

Ecological and Cultural Sustainability in Traditional Korean Houses in Yanbian

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Abstract: *This research examines into the ecological and cultural sustainability of traditional Korean houses, particularly in the Yanbian region. It emphasizes the intricate interplay between various design principles, the use of materials, and the active involvement of the community in preservation efforts. In an era marked by globalization and modernization, which often threatens to overshadow local customs and practices, it becomes increasingly vital to safeguard traditional architecture. This preservation is not just essential for maintaining ecological balance but also for securing the cultural heritage that these structures represent. The traditional Korean houses in Yanbian offer unique insights into sustainable living practices. These houses exemplify a harmonious integration of ecological design concepts, which prioritize sustainability and environmental consciousness. They utilize locally sourced construction materials that reduce the carbon footprint and support local economies. Moreover, these architectural forms foster community involvement, encouraging localized initiatives that aim to regenerate and maintain these valuable heritage sites. This study seeks to understand how traditional architectural techniques can inform and shape modern sustainable development practices. By analyzing the relationship between design, material use, and community participation, the research will explore how these traditional elements contribute to the preservation of cultural identity in a rapidly changing world. The findings aim to enrich the ongoing discussions surrounding sustainable design, underscoring the importance of embedding cultural values and practices into contemporary sustainability initiatives. Ultimately, this work aspires to highlight the relevance of traditional knowledge and practices in addressing modern ecological and cultural challenges.*

Keywords: Ecological Design, Cultural Sustainability, Korean Traditional Houses, Local Materials, Community Engagement

1. Introduction

The notion of sustainability has gained prominence amid global environmental challenges, necessitating a reassessment of conventional architectural techniques that align with nature. In the quest for sustainable development, numerous contemporary construction methods and materials have disregarded the ecological insights inherent in traditional architecture (Guo et al., 2021). This study examines the traditional Korean dwellings in Yanbian, an area where cultural history and environmental factors are closely interconnected. These residences, known for their architectural innovation and compatibility with local ecological circumstances, serve as a significant case study for analysing how ancient design methodologies might guide modern endeavours to attain both ecological and cultural sustainability.

Traditional Korean dwellings, known as hanok, are distinguished by their use of natural resources, including wood, stone, and clay, as well as their capacity to acclimatise to the local environment. In Yanbian, a region with a substantial Korean ethnic demographic, these residences embody decades of acquired wisdom in addressing natural limitations and cultural requirements (Kwon, 2023). The architectural concepts of these constructions prioritise harmony with the natural environment, optimisation of energy efficiency, and the use of locally sourced materials. Furthermore, the development and upkeep of these residences necessitate robust community involvement, wherein collaborative expertise and effort are vital for the preservation of architectural legacy.

Traditional Korean houses in Yanbian are becoming endangered due to growing modernisation and urbanisation. Nonetheless, their sustainability is crucial, not alone for ecological reasons but also for their cultural significance (Pascual et al., 2023). Ecological design approaches including natural ventilation, passive solar heating, and rainwater harvesting are becoming increasingly pertinent as global cultures strive to reduce the environmental effects of contemporary structures. The cultural sustainability of these dwellings is fundamentally anchored in community traditions, wherein the construction process and the transfer of building knowledge throughout generations are essential for preserving cultural identity (Loang, 2024).

This study aims to examine the convergence of ecological and cultural sustainability by evaluating three primary factors: the implementation of ecological design principles, the use of local building materials, and community involvement in regenerative initiatives. This research seeks to enhance the understanding of how traditional architecture can provide sustainable answers to contemporary difficulties by concentrating on these components (Hafez et al., 2023). Additionally, it will analyse the significance of community engagement in preserving both the physical and cultural aspects of these traditional houses. This study will elucidate how sustainable architecture techniques can be enhanced by incorporating cultural values, so increasing their resilience and adaptability to modern environmental and social demands.

Background of Study

The quest for sustainability has consistently been a primary focus in architecture and urban development, especially in light of escalating environmental issues such as climate change, resource depletion, and biodiversity loss. Sustainable architecture has recently become a crucial approach for alleviating the environmental effects of contemporary construction (Hossain et al., 2020). Nevertheless, considerable attention has been directed towards advanced technological advances and novel materials, while the ecological insights embedded in conventional construction methods have sometimes been neglected. This study examines the viability of traditional Korean dwellings in Yanbian, referred to as hanok, as a paradigm for attaining ecological and cultural sustainability.

The Yanbian Korean Autonomous Prefecture in northeastern China hosts a substantial ethnic Korean population, whose architectural legacy demonstrates decades of adaptation to the local environment. The traditional Korean houses in this region serve as both practical residences and representations of cultural traditions and ecological wisdom transmitted through centuries (Oh, 2023). The hanok in Yanbian, similar to those in Korea, are built using locally sourced natural materials, including timber, stone, and clay, and have design aspects that enhance energy efficiency and environmental harmony. Elements like ondol (underfloor heating), expansive eaves for shade, and the meticulous placement of the residence to optimise natural light and ventilation reflect a profound comprehension of the local climate and topography.



Figure 1: Traditional Korean house in Yanbian

These structures transcend ordinary shelters; they constitute an integral component of a broader cultural framework that underscores the synthesis of human activity with the natural environment. Traditional Korean houses in Yanbian are constructed with a philosophy that emphasises harmony between environment and human existence, achieving ecological balance through design decisions that reduce reliance on artificial energy and enhance the utilisation of natural resources. This idea corresponds with contemporary notions of sustainable development, wherein minimising carbon footprints and safeguarding ecosystems are fundamental objectives (Hariram et al., 2023). This study investigates the sustainability of these houses to reveal how historical design ideas might inform modern efforts to mitigate the environmental impact of the built environment.

The sustainability of traditional dwellings in Yanbian transcends their ecological role. These constructions serve as cultural artefacts that embody the values, customs, and communal dynamics of the Korean population in the area (Nam et al., 2020). The construction of hanok has traditionally been a communal endeavour, wherein expertise in building techniques, materials, and upkeep has been disseminated and inherited throughout families and communities. This facet of community involvement is essential for the survival of hanok, as it cultivates a shared sense of ownership and accountability for safeguarding cultural heritage. Sustainability regarding traditional Korean dwellings include not just environmental stewardship but also the preservation of cultural identity and social harmony.

As Yanbian encounters escalating challenges from modernisation and urbanisation, traditional residences are progressively supplanted by contemporary structures that frequently disregard the ecological and cultural values of their forerunners. The destruction of these monuments signifies not merely a loss of architectural heritage but also a disturbance of the region's cultural continuity (Weiss et al., 2022). This study underscores the necessity for a comprehensive approach to sustainability that amalgamates ecological design principles with the conservation of cultural traditions. This research examines traditional Korean houses in Yanbian as potential examples for sustainable development that honours environmental integrity and the cultural heritage of local populations.

The foundation of this study lies in the overarching themes of sustainable architecture, cultural preservation, and community-oriented regenerative initiatives. This research conducts a

thorough analysis of the ecological and cultural sustainability of traditional Korean houses in Yanbian, aiming to provide significant insights into how traditional architecture might influence modern sustainability practices (Zhuo et al., 2024). The objective is to illustrate that sustainable development encompasses not only technology progress but also the integration of historical insights and traditional knowledge into contemporary solutions.

Problem Statement

The swift advancement of modernisation and urbanisation has resulted in the prevalent implementation of modern construction methods that frequently emphasise efficiency and financial profit at the expense of environmental and cultural factors. Consequently, traditional architectural forms, evolved over ages and grounded in ecological principles, are increasingly endangered (Akbar et al., 2020). A significant issue is the escalating loss of traditional expertise and construction techniques related to the development and upkeep of Korean houses in Yanbian. As younger generations migrate from rural regions to adopt contemporary lifestyles in metropolitan centres, the transfer of traditional ecological knowledge and construction methodologies is declining. The erosion of knowledge jeopardises both the physical integrity of traditional houses and the cultural heritage they embody. In the absence of coordinated measures to record and safeguard these practices, the region jeopardises the loss of a priceless cultural asset.

Another issue is the environmental repercussions of contemporary construction technologies, which frequently supplant old, ecologically sustainable building practices with unsustainable alternatives. Contemporary construction materials like concrete and steel possess a significantly greater environmental impact than the natural elements formerly employed in Korean architecture, including wood, clay, and stone (Smil, 2023). Contemporary materials lead to increased energy consumption and carbon emissions throughout the construction phase and the buildings' life cycle, hence intensifying environmental degradation in the area.

The replacement of traditional architecture with contemporary, unsustainable structures is a significant concern in Yanbian. As economic development intensifies, numerous old houses are being razed to facilitate new constructions, frequently disregarding the cultural or ecological significance of the structures being dismantled (Shirazi et al., 2023). This trend not only fosters the homogenisation of the built environment but also results in the erosion of architectural diversity, which has traditionally been influenced by local environmental factors and cultural traditions. The substitution of classic residences with contemporary edifices overlooks the capacity of these structures to exemplify sustainable living amid global environmental issues.

An further issue is the insufficient incorporation of cultural sustainability into contemporary development programs. Despite the growing acknowledgement of sustainable architecture's environmental significance, cultural sustainability frequently goes unrecognized (Bassas et al., 2020). Traditional dwellings in Yanbian are ecologically sustainable and integral to the cultural identity of the local Korean community. Contemporary development policies often neglect the cultural importance of these residences, prioritising economic expansion and infrastructure effectiveness instead. Cultural sustainability is frequently compromised for the sake of advancement, resulting in the degradation of cultural legacy and communal togetherness.

The reduced significance of community involvement in the preservation and revitalisation of traditional architecture poses a considerable problem. The construction and maintenance of traditional Korean houses have historically relied on community involvement, with

collaborative effort and information exchange being essential components (Li et al., 2021). Nonetheless, as contemporary construction techniques prevail, community participation in these processes has significantly diminished. The mismatch between community involvement and conventional architectural procedures further jeopardises efforts to preserve historic dwellings. Active community involvement is essential for ensuring the long-term survival of both the ecological and cultural dimensions of these structures.

2. Literature Review

The notion of sustainability has been thoroughly examined in architecture, environmental science, and cultural heritage, establishing a basis for comprehending how historic construction methods might aid contemporary sustainability objectives. In recent years, the concept of sustainability has expanded to include not only environmental aspects but also cultural and social dimensions (Mies & Gold, 2021). This comprehensive definition acknowledges that sustainable development must include the requirements of both the environment and the communities residing within it, rendering the conservation of traditional architecture an essential concern. The literature on sustainable architecture provides significant insights into how ecological design principles, the use of local building materials, and community involvement can improve both ecological and cultural sustainability, especially for traditional buildings.

Ecological design principles are fundamental to sustainable architecture, fostering synergy between constructed settings and natural ecosystems. In traditional Korean architecture, these ideas are manifest in the construction of structures that harmonise with the local environment. Elements like natural ventilation, passive solar heating, and shaded eaves exemplify an advanced comprehension of optimising energy efficiency and reducing environmental effect (Ji et al., 2023). Ecological design principles encompass more than singular structures; they involve the harmonious integration of architecture with the landscape, ensuring that construction and maintenance techniques do not disturb local ecosystems. The literature emphasises the significance of these design concepts in minimising the ecological impact of structures and establishing living environments that are both comfortable and sustainable.

A crucial element of sustainable architecture is the utilisation of indigenous construction materials. Traditional Korean buildings in Yanbian demonstrate this method by utilising materials easily available in the local environment, including wood, stone, and clay (Liang, 2024). Utilising local resources minimises carbon emissions linked to the transportation of materials from far areas and guarantees that the structures are appropriately adapted to the local environment and conditions. Moreover, local materials frequently possess cultural significance, being linked to the history and traditions of the area. The literature highlights the significance of locally obtained materials in sustainable design, asserting their contribution to environmental sustainability and the preservation of cultural heritage.

Community interaction is a crucial aspect of sustainability, especially for traditional architecture. In numerous traditional civilisations, such as the Korean communities in Yanbian, the construction and upkeep of residences have traditionally been collaborative endeavours, engaging multiple generations and community members (Zhuo et al., 2024). This collective method guarantees the transmission of construction knowledge, safeguarding both architectural heritage and the social connections strengthened by collaborative effort. Research on community engagement in sustainability indicates that involving local communities in the construction and restoration of traditional buildings cultivates a sense of ownership and

accountability for preserving both the physical structures and their associated cultural practices. Moreover, community-driven regenerative initiatives tend to be more sustainable over time, as they guarantee that the structures align with the needs and values of their users.

The interaction of ecological design principles, the utilisation of local materials, and community involvement is essential for attaining both ecological and cultural sustainability. Traditional Korean houses in Yanbian exemplify the integration of sustainable living spaces that harmonise with nature and correspond with cultural values (Li & Li, 2024). The literature on sustainable architecture presents several case studies and theoretical frameworks that substantiate the notion that traditional building methods contribute significantly to sustainability. Nevertheless, it underscores the difficulties that emerge when ancient skills are inadequately incorporated into contemporary development programs or when they are supplanted by more industrialised construction methods.

Underlying Theory: Cultural Preservation Theory

Cultural Preservation Theory is based on the understanding that culture is a fundamental component of human identity, and its preservation is crucial for sustaining the social fabric of communities, especially amid rapid societal transformations like globalisation and urbanisation. The notion originated from the extensive domains of anthropology, sociology, and heritage studies, highlighting the necessity to save cultural practices, traditions, and artefacts endangered by external influences (Guo et al., 2021). Cultural Preservation Theory promotes the proactive protection of both intangible and material cultural assets, such as language, rituals, knowledge systems, and architecture, which collectively provide the foundation of a community's collective memory and identity.

Historically, the necessity for cultural preservation intensified with the advent of industrialisation and modernisation, which frequently resulted in the homogenisation of cultures and the degradation of local customs (Kwon, 2023). This trend was most pronounced in the post-colonial era, during which numerous indigenous civilisations globally confronted the peril of cultural dilution or extinction as modern economic and political institutions prevailed. Cultural Preservation Theory originated as a framework advocating for the protection and revitalisation of cultural assets. The notion asserts that culture is dynamic; it transforms throughout time, although this transformation must honour the foundational characteristics that characterise a community's lifestyle. Cultural preservation entails the deliberate endeavour to sustain and modify traditions to ensure their relevance in modern society.

A fundamental element of Cultural Preservation Theory is the concept of community engagement. The notion posits that cultural preservation should be a community-driven endeavour, wherein local inhabitants actively participate in the transmission of their cultural knowledge and traditions (Pascual et al., 2023). Cultural Preservation Theory advocates for communities to actively engage with their legacy, rather than only observing or documenting it, so assuring its ongoing practice and integration into everyday life. This viewpoint closely corresponds with the examination of traditional Korean residences in Yanbian, where the construction and upkeep of these dwellings have historically been a collective endeavour. The engagement of local communities in safeguarding their architectural heritage is essential for maintaining both the ecological and cultural aspects of these structures.

A crucial element of the theory is the intergenerational transmission of knowledge. Cultural Preservation Theory asserts that cultural traditions must be transmitted from one generation to

another to ensure their preservation. This transmission method guarantees the continuation of cultural practices, despite societal transformations. This pertains to both the physical construction methods and the foundational concepts and values that guide these practices in traditional Korean dwellings (Hafez et al., 2023). By instructing newer generations in the construction and upkeep of these dwellings, the community guarantees the preservation of the cultural heritage linked to traditional architecture. The transfer of intergenerational knowledge is a crucial connection between Cultural Preservation Theory and the sustainability of traditional Korean dwellings, since it underpins both ecological resilience and cultural continuity.

Cultural Preservation Theory also encompasses the notion of adaptation and resilience. The notion supports the preservation of cultural traditions while recognising that cultures must be dynamic and flexible to thrive in evolving settings. This is especially pertinent in light of modernisation, as ancient methods may require adaptation to align with contemporary settings (Wen et al., 2023). The incorporation of traditional materials or architectural concepts in residential construction can be modified to comply with modern environmental rules or economic limitations while preserving the cultural integrity of the architecture. The flexibility of traditional Korean houses in Yanbian is essential for their sustainability, as it involves reconciling modernisation with cultural preservation, a considerable challenge.

Cultural Preservation Theory offers a comprehensive framework for comprehending the significance of traditional Korean houses as ecological and cultural entities in this study. The approach emphasises the necessity of safeguarding historic houses not merely as architectural relics but also as vital representations of a community's history, identity, and connection to the natural environment (Ji et al., 2023). This study connects Cultural Preservation Theory to the sustainability of traditional architectural techniques, emphasising how safeguarding cultural heritage can enhance broader sustainable development initiatives. The theory's focus on community involvement, intergenerational transmission, and flexibility directly influences the study's investigation into the preservation of traditional Korean houses in Yanbian, ensuring both ecological and cultural sustainability are respected.

3. Research Methodology

This study used a mixed-methods research methodology, incorporating both quantitative and qualitative data collection approaches to thoroughly examine the sustainability of traditional Korean houses in Yanbian. The study seeks to encompass a wide array of viewpoints and insights by combining quantitative surveys with qualitative interviews, so enabling a more profound examination of the ecological and cultural aspects of these ancient houses. This method facilitates data triangulation, guaranteeing that the results are statistically sound and contextually rich, therefore offering a more nuanced examination of the study issue.

The quantitative portion of this study employs structured questionnaires to collect numerical data regarding several facets of ecological and cultural sustainability. The questionnaire is administered to a varied sample of local inhabitants, builders, and community leaders engaged in the construction and upkeep of traditional Korean houses in Yanbian. The principal objective of this quantitative survey is to assess attitudes, behaviours, and perceptions concerning the application of ecological design concepts, local building materials, and community involvement in regenerative initiatives. The questionnaire has multiple-choice questions and Likert-scale items designed to evaluate participants' perceptions of the environmental and cultural advantages of traditional Korean dwellings. The study employs statistical analysis,

including descriptive statistics, correlation analysis, and regression models, to discern patterns and relationships between the independent variables—ecological design principles, local materials, and community engagement—and the dependent variable, the sustainability of traditional Korean houses.

The implementation of a quantitative questionnaire methodology facilitates the collection of an extensive dataset from a diverse population, yielding a representative overview of the community's viewpoints. This data is crucial for comprehending overarching patterns and for measuring the degree to which traditional Korean dwellings promote ecological and cultural sustainability. The quantitative data facilitates hypothesis testing and the identification of relevant sustainability predictors. The study aims to ascertain if a statistically significant correlation exists between the utilisation of local resources and the perceived sustainability of traditional dwellings. Furthermore, the quantitative data provides a basis for comparing responses among other demographic segments, including generational disparities in attitudes towards cultural preservation and variations in ecological awareness between urban and rural populations (Loang, 2024).

In addition to the quantitative survey, the qualitative aspect of the research entails comprehensive, semi-structured interviews with important stakeholders possessing firsthand knowledge with traditional Korean households in Yanbian. The stakeholders may be local builders, artisans, community elders, cultural preservation advocates, and government officials engaged in heritage conservation. The objective of the qualitative interviews is to collect comprehensive narratives that contextualise the statistical data acquired from the questionnaire. The questionnaire identifies general trends, whereas the interviews provide profound insights into the experiences of individuals engaged in the preservation and maintenance of traditional Korean dwellings (Loang, 2025).

The qualitative interviews concentrate on several essential themes, encompassing the problems and opportunities linked to ecological design, the significance of utilising local materials, and the role of community engagement in preserving both the physical and cultural dimensions of traditional dwellings. The interviews, through the utilisation of open-ended questions, enable participants to convey their personal narratives, insights, and experiences, thereby uncovering underlying motives, beliefs, and values that may remain unrepresented in quantitative data. The qualitative data is examined through thematic analysis (Loang, 2025), which entails coding the interview transcripts to discern reoccurring themes and patterns. This investigation elucidates the cultural and ecological importance of traditional Korean dwellings and presents insights into the obstacles and facilitators of sustainability within the community.

The integration of quantitative surveys and qualitative interviews bolsters the study's validity through the cross-verification of data from diverse sources. For instance, if the quantitative data indicates a robust association between community participation and sustainability, the qualitative interviews can elucidate the reasons and mechanisms by which this engagement is vital for the preservation of traditional houses. The interviews can illuminate potential disparities in the quantitative data, providing explanations for outliers or unforeseen results. This mixed-methods methodology guarantees that the study's conclusions are comprehensive and substantiated by both empirical evidence and contextual insight.

This study utilises a mixed-methods research methodology that integrates quantitative questionnaire data with qualitative interview data. This methodology facilitates a comprehensive examination of the sustainability of traditional Korean houses in Yanbian,

considering both ecological and cultural dimensions. Quantitative surveys yield measurable insights into community opinions, whereas qualitative interviews provide detailed narratives that contextualise and enhance the comprehension of the research findings. Collectively, these methodologies offer an extensive framework for examining the role of traditional architectural techniques in sustainable development and cultural preservation.

Conceptual Framework

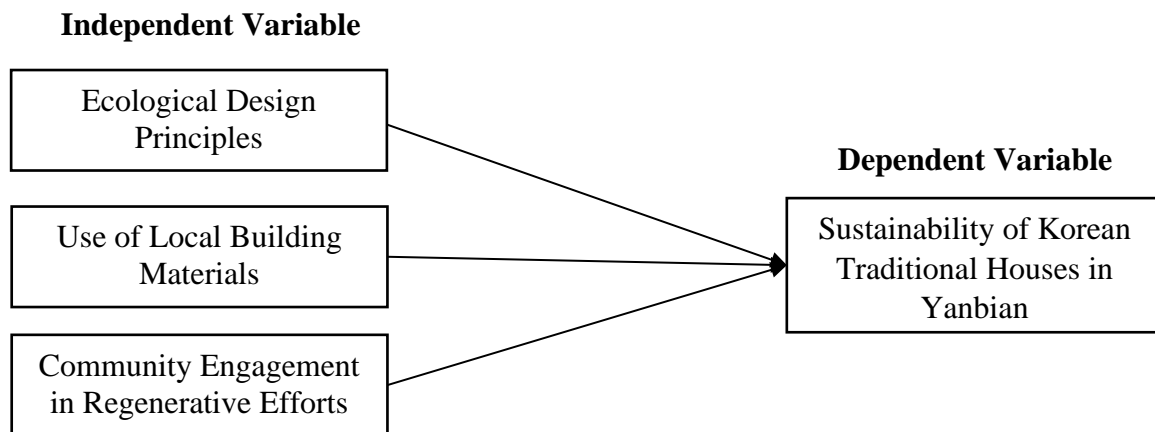


Figure 2: Conceptual Framework

This study's conceptual framework provides a guiding structure that elucidates the relationships among the numerous components pertaining to the sustainability of traditional Korean houses in Yanbian. It amalgamates essential variables—ecological design principles, utilisation of local building materials, and community involvement—with the overarching notion of sustainability, incorporating both ecological and cultural aspects. This framework elucidates the interaction of independent variables affecting the sustainability of traditional dwellings, establishing a basis for the research design and methods.

The core of the conceptual framework is the dependent variable: the sustainability of traditional Korean houses in Yanbian. The concept of sustainability encompasses both ecological and cultural dimensions. Ecological sustainability pertains to the methods by which these residences reduce their environmental footprint via resource-efficient design, utilisation of renewable resources, and conformity with local climate circumstances. Cultural sustainability refers to the conservation of architectural history and the transmission of traditional knowledge and practices through generations. The sustainability of these houses is perceived not just as a function of their environmental efficiency but also as a metric of their capacity to preserve and embody cultural values and identity across time.

The primary independent variable is ecological design principles, which emphasise the harmonious design of traditional Korean dwellings with the natural surroundings. These ideas encompass the implementation of passive heating and cooling systems, including ondol (underfloor heating) and natural ventilation, alongside the strategic positioning of structures to optimise solar energy and other environmental elements. Ecological design concepts diminish dependence on external energy sources and minimise the ecological imprint of structures. This variable is seen as a direct contributor to ecological sustainability by improving energy efficiency and minimising waste. This also pertains to cultural sustainability, as these design methods are fundamentally anchored in traditional Korean philosophy, which emphasises harmony with nature.

The second independent variable is the utilisation of local building materials, which significantly contributes to both ecological and cultural sustainability. Traditional Korean houses in Yanbian are built with locally obtained materials, including timber, stone, and clay. These materials are environmentally sustainable as they diminish the carbon footprint linked to transportation, while also promoting cultural sustainability by preserving local craftsmanship and construction traditions. The utilisation of indigenous materials is frequently associated with the region's natural surroundings, mirroring the community's connection to the land. This variable enhances ecological sustainability by mitigating environmental effect and promotes cultural sustainability by conserving traditional building techniques and materials utilised for generations.

The third independent variable is community engagement in regeneration activities, highlighting the significance of local involvement in the preservation and perpetuation of traditional construction traditions. Community engagement is essential for the sustainability of traditional dwellings, as it guarantees the transmission of the knowledge and skills necessary for their maintenance throughout generations. This variable pertains to both ecological and cultural sustainability: ecological, as community-driven maintenance initiatives guarantee that homes are repaired and modernised through sustainable practices; and cultural, as community involvement cultivates a shared sense of identity and continuity. Within the conceptual framework, community engagement serves as a sustaining force that connects ecological practices and cultural traditions from the past to the present and future, so assuring the long-term viability of these traditional houses.

The interplay among these three separate variables—ecological design principles, local building materials, and community engagement—establishes a comprehensive approach to sustainability. Ecological design principles mitigate the environmental impact of buildings, while the utilisation of local resources anchors the construction in the area environment and cultural heritage. Community engagement integrates these components, guaranteeing the preservation and transmission of the knowledge and traditions essential for the upkeep of these properties. Within the conceptual framework, these interactions are regarded as crucial for attaining equilibrium between contemporary ecological objectives and the conservation of cultural identity.

Furthermore, the conceptual framework acknowledges that these independent variables function interdependently (Suresh & Loang, 2024). They are interrelated, with each affecting and strengthening the others. Community engagement can augment the implementation of ecological design principles by cultivating a profound comprehension of traditional environmental practices. The utilisation of local materials is frequently facilitated by community awareness of regional resources, while the conservation of traditional construction techniques guarantees the sustainable application of these materials. The interconnection is fundamental to the sustainability of traditional Korean houses, as it embodies a system in which environmental, cultural, and social forces together establish a self-sustaining cycle of preservation and regeneration. This study's conceptual framework offers a thorough understanding of the sustainability of traditional Korean houses in Yanbian by integrating ecological design principles, utilising local building materials, and fostering community interaction. The independent variables are regarded as essential factors for ecological and cultural sustainability, with their interactions underpinning the preservation of these ancient dwellings in a manner that honours their environmental and cultural importance. This framework functions as a model for analysing how traditional architecture can provide

sustainable solutions to modern concerns, connecting the past with the future through a harmonious approach to environmental stewardship and cultural preservation.

4. Conclusion

This study underscores the essential contribution of traditional Korean houses in Yanbian to ecological and cultural sustainability. The research emphasises the significance of incorporating traditional knowledge into contemporary sustainability practices by examining critical elements such as ecological design principles, the utilisation of local building materials, and community involvement in regenerative initiatives. These residences, crafted to integrate with the landscape and embody the cultural values of the Korean population, provide significant insights into sustainable living. They illustrate that sustainability encompasses not just environmental efficiency but also the preservation of cultural identity and the promotion of community engagement in safeguarding common heritage.

The study underscores the necessity of a comprehensive approach to sustainability, wherein ecological and cultural components are perceived as mutually reinforcing. Traditional Korean buildings in Yanbian exemplify how ancient architectural techniques may inform modern sustainable development, connecting historical wisdom with current environmental issues. The results indicate that maintaining these traditional practices enables communities to establish resilient systems that honour both the environment and cultural heritage. This study enhances the debate on sustainability by demonstrating that the conservation of historic architecture can provide sustainable solutions for the future while ensuring cultural continuity.

4.1 Theoretical, Managerial and Practical Implications

Theoretical Implications

This research enhances the theoretical comprehension of sustainability by amalgamating ecological and cultural viewpoints. This expands the application of Cultural Preservation Theory by demonstrating how ancient architectural techniques, particularly in Korean houses in Yanbian, can exemplify current sustainable development. The study underscores the significance of perceiving sustainability as a comprehensive concept that integrates both environmental and cultural aspects, reinforcing the idea that sustainable development cannot be realised solely through technological progress but must also incorporate cultural preservation. The study illustrates the interrelation of ecological design, local materials, and community involvement, offering a theoretical framework for utilising historic knowledge systems to tackle contemporary sustainability issues.

Managerial Implications

This study provides significant insights for policymakers, heritage conservation organisations, and local governments tasked with managing sustainable development and cultural preservation. The results indicate that sustainability policies should emphasise the incorporation of traditional ecological methods and the utilisation of local resources. Moreover, managerial initiatives must prioritise enhancing community involvement in the conservation of traditional architecture, as this is vital for ecological and cultural sustainability. Promoting collective ownership and engagement can enhance the sustainability of these cultural assets, and legislative frameworks ought to provide incentives for local communities to actively engage in regenerative initiatives. Managers may utilise this information to establish guidelines for the conservation of traditional architecture within the framework of comprehensive sustainability programs.

Practical Implications

The study offers pragmatic insights for architects, builders, and local groups engaged in the construction and upkeep of traditional houses. The study underscores the necessity for pragmatic implementations of ecological design concepts, including passive heating and natural ventilation, with the significance of employing locally produced materials to mitigate environmental effect. The findings underscore the tangible advantages of community-driven regenerative initiatives, indicating that active participation from local citizens may preserve the cultural significance of traditional houses. Constructors and craftsmen can implement the insights from this study by integrating sustainable building practices into contemporary projects, thereby producing structures that are environmentally efficient while safeguarding cultural heritage.

4.2 Limitations and Recommendations for Future Studies

A primary drawback of this study is its concentration on a particular geographical area—Yanbian—and the traditional Korean residences in this locale. The findings offer significant insights into the sustainability of these dwellings; however, the results may not be applicable to other regions with varying architectural styles, cultural contexts, or environmental conditions. The study used a blend of quantitative questionnaire data and qualitative interviews, which, despite their robustness, may nevertheless be affected by the subjective reactions of participants (Loang et al., 2024). Divergent individual viewpoints on cultural and ecological sustainability may generate bias, hence constraining the generalisability of the findings to a wider population.

Future research should investigate the enduring effects of incorporating old construction methods into contemporary architectural designs, emphasising the adaptation of these methods to address current sustainability issues. Furthermore, research might examine the impact of technology on the preservation and promotion of traditional architecture, including the application of digital tools for documenting and instructing traditional construction methods. A further avenue for future inquiry is the investigation of policy frameworks that facilitate the conservation of traditional architecture, assessing how governments and international entities might enhance incentives for community involvement and sustainable construction methods. By concentrating on these domains, subsequent research can enhance the findings of this study and advance the comprehension of traditional architecture's significance in sustainable development.

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