



# REVIEW ON SUSTAINABLE DEVELOPMENT AND GREEN BUILDING

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**Abstract:** The concept of sustainable building incorporates and integrates a variety of strategies during the design, construction and operation of building projects. The use of green building materials and products represents one important strategy in the design of a building. Selection of construction materials that have minimum environmental burdens is useful in the sustainable development of a nation. Materials are the essential components of buildings construction. There are chemical, physical and mechanical Properties of materials as well as an appropriate design are accountable of the building mechanical strength. The design of green buildings should thus begin with the selection and use of eco-friendly materials with related or better features than traditional building materials. Building materials are usually selected through functional, technical and financial requirements. However, sustainability is a crucial issue in the last decades. The reviewed literature highlight how sustainable building material can contribute to lessen the impact of environmental degradation, and generate healthy buildings which can be sustainable to the occupant as well as our environment.

**Keywords** – Sustainable Building, Sustainable Materials, Green Building, life cycles.

## I. INTRODUCTION

With the increased development of urbanization, environment and energy issues have drawn additional attention from the public and society. The promotion and implementation of the green building concept has therefore become a primary theme of modern construction, because it is seen to promote buildings that are healthy, safe, comfortable, and environmentally friendly . Buildings have a tremendous impact on the environment, using about 40% of natural resources extracted in industrialized nations, consuming virtually 70% of electricity and 12% of potable water, and producing between 45% and 65% of the waste disposed in our landfills. Additionally, they are responsible for a massive amount of harmful emissions, accounting for 30% of greenhouse gases, due to their operation, and an additional 18% induced indirectly by material exploitation and transportation. Simultaneously, the bad quality of indoor environments may lead in health issues to employees in office buildings, hence, reducing efficiency. Also Building construction consumes 40% of the raw stone, gravel, and sand used worldwide annually, and 25% of the raw timber. The objective of the study was to possible explore and highlight how sustainable building material can contribute to lessen the impact of environmental degradation, and create healthy buildings which can be sustainable to the occupant as well as our natural environment. The life-cycle of a green building extends beyond these initial phases, with its full benefits becoming more apparent during the operational stages of the building. However, there is a clear lack of green building projects obtaining green certificates that evaluate the operational stages of the building. Therefore, the research identified the barriers preventing the certification of green buildings in their operational stages. Initially, commonly used international green building rating tools were identified and analysed on the evaluation. There are three primary Green Building Rating Systems in India, which certify green buildings based on their own set of criteria: The Energy Research Institute (TERI) – GRIHA System. Indian Green Buildings Council (IGBC) – LEED System. Bureau of Energy Efficiency (BEE) – EPI System.

## II. LITERATURE REVIEW

A survey of literature was undertaken to be familiar with the subject matter concerned with the building material problem. how sustainable building material can contribute to lessen the impact of environmental degradation. A green building is a practice of creating structures using utmost natural resources making it environmentally friendly. The green building concept has been gaining prominence in India as well as in other countries too. Various experts and agencies have given definition and meaning of the term “Green Buildings”.

The existing literature is classified the review is presented hereunder:

- Development and Green Buildings.
- Building materials problem
- Material selection
- Sustainable building materials life cycles
- Components of sustainable building materials
- Principles of sustainable building design
- Comparison of Green and Non Green buildings

## Development and Green Buildings

In order to mitigate the effect of buildings along their life cycle, Green Building (GB) has become a new building philosophy, pushing the application of more environmentally friendly materials, the implementation of strategies to save resources and lower waste consumption, and the improvement of indoor environmental quality, among others. This might lead to environmental, financial, economic, and social benefits. primary advantages of Green buildings related to indoor environmental quality advancements are the reduction on health costs and the increase on employees' productivity through their perceived satisfaction towards work areas.

### Building materials problem

The material challenge for buildings usually takes various forms. As stated, the grey energy and emissions must be regarded, and the production of building materials involves the use of more high value energy and resources in comparison with building operations. There are also environmental issues with the by-products of material used in buildings, and there are limitations on the extraction of resources used in numerous building ingredients. One should additionally consider the infrastructure used to support the built environment.

### Material selection

Selecting environmentally attractive materials with minimized environmental impacts is generally achieved through the process of resource conservation and selection of non-toxic materials. The resources used to manufacture construction materials affect the environment by depleting natural resources, using energy, and releasing pollutants to the land, water, and atmosphere. Materials which contain irritating, odorous, hazardous, or toxic elements adversely impact human overall health throughout-gassing of volatile components or direct contact.

## III. SUSTAINABLE BUILDING MATERIALS LIFE CYCLES

Evaluation of building products, from the gathering of raw materials to their ultimate disposal, gives a better perception of the long-term costs of materials. A material's life was organized into three stages, Pre-Building, Building, and Post -Building.

### A. Pre-Building phase

The Pre-Building Stage which explains the production and delivery process of a material up to, but not including, the point of installation. This consists of finding raw materials in nature as well as extracting, manufacturing, packaging, and transportation to a building site.

### B. Building phase

The Building Stage refers to a building material's useful life. This stage commences at the point of the material's assembly into a structure, involves the maintenance and repair of the material, and goes all over the lifetime of the material within or as part of the building.

### C. Post-Building phase

The Post-Building Stage refers to the building materials when their performance in a building has run out. At this stage, a material could possibly be recycled in its entirety, have its elements reused back into other goods, or perhaps be thrown away.

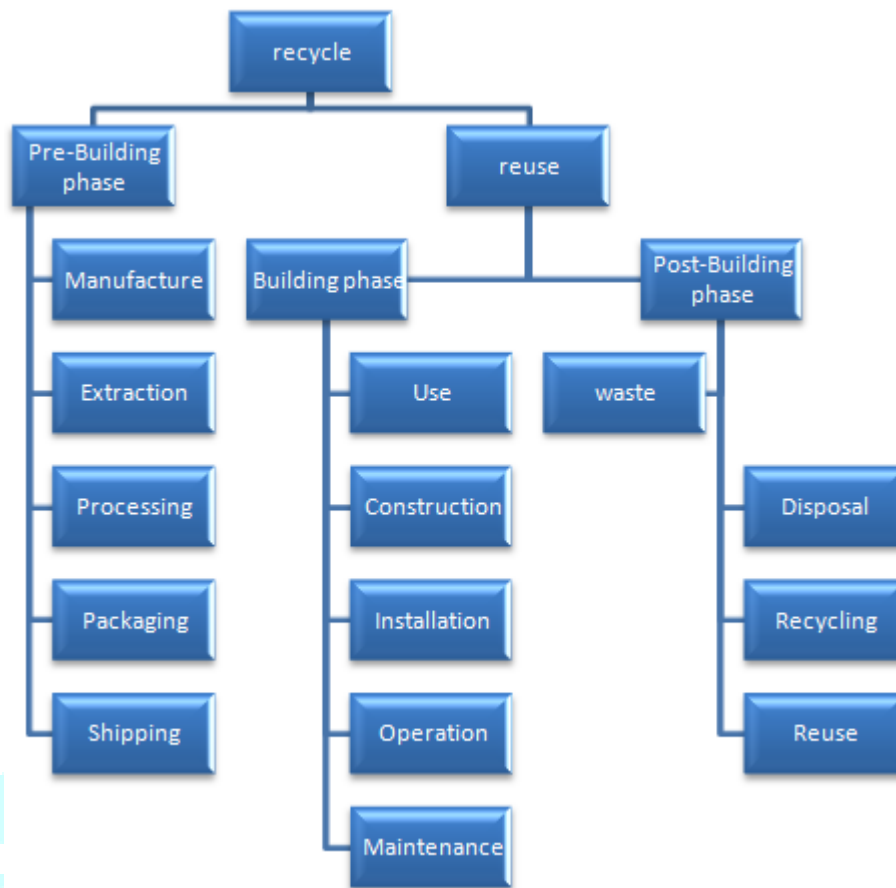


Figure 1: Three phases of the Sustainable building material life

**IV. COMPONENTS OF SUSTAINABLE BUILDING MATERIALS**

Component of Sustainable Green Materials		
Manufacturing Process (MP)	Building Operations (BO)	Waste Mgmt. (WM)
Waste Reduction (WR) Pollution Prevention (P2) Recycled (RC) Embodies Energy Reduction (EER) Natural Materials (NM)	Energy Efficiency (EE) Water Treatment & Conservation (WTC) Nontoxic (NT) Renewable Energy Sources (RES) Longer Life (LL)	Biodegradable (B) Recyclable (R) Reusable (RU) Others ( O)

**V. PRINCIPLES OF SUSTAINABLE BUILDING DESIGN**

In the CIB report on agenda 21 on sustainable construction, states that different nations have their own different strategy and priorities regarding principle of sustainable construction. The report additionally suggests that the primary focus of sustainable construction and design in universal approach is ecological impact to the environment. Five principles of sustainable design were stated in which sustainable building material had been highly recommended.

- Healthy interior environment

All possible measures are to be taken to ensure that materials and building systems do not emit toxic substances and gasses into the interior atmosphere. Additional measures are to be taken to clean and revitalize interior air with filtration and planting.

- Energy efficiency

All possible measures are to be taken to ensure that the building’s use of energy is minimal. Cooling, heating, and lighting systems are to use method and products that conserve or eliminate energy use.

- Ecologically benign materials

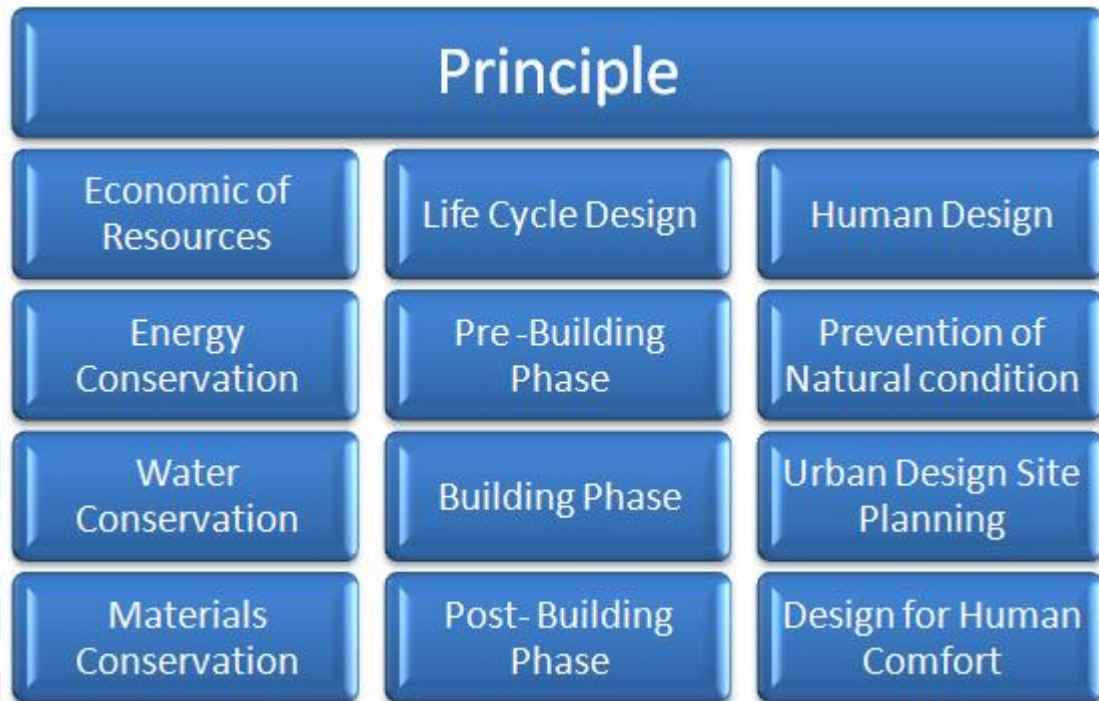
All possible measures are to be taken to use building materials and products that minimize destruction of the global environment.

- Environmental form

All possible measures to be taken to relate the form and plan of the design to the site, the region, and the climate. Measures are to be taken to relate the form of building to a harmonious relationship between the inhabitant and nature.

- Good design

All possible measures are to be taken to achieve an efficient, long lasting, and elegant relationship of use areas, circulation, building form, mechanical systems and construction technology.



**Figure 2: conceptual framework for sustainable design and pollution prevention in architecture.**

## VI. COMPARISON OF GREEN AND NON-GREEN BUILDINGS

Shreshta and Pushpala (2012) note that while green buildings are designed to reduce operating costs by reducing energy consumption they can cost more than non-green buildings. It was found that that the construction cost per square feet of a Green building is significantly higher than that of Non Green building. The findings show that of the ten green envelope components certified under GBI Malaysia, three components increase property values and eight of them do not have any effect on building value. Rahman et al (2017) shed light on the economic performance of green buildings by evaluating Atlantis Highlights in Social Sciences, Education and Humanities, volume 2 16 whether LEED for Homes and properties capture higher market valuations and lower vacancy rates.

## VII. CONCLUSIONS

Sustainable building materials by definition are materials which are domestically created and sourced which decreases transportation costs and CO<sub>2</sub> emissions, they could consist of reused materials, they possess a lower environmental effect, they are thermally effective, they need less energy than conventional materials, they make use of renewable resources, they are lower in harmful emissions and they are economically sustainable. The benefits cannot be achieved without applying proper a sustainable standard like LEED, which is a proper rating system to assist designers. Accordingly, if sustainable principles can be used in building projects, then numerous benefits of green buildings may be achieved, such as Environmental benefits: Enhance and protect biodiversity and ecosystems; Improve air and water quality; Reduce waste streams, and Conserve and restore natural resources. Social benefits: Enhance occupant health and comfort; Improve indoor air quality; Minimize strain on local utility infrastructure, and Improve overall quality of life. Nevertheless, with sustainability as a crucial challenge in the past decades, particularly in developed nations, the environmental load of building materials additionally become a more significant requirement. Among the directions for solutions is to be seen in new material applications, recycling and reuse, sustainable manufacture of products, or use of green resources. However, Green buildings are comparatively more costly when compared to non-green buildings.

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