GREEN LIBRARIES: A WAY TOWARDS SUSTAINABILITY

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Abstract:

The concept of Green Library, comes under a broader concept of green building, design is a newly emergent trend that is shaping the libraries of the present century. The Green Library Movement (GLM) refers to the collective effort of various stakeholders such as libraries, towns, and academic campuses to reduce eco-degradation and promote sustainable practices in libraries. This manuscript deliberates the conditions necessary for a library to be considered "green," the role of librarians in this movement, the key features of green libraries, and various initiatives in India. Additionally, the paper provides a summary of the GLM and role of the librarian in the recent times in promoting environmentally sustainable practices. The major environmental issues of the present era like waste management, water and energy conservation and climate change continue to affect communities, libraries need to adapt their information resources and programs to address these burning issues. Recently, there is an augmentation in the green library structures and awareness about GLM across India. The present work suggests that the librarians must make themselves updated regarding the ongoing sustainability concepts with regards to the green library and GLM and also encourage environmental sustainable practices and spread awareness.

Keywords: *Green Library, Sustainable library, Environment, Climate Change, Energy Conservation, Water Conservation*

1.1 INTRODUCTION:

Libraries have been places for centuries that impart knowledge to society and help them grow (Antonelli, 2008). Einstein quoted "the only thing you absolutely know is the location of the library". This further reflects the importance of the library, which are considered as the place of lifelong learning (Ingole and Kumari, 2021).

At present, the whole world is experiencing human-induced accelerated climate change (Maharana et al., 2021) due to the increased uncontrolled use of fossil fuels, which has raised the greenhouse gases (GHGs) concentration in the atmosphere. The rising temperature or the greenhouse effect is posing a great threat to the whole world and humankind. This global temperature rise has many regional implications as well. There are many international agreements that intent to fight climate change and the most recent one is the Paris climate agreement during the 21st Conference of Parties (COP21). During the Paris climate agreement,

There is a consent among parties to control the rise in the global temperature below 2 °C with respect to the pre-industrial level and try further to keep it below 1.5 °C. Thereafter, countries has prepared there nationally determine contributions (NDCs) to curb the GHG emission. India determined to cut down it GHG emissions by 33% (by 2030) and will completely go net-zero by 2070. Therefore, the contribution should come from each sector to achieve this goal and the libraries are also no exception. Therefore, libraries being the temple of knowledge should also set examples by converting themselves as the green and sustainable libraries.

Earlier, the United Nations Conference on Environment and Development (UNCED), famously called as the 'Earth Summit' (Rio de Janeiro, Brazil, 3-14 June 1992) discuss extensively about the world's

future keeping a focus on the health of environment alongwith socio-economic development. It come up with the noble concept of sustainable development where it propose the sustainable use of the resources so that the need of the present as well as the future generations are met and also the resource remains in a healthy condition which supports life on earth. Further, it talks about the development which are environmentally sound, economically viable and socially acceptable (https://www.un.org/en/conferences/environment/rio1992). With the emergence of the concept of sustainable development, parallelly the notion of green library gained momentum during early 1990s (Ingole and Kumari, 2021; Thomas, 2017; Meher and Parabhoi, 2017; Gupta et al., 2018; Kulkarni, 2018; Vasanthi, 2019; Sindhu et al., 2021).

1.2 Definitions:

The term green means "connected with protecting the environment or the natural world". According to the Cambridge dictionary, sustainable means "the quality of causing little or no damage to the environment and therefore able to continue for a long time". Both terms reflect that they are related to the environment protection and keep those available resources in a healthy state for longer period of time.

The Online Dictionary of Library and Information Science (ODLIS, Reitz, 2004) defines green/sustainable libraries 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.)". At present, the major fundamental societal concerns at a global are the anthropogenic impact leading to accelerated climate change and the necessary actions for the promotion of environmental sustainibilty, and being an important stake holder in society, they are also vital to the libraries (Varatharajan and Chandrashekara, 2007).

The broad definition of a green library includes the basic essence of reducing negative environmental impact on the library and attempts to make best use of the existing renewable resources. It includes the proper design of the building to promote the energy and water conservation and further focuses on the waste management and improving indoor air quality. Therefore, concept of green library promotes overall environmental sustainability throughout its life cycle (Jones, 2016).

1.3 Literature Review:

Libraries play a significant role in promoting environmental awareness and conservation. It is essential for them to actively contribute towards sustainability efforts and educate their patrons about current environmental challenges, empowering them to take action and make a positive impact. Libraries have always strived to broaden their scope and enhance their services to better serve their users and ultimately benefit humanity. As a hub of information sharing and distribution, a Green Library is in a prime position to educate individuals on the significance of sustainability (Choudhary, 2019). They play a pioneering role in setting an example for sustainability within communities, offering dependable information on various topics related to environmental sustainability like waste management, indoor air quality, alternatives to replace the non-renewables and alternative construction methods. This enables individuals to make informed decisions and take action towards a more sustainable future. Therefore, the green library is conceptualized, planned, designed, built, functioned and maintained with keeping attention on the sustainability of the environment (Ingole and Kumari, 2021). The green library comes under a broad category of green buildings. The authors highlighted the design of green libraries and traced their evolution over time (Tseng, 2008). Among the green building structures, libraries are considered to be at the forefront of green design and various upcoming trends of green libraries are deliberated by Brown (2003).

At present, the information regarding green libraries and their practices are limited being a recent concept; however, the available resources on this topic are steadily increasing. Peter and Patricia (2013) provide an overview of how green building is perceived on a worldwide scale, including the design standards that are followed, as well as examples of various libraries from different countries that have incorporated eco-friendly features into their construction. A few scientists' deliberated the global viewpoint on green libraries and highlight the urgent inclusion of green initiatives in libraries of various institutes (Sivasubramanian & Batcha, 2012). The inception of the GLM in the 1990s, its detailed description along with the detailed discussion on the green library as a new concept in library science and various concepts of the green library have been explored by various researchers (Hauke and Werner, 2013; Hauke et al., 2014; Purohit, 2013; Nikam, 2017).

The key elements and design features of green library buildings are the significance of green libraries, including their methods and benefits for achieving eco-friendliness and sustainability (Malode, 2014; Shah et al., 2015)(Nangia et al., 2023). A few authors emphasize the significance of establishing green library environments as a crucial element for the development of future libraries. Datta (2015) suggests that the efforts of librarians and green teams, along with adherence to green building standards and effective green marketing, can contribute to a better environment for society. Meher and Parabhoi (2017) stated green Library concept is a necessary element in achieving a sustainable and environmentally conscious society along with the role of librarians and green libraries across India that are making significant efforts towards environmental sustainability. Divya and Vijayakumar (2017) elaborated on the showcase of green techniques across the Kerala University Library using pictorial diagrams. Additionally, the authors make recommendations for further improving the sustainability of the library (Nangia et al., 2023).

1.4 Green Library And Its Importance:

The idea of Green Library is gaining momentum worldwide in recent times. The concept of a Green Library goes beyond sustainable buildings and encompasses library management practices as well. In response to technological advancements and evolving client expectations, many libraries worldwide are redefining their identity to remain relevant. Green Libraries are at the forefront of this environmental transformation, thus promoting sustainability by reducing waste generation (paper, plastic waste), increasing energy conservation and efficiency, and encouraging the recycling of end of the life discarded materials. They have moved ahead from the concept of the library as a knowledge provider to a new version where the libraries are considered as new age sustainable service providers along with the knowledge. It is important to consider the role of libraries in promoting environmental sustainability alongside the adoption of new media and technologies. While much attention has been given to the future of libraries in the digital age, there has not been enough discussion on how libraries can contribute to a sustainable ecosystem. Green libraries, with their emphasis on reducing paper waste, energy efficiency, and recycling, are pioneering a new vision of libraries as sustainable services.

The libraries in recent time are adopting green features due to the increased affordability and the most important one is to contribute towards conserving and preserving the finite non-renewable resources. Green Libraries provide a welcoming and inviting environment that attracts readers and users. By promoting environmental sustainability, libraries can also contribute to disseminate the information needs of present and future generations. Green Library not only enhances the daily operations and procedures of the library but also creates awareness among the community regarding eco-friendly practices.

1.5 Objectives:

i.   To examine the major features of the green library
ii.   To study the National and international standards for green library
iii. Indian green buildings in educational institutes
iv.   Alignment of the green library to different SDGs

2.1 RESULTS and Discussion:

The following are the major features of a green or sustainable library.

1. Site selection: Compared to other types of buildings, selecting an appropriate site is crucial for a green library. The library is an essential component of any college, institution, university, or department. Its location is crucial in ensuring that users can focus on their reading or studying. Therefore, it should be situated in a suitable site or locality. Additionally, accessibility or connectivity via public transportation is a critical factor that should be given extra attention when searching for a site. Libraries should also be constructed in an area easily accessible for most of the local population and should be centrally located.

2. Construction/Building materials: Selection of environmentally sustainable material while construction can reduce the dependency on the mechanical systems for the improvement of the indoor air quality and improve the overall sustainability of the library. When choosing materials for a library, minimizing waste should be a top priority. Using locally sourced materials can reduce transportation costs and fuel consumption. Additionally, there are many eco-friendly building technologies available today that can be used in the construction of new libraries. India and other countries have established various standards and protocols for constructing green buildings using recyclable and environmentally sustainable materials.

3. Indoor air quality: Proper ventilation is crucial in buildings, as lack of it can lead to expensive cooling costs and harmful toxin buildup that can harm people's respiratory systems. The use of air conditioners should be minimized to decrease the emission of harmful gases that contribute to global warming and the depletion of the ozone layer.
    In a broader sense, in addition to the environmental sustainability, a green library also promotes better health and well-being of the users by focusing on the improvement indoor air quality, mental health, less noise and stress level, increasing working efficiency leading to higher productivity and improved task performance. The indoor plantation removes the indoor air pollutants while planting trees and other vegetation in the surrounding campus is necessary to provide clean and fresh air and to create a cooler environment in the library.

4. Green Paints: As compared to the outdoor air quality, the corresponding indoor air quality is normally two to three-fold higher, and paint is a major contributor to this issue. Harmful chemicals such as VOCs can be emitted from paint for years after its application. There are significant health and environmental concerns associated with paint. However, using paint that is free of VOCs, heavy metals like lead or cadmium, or made from post-consumer recycled content can help reduce exposure to toxins for both individuals and the environment.

5. A green rooftop: The framework for a green library rooftop is an extension of the existing structure, consisting of waterproofing, root repellent, drainage, lightweight growing medium, and plants. Green rooftop systems can be modular or installed separately, with layers of drainage material, growing media, and plants. These rooftops are considered "contained" green spaces that exist separately from the ground level, either below, at, or above grade. They offer a range of public and private benefits and have been shown to provide improved environmental and social outcomes.

6. Water conservation: Libraries have various methods to save water. They can start by implementing a well-designed plan for rainwater harvesting, which can be used for toilets, bathrooms, irrigation, cleaning, and other purposes. This helps the library to save huge amount of water which can otherwise be used for landscaping and greenery around the building. The waste water generated can also be used for cleaning and irrigation. In addition, libraries can use automatic or sensor taps and dual-flush toilets to save water. Installing waterless urinals can also significantly reduce water usage in bathrooms. The waste water from the RO can be collected and can be used for cleaning and irrigation in side the campus.

7. Energy conservation: Power for a green library can be generated through various sustainable sources such as solar, wind, and hydro (water). There are many ways to save energy in a library, Using natural light and energy-efficient lighting can reduce the amount of electricity needed to light the library. Installing solar panels on the rooftop can also generate electricity and reduce the library's reliance on the power grid. In addition, installing sensors to automatically turn off

lights when no one is in the room can help save energy. Regular maintenance and upgrading to more energy-efficient systems can also help to reduce energy consumption such as the high star rating electrical appliances.

8. Waste management: To reduce waste, it is advisable for libraries to avoid purchasing products that are excessively packaged in plastic, boxes, or bags. Instead, they should opt for products with minimal packaging or no packaging at all. For instance, plastic covers can be used to protect books rather than using excessive packaging materials. Library staff can raise awareness among scholars and other library users about waste reduction by using notice boards. The notice boards can display information about the importance of waste reduction, tips on how to reduce waste, and updates on the library's waste reduction efforts. This can help encourage everyone to be more mindful about their waste and adopt more sustainable practices. To reduce paper usage in the office, it's important to prioritize the use of electronic communication for official information. This can be done by encouraging the staff to use email and SMS alerts whenever possible. By maximizing the use of digital technology, we can work towards a paper-free office and reduce our environmental impact. The E-waste generated from the library should be properly disposed of following the Govt. regulations.

Green buildings are known to produce lower greenhouse gas emissions and consume less electricity compared to conventional buildings. Libraries with green roofs are covered with vegetation, which can absorb rainwater and provide insulation, resulting in less heat being absorbed by the building. Green roofs are visually appealing and beautiful. Further, energy consumption can be minimized in the rooms and corridors using motion sensors. Implementing green building standards while designing the library space helps in energy conservation.

2.2 International standards for assessment of green library:

1. LEED: In 2008, the U.S. Green Building Council (USGBC) established the Leadership in Energy and Environmental Design (LEED) certification as a rating system. It is a globally recognized organization that sets the standards and guidelines for the design, construction, operation, and maintenance of environmentally sustainable, economically feasible, and structurally sound green buildings. The LEED rating system operates on a point-based structure, wherein projects accrue points by fulfilling designated criteria concerning sustainable site development, water conservation, energy efficiency, material selection, indoor environmental quality, and innovation. The number of points a project earns determines its level of certification: Certified or pukka (40 - 49), Silver or Tableware (50 - 59), Gold (60 - 79) and Platinum (80 points).

2. BREEAM: which stands for Building Research Establishment Environmental Assessment Method, is a highly recognized environmental assessment method for buildings. It sets the standard for sustainable design excellence and offers a framework to assess a building's environmental footprint. Essential eco-friendly elements encompass the utilization of low-carbon heating and cooling systems, energy-efficient lighting, and water-saving mechanisms. BREEAM's influence extends globally, with operations established in nearly 50 countries worldwide

3. Chicago Illinois Norms: Chicago was one of the pioneers in integrating sustainable practices into public buildings and creating its own sustainability standards, which are heavily influenced by the LEED Green Building Rating System.

2.3 Indian standards for assessment of green library:

1. GRIHA: It is also known as Green Rating for Integrated Habitat Assessment, and has been embraced by the Government of India as the official national rating system for sustainable buildings in the country. The Energy and Resources Institute (TERI) in New Delhi has played a crucial role in India's green building movement and recognized the necessity for a native tool to evaluate environmentally friendly buildings. As a result, they developed "GRIHA," which is now widely adopted by the Indian government as the national rating system. GRIHA is specifically designed to be suitable for all types of buildings across different climatic zones in India, taking into account the country's agro-climatic conditions.

2. IGBC: The Indian Green Building Council (IGBC) was established in 2001 by the Confederation of Indian Industry (CII). Its headquarters are situated at the CII Green Business Centre in Hyderabad, which is considered to be India's first platinum-rated green building. As a leading entity for green building certification and collaboration services in the country, IGBC works towards promoting sustainable building practices. The Indian Green Building Council (IGBC) has collaborated with the U.S. Green Building Council to adopt and adapt the LEED Green Building Standard. Together, they have created a Gold rating system to promote and encourage the adoption of green building practices in India. This aims at encouraging the adoption of green building practices in the country. The council aims to promote an inclusive and accessible and inclusive sustainable built environment, with the ambitious goal of making India a global leader in sustainable building practices by 2025.

2.4 Indian green buildings in educational institutes:

Based on a report by the US Green Building Council in 2018, India secured the third position worldwide, with a total of 899 projects certified under the Leadership in Energy and Environmental Design (LEED) outside the United States. Leading the pack were China and Canada, occupying the top two positions in the list of the top 10 countries for LEED projects outside the US (Vasanti, 2019). Until recently, environmental issues were not given much importance in Indian libraries. However, now we can see that Indian libraries are focusing on creating an eco-friendly environment. They are incorporating green practices such as the use of natural and biodegradable products, resource conservation, raising awareness about the biophysical environment, gathering green information, using sunlight in green design, incorporating greenery within the library, and having a green collection of resources. These efforts are aimed at creating modern, sustainable, and environmentally friendly libraries (Choudhary et al., 2019). Table 1 compiles the major green library/building initiatives in India and table is adapted from earlier studies (Meher and Parabhoi, 2017; Bangar, 2018; Sindhu et al., 2021)

Table 1. Major green library/building initiative in India

Name of the Library	Place	Major features
IIT Roorkee, Mahatma Gandhi Central Library	Roorkee	Promotion of renewable energy resources • Solar PV to generate electricity • Solar Thermal for cooking and water heating
Mumbai University Library	Mumbai	Use of natural resources and building design (reduces energy use) Use of large-size window • to facilitate light penetration inside the reading hall • ventilation
Karnataka University Library	Dharwad	Promotion of the use of green space • Students can borrow books from the library and sit under the tree for reading
TERI Library	Delhi	The Library and Information Centre of TERI promotes • Information requirements • Value-added information services regarding green structures
Anna Centenary Library	Chennai	Promote the • use of energy saving technology • building design for sustainability (optimal utilisation of natural light and air) • Gold rating (LEED) among green libraries
	Delhi	Use of natural resources and building design (reduces energy use)

Delhi University Library		Tall buildings, large-size windows and green space in surrounding to facilitate • light penetration inside the reading hall • ventilation
Calcutta University Library	Kolkata	Use of natural resources and building design (reduces energy use) • Large reading rooms for ventilation and natural light • Vast open areas • Thick walls for thermal insolation
NIT Silchar Library	Silchar	It is an under-construction sustainable library building following • LEED certification system for developing green libraries
Perma Karpo Library	Ladakh	Promotion of renewable energy resources and green surrounding • Use of Solar panels for electricity generation • Green area with by white lotus garden.
IIT, Delhi Library	Delhi	Use of civil structure or building design (reduce energy use) • Wind-T in the library brings the upper air wind to the lower level and causes cooling and ventilation. • gets maximum light during the day and no water in case of rain events. Both of these are civil engineering architecture
Nalanda University	Rajgir, Bihar	This is India's first Net-Zero campus. • Use compressed bricks instead of burnt bricks to cut carbon emission • Clean and renewable energy generation through solar energy farm • Self-sufficient in terms of water use • Thick and large building for natural insulation
Chhatrapati Shahu Ji Maharaj University,	Kanpur	Use of modern technology and building design • Use of soft pads on chair feet for noise reduction. • E-cataloging through computers to promote paperless work • Large windows to promote natural lighting and ventilation
Rashtrasant Tukdoji Maharaj Nagpur University	Nagpur	Use of modern technology and increasing green area • Use of LED lights to cut down electricity use • Plantation around the library for a clean and soothing surrounding • E-Cataloging OPAC to save paper and manpower

2.5 Alignment of the green library initiatives to different Sustainable development goals (SDGs):

This section deals with the alignment of green or sustainable libraries with different SDGs, which has been presented in Figure 1. Green libraries have the tendency to address the major SDGs. The SDG-3 (good health and well-being) can be achieved through the mitigation of

Figure 1: Alignment of green or sustainable libraries with different SDGs

Indoor air quality. Rainwater harvesting in green libraries and its use for gardening and for sanitation purposes reflects the alignment of SDG-6 with the green library. The use of rooftop solar panels to produce electricity shows the relationship of the sustainable library with SDG-7, i.e. affordable and clean energy. The green library needs innovative and updated infrastructure, which builds the basis of sustainable cities, that is how it relates to SDG-9 and SDG-11. The use of solar panels has ultimately helped to reduce greenhouse emission and helps to fight climate change reflecting a relation of SDG-13 with the green library. The indoor as well as outdoor plantation around the library support the biodiversity around it and influence the SDG-15 i.e. life on land. The little effort to sustainability through the green library contributes towards a larger global partnership to fight the negative impact of climate change and is hence related to the SDG-17 (partnership for the goals). Overall, the green library helps to achieve or addresses 8 major SDGs.

2.6 Role of Green Librarian:

Various researchers (Thomas, 2017; Meher and Parabhoi, 2017; Vasanthi, 2019) have worked on the role of the green librarian and suggested the following

i.   The librarian is always looking for people who are willing to work in an eco-friendly library environment and support the green initiatives.
ii.   The role of a green librarian, also known as an eco-librarian, is dynamic as they are responsible for managing budgets to support environmental initiatives within the organization.
iii. A librarian can promote the concept of green libraries to other professionals through various means such as discussions, seminars, and conferences.
iv.   Encouraging others to adopt green library tools and techniques.
v.   Promote the use of biodegradable furniture.
vi.   Promote the use of renewable energy (solar energy)

3. RECOMMENDATIONS AND CONCLUSIONS:

The green library is an innovative concept that will help us to achieve the SDGs and global climate agreements like the Paris Climate Agreement. By implementing sustainable practices in the day-to-day functioning of a library, it is possible to increase efficiency and reduce the library's carbon footprint, minimize waste, and reduce the use of resources. This can also result in long-term cost savings for the library, save time for employees, and attract more patrons. India, as a developing country, has a crucial responsibility to develop in all areas while also protecting the environment. Green buildings play a crucial role in safeguarding the environment; and libraries, along with librarians, hold a direct link to society, offering ample opportunities to educate and inform citizens about sustainable practices. Librarians have a duty not only to provide information but also to lead the construction of modern green buildings that help conserve our natural environment. In the future, library professionals should go beyond merely implementing "Greening Libraries" initiatives. The focus should be on taking proactive measures to ensure the sustainable development of libraries, paving the way for a better future for the next generation (Bansal et al., 2022).

The following are the major recommendation to promote the concept of green library building in India

i. The planning of library buildings should adhere to Green Building Standards to ensure environmentally sustainable construction.
ii. Based on the feasibility, old library buildings should undergo reconstruction or renovation to meet the standards of Green Libraries.
iii. Use of rooftop solar panels, water harvesting systems and improvement of the indoor air quality is of utmost importance.
iv. Libraries can employ a variety of tools to advocate for the concept of green libraries and let their patrons know about the key features of their eco-friendly sustainable buildings. These tools may include leaflets in-library displays, books, magazines, journals, periodicals and library programs that emphasize the theme of promoting sustainability.
v. The University Grants Commission (UGC) must prioritise financial assistance through offering grants for the renovation and transformation of the existing libraries in the academic institutes into green libraries.
    The concept of Green Library is one of the most recent developments in the Library & Information Science discipline. In order to conduct this study, information was collected and compiled from various sources such as websites and renowned journals. However, it was found that information regarding the topic of "Green Library" is sparse.

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