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GREEN LIBRARY: CONCEPT, SUSTAINABLE DEVELOPMENT, FEATURES, IMPORTANCE, STANDARDS AND OVERVIEW IN INDIAN SCENARIO

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Abstract: *The library is synonymous with ubiquity and utility. The role of the library during this worldwide phenomenon is gigantic. Libraries are the platform for lifelong learning and supply users with information and knowledge they have. Environmental challenges like energy depletion and global climate change are influencing the sort of data resources and programs libraries are providing to their communities. The concept of 'Green library' is of recent origin and is under the method of evolution. The Green Library movement started within the early 1990s as a result of libraries becoming curious about environmental issues generally. With the Green Library movement, literature on Green Libraries began to develop, and as a result awareness on the topic began to extend. Today's communities and the world at large are becoming environment-sensitive. Various green-oriented concepts and movements emerge over a period of your time, which have a big relevance to the natural environment. "Green Library (GL)" is one among such concepts and movements. The paper highlights the concept of the green library, green library standards, needs, features, development, and green library initiatives in India. The trend in India isn't only growing in numbers but also extends across the country.*

Keywords: Green Library, Features of green library, green library Standards, Sustainability, Green Libraries in India

I. INTRODUCTION

The "Green Library" movement came out in the 1990s and gained instigation in 2003. A green library also called a sustainable library that's

designed, constructed, repaired, and operated with environmental enterprises in mind. It refers to a structure that certifies the library as an environmentally friendly structure. It's concerted trouble of all mortal beings to make green earth by lessening global warming. Green libraries contribute towards supporting the natural ecological balance in the terrain and conserving the earth as well as natural coffers. It also improves the diurnal operations and processes of the library and intimates the community about responsible environmental practices. (1).

With the advancement of wisdom and technology, our cultures are impacting and changing at a lesser pace. Moment, the demand for anything is adding fleetly, and we people are employing the power of it to fulfill our everlasting demands. In this script, we people are forgetting commodity importance, which should be honored before we people talk about sustainable development in this briskly-changing world. It's nothing but the word 'Green', which is of great significance for a healthy survives. We've observed that over the once many times there are adding interests in a green revolution in nearly every sector and the library is one of them. Moment, libraries that work as gateways for knowledge are particularly responsible not only for propagating the idea of sustainability but also for leading by illustration and therefore serving as exemplars. Libraries of the moment should incorporate green rudiments into their operations. In fact, there are

several reasons why libraries should incorporate green features into their structures. It's vital for the health of library druggies and the mama earth on which we people live green libraries are a part of the larger green structure movement. Also known as sustainable libraries, green libraries are being erected all over the world with numerous high-profile systems bringing the conception into the mainstream. Along with library2.0, green design is an arising trend, defining the library of the 21st century Numerous view the library as having a unique part in the green structure movement due to its humanitarian charge, public and pedagogical nature, and the fact that new libraries are generally high-profile, community-driven systems. Similar libraries are erecting all over the world bringing these systems into the mainstream. Green Library is uniquely placed to educate people on the significance of sustainability and at the same time produce interest and magnet towards libraries. The term Green Library refers to a library that's environmentally conscious in numerous ways. Green library practices are witnessed and impressed for bettered library services. While the arising conception of the green library or sustainable library in India has to travel the long road to reshape the library structures to meet the coming generation. Moment, libraries are considered significant as they not only circulate the idea of sustainability and educate environmental knowledge but also come as

A green structure can be described as incorporated structure rehearses that essentially decrease the ecological impression of a structure in contrast with standard practices. Depictions of the green structure for the most part center around various normal components, particularly sitting, energy, water, materials, waste, and wellbeing. The craving to incorporate the different components of green structure has

a part model for other associations in green practices by allowing encyclopedically and acting locally (Mulford & Himmel, 2010). This invention is passing by erecting green library structures, greening being library installations, furnishing green library services, and embracing environmentally probative and sustainable practices within the library. The two most important effects for making healthy and prosperous sustainable libraries are frugality and ecology. That is, the libraries can manage the use of coffers and save plutocrat and time and they can keep the relationship between living effects and their terrain and can make an eco-friendly terrain.

II. METHADODOLOGY

The idea that with the expansion of Green Library structures in India there will be a conspicuous increase in stoner's library operation rates and satisfaction is also the thesis of the study. Factual webbing and Definition styles were used in the exploration. First of all, global literature sources prepared on the subject were examined and evaluations were made with the information attained in line with the purpose of the exploration. Relative analyses were conducted on samples from Green Libraries to make recommendations.

III. GREEN LIBRARY

prompted the improvement of rating and certificate frameworks to evaluate how well a structure project meets a predefined set of green measures. The most popular framework is Leadership in Energy and Environmental Design (LEED). Created by the U.S. Green Building Council, it centers around the site, water, energy, materials, and the indoor climate.

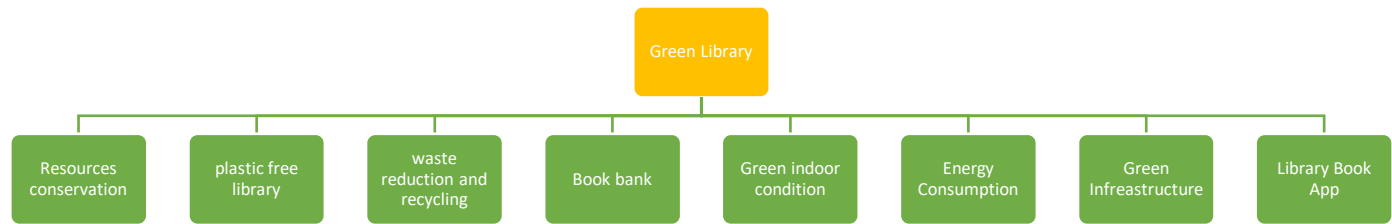


Fig 1: Green library components

3.1 GREEN INFRASTRUCTURE

3.1.1 Material choice: The use of steady, alluring, and earth mindful structure materials is a vital element of any elite execution building exertion. The usage of normal and solid materials adds to the prosperity of the tenants and a sensation of association with the abundance of the regular world. Many structure materials have significant ecological impacts from toxin discharges, environmental obliteration, and exhaustion of regular assets. This will occur during the extraction and procurement of unrefined components, creation and assembling cycles, and transportation. Also, some development materials might hurt human wellbeing by uncovering laborers and building tenants to harmful and unsafe synthetics. Thusly, acknowledgment and determination of earth's best materials for use in development exercises at the pre-building stage present a chance to limit such natural and human wellbeing impacts. Choosing earth alluring materials with limited ecological effects are for the most part accomplished through the course of asset protection and choice of non-poisonous materials. The assets used to fabricate development materials influence the climate by draining regular assets, utilizing energy, and delivering poisons to the land, water, and environment. Materials that contain aggravating, foul, dangerous, or harmful components antagonistically sway humans in general wellbeing all through gassing of unpredictable parts or direct contact. Ideally, materials determinations can be

made dependent on a thorough evaluation of natural weights all through the aggregate of the item or material. This interaction alluded to as ecological life-cycle appraisal, is once in a while attainable for most structure acquirement choices. It is conceivable, nonetheless, to apply life cycle thinking to assess what has had some familiarity with the natural exhibition of items and make shrewd choices (2).

3.1.2 A green rooftop: framework is an augmentation of the current rooftop which includes, at least, great waterproofing, root repellent framework, waste framework, channel material, a lightweight developing medium, and plants. Green rooftop frameworks might be particular, with waste layers, channel material, developing media, and plants previously ready in portable, regularly interlocking networks, or free laid/developed by which every part of the framework might be introduced independently. Green rooftops can be characterized as "contained" green space on top of a human-made construction. This green space could be beneath, at, or above grade, however in all cases, it exists separate from the beginning. Green rooftops can give a wide scope of public and private advantages and have been effectively introduced in nations throughout the planet (3).

3.1.3 Rain water harvesting (RWH): is a course of gathering and putting away water that falls on a catchment surface (regularly a rooftop, albeit practically any outer surface could be appropriate) for use, autonomous from, or supplemental to the mains water supply. This decreases requests on the mains supply, offers some versatility from neighborhood supply issues, and diminishes the measure of energy utilized for water treatment and transportation. Assortment and redirection of surface run-off can likewise alleviate flood hazards and control waste as a feature of a supportable seepage framework (SuDS). Water collecting in structures includes innovation for its legitimate preparation, plan, establishment, activity, and support. Two significant extents of water reaping are (I) the utilization of water for every broadly useful and (II) re-energizing groundwater (4).

3.1.4 Green Paints: By and large, two to multiple times more contaminated than the air outside. Paint is an enormous contributing component to poor indoor air quality and can transmit hurtful synthetic compounds, like VOCs, for a long time after application. There are no kidding wellbeing and ecological worries encompassing paint. Utilizing paints that are liberated from Volatile Organic Compounds (VOCs) like benzene and toluene, liberated from substantial metals like lead or cadmium, or potentially made of post-customer reused content can help with lessening openness to poisons both for yourself as well as your current circumstance.

3.1.5 Associating people groups and individuals: Establishing different conditions that interface and improve networks, asking what a structure will add to its setting as far as sure monetary and social impacts, and connecting with nearby networks in arranging. Guaranteeing transport and distance to conveniences are considered in the plan, diminishing the effect of individual vehicles on the climate, and empowering harmless to the ecosystem choices like strolling or cycling. Investigating the capability of both 'shrewd' and data interchanges innovations to discuss better with our general surroundings, for instance through savvy power frameworks that see how to ship energy where and when it is required (5).

3.2 IMPROVEMENT IN INDOOR AIR QUALITY

Indoor air quality is a major concern to businesses, structure directors, tenants, and workers because it can impact the health, comfort, well-being, and productivity of library inhabitants. Adulterants in our inner terrain can increase the threat of illness.

It's important to control humidity and relative moisture in engaging spaces. The presence of humidity and dirt can beget molds and other natural pollutants to thrive. Relative moisture situations that are too high can contribute to the growth and spread of unhealthy natural adulterants, as can failure to dry water-damaged accouterments instantly (generally within 24 hours) or to duly maintain outfits with water budgets or drain kissers (e.g., humidifiers, refrigerators, and ventilation outfit). Moisture situations that are too low, still, may contribute to bothered mucous membranes, dry eyes, and sinus discomfort (6).

Maintaining good inner air quality requires attention to the structure's heating, ventilation, and air exertion (HVAC) system; the design and layout of the space; and pollutant source operation. HVAC systems include all of the outfits used to vent, heat, and cool the structure; move the air around the structure (ductwork), and filter and clean the air. These systems can have a significant impact on how adulterants are distributed and removed. HVAC systems can indeed act as sources of adulterants in some cases, similar to when ventilation air pollutants come defiled with dirt and/ or humidity and when microbial growth results from stagnant water in drip kissers or unbridled humidity inside of air tubes. Because of the HVAC system's significance, good inner air quality operation includes attention to.

3.2.1 Ventilation system design: The air delivery capacity of an HVAC system is grounded in part on the projected number of people and the quantum of the outfit in a structure. When areas in a structure are used other than their original purpose, the HVAC system may bear revision to accommodate these changes. For illustration, if a storehouse area is converted into space enthralled by people, the

HVAC system may bear revision to deliver enough conditioned air to the space.

3.2.2 Outside air force: An acceptable force of outside air, generally delivered through the HVAC system, is necessary for any office terrain to adulterate adulterants that are released by outfit, erecting accouterments, furnishings, products, and people. Distribution of ventilation air to enthralled spaces is essential for comfort.

Out-of-door air quality. When present, out-of-door air adulterants similar to carbon monoxide, pollen, and dust may affect inner conditions when the outside air is taken into the structure's ventilation system. Duly installed and maintained pollutants can trap numerous of the patches in this out-of-door force air. Controlling gassy or chemical adulterants may bear further technical filtration outfits.

3.2.3 Space planning: The use and placement of cabinetwork and outfits may affect the delivery of air to an engaging space. For case, the placement of a heat-generating outfit, like a computer, directly under an HVAC control device similar to a thermostat may beget the HVAC system to deliver too important cool air because the thermostat senses that the area is too warm. Furniture or partitions that block force or return air registers can affect IAQ as well and need to be deposited with attention to the tailwind.

3.2.4 Outfit conservation: Active conservation of HVAC outfits is essential for the acceptable delivery and quality of erecting air. Each well-run structures have preventative conservation programs that help ensure the proper functioning of HVAC systems.

3.2.5 Controlling other contaminant pathways: Adulterants can spread throughout a structure by moving through stairwells, elevator shafts, wall spaces, and mileage chases. Special ventilation or other control measures may be demanded by some sources.

3.2.6 Plants:

Plants can absorb and catabolize colorful poisonous substances that live in the terrain or also called phytoremediation, despite this capability is still not

optimally employed as a medium for air sanctification in the room. The process of air sanctification by Plants has not been extensively known but in general, trends in the selection of Plants at houses are grounded on aesthetic considerations, continuity, and low conservation costs. Utmost of the named inner Plants are broadleaf species. Still, broadleaf Plants are a process of adaption to the terrain. One effect of adaption is the reduction of stomatal pores on the leaves therefore adulterants are only more attached to the leaves and aren't absorbed (7). Grounded on the National Aeronautics and Space Administration (NASA) exploration, indoor Plants can be useful as natural water-filtration that functions as pollutants of VOCs similar to formaldehyde, benzene, and trichloroethylene. Some exemplifications of indoor Plants published by NASA as shown below. (8)

Inner shops as water filtering are recommended by the National Aeronautics and Space Administration (NASA) (1989)

Types of plants English ivy (*Hedera helix*), Green Spider plant (*Chlorophytum elatum*), Peace lily (*Spathiphyllum 'Mauna Loa'*), Chinese evergreen (*Aglaonema modestum*), Bamboo palm (*Chamaedorea seifrizii*), Variegated snake plant, mother-in-law's tongue (*Sansevieria trifasciata 'Laurentii'*), Heartleaf philodendron (*Philodendron cordatum*), Selloum philodendron (*Philodendron bipinnatifidum*), Elephant ear philodendron (*Philodendron domesticum*), Red-edged dracaena (*Dracaena marginata*), Cornstalk dracaena (*Dracaena fragrans 'Massangeana'*), Weeping fig (*Ficus benjamina*), Barberton daisy (*Gerbera jamesonii*), Florist's chrysanthemum (*Chrysanthemum morifolium*), Aloe vera (*Aloe vera*), Janet Craig (*Dracaena deremensis "Janet Craig"*), Warneckeii (*Dracaena deremensis "Warneckeii"*), Banana (*Musa oriana*).

Presently, the standard criteria for opting for indoor plants haven't yet been determined. Still, in recent decades, the use of inner plants as air sanctification media has entered a lot of attention and has been delved on a broad scale. Tests of the effectiveness of inner plants as air cleaners innovated by NASA revealed that shops have the capability in reducing situations of adulterants in the room.

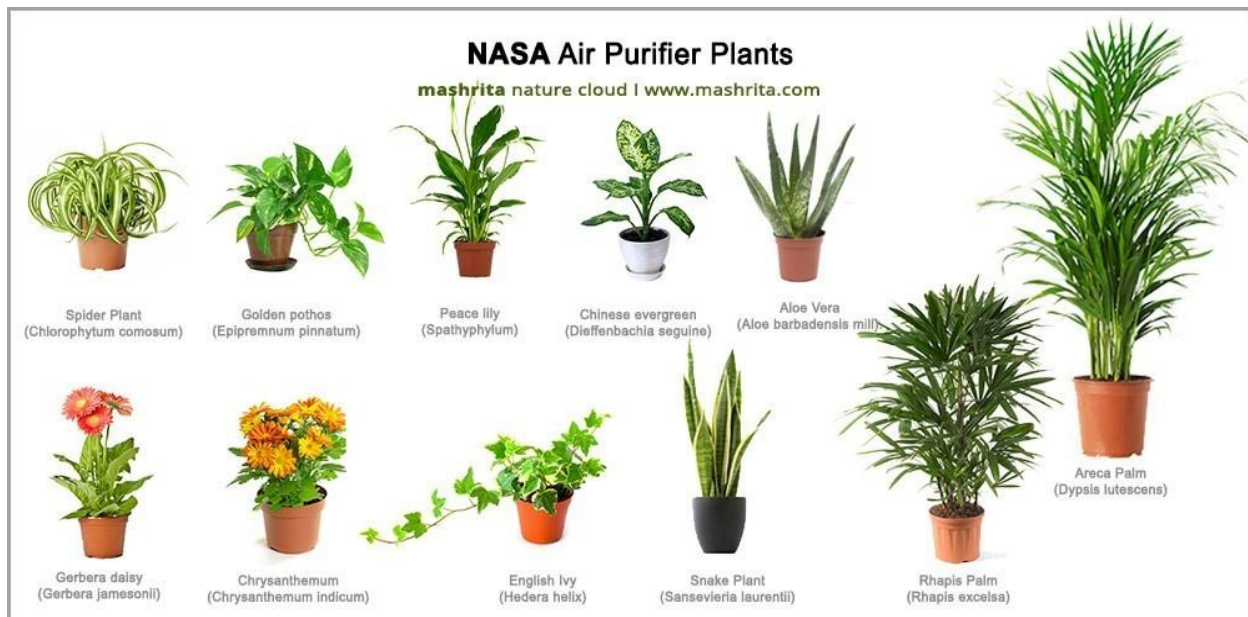


Fig 2: Indoor plants for improvement of air quality (NASA)

3.3 WATER CONSERVATION:

Every library uses water in different ways-some use it a lot further than others. It's veritably important to know how important water to use and where is to use it.

1. Go Low-Flow Whether break room or bathroom showers and gates, make sure they're accouter with low-inflow restrictors. A low-inflow gate aerator emits lower than 1.5 gallons of water/ nanosecond as a comparison to 2.2 gallons for standard gates. Aged toilets use nearly 5 gallons of water per flush, but now they're using just 2.

2. Buy Water-effective Outfit several types of outfits are used by libraries that consume a lot of water but are available in water-effective models or you can say having less-water ferocious druthers. It may bring kindly advanced but can pay snappily through water and water-heating energy savings.

3. Reduce Landscape water use Lush green fields may bear hundreds or dozens of gallons of water. Now, consider some planting native geographies or at least water-ferocious options. Consider a rainwater harvesting system to collect water on the worksite for geography irrigation or you can also

use a detector irrigation system to more control the surface water use.

4. Engage library workers Every hand at the library plays a significant part in-water operation. So, this is a high occasion to get library workers involved in the business green sweats. Whether it's part of a publishing composition in the newsletter or green platoon trouble, remind your workers every time to be conscientious of water operation and ask for ideas on how to save it.

5. Apply energy-effectiveness measures to reduce the need for structure and outfit cooling and heating, which will reduce the quantum of water needed by these systems. Keep inner temperatures at a comfortable setting while adding the effectiveness of cooling halls, evaporative coolers, and boilers by using indispensable sources of water, similar to air tutor condensate and captured rainwater. Examiner cooling palace and boiler water chemistry to minimize the mineral buildup in the system and maximize the number of times water can be reclaimed through the system.

6. Get a Water Inspection Libraries that are using a massive quantum of water should seriously consider

getting professional services results in reducing the consumption of water. A marketable water inspection platoon examines how important water a library must use and also give openings to save your water. These kinds of regular checkups also help to identify expensive water leaks that need to be repaired.

3.4 ENERGY CONSERVATION

Energy conservation in library structures is the reduction in erecting energy consumption without reducing thermal comfort. It generally results in better inner air quality and the inhabitant's productivity. Energy conservation measures don't always yield instant fiscal impulses; still, they increase public energy security, reduce environmental pollution, reduce dependence on reactionary energy, and so on. University library belongs to a kind of large public structure, which is also a high energy consumption structure. Among the structure energy consumption, air exertion system energy consumption accounts for the largest one which is 49 of the total energy consumptions. Meanwhile, lighting and power consumptions are 15 and 35 independently. It employed the control variables system to dissect the influence of four factors which are lighting power viscosity, Inner help viscosity, summer inner design temperature, and summer air force temperature on erecting energy consumption. Lighting power viscosity has a direct impact on the structure energy consumption, and the influence is bigger. Summer force air temperature on the degree of influence of erecting electricity consumption is lesser than the summer inner design temperature. Inner help viscosity substantially affects the cargo of the air exertion system in summer, and also impacts the overall power consumption (6).

Following styles can be used in the library for energy conservation (Conserve Energy Future)

1. Establish energy-effective practices in the library Depending on the mileage company you're paying; they generally have off to high peak times during the day. Try your stylish to only use redundant energy during the low or out-peak times. Encourage your workers to follow this same model and see how energy operation decreases with further action.

2. Use the hibernation point of computers and laptops Hibernate point in laptops and desktops allows you to save you're being work as it is, and you can continue from the same point the coming day. Record your workstation to switch to hibernate mode after working hours and during weekends.

3. Switch off the outfit when not in use Make sure that you switch off all printers, scanners, broilers, lights, air conditioners, coffee dealing machines during weekends or leaves. They continue to draw power indeed if they're plugged in. Switching them off after working hours will conserve energy and reduce your energy bill.

4. Buy energy-effective bias Energy-effective bias bring further outspoken, but over times of use, they're going to save you, plutocrat. This holds for any outfit that runs on electricity – spending a little more can affect significant savings over time.

5. Minimize artificial lighting and make use of skylights Artificial lights consume power, while skylights are free. Try to use maximum daylight and use artificial lights in dark areas. Lower energy means lower plutocrat spent on electricity bills.

6. Check library doors and windows for windows, fit the reflective film, external shutters, and internal hangouts to reduce the quantum of sun entering the structure. Fit bus door shutters and draft excluders. Sealed doors are better for cooling in the summer and keeping the heat in during the downtime.

3.5 WASTE MANAGEMENT

1. Reduce library Packaging Purchases Avoiding products wrapped in plastic or exorbitantly packaged in boxes and bags is a great way to induce lower waste. The library will also save energy and natural coffers. Avoid packaging when possible. For illustration, use plastic quilting on books.

2. Spread mindfulness among the scholars and the staff regarding waste avoidance and reduce system through notice boards.

3. Maximize the use of-mails for sanctioned information. Try to make our office paper-free as much as we can by maximizing the use of e-mails

and SMS cautions. Some websites allow free SMS each over the world. So, we can use this technology among the staff of the council.

4. Minimize the use of paper by enforcing the Electronic Bulletin Board/ Electronic Notice Board in the council.

5. Produce a Recycling Program Recycling is one of the stylish ways to reduce office waste and help the terrain. When you produce a new recycling program for your business, you'll need to make sure that all of your workers are on board with the plan. Along with placing recycling lockers throughout your office space, you may want to hold a meeting where you bandy the significance of recycling. Creating recycling impulses and prizes can also help to encourage your workers to reclaim.

3.6 RENEWABLE ENERGY

Renewable energy and related technologies applicable to the erected terrain include

1. Electricity generation

Rooftop photovoltaic (PV) systems, which induce electricity directly from the sun using solar panels generally mounted on the roof.

IV. NORMS FOR GREEN LIBRARIES

4.1 Centre of Science and Science and Technology for Rural Development (COSTFORD):

It's a non-profit voluntary Association innovated in 1984 with a focus on furnishing people with technological support in green structure technology. It provides people with a low-cost and eco-friendly casing terrain that will be applicable for living. It highlights the use of energy-effective ways and accouterments like padding arbor roofing, exposed brickwork, bamboo, slipup jali, etc., and minimizes the use of accouterments similar to cement, bricks, sword, etc. (9)

4. 2 Habitat Technology Group (HTG): It's a non-profit government association established in 1987 in Kerala. It also has some responding centers in some places abroad. It efficiently designs structures with low cost and the least effect on the eco-friendly terrain. Till now HTG has formed over 1 lakh green structures each around the world. (10)

Structure- integrated PV systems, which induce electricity directly from the sun using solar panels that are integrated into structure structures, either on the roof, walls, or indeed windows (using transparent panels) in some cases.

2. Hot water systems

Solar thermal systems, which toast water directly from the sun. Heat pumps, which toast water using warmth from the girding air, water, or ground. Solar heating and cooling systems Solar thermal cooling, which uses the heat of the sun to drive cooling and/or dehydration processes. Solar heating systems are similar to heat pumps, which draw and boost heat from the girding air, water, or ground. 'Passive' solar design results, which naturally toast or cool structures without the need for 'active heating and cooling systems.

Energy storehouse systems similar to batteries and thermal storehouses include hot water storehouses and storehouse of warmth and "coolth" in erecting structures.

Control systems that manage the inflow of energy into and out of parcels to increase the total quantum of renewable energy used.

4.3 Leadership in Energy and Environment Design

(LEED): In the time 2000, the LEED (Leadership in Energy and Environment Design) was evolved under the association of USGBC (United States Green Building Council) with the charge to change the system by which the structures are designed and erected. The LEED is the encyclopedically honored body that provides the frame for the Eco-friendly, cost-effective, well-erected green structures. The LEED-certified structure is an important step towards a prospering and healthy terrain, so the. quality of life can be bettered. The green structure can qualify for four situations of an instrument. (11)

- Pukka 40-49 points
- Tableware 50-59 points
- Gold 60-79 points
- Platinum 80 points

4.4 Building Research Establishment Environmental Assessment Method (BREEAM)

It's the world's longest established system for assessing, standing, and certifying the sustainability and environmental aspects of the structure. It has been working nearly in over 50 countries around the globe and has handed further than structures the BREEAM certified structure marks. (12).

4.5 Chicago Illinois Norms

Chicago is one of the first metropolises to incorporate environmentally friendly practices into public structures and develop its standard. This standard is largely told by LEED Green Building Rating System.

4.6 Brown Green Standard

California Governor Jerry Brown bandied the arising trend of green libraries and placarded that the libraries were on the cutting edge of green design. New or repaired state structures over sq. bases will have to reach the U.S. Green Building Council's LEED Tableware Instrument or advanced as well as incorporate clean energy generation.

4.7 IGBC Indian Green Building Council Standard

In 2001 Confederation of Indian Industry (CII) formed IGBC with a vision to enable a sustainable figure terrain for all. IGBC has certified the LEED Green Building Standard from the U.S Green Building Council and in Collaboration developed a Gold standing system to promote Green Structures in India. The Confederation of Indian Industry (CII)

was established in 1895 and it works nearly in collaboration with the government programs. It's a non-government and not-for-profit association. The Indian Green Building Council (IGBC) was formed in 2001 under the Confederation of Indian Industry (CII) with the vision to establish green structure culture in the country. It offers colorful other services similar to green structure training programs, standing. programs, instrument services, etc. Till now further than 5800 systems are presently being registered under IGBC from India as well as foreign countries. (13)

4.8 Herbage Standing for Integrated Habitat Assessment (GRIHA)

TERI (The Energy and Coffers Institute, New Delhi) is another association that's in the van of the green structure movement in India. It was TERI who prognosticated the need for the development of an indigenous tool for a standing green structure in India which led to the foundation of 'GRIHA'. The Energy and Resource Institute (TERI) was established in 1974 with the vision of working for global sustainable development and changing for the better hereafter. It's working in the direction of clean energy, water operation, waste operation, pollution operation, air quality operation, eco-friendly terrain, etc. TERI developed a standing system named GRIHA. While in the time 2007 Government of India espoused GRIHA as the public standing system for green structures. (14).

V. INITIATIVES OF GREEN LIBRARIES IN INDIA

5.1 Karnataka university library: University's vision is to resuscitate a green space for scholars and culture. A clean area for scholars with new confines, instructional signage boards, corners for deep studies & group conversations, a space for heritage walks, a center for photos, oils, and gouaches. This conception of Green Library provides a study atmosphere in a natural-green terrain with lush verdure. This system is a mix of heritage and ultramodern aesthetics with all installations, including a compass for group conversations in the silence of the green space. Keeping this in view, the University has taken every care to see that the Green Library is given a facelift both in terms of conservation and structure, incorporating

ultramodern flies, Gurukul Hooches, open determinedness mantraps, determinedness tables with benches beneath the trees, solar lightings, etc. Indian education the education system Gurukula system amidst of the natural timber. Keeping this traditional system of education, the Karnataka University launched a design on Green Library. The conception is to give a unanimous natural terrain for the study. This system is a mix of traditional and ultramodern systems with all amenities. Keeping this in vogue the Green Library has been established in the center of the lot and provides all installations to scholars for study. The installations include sitting, a force of drinking water, Wi-Fi connectivity, and other installations, etc.

The main library allows scholars to pierce books but they cannot go for group or combined studies and bandy the subject matter inside the library. This is coming in the way of understanding the subjects completely for the scholars. Realizing this chain in literacy, the varsity decided to set up the eco-library. Scholars who have time to spare before their coming class and who wish to go through handbooks or have a discussion can drop into the eco-library. Also, those preparing for examinations can use it and need not go to the main library which is a little down from the main structures. Nearly all postgraduate departments of the university are located in the surroundings of the eco-library (15).



Fig 3: Karnataka university library

5.2 The Mumbai University (MU): is all set to make a new library at its Vidyanagri lot in Kalina grounded on the conception of a ‘green structure. The library structure which will come upon roughly 4500 square measures of the area will be the varsity’s first green structure. The structure will be a base plus a two-story structure and will have a capacity to accommodate 300 people at one time indoors. According to the varsity’s proposed design

of the structure, there will seating arrangements available outside the structure to give an “open space literacy terrain” to scholars. The resource center’s Collection is concentrated on the Digital images and Publish Resource (National and International Journals, eBooks) and produce the literacy terrain in an open space handed with Wi-Fi and special kind of conference installations and also connected to other libraries (16).



Fig 4: Mumbai university

5.3 The Anna Centenary Library, Chennai: is a state-of-the-art library structure by the Department of public libraries, Tamil Nadu State Government. The structure is located in a well-advanced area in Kotturpuram, Chennai, amidst Educational/Institutional surroundings and easy access from all Corridor of the megacity. The structure has been developed in 8 acres of land with world-class installations with an approximate erected-up area of 3.8 lakhs sq.ft. The library has the capacity to house 1.2 million books. High-performance glazing from Saint-Gobain Glass balances daylight transmission with heat penetration. The structure is designed in such a way that the reading area receives good daylight. The seven-story patio allows in abundant natural light. The vision is to be an internationally honored civic Library known for excellence in literacy, innovative exploration, and community engagement that contributes to the profitable vitality, environmental sustainability, and quality of life in the Chennai region and beyond”. This demonstrates the commitments of the Tamil Nadu state government towards guarding the terrain for the unborn generation. The library structure complex consists of a Library structure (G 8) and a theater (G 1) to accommodate 1200 persons. To ameliorate the thermal comfort of the inhabitants, the structure has been handed with acceptable air exertion. The design achieved the prestigious LEED Gold standing given by the Indian Green Building Council under New Construction standing. This is a

unique achievement for the Tamil Nadu State Government and happens to be the first library structure in the Asian region to get this coveted standing (17).



Fig 5: The Anna centenary library

5.4 The Perma Karpo Library: Designed by Arup for a small village in Ladakh (in the Indian Himalayas), is the perfect illustration of how good design, wisdom, and original knowledge have worked together to produce a structure that's as sustainable as its beautiful. The Perma Karpo Library is part of the Druk White Lotus School, which is located in the Indian Himalayas. This design was initiated by Arup as part of their pro bono work. Arup came interested in the design when they saw the eventuality to impact the development of remote regions in the Himalayas. At Arup, every time an associate is given leave of absence to go and supervise the design on the point. At the same time, a platoon is in charge of delivering results that can be applied on point.

Amongst the technologies and design results used on point voiced Trombe Walls, hair sequestration, a slush roof, timber paneling, and indeed solar panels on the roof. The accouterments are locally sourced, and the experience and design results are worked out with the people on-point to ensure that the knowledge remains in place. The library is part of a larger development which will be finished at around 2010 (18).



Fig 6: The Perma Karpo Library

5.5 Indian Institute Technology (IIT) Library, Roorkee-Mahatma Gandhi Central Library of the Institute: finds a unique place in the academic library script in this part of the world. It's an admixture of the classic and the ultramodern. While it's one of the oldest academic libraries in the country, it's housed in an sq. ft. state-of-the-art ultra-modern centrally broiled structure equipped with all the rearmost ICT installations spread over four bottoms.

Faculty and scholars led the enterprise to save significant electricity by conducting an energy inspection and developing programs for reducing electricity consumption and energy conservation. Using Solar PV for electricity generation as well as Solar Thermal for cooking and water heating covering the entire lot is an iconic action accepted by the faculty and scholars for maximum application of energy at the Institute. All the systems have detectors installed to check the optimal performance of installations and induce data for further exploration in these areas.

More Green Enterprise is being planned for wastewater treatment as well as recycling and rainwater harvesting in a decentralized manner. Out of the total solid waste generated in the lot separating organic and inorganic waste is being planned and reviewing the available technology that can co-generate biomass energy from our organic waste (19).



Fig 7: Green campus of IIT-R

5.6 The Energy and Resources Institute (TERI)-Library: Established in 1974 as an Attestation and Information Centre, TERI LIC has surfaced as a pioneering exploration library and information center in South Asia on energy, terrain, and sustainable development. The Centre is one of the largest in the region and utmost ultra-modern in terms of service, structure, and information technology operations.

The Library and Information Centre of TERI serves primarily to meet all information requirements of in-house experimenters; the Centre also serves energy and terrain professionals worldwide by furnishing value-added information services (20).



Fig 8: TERI-Library

CONCLUSIONS

To conclude, it's to be said that green image is a good image for the libraries and should use their way of going green to promote an important green image towards their stakeholders and druggies. India is a developing country and it should develop in all fields. Green Structures have a veritably important part in environmental protection. Libraries and librarians are directly related to society and their green structures are giving them great openings to educate the citizen. For the coming generation, library professionals should move beyond environmental sustainability instanced by colorful practices of "Greening Libraries" and concentrate on the visionary way to guarantee unborn sustainable development of libraries. Environmental design should be preferred during the construction phase of libraries. The accouterments used while constructing the structures, the wastes and feasts that may. do after the construction is consumed fleetly the world's natural coffers. For this, it has come more. important to produce green structures with the conception of sustainability each over the world. There are institutions similar as 'LEED' that determine the rules and norms to be followed for a structure to come a 'green structure'. These institutions produce guidelines for Green Building Certificate Systems. Libraries need to move fleetly towards the thing of getting a Green Library with their adding stoner capacity. The prospects of new generation druggies are also changing. They demand places where they can feel safer with systems that are more environmentally friendly, that

bear zero waste, that enable waste to be reclaimed and use. lower energy. When the inner air quality specified in the norms is assured, when the accouterments used in the innards are named not to harm mortal health, when the interior comfort. Numerous public and transnational bodies are extending their help to make green libraries. Some of the Indian libraries have been trying to make the green library movement successful and librarians should take enterprise and share in the green library movement to make it more fruitful. Numerous public and transnational bodies are extending their help making libraries a green place. Still, along with these bodies, library druggies, librarians and government should take enterprise and laboriously share in the green library movement making it successful. It's to be noted that moment's libraries as gateways for knowledge are particularly responsible not only for propagating the idea of sustainability but also for leading by illustration. Always remember that a small way in going green can produce big results over some time.

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