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Green building technology in libraries: Indian perspectives

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Abstract
Green building made with natural and reusable construction material to save the environment as well as human life. Conservation of natural resources such as water through rain water harvesting, Energy through solar and wind energy, electronic media instead of paper and provisions of natural lights and fresh air, are the most important components of the green building technology. The main objectives of the Green library technology is to support the use of environmental friendly and safe materials of building construction to conserve our fast depleting natural resources, reducing carbon footprint, improving indoor air quality. In India also, the vision of Indian Green Building Council (IGBC) is, "To enable a sustainable built environment for all and facilitate India to be one of the global leaders in the sustainable built environment by 2025". The IGBC provides wide range of services such as certification, training and rating program. India is facing very serious issue of air pollution condition is worsening day by day. Another burning problem is shortage of water as an alarming 21 Indian cities are estimated to run out of water by 2030. In order to provide sufficient natural resources and a safe environment to our future generations, many efforts are being made by the whole world, the concept of green building is one of them. Use of reflective glass technology, rainwater harvesting through percolating Wells, use of water efficient equipment and fixtures, use of solar and wind energy, sewage treatment plant are some of the technology we can use for library building for sustainable development.

Introduction
"Try to leave the Earth a better place than when you arrived – *Sidney Sheldon*"

A Green building technology is denote for the building construction technique which uses reusable and recyclable materials to make the building efficient and environmental friendly. Green building technology included geothermal heating to energy-efficient appliances and materials to reducing the impact of building on human and environmental health. A green building is a structure that is capable of obtaining its own resources throughout its lifetime. US Green Building Council's LEED (Leadership in Energy and Environmental Design) has described many different elements that works towards a green or sustainable building.
"LEED is a holistic system that doesn't simply focus on one element of a building such as energy, water or health, rather it looks at the big picture factoring in all of the critical elements that work together to create the best building possible. The goal of LEED is to create better buildings that:
- Reduce contribution to global climate change.
- Enhance individual human health.
- Protect and restore water resources.
- Protect and enhance biodiversity and ecosystem services.
- Promote sustainable and regenerative material cycles.
- Enhance community quality of life.

LEED certified buildings save money, improve efficiency, lower carbon emissions and create healthier places for people to live. They are a critical part of addressing climate change and meeting ESG goals, enhancing resilience, and supporting more equitable communities.

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To achieve LEED certification, a project earns points by adhering to prerequisites and credits that address carbon, energy, water, waste, transportation, materials, health and indoor environmental quality. Projects go through a verification and review process by GBCI and are awarded points that correspond to a level of LEED certification: Certified (40-49 points), Silver (50-59 points), Gold (60-79 points) and Platinum (80+ points)."

Indian Green Building Council (IGBC): The IGBC was established in the year 2001. The vision of the council is, "To enable a sustainable built environment for all and facilitate India to be one of the global leaders in the sustainable built environment by 2025". The IGBC provide wide range of services as certification services, developing a new green building rating program. The council also arranged green building training and organise annual flagship event of Green Building Congress on green buildings.

According to the Indian Green Building Council: "A green building is one which uses less water, optimises energy efficiency, conserves natural resources, generates less waste and provides healthier spaces for occupants, as compared to a conventional building."

The main objective of making a green building
- Taking care of the health of the labourers engaged in the construction work and the people living in the building.
- To increase the working efficiency of the workers by using safe materials of building construction.
- To conserve our fast depleting natural resources like water and energy.
- Reducing carbon footprint in the environment.
- Minimizing the harmful effects on the environment during and after construction.
- Improving Indoor Air quality.

A green building technology helps in achieving all these objectives very well. A green building is a structure that is environmentally friendly and resource-efficient.
Green library concept: Library built with natural and reusable construction material. Conservation of resources such as water through rain water harvesting, more use of electronic media instead of paper, use of solar and wind energy, use of environmental friendly shelves and furniture. and provisions of natural lights and fresh air are the main features of the green library technology.

According to New World Encyclopaedia
"A Green library, also known as a sustainable library, is a library built with environmental concerns in mind. Green libraries are a part of the larger green building movement."

IFLA ENSULIB Section defined as: "A green and sustainable library is a library which takes into account environmental, economic and social sustainability. Green and sustainable libraries may be of any size, but they should have a clear sustainability agenda which includes:
- Green buildings and equipment: The emissions, or carbon footprint, of the building and equipment are actively decreased.

- Green office principles: Operational routines and processes are environmentally sustainable.
- Sustainable economy: Consumption is restrained, circular and sharing economy practices are advanced and are made accessible to the community.
- Sustainable library services: Relevant and up-to-date information is easy to access for users, shared spaces, devices, and environmental education is offered, and operations are efficient. The library has a positive carbon handprint.
- Social sustainability: Good education, literacy, community engagement, cross cultural diversity, social inclusion, and overall participation are considered. The library works actively to reduce inequality.
- Environmental management: Environmental goals are SMART (Specific, Measurable, Achievable, Realistic and Time bound), and the library works to decrease its own negative impact on environment. The library's environmental policy, its implementation and the results of environmental work are communicated to a broader audience.
- Commitment to general environmental goals and programmes: Commitment is guided by the UN Sustainable Development Goals, the Paris Climate Agreement and related environmental certificates and programmes".

Online Dictionary of Library and Information Science (ODLIS) has defined Green library as: "A library designed to minimize negative impact on the natural environment and maximize indoor environmental quality by means of careful site selection, use of natural construction materials and biodegradable products, conservation of resources (water, energy, paper), and responsible waste disposal (recycling, etc.)."

Characteristics of the green library buildings technologies: A green building consist of the following process:
- Use of sustainable construction material made from renewal resources or recycled material.
- Reduces product emission with minimum pollutants to create a and hygienic indoor environment.
- Reduces water uses in landscaping through:
1. By strategic Tree Planting.
2. By reducing your lawn size.
3. By using Perennials and Grasses.
4. By using environmental friendly water irrigation systems.
5. By rainwater harvesting.
- Least disruption to the construction site.
- Renewable energy and recyclable materials.
- Non-toxic material and equipment.
- Energy efficient and eco- friendly building equipment.
- Natural lights and air quality.
- Safety of human health and environment.

Need of green library technology in India
The problem of air pollution, global warming, shortage of electricity and water are widely spreading not only in India but the whole world is suffering the consequence. In order to provide sufficient natural resources and a safe

environment to our future generations, many efforts are being made by the whole world, the concept of green building is one of them. India is facing so many environmental issues, some are on its prime concern:

Air quality in India
Air pollution in India is a serious environmental issue. According to the Health Effects Institute, in 2015, over 1.1 million premature deaths in India were caused by air pollution. In 2019, air pollution led to about 18 percent of all deaths in the country.

Population of India: The current population of India is 1,412,236,610.based on World meter elaboration of the latest United Nations data. 31% percent of Indian population lives in Urban Areas.

Energy consumption in India: will touch 4 trillion units by 2030. Commercial energy consumption is increased 700% in the last four decades and the numbers are growing.

Water problem in India: "There is a shortage of average 225 million litre water per day in major Indian Cities, and an alarming 21 Indian cities are estimated to run out of water by 2030."

Use of green Building technology in libraries: libraries can be design in a way that we get maximum use of our local and natural recourses with less negative effects and without harming our environment and human health. These are some technology used in green or sustainable library:

- **Use of reflective glass technology** reflective glasses uses protection coating to filter heat and radiation from direct sunlight. Because it provides natural day lights to come inside the library building it makes low energy bills by cut the cost of artificial lightening and air conditioning.
- **Environmental friendly water based paints:** Their low level of volatile organic compound (VOC) makes them human and environmental friendly less harmful effects on your health. water-based paints is better than solvent-based paints.
- **Rainwater harvesting through percolating Wells:** Percolation well is a form of Rain Water Harvesting System. It is a most effective way to preserve rainwater by which groundwater level get recharged.
- **By using water efficient equipment and fixtures:** the amount of water used for essential services can be drastically reduced by more than 50% with the use of water-saving fittings and fixtures. Some examples include: low-flow taps and shower heads and dual flush toilets.
- **Friendly library building for every type of user:** ramps, rails, and special toilets to make all area accessible to suit the special needs of differently abled persons.
- **Electric charging points in parking** to charge vehicle to promote new invention and development all parking space equipped with charging points.
- **Alternative energy sources** Solar energy is environmentally friendly technology and most significant renewable and green energy sources with zero energy consumption and carbon emissions as it is

mostly related to renewable energy sources like solar or wind energy.

- **LED lights and motion sensor equipment** to lessen harmful effects and control the wastage of electricity. "Traditional fluorescent tubes may only last you 34,000 hours, however, Energy Focus LED lights were found to surpass 70,000 hours of testing. We even back up our claims with a 10-year end-to-end warranty for most of our LED tubes and luminaires. Imagine not having to change a single light bulb for 10 years."
- **Waste segregation-** to segregate waste in three zones 1) paper and cardboard etc. 2) plastic bottles glass etc. 3) kitchen waste.
- **STP treatment of water:** Sewage Treatment Plant (STP) is a process of treatment of Sewage water from basin, bathing and kitchen sink and reusing for Gardening, Agricultural and other general uses. Treated Sewage water is treated and maintained as per the norms of Pollution control board.

Conclusion
Today green library technology is becoming a significant trend to save the environment. Green libraries also messages the people about environmental safety through their sustainable building structure. Beside this green libraries promoted natural light and fresh air. The site selection to structural design, energy, water and safe and environment friendly construction materials, green libraries are designed thoughtfully. Now builder can capitalize on the local natural resources which are easily available and most efficiently operate in the local environment. The government should encourage the use of green library technology as well as librarian should also take part to make their library green.

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