

# Sustainable Infrastructure Development – A Need For Civil Engineering

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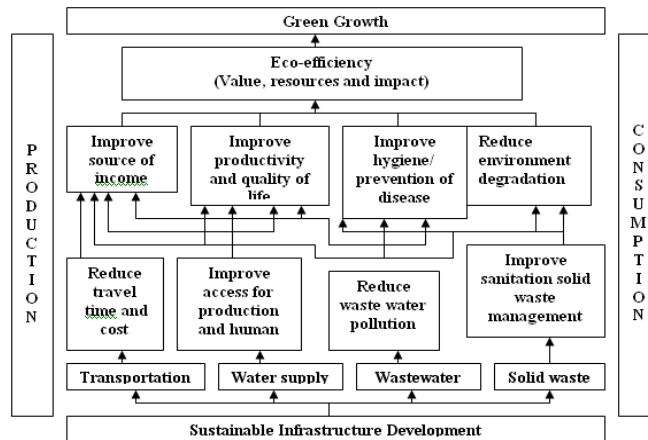
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**ABSTRACT :** The civil engineering profession recognizes the reality of limited natural resources, the desire for sustainable practices and need for social equity in the consumption of resources. This paper discusses a framework for incorporating sustainable infrastructure concept and important to green building rating systems. By providing a better understanding of sustainability, civil engineers can provide proactive solution to competitive global infrastructures.

**KEYWORDS:** Sustainable design, green building.

## I.INTRODUCTION

“Sustainable development in a diverse world “. Sponsored by the European Union, integrates multi disciplinary capacities and interprets cultural diversity as a key element or a new strategy for sustainable development.[1] Also this accommodates human needs without diminishing the health and productivity of natural systems. The American Institute of Architects defines sustainability as “the ability of society to continue functioning into the future without being forced into decline through exhaustion or overloading of the key resources on which that system depends. Sustainable development (also called Green Building or environmentally friendly development) is not a particular style, technique, or practice. Rather, it is a philosophy of land development and construction fostering environmental responsiveness, resource efficiency and community and cultural sensitivity. These concepts are incorporated in different ways according to the kind of project, the goals for the project and the available budget.



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## II.SUSTAINABLE INFRASTRUCTURE DEVELOPMENT AND GREEN BUILDING

### Sustainable Infrastructure Development

Infrastructure, especially water, waste, energy and transport infrastructure, is intimately and essentially intermeshed with economic growth, people's lives and environmental sustainability the inability of the cash-strapped public utilities to provide financial resources for development and private sector participation in infrastructure development, it becomes very important that resources for development are directed towards sustainable development.[3] However, the countries in the region need to consider the long-term impact of infrastructure development on the sustainability and eco-efficiency of their economic growth. It is time to think differently about infrastructure development, taking into account eco-efficiency and resource conservation over the lifetime of the infrastructure. In this process, the concept of Green Growth, especially eco-efficiency, needs to be incorporated into policies for infrastructure development throughout the life cycle.

According to the World Bank (1994) [2], infrastructure can deliver major benefits in economic growth, poverty alleviation and environmental sustainability—but only when it provides services that respond to effective demands and does so efficiently. Figure 1.0 provides a simple diagram of how sustainable infrastructure, such as for water, wastewater, solid.Waste and transportation, can contribute to green growth

### Green Building

Green Building, also known as green construction or sustainable building, is the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle: from silting to design, construction, operation, maintenance, renovation and deconstruction. This practice expands and complements the classical building design concerns of economy, utility, durability and comfort [4]. Although new technologies are constantly being developed to complement current practices in creating greener structures, the common objective is that green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment by:

- Efficiently using energy, water and other resources  
Figure 1.0 Sustainable infrastructure development in relation to green growth.
- Protecting occupant health and improving employee productivity
- Reducing waste, pollution and environmental degradation

## III.MATERIAL AND METHODS

On the aesthetic side of green architecture or sustainable design is the philosophy of designing a building that is in harmony with the natural features and resources surrounding the site. There are several key steps in designing sustainable buildings: specify 'green' building materials from local sources, reduce loads, optimize systems and generate on-site renewable energy [5].

## IV. STRUCTURE DESIGN EFFICIENCY

The foundation of any construction project is rooted in the concept and design stages. The concept stage, in fact, is one of the major steps in a project life cycle, as it has the largest impact on cost and performance. In designing environmentally optimal buildings, the objective function aims at minimizing the total environmental impact associated with all life-cycle stages of the building project. Creating sustainable buildings starts with proper site selection. The location of a building affects a wide range of environmental factors – such as security, accessibility and energy consumption, as well as the energy consumed by transportation needs of occupants for commuting, the impact on local ecosystems and the use/reuse of existing structures and infrastructures. If possible, locating buildings in areas of existing development where infrastructure

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## V.ENERGY EFFICIENCY

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### Water Efficiency

Reducing water consumption and protecting water quality are key objectives in sustainable building. One critical issue of water consumption is that in many areas of the country, the demands on the supplying aquifer exceed its ability to replenish itself. To the maximum extent feasible, facilities should increase their dependence on water that is collected, used, purified and reused on-site. The protection and conservation of water throughout the life of a building may be accomplished by designing for dual plumbing that recycles water in toilet flushing. Waste-water may be minimized by utilizing water conserving fixtures such as ultra-low flush toilets and low-flow shower heads. Point of use water treatment and heating improves both water quality and energy efficiency while reducing the amount of water in circulation. The use of non-sewage and grey-water for on-site use such as site-irrigation will minimize demands on the local aquifer.

### Material Efficiency

Building materials typically considered to be 'green' include rapidly renewable plant materials like bamboo (because bamboo grows quickly) and straw, lumber from forests certified to be sustainably managed, ecology blocks, dimension stone, recycled stone, recycled metal and other products that are non-toxic, reusable, renewable and/or recyclable (e.g. Trass, Linoleum, sheep wool, panels made from paper flakes, compressed earth block, adobe, baked earth, rammed earth, clay, vermiculite, flax linen, sisal, sea grass, cork, expanded clay grains, coconut, wood fiber plates, calcium sand stone, concrete (high and ultra high performance, roman self-healing concrete, etc.) The Environmental Protection Agency (EPA) also suggests using recycled industrial goods, such as coal combustion products, foundry sand and demolition debris in construction projects. Polyurethane heavily reduces carbon emissions as well. Polyurethane blocks are being used instead of Construction Management Teams (CMTs) by companies like American Insulock. Polyurethane blocks provide more speed, less cost and they are environmentally friendly. Green materials are environmentally responsible because impacts are considered over the life of the product.

### Indoor Environmental Quality Enhancement

The Indoor Environmental Quality (IEQ) category in Leadership in Energy & Environmental Design (LEED) standards, one of the five environmental categories, was created to provide comfort, well-being and productivity of occupants. The LEED IEQ category addresses design and construction guidelines especially: Indoor Air Quality (IAQ), thermal quality and lighting quality. Indoor Air Quality seeks to reduce Volatile Organic Compounds, or VOC's, such as microbial contaminants. Buildings rely on a properly designed High Ventilation & Air Conditioning (HVAC) system to provide adequate ventilation and air filtration as well as isolate operations (kitchens, dry cleaners, etc.) from other occupancies.

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## Water Reduction

Green architecture also seeks to reduce waste of energy, water and materials used during construction. For example, in California nearly 60% of the state's waste comes from commercial buildings. During the construction phase, one goal should be to reduce the amount of material going to landfills. Well-designed buildings also help reduce the amount of waste generated by the occupants as well, by providing on-site solutions such as compost bins to reduce matter going to landfills [6].

## VII.GREEN BUILDING RATING SYSTEM

### What is Indian Green Building Council

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### IGBC Green Homes Rating System

Indian Green Building Council (IGBC) Green Homes is the first rating program developed in India, exclusively for the residential sector. It is based on accepted energy and environmental principles and strikes a balance between known established practices and emerging concepts. The system is designed to be comprehensive in scope, yet simple in operation [8].

### Benefits of Green Home

A Green Home can have tremendous benefits, both tangible and intangible. The immediate and most tangible benefit is in the reduction in water and operating energy costs right from day one, during the entire life cycle of the building [9].

#### Tangible benefits

- Energy savings : 20 – 30 %
- Water savings : 30 – 50%

#### Intangible benefits

- Enhanced air quality,
- Excellent day lighting,
- Health & well being of the occupants,
- Conservation of scarce national resources
- Enhance marketability for the project.

### Eligibility

Indian Green Building Council (IGBC) Green Homes Rating System is a measurement system designed for rating new residential buildings which include construction categories such as

- Individual homes
- High rise residential apartments,
- Gated communities
- Row houses
- Existing residential buildings which retrofit and redesigned in accordance with the IGBC Green Homes criteria.
- The project team can evaluate all the possible points to apply under the rating system using a suitable checklist. The project can apply for IGBC Green Homes certification if it can meet all mandatory requirements and achieve the minimum required points.

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## VIII.CONCLUSION

Engineers have a leading role in planning, designing, building and ensuring a sustainable future. Engineers provide the bridge between science and society. In this role, engineers must actively promote and participate in multidisciplinary teams with other professionals, such as ecologists, economists and sociologists to effectively address the issues and challenges of sustainable development.

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