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GREEN BUILDING FOR QUALITY LIVING

Supriya Shinde, Nikita kanawade, Sarika Palande, Nutan Zaware, Prof. S. C. Dighe

Department Of Chemical Engineering ,P.D.V.V.P. Polytechnic Loni

HOD of Chemical Engineering Department

Abstract:

The practice of increasing the efficiency with which buildings and their sites use energy, water, andmaterials, and reducing building impacts on human health and the environment, through better sitting, design, construction, operation, maintenance, and removal—the complete building life cycle. The practice of creating structures and using processes that is environmentally responsible and resource-efficient throughout a building's life-cycle from sitting to design, construction, operation, maintenance, renovation and deconstruction. This practice expands and complements the classical building design concerns of economy, utility, durability, and comfort. Green building is also known as a sustainable or 'high performance' building. Both of these definitions mention **life cycle assessment (LCA)**. LCA is the investigation and valuation of the environmental, economic, and social impacts of a product or service in the context of green buildings.

LCA evaluates building materials over the course of their entire lives and takes into account a full range of environment impacts, including materials embodied energy: the solid waste generated in its extraction, use and disposal: the air and water pollution associated with it: and its global warming potential. LCA is an import green. The most important element: the efficient use of energy building can incorporate manant tool because it can demonstrate whether a product used in a green building is truly y green features, but if they do not use energy efficiently, it is difficult to demonstrate that they are truly green. In fact, given that the term "green Building" can be somewhat vague, some people prefer to use the term "high performance building". A high performance building is a building whose energy efficiency and environmental performance is substantially better than standard practices. Although green buildings, on averageuse less energy than conventional buildings. Energy efficiency remains elusive. In fact, there is a growing debate whether buildings that achieve some level of LEED certification are more efficient in their use of energy than regular buildings. It suffices to say that if a building is not energy efficient, it cannot be said to be green.

The reality of the built environment: the problem of existing buildings although green buildings represent the next phase of buildings, the reality is that the vast majority of buildings are not green, and these buildings will continue to be used for many years to come. Improving the energy efficiency of existing buildings typically involves a process called retrofitting, which can mean anything from installing more energy-efficient fixtures to increasing the amount of insulation in a building. While greening existing buildings does not receives that attention that new green buildings do, it is certainly more important when looking at reducing the environmental impacts of buildings nationwide.

Impacts of conventional buildings that green buildings seek to rectify the environmental impacts of buildings of buildings are enormous. They are responsible for large greenhouse gas (GHG) emissions as well as emissions of other harmful air

pollutants. They also generate large amounts of construction and demolition (C&D) waste and have serious impacts on plants and worldwide. Buildings consumers massive amount of energy. The United Nations environment programme has reported that 30-40 percent of all primary energy produced worldwide is used in buildings. In 2008, the international energy agency released a publication that estimated that existing buildings are responsible for more than 40 percent of the world's total primary energy consumption and for 24 percent of global CO2 emissions.

Greenhouse gas emissions are indoor air pollution given that buildings use large amounts of energy, and given that most of this energy comes from the burning of fossil fuels. Unfortunately, greenhouse gases are not the only harmful pollutants that building emits. Indoor levels of air pollution may greatly exceed outdoor levels. Indoor air pollution is particularly important given that we spend most of our time indoors. It estimated that indoor levels of pollution may be two to five times higher, and occasionally more than 100 times higher, than outdoor air pollution levels. This pollution can come from a wide variety of sources. One way to reduce the presence of these toxins is to ensure that indoor air is frequently replaced by outdoor air and to ensure that this is properly filtered, unfortunately. Buildings are often poorly ventilated and do not sufficiently filter the air that is recalculated, leading to air this is potentially harmful to building occupants health. A primary consideration of green buildings is the health and well being of their occupants.

Further, wastewater from buildings typically goes into municipal sewer systems rather than being treated on-site or used for non-potable purposes. Buildings also usually displace vegetation that can capture and absorb precipitation. The net result is that municipal sewer systems are often overburdened. During rainfall events, billions of gallons of water flow into these sewer systems as runoff, carrying contaminants with them. Many older municipalities have combined sewer systems are not designed to treat the massive amounts of water that flow into them during heavy rainfall events. Thus, they are equipped with combined sewer overflows (CSOs), which act as safety valves and deposit much of this water, which contains raw sewage and other contaminants, into waterways.

"Gray Water" can also be used in building operations, gray water is water drained from baths, showers, washing machines and sinks that can be captured and used again. Gray water can be collected and reused for irrigating landscapes. A dual plumbing system is necessary for recycling gray water within a building. Biological wastewater treatment can also be used to recycle gray and black water.

Land use and consumption many millions of acres of land in this country have buildings constructed on them. Although buildings that leads to large amounts of land, this is not the primary issue. Rather, it is the poor sitting of buildings that leads to large amounts of land (and other resources) being consumed. For example, buildings that are not built in existing residential or commercial areas require the construction of new roads, sewer lines, utility poles and other infrastructure to reach them, which can lead to, among other things, habitat destruction. In addition, many buildings are not reachable by public transportation and thus require the construction of parking lots or garages. Most significantly, buildings that are built on the fringes of existing urban or suburban areas often contribute to the problem of sprawl. Although sprawl can have many definitions, generally speaking, sprawl is the spreading of a city or, more typically, its suburbs to previously undeveloped or lightly developed areas between 1982 and 1997, approximately 25 million acres (39,000 square miles) of rural-which includes forest, rangeland, pastures, cropland, and wetlands- were developed. From 1970 to 1990, the 100 largest urbanized areas expanded over an additional 14,545 square miles. Green buildings construction is a multibillion-dollar industry and requires the constant production and harvesting of millions of tones of a variety of raw materials to meet worldwide demand. By any measure, the amount of raw materials each year, and it has been estimated that the construction industry consumes half of all products produced by volume. A conical part of green buildings is the material that is used in their construction. Although definitions vary, green building materials are generally composed of renewable rather than non renewable resources and are environmentally responsible because their impacts are considered over the life of the product. In addition, green building materials generally result in reduced maintenance and replacement costs over the life of the building, conserve energy, and improve occupant health and productivity. Green building materials can be selected by evaluating characteristics such as reused and recycled content, zero or low off-gassing of harmful air emissions, zero or low toxicity, sustainably and rapidly renewable harvested materials, high recyclability, durability, longevity and local production.

According to some estimates, four tons of wastes are typically deposited into a landfill during the construction of a new

2,000 square foot home, construction waste consists primarily of lumber and manufactured wood products (35 percent), drywell (15 percent), masonry materials (12 percent) and cardboard (10 percent). The remainder is a mix of roofing materials, metal, plaster, plastics, foam, insulation, textiles, glasses, and packaging. Although much of this material is recyclable, most of it is deposited into landfills. Green buildings generally seek to minimize the amount of C & D waste they generate. One way they do this is by recycling or reusing C & D waste, such as by using inert demolition materials as base material for parking lots of roadways. For sites that include the demolition of existing structures. Plans can be developed early in the design process to manage and reuse as much material as possible through the deconstruction, demolition and construction processes. Demolition generates large amounts of materials that can be reused or recycled-principally wood, concrete and other types of masonry, and drywell. Rather than demolishing is the orderly dismantling of building components for reuse or recycling. In contrast to building is the orderly

dismantling of building components for reuse or recycling. In contrast to building demolition, deconstruction involves taking apart portions of buildings or removing their contents with the primary goal being reuse.

Key Words: Green, Building, Harmful, dismantling

1.INTRODUCTION

The beginning of the twenty-first century has ushered in the era of green buildings. Normal buildings useenergy inefficiently, generate large amounts of waste in their construction and operation, and emit largequantities of pollutants and greenhouse gases. In contrast to conventional buildings, green buildings seekto use land and energy efficiently, conserve water and other resources, improve indoor and outdoor, airquality, and increase the use of recycled and renewable materials. While green buildings still constitute atiny subset of existing buildings, their numbers are increasing rapidly. Green building (also known asgreen construction or sustainable building) refers to both a structure and the application of processes thatare environmentally responsible and resource-efficient throughout a building's life-cycle: from planningto design, construction, operation, maintenance, renovation, and demolition. This requires closecooperation of the contractor, the architects, the engineers, and the client at all project stages. The GreenBuilding practice expands and complements the classical building design concerns of economy, utility, durability, and comfort. Green building brings together a vast array of practices, Techniques and skills to reduce and ultimately eliminate the impacts of buildings on the environment and human health. It oftenemphasizes taking advantage of renewable resources, e.g., using sunlight through passive solar, activesolar, and photovoltaic equipment, and using plants and trees through green roofs, rain gardens, andreduction of rainwater run-off. Many other techniques are used, such as using low-impact buildingmaterials or using packed gravel or permeable concrete instead of conventional concrete or asphalt toenhance replenishment of ground water.While the practices or technologies employed in green building are constantly evolving and may differfrom region to region, fundamental principles persist from which the method is derived: siting andstructure design efficiency, energy efficiency, water efficiency, materials efficiency, indoorenvironmental quality enhancement, operations and maintenance optimization and waste and toxicsreduction. The essence of green building is an optimization of one or more of these principles. Also, withthe proper synergistic design, individual green building technologies may work together to produce agreater cumulative effect.On the aesthetic side of green architecture or sustainable design is the philosophy of designing a buildingthat is in harmony with the natural features and resources surrounding the site. There are several key stepsin designing sustainable buildings: specify 'green' building materials from local sources, reduce loads, optimize systems and generate on-site renewable energy

2. Body of Paper

Fig-1

❖ GREEN BUILDING OBJECTIVES

A truly sustainable built environment re-integrates into nature. In a natural system there is no such thing as waste and each individual's waste products become inputs for someone else. It is possible for humanity to once again become part of these natural cyclical systems.

Buildings that take their cue from nature and their surroundings can support, strengthen and improve the functioning of natural systems while also improving their own functionality.

- **CONSERVING THE NATURAL ENVIRONMENT**

Structures and infrastructures tend to disturb the natural environment and ecosystems significantly; top soil, vegetation, water cycles, animal behavior and biodiversity in general are impacted on by the built environment. All of these systems are necessary for the healthy functioning pf the planetary systems that are needed for our survival.

- **OPTIMUM USE OF BUILDING MATERIALS**

Buildings materials utilize natural resources. Obtaining these materials requires timber harvesting, cultivation, mining and quarrying. Many of these activities are currently degrading the environment. Once obtained, these materials need to be processed, manufactured and transported. Using local materials as far as possible is an easy way to be greener.
It is therefore imperative to specify the most sustainable building materials possible and to use them in the most efficient way.

- **ENERGY EFFICIENCY**

It is estimated that around 40% of the planet is by buildings. By far the majority of energy is generated using non-renewable sources such as coal, gas and oil. Being non-renewable, these resources will get depleted and, as they become scarcer, become more expensive and more difficult to extract. The process of converting these fossil fuels into energy in most cases produces greenhouse gases (GHGs) which contribute to global warming.
Energy efficient buildings contribute significantly to lowering humanity's overall energy requirements. With in turn reduces the building sectors carbon footprint.

- **WATER EFFICIENCY**

Fresh water is increasingly being recognized as a scarce resources and water systems are becoming increasingly polluted. It is estimated that buildings consume 40% of all fresh water that is used. This water is used for drinking, cooking, sanitation, cleaning and for the industrial processes that take place in many buildings.
Appropriate water harvesting, recycling and conservation can make a significant impact in preserving this most precious commodity.

- **WASTE MAMAGEMENT**

Buildings generate an ongoing amount of waste during their lifetimes and in their eventual deconstruction. This waste can be liquid, solid or gas and places a burden on the environment because it can't be safely and healthy disposed of.

Recycling is one of the best ways of managing waste. Not only can the continuous waste generated by the building by recycled but the actual building itself is able to be recycled when no longer required. In effective recycling waste from one function becomes a resource for another.

The careful management of consumption, clever design and appropriate material choice can significantly reduce waste output.

- **SOCIETY AND THE HUMAN EXPERIENCE**

Buildings have a profound effect on their occupants and users- influencing and shaping the way in which we live. Learn, work, play, contemplate and relax.

The design, resolution and ongoing condition of buildings can either improve or detrimentally impact on the wellbeing of the occupants.

A built environmental that promotes human dignity, safety, security, hygiene, ease of use and sound community values will promote wellbeing on an individual and collective level.

Well adjusted, balanced and cared about people and societies are sustainable. Dysfunctional ones are not.

- **HEALTH**

Buildings effectively create an internal environment which profoundly affects its occupants. Air quality, light quality, acoustics, temperature and hygiene can promote or hinder health, depending on how they perform.

It has been found that buildings that are environmentally sustainable tend to promote health, which in turn improves the wellbeing of its occupants as well their productivity. There are many case studies proving that the increased productivity of occupants has been the most lucrative result of a greening process.

- **ECONOMIC SUSTANIBILTY**

Sustainability includes financial and economic sustainability, resource- hungry buildings are costly to produce and use, and this places a strain on the overall socio-economic fabric of society.

The costs of energy, water and materials are going to continue to increase as they become rqlscarcer and an efficient building can contribute hugely towards the financial hardship in the world are increasing and a thoughtful and efficient built environment could realize benefits for many levels in society.

❖ Environmental Parameters

A brief; 2000-2013 the parameters for environment friendly constructional practices have been always a part of the bye laws & the literature of corporations. The environmental status reports have been a strong proof for the same. The parameters were never highlighted as a separate entity but always a part of the integrated construction process. The need for a recognized methodology & degree of greenness was realized & so the concept of green ratings was introduced in the country. International protocols & growing awareness in the global scenario also created the need in the Indian market. The rating tool offered a similar concept which was associated with project branding and measurement of green status. The concept of green buildings picked up pace after year 2000 in India. The authority organizations presented their voluntary assessment systems to the citizens which were propagating the green construction practices from design to operational phase. For its proliferation several offers & benefits including monetary benefits were attached to the rating systems. The globally recognized rating LEED made a way in India with its green homes rating which was further modified to Indian context by confederation of Indian industry (CII). The rating was termed as IGBC green homes. Where IGBC is Indian green building council clearly highlighting the localized

sense. ECO housing India. IGBC green homes and GRIHA are the ratings that were presented to the city of Pune during the past decade. Environmental parameters influence the distribution, abundance & activity of animals & plants. Local meteorological conditions such as air temperatures, rainfall or sunlight may affect the behaviour of terrestrial organisms, and water current, dissolved oxygen, suspended material &river bed topography may influence aquatic species. Green building rating systems in India, there are rating systems like LEED, IGBC, ECO housing & GRIHA. They have a prede fined set

of criteria that have intent towards direct applicable environment aspect with points against each of them. Few points are mandated while others are voluntary as per the choice of the project. Buildings are required to fulfil the defined criteria & achieve a certain number of points to be certified. In addition to these rating systems, there are codes that are applicable to defined projects. These codes are not mandated till date but might be a mandate to go with in near future. Energy consumption building code (ECBC) has a direct implication with measurable energy savings. With all these guidelines there is national building code (NCB) which provide instructions on the energy consumption of buildings. All buildings in India need to comply with the guidelines set up by ECBC & the NCB.

We can define green buildings as structures that ensure efficient use of natural resources in construction. Use of eco-friendly building materials, savings in water & energy & other resources with minimal generation of non-degradable waste are key parameters for green buildings. Further to the basic systems in the defined green way, technology support enhances the greenness quotient of the project. Technologies prove very useful to help measure the actual savings that reflect in the system. Examples like efficient cooling systems with sensors that can sense the heat generated from human body & automatically adjust the room temperature, prove much more beneficial than only limiting to system installations, further saving energy. The same applies to the lighting systems too resulting in saving of energy against lighting. Green buildings have a smarter lighting system that automatically switches off when no one is present inside the rooms. Simple technologies like air based flushing system in toilets that avoids water use by 100% use of energy efficient LEDs & CFLs instead of conventional incandescent lamp, new generation appliances that consume less energy and many other options help in making the buildings green & make them different from conventional ones. The Pune city, all the four rating systems are predominantly noted. Due to the applicable benefits to the region, the city experiences a large green building footprint in the country with LEED & GRIHA combined footprint.

1. Green building parameters: there are several parameters on which a building is evaluated before being awarded witha final certification. The overall parameters can be categorized as following major heads:

2. Efficiency of site selection and planning: the site selection & planning selection address the ecology & environmental concerns related to residential construction & site development activities including the design of landscape.

3.Water management: efficient water & waste water management for reducing water usage demand on fresh water resources is the prime focus, the residential sector is one of the significant water consumers, after agricultural. The certification parameters encourage water usage in a self-sustainable manner through reduce-recycle-reuse concept.

4. Energy efficiency: reducing demand of conventional energy by optimization of building design & structure is the prime focus. Incorporating renewable sources of energy & renewable energy based systems such as solar water heater to reduce the use of conventional energy are evaluated & applied in the project under this head.

5. Materials: efficiency in selection of sustainable materials for construction & the technologies considered is evaluated.

6. Indoor environmental quality: enhancement of indoor environment quality like indoor air & thermal quality is evaluated including daylight parameters.

7. Innovation: the credits that are performing exemplary in few of the above criteria can avail additional points under innovations. Also if the project attempts any beneficial activity that is not mentioned in the rating but that can help to prove positive benefit to the environment they can claim additional points under this head.

Focus Area	**IGBC**	**GRIHA**	**Combined**
Building planning & designing (AC/ non AC)	15%	12%	14%
Energy efficiency (lighting, HVAC, renewable)	13%	12%	13%
Construction materials	12%	12%	12%
Indoor environmental quality	11%	11%	11%
Waste management	11%	10%	11%
Innovations	9%	9%	9%
Water efficiency	7%	7%	7%
Social consideration	7%	7%	7%
Landscaping	6%	6%	6%
Site selection	4%	6%	5%
Preservation of natural resources on site	4%	5%	5%
Efficient transportation system	1%	3%	2%

To compare green and conventional buildings, major parameters that will be under consideration include those areas where the green element shall make an impact. There are many parameters which will have common consideration as per the sanctioning mandates or by the environmental committee suggestive mandates. Only those parameters that are additional for green building will be accounted for this study.

9. Case study analysis: a brief survey was carried out for a sample of 150 where the preference of the developers & buyers was asked for the rating to be opted for while doing a green building. Looking at the popularity of the ratings in the buildings sector in private & government sector both, IGBC & GRIHA prove to make a mark in the Indian industry. Similarly for the city of Pune both these ongoing ratings are prominent & exceed the footprint than other ratings. We can thus study the two prominent ratings in Pune i.e IGCB &GRIHA ; for the preferential weigh age catered to each of the criteria as defined by green norms. As per the

defined categories of the ratings, the following table is identified with the weigh age in terms of points given to each criteria under that category. From the above tables it can be realized that the prevalent rating systems in India give most priority to the building design & comfort parameters, average high priority is for the materials &water & waste management is given considerable weight age, significant points lie with the main credits but the supporting credits are designed in such ways that they have great influence or main points. With their minor number they can assume greater impact on main point further adding green quotient to the project. Further detailed analysis for these parameters is carried out on the basis of their cost impact against each of the criteria. Cost impactive parameters for green & conventional buildings

In residential sector for most preferred ratings of IGBC & GRIHA many projects can be identified that have reached a benchmark for study. Considering the parameters of conventional and green buildings, a detailed study is carried out for GRIHA and IGBC criteria to understand the impactive credits for the entire project. The cost impact shall only be considered for first costs impact, either increasing or decreasing cost for conventional against green building. The overall study has been divided in two parts majorly. The first part of the study is the identification of the criteria or the variables of the cost parameters for conventional against green. Whilst the second part is the actual set of certified buildings are studied for the impacted cost. Here the detailed checklist for both rating systems is analyzed for the first cost impact that is probable for both the conventional and green. To attain the impact happening through the green initiatives was segregated as per their variables that were further related to combination working . The analyses helped us to identify how the cost increment or decrement is impacting the green against the conventional case. This analysis is made against each sub part of the criteria for both ratings and segregated under heads as mentioned in the figures below. The graphs below in Fig. 1 & Fig. 2 mention the weight age of Cost impact that was noted for the variables. It is noted from the above Fig. 1 and Fig. 2 that the parameters related to site and energy show a significant increase in cost parameters with green attempted criteria whilst there is also a significant decrease observed with the parameters of materials specifically under the structural head. With the increase in cost there is a high scope for cost decrease also with the attempt of right technology and correct material selection. Simultaneous decrease is also observed under the water and site credit with the responsible parameter of landscape.

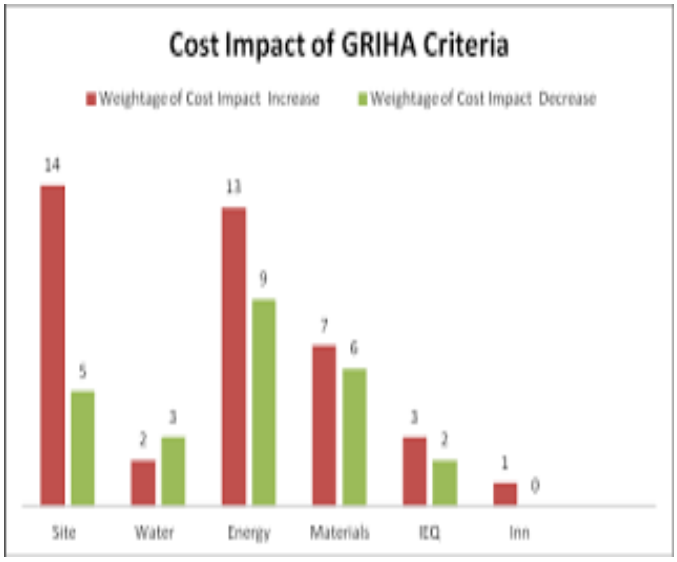

Fig-2

3. CONCLUSIONS

This research identified the exciting development taking place on the technology front and analyses their implications for intelligent and green buildings, high lighting examples of “best in class” buildings employing green and intelligent technologies. These buildings are dynamic provided documents evidence to educate and influence end-users, building owners, architects, and contractors that a “greener building” can be achieve using intelligent technology and gap this “greening” will provide a tangible and significant return on investment. Green buildings have greater payoffs than the cost to construct them making them a good

investment over using standard building sites and materials. Many components play into the construction and design of a green building including location and building materials. Green buildings, weather they are homes, offices, or school, are built to reduce pollution, conserve energy used, and to more efficiently used to renewable resources. Several practices that are now used by those "going green" were used long ago. Ancient greeks built homes structure to attract solar heat during the winter months. Green building (aka sustainable buildings) ideas becomes much more popular during the 1990s. In 1992 the first green building program began in Austin, Texas, the following year the U.S. green building council (USGBC) was founded in 1998 they launch their leadership in energy & environmental design (LEED) which is green building rating system and certification program that is nationally accepted. A location is important when constructing site. Environmentally sensitive areas are not most desirable when searching for location. The most beneficial spots to build upon are former parking lots, shopping centers, and factories. Building should be constructed within easy walking distance from public transportation, schools, and stores so that bicycles or walking can be used as opposed to driving your car (which emits pollution into the air). Also the building should be placed where it can received great amount of natural daylight to reduce lighting requirement, and make the most of what can naturally be used. Windows should also strategically be place to green in daylight. A new technology that is now used frequently instead of standard windows is dual glazed windows (they reduce heat gain in the summer and heat loss in the winter). This research identified exciting development taking place on the example of "best in class" building employing green and intelligent technologies. These buildings are dynamic environments that respond to their occupants? Changing needs and life styles. This research provided documented evidence to educate and influence end-users, building owners, are architects, and constructors that a " greener building" can be achieved intelligent technology and this "greening" will provide a tangible and significant return on investment to all the above going 'GREEN' IS THE ONLY. Green building can be made cost neutral with the right implementation of strategy at the correct aspect. Maintaining the balance between cost raise and cost decrease a neutral approach can be attain where in a premium rating at no additional cost can be realized. The benefits on the life-cycle performance are the added advantage for the project with long term savings. Every actively associate with green is for the wider cause of sustainable parameter and always proves beneficial to easy stakeholder directly or indirectly. A sufficient return on a energy efficiency investment is crucial for the sustainable development of the green building industry. The concern of environment and sustainable development has been increased recently. These problems force the countries to adopt a number of policies that enhance energy efficiency and apply baseline parameters and in accordance with international standards. Green building has now become a forefront of sustainable development in this century that takes the responsibility for balancing long-term economic, environmental and social health. It offers an opportunity to create environmentally efficient buildings by using an integrated approach of design. Further, this research article provides a systematic methodology for the generation of the criteria and then the procedure for the development of the criteria weights based on the responses of the experts. These weights can be utilized for the development of green building rating tool.

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