural ecosystems are well preserved. The use of local elements such as traditional architecture, customs, cuisine, and community livelihoods not only diversifies tourism products but also stimulates local economic development.

However, this rapid growth also poses significant challenges, particularly in the development of tourism infrastructure. In practice, many community-based tourism facilities rely on modern construction materials that are poorly aligned with local ecological and cultural conditions. The overuse of materials such as concrete, plastics, and metals increases environmental pressures and undermines the authenticity of landscapes and traditional architecture..

In the context of climate change and the transition toward a green economy, material selection must be evaluated based on life cycle impacts, carbon emissions, recyclability, and ecosystem effects. For community-based tourism, which is closely linked to natural and cultural resources, this issue is increasingly critical. Therefore, developing a systematic set of criteria for classifying and evaluating environmentally friendly materials is essential for guiding sustainable development in this sector.

emphasizes a balance among three core pillars: economic, social, and environmental dimensions.

Within this framework, community-based tourism is considered a practical manifestation of sustainable development principles at the local level. According to Peter E. Murphy (1985), community-based tourism is a form of tourism development that relies on the active participation of local communities in decision-making and resource management. Harold Goodwin and Rosa Santilli (2009) further argue that the essence of community-based tourism lies not only in participation but also in equitable benefit distribution and enhancing community capacity.



In the context of Vietnam, community-based tourism is closely associated with the preservation of indigenous cultural values and the promotion of sustainable livelihoods for rural and mountainous populations. This creates specific requirements for the selection of construction materials, as such materials must not only meet technical standards but also be compatible with local landscapes and cultural identity.

#### **Theory of Environmentally Friendly Materials**

The concept of environmentally friendly materials originates from the fields of ecological architecture and sustainable construction. According to the World Green Building Council (2016), green materials are those that have minimal environmental impact throughout their life cycle, from raw material extraction, production, and transportation to use, disposal, or recycling.

According to Charles J. Kibert (2016), environmentally friendly materials should meet criteria such as reducing greenhouse gas emissions, conserving energy, minimizing the use of non-renewable resources, and ensuring human health and safety. In addition, green materials should be recyclable or biodegradable, thereby contributing to the reduction of solid waste and environmental pollution.

For community-based tourism, this concept is further extended toward a “localization” approach, which prioritizes the use of locally sourced materials such as bamboo, wood, and rammed earth. This helps reduce transportation costs, limit carbon emissions, and preserve traditional architectural identity. According to the United Nations Environment Programme (2018), the use of local materials not only provides environmental benefits but also enhances local livelihoods and community participation.

### **III. PROPOSED CRITERIA FOR CLASSIFICATION AND EVALUATION OF ENVIRONMENTALLY FRIENDLY MATERIALS FOR COMMUNITY-BASED TOURISM IN VIETNAM**

#### **Principles for Developing the Criteria System**

In research on the sustainable development of community-based tourism, construction materials are not merely technical inputs but also critical components that directly influence the ecological environment, cultural landscape, and economic efficiency of the model. Therefore, the development of criteria for classifying and evaluating environmentally friendly materials should adopt an interdisciplinary approach, integrating environmental science, ecological architecture, and sustainable tourism development.

The proposed criteria system is grounded in three fundamental principles:

(i) Life Cycle Assessment (LCA) approach: evaluating materials throughout their entire life cycle, from extraction and production to use and disposal;

(ii) Systems approach: considering the interactions between materials and natural, economic, and social environments;

(iii) Local context approach: ensuring compatibility with ecological, cultural, and infrastructural conditions in community-based tourism destinations in Vietnam.

Based on these principles, the criteria system is structured into two main groups:

(1) Criteria for classifying environmentally friendly materials;

(2) Criteria for evaluating the effectiveness of material use in community-based tourism.

#### **Criteria for Classifying Environmentally Friendly Materials**

The classification criteria for environmentally friendly materials are developed based on a life cycle approach, systematically considering stages from material origin and production processes to use and disposal. Accordingly, materials are categorized based on their level of impact on natural and social environments, providing a foundation for evaluating and selecting appropriate materials for community-based tourism activities.

- **Criteria on material origin:** Material origin is a core criterion reflecting the degree of dependence on natural resources. Materials can be classified into natural materials, rapidly renewable materials (e.g., bamboo), and recycled materials. Locally sourced materials with high renewability and low reliance on non-renewable resources are rated more highly, as they help reduce transportation emissions and support local livelihoods.

- **Criteria on environmental impact:** This criterion evaluates environmental impacts generated during production, including greenhouse gas emissions, energy consumption, and the generation of solid waste and wastewater. Environmentally friendly materials are those with low emission intensity and production processes that cause minimal pollution, aligning with carbon reduction requirements.

- **Criteria on recyclability and reusability:** Recyclability reflects the potential to extend the life cycle of materials. Materials that are easy to disassemble, reuse, or recycle at the end of their life cycle contribute to reducing waste and alleviating pressure on local environmental management systems.



- **Criteria on biodegradability:** Materials with high biodegradability that do not release toxic substances or microplastics are prioritized, especially in eco-tourism areas. This criterion is particularly important in environmentally sensitive regions such as mountainous areas and nature reserves.

- **Criteria on human health safety:** Materials must ensure no emission of toxic gases, contain no hazardous chemicals, and pose no negative effects on human health throughout their life cycle. This is especially important in homestay models, where tourism spaces are closely integrated with daily living environments.

- **Criteria on contribution to ecosystem conservation:** This criterion assesses the extent to which materials help maintain natural landscapes, limit excessive concretization, and reduce environmental encroachment. Environmentally friendly materials should not only “minimize harm” but also “contribute positively” to ecosystems and tourism landscapes..

The proposed criteria for classifying environmentally friendly materials are summarized in the table below.

**Table 1.** Criteria for Classifying Environmentally Friendly Materials

No.	Criteria Group	Evaluation Content	Environmental Significance
1	Material Origin	- Source of raw materials - Renewability - Degree of dependence on non-renewable resources - Classification: natural, rapidly renewable, recycled	Reduces exploitation of non-renewable resources, limits transportation emissions, promotes the use of local materials, and supports community livelihoods
2	Level of Environmental Impact	- Greenhouse gas emissions during production - Amount of solid waste and wastewater - Risk of soil, water, and air pollution	Protects sensitive ecosystems and maintains the natural environment’s capacity for self-recovery
3	Recyclability and Reusability	- Ability to be recovered and reused - Ease of disassembly - Reduction of hard-to-treat waste	Reduces pressure on limited waste management systems and optimizes resource and cost efficiency
4	Biodegradability	- Decomposition time - Persistence in the environment - Risk of generating toxic substances or microplastics	Minimizes long-term pollution, suitable for nature reserves and eco-tourism areas

No.	Criteria Group	Evaluation Content	Environmental Significance
5	Human Health Safety	- No emission of toxic gases - No hazardous chemicals - No long-term health impacts	Ensures a safe living environment for local communities, tourists, and workers
6	Contribution to Ecosystem Conservation	- Protection of natural landscapes - Maintenance of forest, soil, and water ecosystems - Limitation of excessive concretization and environmental encroachment	Contributes to long-term conservation and sustainable development of community-based tourism

Source: Proposed and developed by the author.

### Criteria for Evaluating the Effectiveness of Using Environmentally Friendly Materials

The criteria for evaluating the effectiveness of using environmentally friendly materials are developed to comprehensively assess the impacts and values generated by materials throughout their life cycle and operational use in community-based tourism activities. This approach goes beyond environmental aspects to also encompass economic and social dimensions, thereby providing a basis for evaluating the effectiveness and sustainability of material use.

The specific evaluation criteria are presented in the table below:

**Table 2.** Criteria for Evaluating the Effectiveness of Using Environmentally Friendly Materials

No.	Criteria Group	Evaluation Content	Significance for Community-Based Tourism
1	Life Cycle Assessment (LCA)	- Comprehensive life cycle analysis: extraction, production, transportation, use, maintenance, disposal/recycling - Assessment of environmental impacts	Ensures a comprehensive evaluation, avoids one-sided judgments, and supports the selection of truly environmentally friendly materials
2	Overall Environmental Impact	- Impact on tourism landscapes - Impact on natural ecosystems - Impact on community livelihoods	Preserves landscapes, protects sensitive ecosystems, and maintains ecological balance at community-based tourism destinations
3	Reusability and Post-Use Waste Management	- Potential for reuse in other constructions - Ease of disassembly - Waste treatment methods	Reduces pressure on local waste management systems and aligns with limited



No.	Criteria Group	Evaluation Content	Significance for Community-Based Tourism
			infrastructure conditions
4	<b>Economic Efficiency</b>	- Initial investment cost - Maintenance and repair costs (reasonable level) - Durability and long-term efficiency	Ensures financial sustainability for community-based tourism models, prioritizing long-term benefits
5	<b>Tourist Acceptance</b>	- Level of tourist satisfaction - Awareness of green spaces - Compatibility with sustainable tourism trends	Enhances destination attractiveness, improves visitor experience, and strengthens tourism competitiveness
6	<b>Long-term Sustainability</b>	- Adaptability to climate change - Alignment with sustainable development orientation - Scalability of the model	Contributes to stable, long-term development and enables wider practical application

Source: Proposed and developed by the author.

The Life Cycle Assessment (LCA) method is employed as a fundamental scientific tool to comprehensively analyze the environmental impacts of materials throughout their entire life cycle. Specifically, LCA enables a systematic examination of all stages, including raw material extraction, production, transportation, construction, use, maintenance, and final disposal or recycling. This approach overcomes the limitations of partial or stage-specific assessments, ensuring that material selection is based on scientific evidence and fully reflects environmental performance.

On this basis, the criterion of overall environmental impact is established to evaluate the extent to which materials affect tourism landscapes, natural ecosystems, and local community livelihoods. In eco-tourism areas, where ecosystems are highly sensitive, this criterion plays a particularly critical role in ensuring a balance between tourism development and natural resource conservation.

In addition, the criterion of reusability and post-use management reflects the flexibility of materials at the end of their life cycle. Evaluation indicators include ease of disassembly, potential for reuse in other constructions, and waste treatment options. Prioritizing materials with high reusability helps reduce waste generation and alleviates pressure on local environmental management systems, especially in community-based tourism areas where infrastructure remains limited.

The criterion of life cycle economic efficiency is considered from a long-term perspective, including initial investment costs, maintenance and repair costs, and the durability of structures. Unlike traditional approaches that focus on short-term costs, this criterion emphasizes the overall efficiency of materials throughout their life cycle, thereby contributing to the financial sustainability of community-based tourism models.

Moreover, the criterion of tourist acceptance is incorporated to reflect market factors and user experience. Evaluation indicators include visitor satisfaction, awareness of ecological spaces, and alignment with sustainable tourism trends. In the context of the growing demand for sustainable tourism, this criterion is significant in enhancing destination attractiveness and competitiveness.

Finally, the criterion of long-term sustainability is integrative in nature, assessing the adaptability of materials to climate conditions, environmental changes, and sustainable tourism development orientations. It also considers the scalability and replicability of material use across different contexts. Accordingly, a material can only be considered truly environmentally friendly when it not only minimizes negative impacts but also contributes positively to the stable and long-term development of community-based tourism systems.

#### IV. CONCLUSION

The research results indicate that developing a set of criteria for classifying and evaluating environmentally friendly materials for community-based tourism in Vietnam is both necessary and highly feasible in the context of the transition toward sustainable development. The proposed criteria system is not only grounded in international theoretical frameworks such as LCA, ecological architecture, and sustainable development, but is also adapted to the specific ecological and cultural conditions of community-based tourism destinations in Vietnam.

First, the group of classification criteria clarifies the concept of “environmental friendliness” through key aspects such as material origin, emission levels, recyclability, and biodegradability. These findings are consistent with international studies on green materials, while also emphasizing the local dimension—an essential characteristic of community-based tourism in Vietnam. Prioritizing locally sourced materials such as bamboo and wood not only reduces environmental impacts but also helps preserve cultural identity and support community livelihoods.

Second, the group of criteria for evaluating



material use effectiveness expands the analytical framework beyond environmental aspects to include economic and social dimensions. This demonstrates that environmentally friendly materials should not be assessed solely based on physical or chemical properties, but also in relation to operational efficiency, tourist experience, and long-term destination development. Notably, the integration of LCA helps to overcome the limitations of traditional evaluation methods that focus on isolated stages.

However, the study also reveals several challenges in applying the criteria system in practice. First, the quantification of criteria, particularly those related to environmental and social aspects, still depends on the availability of data and specific measurement methods. Second, awareness among local communities and tourism stakeholders regarding environmentally friendly materials remains uneven, leading to suboptimal material choices. Third, the lack of specific policies and technical standards constitutes a barrier to the widespread implementation of green material solutions.

Furthermore, the study remains at the stage of proposing a theoretical and conceptual framework and has not yet been empirically validated on a large scale. Therefore, further research is needed to apply the criteria system to specific case studies in order to assess its applicability and refine it according to different ecological regions and tourism types.

#### IV. CONCLUSION

This study has developed a scientifically grounded framework for classifying and evaluating environmentally friendly materials in the development of community-based tourism in Vietnam. The criteria system is designed using an integrated approach based on Life Cycle Assessment (LCA) and sustainable development principles, consisting of two main groups: (i) classification criteria based on environmental characteristics, and (ii) evaluation criteria for material use effectiveness

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