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Analysis of Sustainability in Building Construction

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ABSTRACT

Sustainable building construction is a comprehensive process of design and construction that employees techniques to minimize adverse environmental impacts and reduce the energy consumption of a building while contributing of the health and productivity of its occupants. A sustainable building is that they should be designed and operated to reduce the overall impact of the built environment by effectively using energy, manpower and other resources protecting occupant health and improving employee productivity and reducing waste pollution and environmental degradation. This paper will study 15 cases about sustainable construction and also the alternatives and implementations required for Sustainable construction.

KEYWORDS: *Sustainability, Sustainable design and construction*

I. INTRODUCTION

Sustainability is a state that requires the humans to carry out their activities in a way that protects the functions of the earth's ecosystem as a whole. The issue of sustainable development is broad and of global concern, and as such, involves all relevant communities and interested parties. Both the current and future needs of the global community define the extent to which economic, environmental and social aspects should be considered in the sustainable development process.Construction and the built environment have a huge impact on the environment, human health, and the overall economy. The construction of residential high-rises worldwide is growing rapidly which stresses on the question of the quality of life these buildings provide for their inhabitants. Improving the quality of life is one of the nine principles the sustainable society World Conservation Strategy (1991) has developed on. The quality of life regarding health includes air quality, thermal comfort, aural comfort, visual comfort and in its physical dimension: appropriate flat layouts along with amenities in the building enhancing social interactions such as gardens, pool, gym, sky-lobby, cafés/restaurants and more. Given how much energy the high-rises consume both during construction and exploitation, the enormous amount of materials they use and a large number of residents they shelter, sustainable design is the only responsible answer to the problems the characteristics of the high-rises impose. The descriptions 'green' and 'sustainable' in relation to buildings, building systems and building products are now well-embedded in the technical literature, with the terms frequently used interchangeably but often ill-defined. A problem with the use of such semi-technical descriptions is that meaning depends on one's perception. 'Green'

implies being environmentally friendly in reducing the negative impacts on the environment of a product or activity. A green building is generally regarded as having reduced environmental impacts, even if the extent is not quantified unless the building has been rated under a building environmental assessment method (BEAM). 'Sustainable' implies something more. According to the Merriam-Webster Online Dictionary the meaning is, 'capable of being sustained', and 'of, relating to, or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged', and from theCollins English Dictionary, '(of economic development, energy sources,etc.) capable of being maintained at a steady level without exhaustingnatural resources or causing severe ecological damage.

II. SCOPE AND OBJECTIVES

The objective of this paper is to study the different literatures about sustainable construction and identify the alternatives that can be considered for a sustainable building construction.

The scope of this paper includes:

- Improvement of the construction sector and the built environment.
- Reduction of adverse impacts while improving value, where impacts as well as value may be judged against any combination from the three primary aspects of sustainability.
- Environment: reduces water use, reduce net land disturbance, and reduce net emissions.
- Social: improve equal employment opportunities, improve contribution to community capacity building, and reduce impact on heritage.
- Economic: optimize long-term economic value.

III. LITERATURE REVIEW

A literature review is a detailed report of information obtained from the various literature that is related to our area of study. The review describes, summarize, evaluate and clarify this literature. This section represents the review of literature collected from various journals and articles that are most relevant to the study. The report "Management of Sustainability in Construction Works". Written by Sneha.S& Aarthi.R of Nehru Institute of Technology investigate the major factors affecting sustainability in whole construction industry The research results are expected to make clear that weather the awareness of sustainable development is present among construction industries, the level of the implementation of sustainable development factors in construction is satisfactory or not and professionals believe that the government has a major role to develop sustainable building in Kerala .

In the report "Sustainable Architecture: Practices and Methods to Achieve Sustainability in Construction" written by.Bruno Marques and Carlos Rafael Loureiro discuss the concept of sustainable architecture, seeking to discuss more accurately the theme of recycling, optimization and lifecycle of building materials, and their importance in saving natural resources, energy performance, building construction, and to what extent experience and training can influence the practice of a more sustainable architecture.

The report "Social and Environmental Sustainability for Better Quality of Life in Residential High-Rises" Written by Elena Kalchevaa, Ahmad Takia and Yuri Hadia of Leicester School of Architecture, De Montfort University, Leicester, Leicestershire, LE1 9BH, UKinvestigates what sustainable design responses are linked to higher quality of life in residential high-rises. The methodology of the research is relying on 12 interviews with prominent architects of high-rise buildings, carried out in January-June 2016.

In the report "Sustainable development A Rethinking of Construction Industry in India" by B. M. Kataria, V. B. Pathak and Dr.J. A. Shah of S.N.P.I.T. & R.C.,Umrakh, India ,brings together research on available alternatives and implementations required for Sustainable development. More than ever, Construction industry of India is concerned with improving the social, economic and environmental indicators of sustainability. For sustainable development and hence leave resources for the future generation to satisfy their needs. This paper provides possible aspect where and how sustainability can be adopted and implemented and/or incorporated for sustainable development.

The report "Sustainable Lighting System for University Buildings" written by .Farheen Zehra, Kasim A. Korkmaz and Mohammad S. Ahmeda (2018) of College of Technology, Eastern Michigan University, Ypsilanti, MI, 48197. U.S.A, presents several measures a typical university building can

take to transform its existing inefficient lighting system into a 100% sustainable lighting system with the least payback time. This research paper documents several measures which can reduce lighting demand in a university building and identify the implementation of these measures can on the building. In conclusion, the payback time of the proposed efficient lighting system installation is calculated to justify the need for the energy efficient lighting system in buildings.

The report "Sustainable design responses for residential high-rises" written by Elena Kalchevaa, Ahmad Takia and Yuri Hadia of Leicester School of Architecture, De Montfort University, Leicester, Leicestershire, LE1 9BH, UK discusses the sustainable design responses through the experience of twelve architects, informing the various parties of four important aspects of the sustainable design of residential high-rises. The methodology is based on an interview protocol with these four questions. The interviews were carried out in January-June 2016. The architects provided comprehensive data on the topic, including how to design residential high-rises in order to foster more social interactions, how to make these buildings more energy efficient and their views on renewable energy solution available.

The report "Factors Affecting Sustainable Performance of Construction Projects during Project Life Cycle Phases" by .Adnan Enshassi1, Bernd Kochendoerfer and Hadeel Al Ghoul (2016) investigate the factors affecting sustainable performance of construction projects throughout project life cycle phases in the Gaza Strip. A total of 53 sustainable factors (economic, social, and environmental sustainable factors) were identified through extensive literature review and confirmed by experts interviews and a pilot study. These factors are classified in relation to the project life cycle phases; inception phase, design phase, construction phase, operation phase, and demolition phase.

Another report "Assessment of sustainable construction practices" by Sattar Sattary from Center for Sustainable Design, Department of Architecture, University of Queensland, Brisbane, Australia, investigates methods of assessment of the building during construction process. It proposes a series of criteria, which can be used to assess the sustainability of various building practices during the construction stage. (These criteria are to be developed into a formal checklist in a later paper - this would enable designers and other interested parties to identify the most appropriate sustainable practices for their projects). Following a discussion of existing construction practices, three methods for assessment of sustainable construction practice are critically reviewed (the Lawson method, the Twin model, and the LEED model). Finally there is proposal of criteria that can be considered in assessment of environmental impact during the building construction process.

The report "Methodology for the application of sustainable construction". By L.N. Jesus & M.G. Almeidan University of Minho, Guimarães, Portugal and A.C.Almeida Chamartín Real State, Lisboa, Portugal;present a methodology to assess the cost-effectiveness of the application of sustainable measures into buildings, through actions that establish a balance between environmental, economic and social factors. The methodology is based on the comparison of a case study (a building with application of sustainable concepts) with some reference buildings that will allow to show the triple bottom line added values. The aim is to achieve an optimum balance point, with an acceptable pay-back time, and to provide evidence of good economic results that encourage the investment into sustainable construction.

The report "Sustainable Building and Construction in Singapore" written by Dr Edward Anggadjaja and Yvonne Soh Swee Leng ; Building and Construction Authority, Singapore; presents an overview of the sustainable building and construction strategies envisaged by the Building and Construction Authority (BCA), Singapore. Various policies and initiatives that are currently being pursued are discussed. Two of the latest commercial development projects in Singapore that have successfully adopted sustainability principles are described. The first project involves the use of structural concrete with high dosage of Recycled Concrete Aggregates (RCA) up to 100% replacement for a closed-loop zero-waste construction, while the second project attained.

The report "Managing sustainability within construction projects" by Malik .M. A. Khalfan (2006) of Salford Centre for Research and Innovation (SCRI) in the Built and Human Environment; discusses some of the sustainability issues identified during the field work, and

highlights the need for a structured framework to consider and incorporate sustainability issues during the whole design and construction process of a project. The latter part of the paper discusses the incorporation of these issues within the Process Protocol, as SMAZ. The paper argues that the key for successful use of SMAZ within the industry is the awareness about the sustainable development among design and construction staff and operatives, knowing the importance of different activities and sub-activities within the SMAZ tool, and motivation to bring changes for betterment within the current day-to-day construction and design processes. The paper towards the end also highlights the areas which need further research and development.

The report "A Review of Design Considerations and Representation of Sustainable Tall Building"; by Hyeong-Il Kimand Sungwoo Shin (2012) provides an analytical survey of the significance of adaptable use of sustainable solutions that demonstrate use of renewable energy resources, and respond to climatic conditions with energy conscious design principles including form, orientation and materiality of the buildings on the current practice.

The report "Laurie Baker: A model for Sustainable Architectural Design" by Saurabh Tewari (2017) of School of Planning and Architecture, Bhopal shows the embedded dimensions of sustainability in Architect Laurie Baker's philosophy and practice of architecture through looking into his words and works. Sustainability, taken as a holistic concept here, is elaborated on ecological, economic, human, cultural and historical dimensions. Each of these dimensions has been supported through a Baker's quote with supporting work illustration. The background covers the post-independence dilemmas of choosing between revivalism and modernism. It then moves to the changing landscape of sustainability in architecture's practice and academia. Later through case demonstration, it suggest that the need of searching a relevant sustainable model for our own contextual needs of architecture can be met through Baker's philosophy.

In the report "Sustainability in Construction Sector" by Mustafa Y lmaza, Adem Bak (2015) of Turkish Military Academy, Civil Engineering Department says the concept of "Sustainability" defined for the first time by Brudland Report which is published in 1989 by United Nations of the World Commission on Environment and Development has been placed in the center of several studies and practices. Adaptation of environment and energy policies supporting economic development not threatening natural life, in international community makes states, establishments, institutions and business world and non-governmental organizations and other stakeholders force to act at this way. Eco-friendly and smart buildings are the result of sustainable environment policies in construction sector which is widely responsible for consumption of natural resources and for environment pollution.

The report "The Essential of Sustainable Building Construction Practices" by . Chandrasekaran Balaji Venkateswarana, ME (Struct.) Ph.D(2019) shows that The sustainable building practices are essential techniques considered in construction of buildings in order that the resources of the earth are not depleted and the resources are carried forward to the future generations. This paper discusses the essentials of sustainable building construction practices in India. The techniques through which the sustainability could be achieved i.e., alternate building technologies available for adoption, building materials suitable to achieve sustainability and renewable energy sources etc., are discussed.

IV. Conclusion

Sustainable construction practices are essential in the construction industry in order to avoid the depletion of natural resources and also for a better life quality of the occupants. It can reduce many impacts that occur during the construction and also after the construction. In this paper I studied the journals and I understood why and how sustainability should be implemented in building construction.

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