Essentiality of Green Building Practices for A better Future

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Abstract – India, as a developing nation, is moving with a good spark with almost each and every sector. But in this race, somewhere, we are ignoring the negative impact of such rapid growth, on our society and environment. Majorly, the construction industry has put a larger leg into the emission of Greenhouse gases and various other pollutants as the definition for comfort has been changed to us. The negative impact, which such growth is imparting to the social order and most importantly to the environment, should not be overlooked and should be considered as a matter of immediate concern as it is going to harm our future generations and it should be rectified in time by adopting some good practices. In this article, we are going to discuss the importance of some good practices which should be adopted before, while and after the construction of a building, for moving towards sustainability.

Index Terms – Environment, Sustainability, Green Buildings, Resource Efficiency, Passive Techniques.

1. INTRODUCTION

A green building is one which uses less water, optimizes energy efficiency, conserves natural resources, generates less waste and provides healthier spaces for occupants, as compared to a conventional building.

The residential building sector is one of the largest consumers of electricity in India. Continuous urbanization and the growth of population result in increasing power consumption in buildings. Thus, while experts express the huge potential for energy conservation in this sector, the belief still predominates among stakeholders that energy-efficient buildings are more expensive than conventional buildings, which adversely affects the "greening" of the building sector. This belief is contested by studies finding evidence for the opposite being the case.

Green building in India - Wikipedia, the free encyclopedia.mht

2. WHAT IS GREEN BUILDING?

A green Building is the building, which has a lesser consumption needs of natural resources like energy, water and also it produces less waste & Green House Gases. Such building, then, considered to be healthy for people living or working inside as compared to a regular Building. Another meaning, in context of environment, is "clean environment, efficient water usage and management, and healthy living". Building Green is not only about making an energy efficient building, but also about moving ahead to the level of optimization, considering the local ecology, use of vernacular materials and most importantly they are built to reduce natural resource intakes.

Therefore, considering the experiences of our traditional architecture, we can easily say that the practices adapted at that time, were more towards "green" as the consideration was towards developing a natural environment, rather than blindly copying the practices from the developed countries.

The construction industry is the major consumer of energy in our economy, by consuming about 35-40% of total energy while construction of buildings. Once the construction is completed, the energy is consumed in form of lighting, HVAC systems, security systems and other maintenance tools, for successful operation of the building. The consumption of energy at this stage should be reduced to optimum level.

Thus the thought for sensible or say green building pose its intensity on two major considerations:

•Acceleration in the efficiency of the building in context of energy consumption, i.e. water, material and required operation skills

•Alterations in the building's negative impact over the environment, as well as human health, throughout the life cycle of the building.

3. HISTORY

In the later half of 1970's, the sudden increase in fuel costs encourage Architects as well as Ecologists towards the concept of Green building and to seek for some unconventional solutions for building construction to avail the optimized energy demands. Newer concepts such as double and triple glazing, reflective roofing materials and modified painting solutions etc. had been experimented and tried to include them in practice. But, in the meanwhile, the fuel prices got decreased and thus the Green movement did not get much assistance. Again, in early 90's, the lagged behind practices of Green buildings got a boost and people started talking of necessity and application of Green and Sustainable building concepts. Since then, this movement got momentum and, as a result, we can see its application in the newer buildings and construction industry.

4. EXISTING BUILDING SCENARIO IN INDIA : A BRIEF

India, the seventh largest country in the world, is a leading economy and home to over one billion people living in various climatic zones. The country's economy has been growing at a fast pace ever since the process of economic reforms started in 1991. Construction plays a very important role in its economy contributing on an average 6.5% of the GDP. Commercial and residential sectors consume a lot of energy throughout the life cycle of buildings thus becoming a major contributor to greenhouse gas emissions. Given the spiraling urban growth, the number of buildings, energy consumption and the resultant carbon emissions is on a rise in the country. As per the 17th Electrical Power Survey (EPS) of the Central Electricity Authority, the electricity demand is likely to increase by 43.7% in 2016-17 as compared to 2011-12 and by yet another 37.5% in 2021-22 as compared to 2016-17. Energy consumption in Indian buildings is expected to increase substantially due to economic growth, construction growth and human development. Also the growth in commercial sector and the shift from rural to urban living will continue to take place. This will result in a substantial increase in resultant emissions from the buildings sector alone and need concerted efforts to bring down the energy consumption by buildings through various measures. To lower down the energy demand in buildings, we have to follow the path towards sustainability and follow certain strategies at each and every considerable aspect in the building and will have to consider the building as a 'Whole'.

5. GREEN BUILDING STRATEGIES

Alterations in the building's negative impact over the environment, as well as human health can be achieved by adopting the following strategies:

5.1 Sustainable Site Selection

The first aspect for taking a step towards green is selection of a sensible site, i.e., the site should be free from the extreme challenges and sensitive habitats like flood lands/wet lands or endangered wild life habitats. Clearance of green fields or grasslands only, will not satisfy the objective of making green. The site should be a reclaimed brownfield or antecedently mature site equipped with all required utilities. The proximity to mass transit points and near availability of community resources will increase the opportunities for least automobile dependence and decrease the consumption opportunities on fossil fuel and will be helpful in development of self sustainable communities and neighborhoods.

5.2 Sustainable Materials and Resources

Sustainable building materials are those which sustain themselves in the aspects of their own life as well as impact of their presence over the surrounding which environs them. In other word, we can say that these materials are environmentally responsible materials. Such materials are usually composed of renewable resources, instead of non-renewable resources. Depending upon the project's specific goals, the assessment of such materials may be done on one or more characteristics, like zero or low toxicity, high recyclability, zero or low off gassing of harmful air emissions, durability, reused and recycled content and sustainably harvested material.

Dimensional planning and other material efficiency strategies are used to reduce the construction costs. Construction and demolition material can be reused and recycled as base course for landfills. Proper planning for managing materials through deconstruction, demolition and construction is to be done.

Use of reused or recycled material in a considerable manner will be economical as well as will help to conserve natural resources such as wood, stone etc.

Use of rapidly renewable materials, such as bamboo flooring, wool carpets, strawboard, cotton ball insulation (made from denim scrap), genuine linoleum flooring, or poplar oriented-strand board (OSB) will help in reducing the usage and depletion of finite raw material.

Use of materials that are available locally is preferred over materials that need to be brought from distant places. It saves transportation costs. Also, alternative materials that can be generated from waste with lesser energy is used over conventional building materials.

5.3 Energy use Reduction Techniques

As said earlier, the objective of green building is to reduce the consumption of natural resources and pose a lesser impact on the environment with all its life-cycle stages. However, building as a process is not streamlined as an industrial process, and varies from one building to the another, never repeating itself identically.

The energy consumption can be reduced or optimized by adopting the following strategies:

5.3.1 Design to reduce energy consumption:

The design of the building should be in such a way so as to reduce the consumption of energy in lighting, ventilation and air conditioning. The orientation of the building should be such so as to be favorable and responsive to sun, as per climate of the region as well as air movement. The location of habitable and non-habitable rooms should be coherent so that they can reduce consumption of energy to be used for lighting and air conditioning. For example: in hot and dry climate, the non habitable areas should be such located that they can shelter the exposed facades of the habitable rooms and cut off the sun coming over such exterior facades. The habitable areas can also be sheltered by locating most of the longer facades into north-south orientation. This will enable the building to be cooler and prevent the direct sun to enter indoors and moreover, will

reduce the cooling load over the air conditioning system.

5.3.2 Use of renewable energy:

Renewable energy, mostly collected by wind and sun give significant benefits for our buildings. One major advantage with the use of renewable energy is that as it is renewable therefore it is sustainable and so, will never run out.

Moreover, Renewable energy installation generally calls for lesser maintenance than conventional generators. Their fuel being derived from natural and available resources reduces the costs of operation. Though the installation of the system to generate it may seem to be costlier than the conventional system, but trustfully it reduces the operational cost of the building to a far extent.

Even more importantly, renewable energy produces little or no waste products such as carbon dioxide or other chemical pollutants, so has minimal impact on the environment.

Renewable energy projects can also bring economic benefits to many regional areas, as most projects are located away from large urban centers and suburbs of the capital cities.

5.3.3 Incorporate solar passive energy techniques:

Incorporation of solar passive techniques in building design minimize load on conventional systems of HVAC. Passive systems provide thermal and visual comfort by using natural energy sources, e.g. solar radiation, outside air, sky conditions, wet lands, vegetation, and internal gains. Energy flows in these natural systems are by natural means such as radiation, conduction and convection with minimal or no use of mechanical means. The solar passive systems vary from one climate to other. For example, in cold climate, the aim would be to design a building in such a way that solar gains are maximized, but in a hot climate, solar heat gain is supposed to be reduced as much as possible.

5.4 Indoor Environment Quality:

Indoor Environment Quality is a very important parameter to be considered for Green Buildings. It directly affects the health of occupants, as shown by recent studies too, which says that in buildings with good environmental quality, the likelihood of respiratory diseases, asthma, allergy, sick body syndrome is less.

Indoor contaminants such as dust mites, cockroaches, pet dander, smoke and some chemicals can trigger asthma attacks

Also, there are some construction, cleaning/maintenance materials that emit toxic gases, volatile organic compounds (VOC) that have detrimental effect on occupant's health. Suitable paints, adhesives, composite wood, carpets should be selected that emits less or none VOCs. Examples of such low VOC emitting products include carpets made of wool, low VOC paints. Also, selection of microbial resistant material is necessary to prevent indoor microbial contamination is necessary. Proper drainage system for roof, surrounding landscape, air conditioner coils to control humidity in building.

Proper heating and cooling system that ensures adequate ventilation, fresh air with in duct filtration system should be installed to improve the quality of indoor environment.

Ventilation is a very important factor in maintaining healthy indoor air quality as it is responsible for air exchange which supports the health and comfort of building occupants. Effective design and planning taking care of ventilation is necessary to reduce the requirement of artificial ventilation.

Out of various techniques which can be employed for the enhancement of indoor environment quality, a few have been discussed below:

5.4.1 Wind Towers:

Wind towers can be used at the sites where a considerable wind velocity use to be found. The tower has opening at the top that directs wind into the building through many other openings in different parts depending on the direction of wind flow. Mechanical means can also be incorporated to enhance the performance of the wind tower.

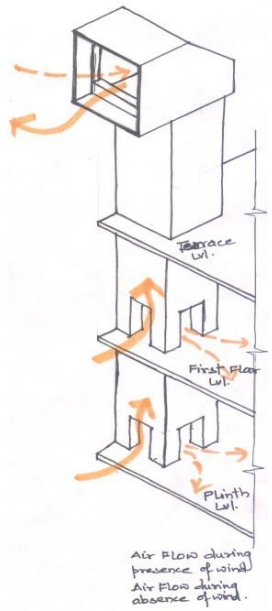

Figure: Wind Tower

5.4.2 Induced Ventilation

In this method, difference in temperature of air is created for its movement. Section Designing is done so as to ensure that the hot air rises up and escapes out drawing cooler air from atmosphere thereby making the ambiance cooler. The designated openings as the inlet for cooler air should be

positioned considering the surroundings and air flow patterns of the site.

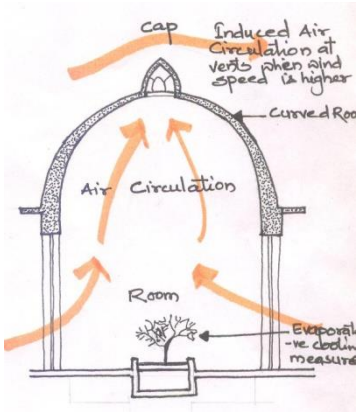

Figure: Induced Ventilation

5.4.3 Earth Air tunnel System**:**

A pipe is buried at a depth of 4-5 meter where temperature is equal to the annual average temperature. Air from Blower passes through the pipe and gets cooled in summer and heated in winters.

The diameter of the pipe should be such adequate to regulate the air pressure and velocity.

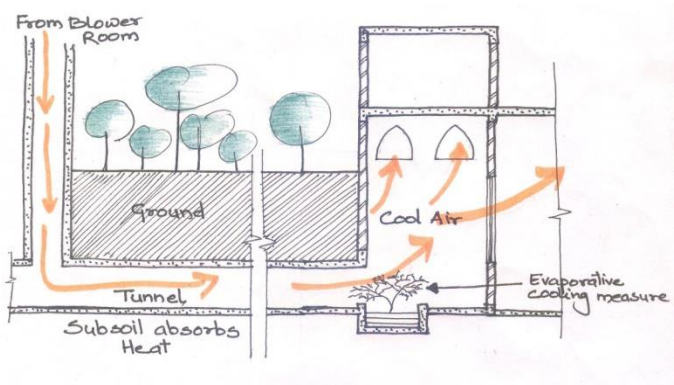

Figure: Earth air Tunnel System

5.5 Water Management and Efficiency**:**

The shortage of water is one of the most considerable issues in India now a day. It needs a considerable effort to aware the society about the scarcity of such a useful resource. That's why Green building programs have brought water use issues in buildings to the forefront. Water performance of buildings is defined as the overall water consumption.

Water use in buildings falls into three categories:

•Domestic water- water used for washing, bathing, cleaning, waste removal, and in food service functions. Consumption of domestic water is controlled by the fixtures installed in the building.

•Process water- Water that is to be used in heating and cooling of spaces.

•Irrigation- Water to be used in landscaping.

Similarly water outputs in a building include:

Waste water- Used water, that comes out from kitchen sink, wash basin and activities like bathing and washing clothes.

Evaporation- Evaporation can account for a significant water loss in building systems that rely on evaporative cooling towers.

Leaks- Leaks can also account for a significant quantity of water use if they are not detected and corrected in a timely manner. In taking a strategic approach to improving water performance, all inputs, uses, and outputs should be considered.

If we start thinking about water use in buildings on a more strategic level, there are three approaches to water performance in buildings that are worth considering:

(i) Key Fixtures Approach: This approach is based on the principle of acquiring efficiency through installation of water efficient fixtures. Water efficient toilets, urinals, lavatories, showers, and food service equipment are targeted and designed (or replaced in existing buildings) for the highest level of water savings. The advantage of this approach is that it is simple to implement, and there are a number of labeling programs that guide us to the most efficient fixtures available. A major disadvantage is that it works inside the building only and the "whole building" approach to water management is ignored. The other disadvantage is that the user is entirely dependent on the upgrade in fixture market for any further improvement.

(ii) Global Water Consumption Approach: This approach considers the overall water consumption of the building, including the consumption of the fixtures. It uses a net-water use metric for determining total water use. Using the overall consumption approach gives "credit" for water reduction strategies such as rainwater harvesting and gray water use. In this approach, the water consumption of a comparable standard building is determined as a reference value. This methodology is the basis for the water rating category of several green building rating systems such as BREEAM and LEED.

(iii) Water Management Plan (WMP) Approach: This approach is more strategic in nature. It incorporates the fixtures approach and the global water consumption approach in order to reduce consumption. The primary concept is to meter and target. Reduction strategies such as fixture replacement, gray water use, leak prevention and monitoring, and use of technologies to reduce cooling water loss in open loop cooling systems can be implemented once consumption is properly measured at the system level.

Of all three of these approaches, the water management plan (WMP) approach offers the facility manager the greatest opportunity for continuous improvement. Consumption data is based on real data, not theoretical fixture and use rates, and it allows for the incorporation of the greatest number and variety of reduction strategies.

Managing water use in buildings is not merely an issue of reducing consumption. For example, the use of bottled water in facilities is both a water use issue and a waste issue. Changing policies toward one may cause an unintended change in the other. The facility manager is in the unique position to understand the organizational strategies, drivers, and incentives for sustainability initiatives.

5.6 Waste Management:

Waste management is a significant aspect under Green Building standards and also comprises certain guidelines for its achievement. To generate nominal quantity of waste during construction is the prior goal. In general, a large amount of waste is produced during construction which is not reusable and used as landfills into dump yards. Such waste is needed to be reduced. A building constructed with proper designing and following Green architecture standards produce less amount of waste as compared to other buildings.

In addition, a considerable amount of waste is produced while the demolition of a building. A better alternative for this is the process 'Deconstruction', in which the waste is harvested and is made to reuse as building material.

For example, used wood can be easily reused. Similarly, waste water from dishwashing, washing machines can be reused for non potable purpose like flush toilets and gardening, but only after considerable treatments. Reusing of waste also eliminates the need and effort for their disposal and treatment.

5.7 Building operations and maintenance:

After construction, the proper management of building is very necessary to ensure that it operates as intended, because the key goal of Green Building can be achieved only if the building is performing as per the standards.

Regular monitoring of services to ensure efficient operation is necessary. Testing, adjusting and upgrading of electrical, mechanical systems from time to time to ensures that the building is performing as commissioned.

6. CONCLUSION

Green building is an idea that must be adopted by the society for financial, social and most importantly environmental benefits. Various agencies like LEED, IGBC, and BEE etc are working to help service providers and consumers to work together for creations with minimum impact on environment. But without stepping into the current situation, the implication of such strategies is impossible and meaningless. Since we, the human being, are responsible for the situation, it is our responsibility to strive and implement the solutions, so that our future generations may get the same what nature has given us. By imparting proper education and awareness towards environmentally sustainable practices and by providing incentives from government, it is possible to bring home the benefits of green building practice.

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