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Investigating and Assessing the Feasibility of using Green Construction Management in Construction Projects in Tonekabon City

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Abstract

The present study was conducted with the aim of investigating and assessing the feasibility of using green construction management in construction projects in Tonekabon city. The method of this research is applied in terms of purpose, descriptive survey in terms of implementation method, and quantitative in terms of data analysis method. The statistical population of the present study consists of experts active in the field of green construction in Tonekabon city, of which about 10 people with at least 15 years of experience in green construction in this city were selected. The researcher's questionnaire plays the role of a data collection tool in this study, the validity of which was confirmed by professors and experts, and the reliability of the research was confirmed using Cronbach's alpha calculation. Another questionnaire used in this study was the Paired Comparisons Questionnaire for AHP analysis. The results of the one-sample t-test showed that individual, competency, and managerial barriers were significant at 99% of the implementation barriers to green construction in Tonekabon County. After identifying the factors using the fuzzy AHP analysis method, the ranking results showed that the important factors in the lack of implementation of green construction in Tonekabon city include: 1) lack of access to specialized personnel, 2) lack of private sector investment in green construction, 3) lack of access to necessary infrastructure, 4) lack of attention from project managers to green construction, 5) lack of attention to the environment among the workforce, 6) low or very limited environmental knowledge of individuals, 7) lack of appropriate technical support in the field of green construction, 8) lack of proper infrastructure in the field of construction waste recycling, 9) lack of proper planning, 10) inadequate management, 11) lack of economic efficiency of green construction from the perspective of project managers 12) lack of initiative by project managers in the field of green supply chain 13) failure to define a comprehensive and dynamic process 14) lack of appropriate culture 15) lack of knowledge in the field of green construction.

Keywords: Green construction management, Tonekabon city, Construction waste.

1 | Introduction

In the mid-1960s, the first efforts to preserve and protect the environment were made. In the following decades, the pace of these movements and efforts increased, both from a public and governmental

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perspective. In fact, this management method was the only suitable solution for various institutions to move forward to deal with environmental degradation [1]. Green management, as one of these management practices, includes a series of management concepts to increase the convergence of social, economic, and environmental responsibilities.

Today, the green approach is one of the approaches that is being developed in the world, and green management has carefully addressed issues such as increasing air pollution, climate change, deforestation, and other issues (especially in the fields of green building, green energy, and green waste) And all her efforts are to create special standards and regulations that will lead to a greener path for factories, organizations, etc.

In fact, this type of management is a kind of intellectual change in the work of various organizations and projects according to the characteristics of the environment [2]. For example, according to a report, employees of companies with stronger standards in the field of green management have higher morale. On the other hand, companies that have adopted this management have been able to save costs [3]. In other words, green management must operate in a hybrid manner, combining scientific knowledge and accumulation with empirical skills, and its performance must be in such a way that:

considers the laws of nature within its organization, both structurally and behaviorally, and that its operations are consistent with environmental rules and regulations; seeks help from environmental protection systems to reduce the negative impacts of its organization's activities and actions Its efforts should be towards producing and providing healthier, cleaner, safer and higher quality goods and services; It should minimize the amount of waste and waste of its goods and services and aim to produce zero waste; The results of its actions, in addition to providing the means for its own and its organization's continued survival, should also help to continue the activities of natural ecosystems; In addition to financial reports, it should publish its social and environmental responsibility report transparently and regularly; By anticipating, recognizing, and responding to the expectations of the target community, in addition to being aware of advanced methods used in other organizations, it should also generate income; Before laws and regulations force her to reduce the risk of her actions to humans and other living beings, and ecosystems in general, she should think about this principle herself and direct the activities of her subordinates to further improve the quality of life of employees, customers, and the environment [2].

In short, project-oriented organizations, especially in the construction industry, always seek to effectively manage projects through the use of various assets (including knowledge, skills, tools, techniques, experiences and lessons learned, procedures, approaches and processes, standards and specialized and professional project management methodologies).

To meet the needs and expectations of stakeholders. In the context of organizational project management, one of the most important of these assets is related to the concept of sustainability, which encompasses a wide range of values and ideas in three areas: economic (profit), social (people), and ecological-environmental [4]. In this regard, various methods and solutions have been proposed to achieve sustainability. Among the most recent of these is green project management, which was introduced by the Global Green Project Management Organization.

This social organization has been working since 2009 to evolve the project management profession with a focus on green and sustainability, and has been approved by organizations such as UNESCO and the International Project Management Association, and also has the P.5 standard, methodology This social organization has been working since 2009 to evolve the project management profession with a focus on green and sustainability, and has been approved by organizations such as UNESCO and the International Project Management Association, and also has the P.5 standard, methodology As a supporter of the United Nations Global Compact, the Green Project Management Institute plays a role in promoting global citizenship through supporting sustainable projects, and considers this to be its most fundamental mission.

The institute also considers itself the originator of the global green project management movement, which includes methods for achieving sustainability based on principles such as:

- I. Commitment and responsibility.
- II. Ethics and decision-making.
- III. Integration and transparency.
- IV. Reliance on principles and values.
- V. Social and ecological equality.
- VI. Economic prosperity.

2 | With the Increase in Construction and Demolition Waste

Many building components can be recycled if they have a suitable market. Asphalt, concrete, and crushed stone are often recycled in the form of gravel or concrete and asphalt products. Recycled wood has the potential to be used in new wood materials such as furniture and plastic-composite decking, or as plant fertilizer. Metals such as steel, copper, and brass are also valuable items to recycle. Although the cardboard packaging left over from the materials used on the site is not considered construction and demolition waste, there are many markets for recycling these materials, and in this regard, they can be considered construction and demolition waste.

It is worth noting that sometimes the materials used for recycling are not usable due to lack of management. Recyclers must have a number of characteristics, such as familiarity with local and state laws, obtaining the necessary licenses and certificates, having the necessary and adequate management, etc. The United States Environmental Protection Agency has provided the necessary information on its website regarding the price and conditions of recycled materials in different locations (different states and cities) so that waste management can be carried out properly.

3 | The Relationship Between the Building and the Environment

At the beginning of the 21st century, we are faced with the severe impacts of human activities on the natural environment, ecological systems, and even humans themselves. The construction of the built environment, more than any other human activity, has direct, complex, and long-term effects on the biosphere. The impact of the materials used in this process alone is enormous and significant. For example, the manufacturing, production, and supply of construction tools and materials in the United States alone involves the movement of 6 billion tons of materials per year to meet construction needs. Some estimates and studies state that more than 90% of the materials extracted from mines, forests, and other raw material sources throughout history have been consumed in existing buildings and infrastructure. The rate of material waste in the construction sector has been estimated at a rate equivalent to half a ton per person per year, or 45 to 90 kilograms per square meter of infrastructure in new construction. The waste of materials during the renovation process is also estimated at a factor of 320 to 900 kilograms per square meter. The processes of demolition of existing buildings are also accompanied by unimaginable amounts of waste: processes in which the reuse of materials resulting from the demolition is either very small or does not occur at all [5].

Society today is literally at a crossroads, facing difficult decisions and choices. Today, many issues threaten the very existence of humanity, none of which is as significant as global climate change. Mean while, energy is one of the main causes of this crisis due to the release of carbon during the burning of fossil fuels. The built environment is a major consumer of energy, accounting for over 30% of primary energy sources in the United States. The widespread distribution of the built environment in the United States and the resulting need to use automobiles to travel between work, home, school, and shopping produces unacceptable amounts of carbon dioxide. Transportation accounts for over 40% of primary energy consumption in the United

States, a large portion of which is the result of the unfavorable distribution of the built environment across the country's cities and communities [6].

Some may consider the term "precipice" to be more appropriate to describe the current situation facing human society, rather than the term "dilemma." The increase in greenhouse gas emissions has already caused a dangerous increase in the average global temperature. A rise in temperature that can be traced directly to energy use in buildings and transportation. Systems theory states that global systems such as climate and weather operate non-linearly, meaning that any increase in the amount of carbon dioxide in the atmosphere does not necessarily lead to a change proportional to that increase

The dynamic and erratic characteristics of the Earth's climate are such that the weather can instantly change, shift, and shift from one specific temperature organization to another in a very short time. Evidence from fossil studies shows that such changes have occurred before; temperature changes of up to 10 degrees Fahrenheit over a decade, which is very small in geological time periods [7]. Climate change is just one of many problems that must be addressed by human society. Problems such as: reduction in biodiversity, loss of soil biodiversity, depletion of fishery resources, and pollution of soil and air due to the release of tens of thousands of synthetic chemicals, some of which contain natural hormones that cause severe damage to the body systems of animals and even humans.

4 | Benefits of Green Construction

In addition to social responsibility and good practices, which are among the main reasons for innovation with green buildings, there are other factors, including: New ways to conserve water, wastewater treatment, and water reuse technology are helping to cut buildings' water consumption by up to half, which could lead to a 5-10 percent reduction in total water use. Finally, green buildings are also beneficial for the environment. Features such as cool and green roofs emphasize the sensitivity of preserving the urban habitat. Innovation in surface wastewater management and the use of certified sustainable wood and materials with recycled content help reduce the environmental and infrastructure impacts of our current building methods.

To understand sustainable buildings, we divide and introduce their impact on the environment and residents into five broad areas:

- I. Sustainable site planning.
- II. Water conservation and saving.
- III. Energy efficiency and renewable energies.
- IV. Protection of materials and resources for indoor environmental quality.

Green buildings are designed to reduce the impacts of construction on human health and the environment:

- I. Efficient use of energy, water and other resources.
- II. Protecting the health of residents.
- III. Reducing waste, pollution and environmental degradation.

5 | Conclusion

Sustainable construction means moving on the human-environment axis (generally, the concept of sustainability is human-centered and the concept of green is environment-centered and compatible with nature). And it encompasses the entire life cycle of a building, from the design stage to planning, implementation, delivery, and after delivery of the building. In fact, in line with the path of sustainable development and in order to solve the problems of today's modern and industrial world, the purpose of this type of construction is to construct a building based on the principles of sustainability, ecological design, and green architecture, optimizing energy consumption, and reducing environmental harms and social and cultural problems.

In the meantime, given the necessity of economic development and the importance of considering concepts related to green management in the success of new projects, especially in the construction industry, a new field called green project management was introduced. According to the studies conducted and the findings obtained, it can be concluded that the factor of specialized labor has the greatest impact on promoting green construction in the construction industry of Tonekabon County, and the factor of lack of knowledge in the field of green construction has the least impact on promoting sustainable construction in the construction industry.

Also, with a slight difference compared to the factor of access to skilled labor, the lack of private sector investment in green construction was in the next position. The results of the present study were consistent with the research of [8–14]. Gan et al. [8] showed that the main barriers to the adoption of green construction were identified as traditional social norms of rural housing construction, lack of skilled labor/experts, popularity of the self-built model, lack of policies and regulations for GBTs in rural areas, incomplete technical standards or systems, and lack of government attention.

Tseng et al. [11] showed that safety and durability are the most important aspects of social sustainability of green building. Other key aspects are health and comfort and accessibility and convenience. This set of indicators facilitates decision-making processes for practitioners and provides appropriate practical guidelines for various stakeholders to enable the achievement of social sustainability. Opoko et al. [9] showed that the main factor preventing architects from implementing green building technologies is customer resistance. Wang et al. [10] showed that science and technology input is the fundamental influencing factor, while industrial size and green financial support are the main influencing factors for green building development.

showed that construction stakeholders are aware of the existence and acceptance of some green materials such as empty plastic bottles, clay and mud, grass, bricks, stones, and timber, showing a negligible correlation at the $p > 0.05$ level [15]. Xia et al. [12] showed that to properly understand and use green building technology, it is necessary to improve the policy and incentive policy, enhance the professional quality and technical ability of certified employees and consultants, establish and continuously update the evaluation system, strengthen technological innovation, and integrate design and management. Chen et al. [13] showed that the results of the ranking analysis showed that the barriers were critical, with the top three most important barriers being higher costs, lack of government incentives, and lack of financing programs.

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Author Contributions

Conceptualization, V.M.L.; Methodology, V.M.L. and S.S.; Software, M.B.; Validation, V.M.L., S.S., and M.B.; Formal analysis, S.S.; Investigation, V.M.L.; Resources, V.M.L.; Data curation, M.B.; Writing original draft preparation, V.M.L.; Writing review and editing, S.S. and M.B.; Visualization, M.B.; Supervision, S.S.; Project administration, V.M.L. All authors have read and agreed to the published version of the manuscript.

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Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request. No publicly archived datasets were generated during the current study.

Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analysis, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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