

Acknowledgment

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We are doing this project not only for marks but also to increase our knowledge.

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Abstract

This research paper investigates the concept of green buildings as an efficient technique for achieving sustainability in Nepal despite quick urbanization and environmental issues. Green buildings are built, constructed, and maintained with environmental concerns, the use of green technology, sustainable ingredients, and eco-friendly activities to minimize natural resource use and carbon emissions. The application of green building strategies no longer only benefits the environment but also boosts human happiness, social justice, and the development of a green economy. This research examines the relevance of sustainable building approaches, highlighting energy performance, solid waste management, and water conservation. It assesses the present condition of green building techniques in Nepal and the policy steps done by the government to encourage eco-friendly development. Through a thorough literature investigation and information analysis, the study demonstrates the potential advantages of green buildings in terms of decreased electricity intake, lower environmental effects, and increased living standards. It also addresses problem experienced by developers in implementing green construction principles, such as financial limits and lack of knowledge among the customers. The analysis shows that green buildings are ideal throughout Nepal, and government policies and incentives are important to facilitate their adoption. Recommendations include the need for precise and explicit sustainable building policies at all levels of government and the promotion of green building techniques via education and awareness initiatives.

Keywords: Green Building, Sustainability, Urbanization, Environmental Challenges, Sustainable Construction Methods

Contents

Acknowledgment	I
Abstract	II
Acronyms	IV
1 Introduction	1
1.1 Background of the Study	2
1.2 Problem Statement	3
1.3 Objective of the Study	4
2 Literature Review	5
2.1 Principles of Green Buildings	7
2.1.1 Effects of Green Buildings	8
3 Methodology	9
3.0.1 Literature Review	9
3.0.2 Data Collection	9
3.0.3 Data Analysis	9
3.0.4 Case Study	9
3.0.5 Policy Analysis	10
3.0.6 Recommendations	10
4 Data Collection and Analysis	11
5 Conclusion	13
6 Recommendation	14

Acronyms

UWTC United World Trade Center

GTC Green Technology Center

ICIMOD The International Center for Integrated Mountain Development

PAHS Patan Academy of Health Science

List of Figures

1.1	Concept of Sustainability	1
2.1	The Proposed Green Building	7
3.1	Methodology Invovled	10
4.1	Bayalpata Hospital in Accham with rammed Earth Technology	11

Chapter 1

Introduction

Rapid urbanization resulting from rural migration has grown progressively more urgent in many regions of the world. This population change offers a tremendous challenge to natural resources, particularly in big cities, which typically encounter environmental challenges such as water shortages, water pollution, and groundwater depletion. To address these concerns, it is necessary to act today at communal and individual levels. One viable way is to implement "green building" solutions, which entail the installation of housing systems that minimize demand for natural resources and carbon emissions. A "green building" is a structure planned, constructed, and maintained with the environment in mind. This involves the use of energy-efficient technology, sustainable materials, and other actions that decrease the use of natural resources and CO₂ emissions. A great example of this is rainwater harvesting, where rainwater is gathered for different chores such as gardening and cleaning. This helps lower the quantity of water extracted from natural sources, therefore reducing environmental effects. In addition, water and wastewater recycling technologies may be employed to decrease water wastage, and high-efficiency facilities may need less energy run. A green construction strategy's execution not only helps the environment, but also human welfare, social justice, and the establishment of a green economy. For instance, greater quality, thermal comfort, and access to sunshine are advantages of green buildings that may increase tenant quality of life. This may then result in higher productivity better health, as well as less stress.

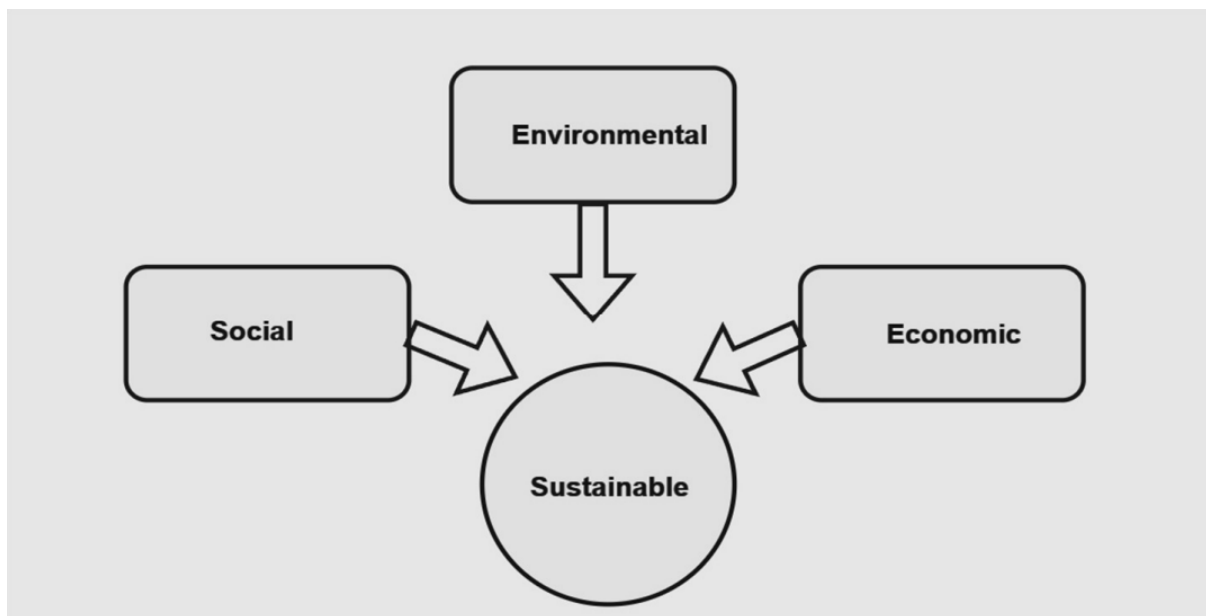


Figure 1.1: Concept of Sustainability

In Nepalese cities, drought, rubbish disposal, and pollution are all major problems, and it is expected that climate change will put even more burden on municipal services. Sustainable building is suggested as a potential remedy for these problems. Sustainable building aims to lessen the consumption of natural resources while also enhancing human welfare, advancing social justice, and maintaining a green economy. To ensure success, energy-efficient construction, technology, and environmentally friendly methods for water and wastewater management system maintenance must be used. Sustainable building approaches offer various advantages. They contribute to energy consumption reduction, which may cut energy prices and diminish dependency on fossil fuel. They also tend to utilize less resources and generate few pollutants, which may aid minimize the environment influence of building projects. Finally, since they are of healthier and more pleasant, they may also assist in increasing the quality of life for individuals who dwell in and work in buildings. Making sustainable construction approaches norm rather than the exception is the present issue. To achieve this, governments and industry must work to develop incentives for builders and designers to utilize ecological friendly solutions. This might include tax incentives enterprises that adopt sustainable materials and processes, well as subsidies for renewable energy sources. Furthermore extra research and development is necessary to product current technologies and materials that are more energy efficient and sustainable than those now available. The construction sector has a considerable influence global energy usage. Buildings absorb 40% of overall energy usage, according to the World Business Council Sustainable Development. This indicates that construction sector is a significant contributor to glob warming since buildings release Green House Gases (GHG). In fact, researchers anticipate that worldwide carbon emissions from buildings would reach 42.4 billion tons 2035. Because the construct ion company require s natural resources and energy, which might result i n sound and other forms of environmental pollution as well as the was generation following building deconstruction, this is a b problem for all countries with restricted territory. T construction sector is a significant cause of environment harm, and it is necessary that actions be made to minimize energy usage and GHG emissions in order to safeguard the environment. One of the most efficient methods to achieve this is to encourage energy efficiency in buildings. Energy-efficient buildings consume less energy to function, lowering the amount of energy that has to be generated and, in turn, reducing GHG emissions. Energy, energy-efficient appliances, insulation, lighting, and the usage of renewable energy sources like solar and wind may all be utilized to using renewable energy sources for building operation. Lastly, governments should give incentives construction enterprises to utilize sustainable building techniques, such as granting tax exemptions or subsidies those that use renewable energy sources.

1.1 Background of the Study

Changes in the economy and improvements in people's quality of life are both results of development. The expansion of the nation's physical infrastructure has reached new heights.

Humankind has created everything easier and more comfortable for himself, from a little hut to a large building, in order to live and exist and continuous focus in construction has drawn attention to reduce, reuse, recycle and rethink for maintaining green through lean construction approach. People in Big city have a strong preference for living in high-rise buildings and are willing to pay a premium for the privilege. These days, shopping malls, restaurants, movie theaters are all in fierce competition with one another, they all want to be distinctive and original in comparison to one another. As a result, enormous structures are developed on a massive scale, requiring enormous investments and taking up acres of land. One thing that nobody pays any attention to is the neighborhood and the natural nature in which they dwell. They do a great deal of direct and indirect damage to the natural nature around them. The environment of being environmentally friendly is often disregarded by many large corporations. A “green” building is a form of building that, in its design, construction, or operation, avoids or eliminates negative impacts and may have beneficial impacts on our climate and environment. Green buildings are also known as environmentally friendly buildings. The preservation of the environment and the conservation of natural resources are both accomplished through green buildings, which also increase the quality of life. Housing demand, needs and low costing housing have been focused in Nepal through government, INGOs, NGOs and peoples but no much focus on Green Building yet. The term “green building” refers to a vast array of practices, methods, abilities that aim to reduce and, eventually, eliminate the negative effects that buildings have on both the surrounding environment and human health. One of the options that may be used to reduce the significant negative impacts that the existing building stock has on the environment, society, economy is green building. On the other hand, there hasn’t been any kind of comprehensive review done on all of these different studies, which is something that’s really necessary for the ongoing work. In the most recent few decades, there has been a remarkable development in the number of studies on environmentally green building.

1.2 Problem Statement

Nepal is facing rapid urbanization and environmental issues, which necessitate the adoption of sustainable practices in the construction sector. The traditional building methods in Nepal are resource-intensive and contribute significantly to carbon emissions, exacerbating environmental degradation. Despite the benefits of green buildings, their adoption is hindered by various challenges, including financial constraints and lack of awareness among stakeholders. The current policy framework in Nepal also lacks explicit sustainable building policies, which further discourages the adoption of green building techniques. This study aims to address these challenges and identify strategies to promote the adoption of green buildings in Nepal.

1.3 Objective of the Study

In this study, we conduct an analysis of a critical review of the existing body of knowledge about investigations linked to green building.

1. Conduct an analysis of a critical review of the existing body of knowledge about investigations linked to green building.
2. Examine the current state of green building techniques in Nepal.
3. Assess the policy initiatives undertaken by the government to promote eco-friendly development.
4. Identify the benefits of green buildings in terms of energy efficiency, environmental sustainability, and improved living standards, and explore the challenges faced by developers in implementing green construction principles.

Chapter 2

Literature Review

The Bird Island Project in Malaysia is a green construct that implements the Zero Energy Home Concept. Green Buildings in Malaysia are made utilizing ecologically friendly components such as bamboo frames and sustainably product silicon glass cloth. Green technology is also employed i n building of Green Buildings, such as energy- a water- efficient appliances, grey water recycling systems, a solar thermal systems. The energy utilized by the tenants the Green Buildings on Bird Island is produced by solar roof tiles. However, developers in Malaysia confront various hurdles while creating green structure s. One of the challenge is the shortage of eco-friendly technology and materials Malaysia. This makes it more costly to develop a green building since most of the resources need to be import. Another difficulty is the low degree of homeowner acceptance of and reactions to green buildings. Many Malaysian build owners are not aware of green buildings or their advantage development of green buildings in Malaysia. It demonstrates that it is possible to construct high-quality, energy-efficient buildings that are also affordable. As more people become aware of the benefits of green buildings, it is likely that the demand for these types of buildings will increase in Malaysia.

The usage of construction materials, including glass, concrete, metals, and ceramics has increased in India because of rapid urbanization, globalization, and economic expansion. To solve the energy problem, green buildings use the least amount of energy possible. The return on investment for modern green buildings i n India has been lowered to between two and seven years thanks to the LEED (Leadership in Energy and Environmental Design) rating system used by the Indian Green Building Commission. The biggest barriers to their development in India are a lack of knowledge about the benefits of green buildings, sustainable materials, and cutting-edge technologies. CIIIGBC and other specialists are working to resolve these problems so that developers can continue to operate effectively.

The decrease energy use and water usage helps to lessen the impact on environment. Additionally, the usage of renewable energy promote a better environment for the people of Nepal. By minimizing energy use and water usage, green buildings as in preventing air and water pollution. Furthermore, green buildings are built to maximize natural light, which helps lower the risk of health concerns such as eye strain and headaches. Green buildings are also good for the economy. By minimizing energy use and water usage, green buildings as in minimizing energy expensess. Studies have shown that these guidelines are most effective when implemented at the community level in construction projects and in commercial projects at all levels

of government. Furthermore, green incentive measures have the greatest impact two to three years after their implementation. The benefits of third-party energy efficiency inspections and testing are numerous. Perhaps the most significant is the cost savings that can be achieved. Additionally, third-party inspections and testing can help to ensure that the environment is not damaged, as energy-efficient systems are more sustainable and help to reduce carbon emissions.

The majority of our experts do not look at going green as something that limits a homeowner. 65% of our experts believe there are an equal number of eco-alternatives for any home project. Some even went as far to say that green options offer new opportunities, rather than hinder existing options. These experts believe manufacturers are creating eco-alternatives at a fast pace, so there should be no limitations on what green options homeowners can use in their homes. Some manufacturers are even creating new possibilities as they uncover more sustainable ways to build and maintain our homes. “In the past, going green meant sacrificing design, function and price,” explained Jennifer Dusina of freedom Rail closet solutions. “But today builders are reacting to the new demands of home buyers for greener choices. They’re working towards making green homes more obtainable for the masses.” One of the main concerns our experts have is that the phrase “going green” is becoming trendy, and, as a result, devaluing the reasons for joining the green movement in the first place. A few experts even claimed the term “green” should be eliminated from homeowners’ vocabulary.” The term green should seriously be banished; we’re far too into the mixed messaging for society to ever get on the same page,” said Kelly Fall is, interior designer and owner of Remote Stylist, a website offering online interior design services. Regardless of how the terminology evolves, most of our experts think going green is here to stay. Some even said sustainability has been around for centuries, but it was in the form of reusing pass-along and hand-me-downs. The “newness” associated with the green movement has to do with the fact that manufacturers are catching on and starting to make new products that are sustainable. “Saving the planet is no longer thought of as a fringe movement, but rather a way of life for all of us,” said Valorie Hart of the interior design blog Visual Vamp.

The Expert Opinion: Going Green Imposes Limitations

Among the 35% of responses that indicated going green requires a sacrifice from the homeowner, there was a predominant theme in what exactly was considered a limitation. Though some experts said there were limitations when it comes to choices and availability, all of them mentioned price as a restraining factor. “I do believe going green constrains homeowners, but not because of design or product limitations,” said Chris Rodenius of Tool Rank, a site dedicated to tool reviews. “I believe the constraint has to do with the price of going green. If you want to go 100% green, it is going to cost you big time.

2.1 Principles of Green Buildings



Figure 2.1: The Proposed Green Building

1. Best location, integration of building into landscape, environment, and transportation infrastructure.
2. Maximizing the utilization of solar energy and daylight can be achieved by strategically positioning windows in a south orientation.
3. The pursuit of minimal energy consumption, heightened efficiency, and the exploration of alternative energy sources are key objectives in contemporary discourse.
4. Use of safe, renewable, and recycled materials.
5. The inclination towards utilizing material sourced from the local region.
6. Enhancing the quality of indoor air.
7. The efficient and effective upkeep of buildings for maintenance purposes.

2.1.1 Effects of Green Buldings

1. Increase the effectiveness of using natural and renewable resources, such as water, wind, and the sun.
 - Implement rainwater harvesting systems to collect and utilize rainwater for various non-potable purposes.
 - Install wind turbines in appropriate locations to harness wind energy for electricity generation.
 - Optimize the design and placement of solar panels to maximize the capture of solar energy for heating, lighting, and power generation.
2. Reduction of operating costs.
 - Employ energy-efficient appliances and systems to decrease electricity consumption.
 - Use advanced insulation materials and techniques to reduce heating and cooling costs.
 - Implement smart building technologies to monitor and manage energy use effectively.
3. Reduced greenhouse gas emissions.
 - Transition to low-emission and renewable energy sources for building operations.
 - Implement green building practices that reduce the carbon footprint during construction and throughout the building's lifecycle.
 - Encourage the use of public transportation, cycling, and walking to reduce emissions from commuting.
4. Reducing the negative influence on human health during a stay in a residential building (through the whole building life cycle) by using the most recent, energy-saving, natural, and safe materials.
 - Utilize low-VOC (volatile organic compounds) paints and finishes to improve indoor air quality.
 - Select materials with low embodied energy and high recyclability to minimize environmental impact.
 - Incorporate natural lighting and ventilation systems to enhance indoor environmental quality and occupant well-being.

Chapter 3

Methodology

In this research paper, a comprehensive methodology is adopted to investigate the concept of green buildings as an efficient technique for achieving sustainability in Nepal. The methodology is designed to provide a holistic understanding of the potential benefits, challenges, and policy implications of green buildings in the context of Nepal's urbanization and environmental challenges.

The methodology consists of the following steps:

3.0.1 Literature Review

A thorough literature review is conducted to gather information on green buildings, sustainable construction methods, and their relevance in Nepal. The literature review covers various aspects of green buildings, including their definition, principles, benefits, and challenges. It also includes a review of existing policies and incentives related to green buildings in Nepal.

3.0.2 Data Collection

Both primary and secondary data are collected for this research. Primary data is collected through interviews with experts in the field of green buildings and sustainable construction methods. Secondary data is collected from various sources, including government reports, academic articles, and industry publications.

3.0.3 Data Analysis

The collected data is analyzed using qualitative and quantitative methods. Qualitative analysis is used to identify themes and patterns in the data, while quantitative analysis is used to measure the magnitude and frequency of the identified themes and patterns.

3.0.4 Case Study

A case study of a green building project in Nepal is conducted to provide a practical example of the implementation of green building principles. The case study includes a description of the project, its objectives, challenges, and outcomes.

3.0.5 Policy Analysis

The research includes an analysis of existing policies and incentives related to green buildings in Nepal. The analysis is conducted to identify gaps and opportunities for improving the policy framework for promoting green buildings.

3.0.6 Recommendations

Based on the findings of the research, recommendations are made for promoting green buildings in Nepal. The recommendations include policy measures, awareness campaigns, and education and training programs.

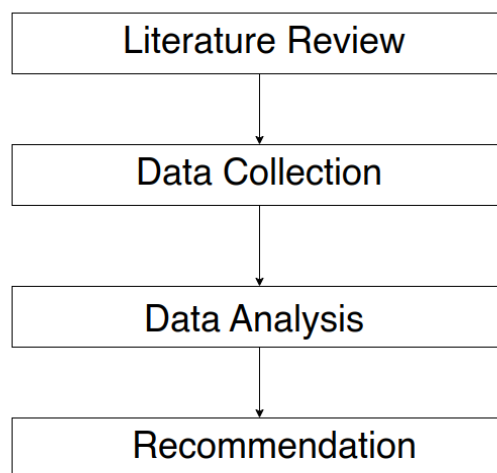


Figure 3.1: Methodology Involved

The data collected from the literature review, expert opinions, and case studies were analyzed using a qualitative approach. The data were coded and themed to identify patterns and trends, which were then used to draw conclusions and make recommendations.

The methodology is designed to provide a comprehensive and rigorous approach to investigating the concept of green buildings in Nepal. It ensures that the research is grounded in existing knowledge, while also providing new insights and recommendations for promoting green buildings in Nepal.

Chapter 4

Data Collection and Analysis

Green building and green construction are crucial to sustainable development. This approach advocates for the use of sustainable, locally obtained resources like minerals, sand, and stone, as well as natural construction materials like greenery, flora, hay, bamboo, lumber, and natural sunshine. The ecological, social, and economic consequences of the building stock may be mitigated via green construction. Many municipalities have put incentives and discounts into place to promote green buildings, such as the Pokhara Metropolitan Authority, which pays huge rewards and discounts to people who design ecologically friendly structures.

Examples of Green Building Structures in Nepal

1. Kathmandu Eco Hotel
2. United World Trade Center (UWTC)
3. Patan Academy of Health Sciences (PAHS)
4. International Centre for Integrated Mountain Development (ICIMOD) Headquarters
5. Garden of Dreams (GTC)



Figure 4.1: Bayalpata Hospital in Accham with rammed Earth Technology

Energy efficiency is a vital component in building eco-friendly constructions. Consequently, less energy is needed to complete the same task. For instance, a compact bright bulb needs a lot

less energy to generate the same amount of light as a standard regular bulb, making it a more efficient alternative. Another key component of environmentally responsible building is solid waste management, which encompasses trash collection, transportation, treatment, or waste reduction, as well as waste inspection. Water conservation is a key factor when planning green buildings. Policies, plans, and activities should be put in place to fulfill the current and future human demand, secure the hydrosphere from depletion, and manage fresh water as a natural resource sustainably. Open green space should be given priority in the Kathmandu Valley's 20-year strategic development master plan as it is crucial to resilient cities. To resist the existing and future tendencies of urbanization, green open space is necessary.//

Indicators	Green Construction	Traditional Construction
Electricity consumption	Low	High
Indoor Environmental Quality	Very low	High
Emission level	Low	High
Waste Management system	Highly effective	Effective
Building Materials	Environmental	Environment Friendly
Design Practices	Friendly	Normal
	Complex	

Table: Comparison of Traditional and Green Construction

In general, green construction is vital for establishing ecologically friendly and resilient cities. Green construction should be a top priority for those wishing to increase their green credentials because it is a terrific technique to minimize the financial, social, and environmental repercussions of their current structures. The Pokhara Metropolitan Authority has set an ambitious aim to develop Pokhara into a metropolis of eco-friendly structures within a few short years. To this aim, it has designed a plan to give large incentives and discounts to those who construct green buildings. The Dharan Sub- Metropolitan City has already taken efforts to promote this project, granting a 50% reduction on fees for green building approvals and designs, while the Lalitpur Metropolitan City has subsidized various key services.

Chapter 5

Conclusion

The study indicated that green buildings are desirable across Nepal and that government measures are needed to assist green buildings. This is in line with foreign NGOs aiding the Nepalese government to promote green buildings. A literature review and primary data gathering from respected authorities and specialists were used in research. We obtained data using qualitative research approaches. The findings reveal that green buildings relate to the usage of ecologically friendly materials. These resources are available locally and utilized to promote government policy at the municipal, provincial, and national levels. Passive solar buildings will be used to increase energy efficiency, waste management, and water conservation. It has been seen that certain towns have started offering tax advantages to users and some green building guidelines are being created to achieve a green economy in Nepal. The research results should be adopted by relevant departments to promote green construction in Nepal. This is excellent for the environment because green buildings are more energy efficient and consume fewer resources. They help minimize waste and pollution and promote a healthier lifestyle for those who live in them. In conclusion, research shows that green buildings are desirable across Nepal. The study also provides a basis for the implementation of the government's green building policy. This is good for the environment and the local economy. It is essential to point out that the research findings should be put into action by relevant authorities to promote green building in Nepal. // //

In conclusion, research shows that green buildings are desirable across Nepal. The study also provides a basis for the implementation of the government's green building policy. This is good for the environment and the local economy. It is essential to point out that the research findings should be put into action by relevant authorities to promote green buildings in Nepal.

Chapter 6

Recommendation

It is imperative for all levels of government, including local, provincial, and federal, to create policies that cater to the growing need for more detailed and specific recommendations in regard to sustainable buildings. The National Building Codes have initiated provisions for environmentally friendly buildings. To guarantee that sustainable building practices are encouraged, researchers, professionals, investors, and users at the municipal level must incorporate adaptation and mitigation strategies into their planning and service delivery. The implementation of a state-of-the-art approach called "green building" is crucial for fostering sustainable development and promoting the sustainability of our built It is imperative for all levels of government, including local, provincial, and federal, to create policies that cater to the growing need for more detailed and specific recommendations in regard to sustainable buildings. The National Building Codes have initiated provisions for environmentally friendly buildings. To guarantee that sustainable building practices are encouraged, researchers, professionals, investors, and users at the municipal level must incorporate adaptation and mitigation strategies into their planning and service delivery. The implementation of a state-of-the-art approach called "green building" is crucial for fostering sustainable development and promoting the sustainability of our built