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Application of green concepts in the libraries of Thiruvananthapuram: an investigation

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Abstract

The present study aims to judge the green concepts in the library buildings of Thiruvananthapuram by the key areas listed by Leadership in Energy and Environmental Design(LEED) such as site location, water conservation, energy efficiency, materials, indoor air quality, and a bonus category for innovation and design. The data for the study was collected from the chief librarian and the users of the major libraries in Thiruvananthapuram such as Kerala University Library (KUL), State Central Library (SCL), Kerala Legislature Library (KLL), Regional Cancer Centre Library (RCCL), VSSC library (VSSCL) and Centre for Development Studies Library (CDSL). The study analyzed the methods and techniques adopted for greening libraries. The data collected from 259 users of the libraries under study through stratified random sampling. A five point Likert scale was used for identifying the attitude of the users towards greening concepts. It was found that Vikram Sarabhai Space Centre (VSSC) Library occupied the top position followed by Kerala University Library in the adoption of greening concepts and methods. The users of State Central library and Kerala Legislature library have positive attitude towards the introduction of green concepts in their libraries.

Keywords: Green libraries, Leadership in Energy and Environmental Design (LEED), Indian Green Building Council (IGBC), Sustainable libraries, Green library movement, Green concepts and techniques

1. Introduction

Green Libraries are new concept of library building in 21st century. The growing concept is a part of the Green Library Movement emerged in the early 1990s and gained popularity in the library profession around 2003. The two most important things for making healthy and prosperous sustainable libraries are economy and ecology. That is, the libraries can manage the use of resources and save money and time and they can keep the relationship between living things and their environment and can make eco-friendly environment. In new construction and library renovation, sustainability is increasingly achieved through Leadership in Energy and Environmental Design (LEED) certification a rating system developed and administered by the US Green Building Council (USBGC).

There are many ways to define a green library, Indian Green Building Council (IGBC) (2013) [1] defines "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.". There are a number of central themes that run through all of them, including, minimizing the negative impact the building will have on the local environment, and if possible having a positive impact by reducing the use of water and energy and designing in a way that maximizes the use of natural and renewable resources. Integrating actual greenery and vegetation into the building and site design; preferably, using drought resistant and/or native vegetation and maintaining high standards of indoor air quality to help ensure the health of the people who inhabit the building. As a social institution, the role of library is to bring the concept of greening into the main stream. Librarians should act as a role model for sustainability by providing suitable and relevant information related to green issues. Librarians should also encourage and support the emerging concept and help communities to understand

green and sustainable concepts. Green Libraries' are really working most extraordinary in the current situation. Green Library does not require any high budgetary provisions; it is affordable and can be done at the existing conventional library budgetary provisions.

2. Review of Related Literature

Pangail (2015)[2] in a study explained the importance of green libraries, and answered the questions about why and how are libraries becoming green with respect to different standards such as USGBC, LEED, Chicago Illinois Standard, Brown Green Standard, IGBC, Green Rating for Integrated Habitat Assessment (GRIHA) etc. It also attempted to familiarize some Green Libraries – University of California, BIBLIO Centrum, Helsinki, Kanazava, Japan, National Library, Singapore, and Anna Centenary Library in Taml Nadu in India and abroad. The study concluded that libraries must respond to increasing focus on Green Movement and should act as role model for sustainability by providing suitable and relevant information related to green issues and concerns.

In a paper Suresh Kumar and Antoo (2014)[3] explained that the idea and behavior of creating green libraries is approaching a tipping point at the global level and transforming into a library movement by building green libraries, by greening existing library facilities, providing green library services, and embracing environmentally supportive and sustainable practices within the library. It was suggested that librarians have to be keen on updating themselves on sustainability trends and should provide awareness and create the space in the libraries to exemplify the Green practices.

Divya and Vijayakumar (2013)[4] in an article opined that green library is the library of the 21st contrary and rightly pointed out that this is the right time for librarians to support green library movement

3. Objectives of the study

The main objectives of the study are:

1. To identify the greening factors existing in the libraries of Thiruvananthapuram;

2. To analyze the methods and techniques adopted by the libraries for greening the libraries;

3. To grade the libraries in Thiruvananthapuram based on green concepts;

4. To identify the attitude of the users towards the green libraries

5. To make suggestions for reorienting the libraries for sustainable development.

4. Data and Methodology

The present study is limited to six major libraries in Thiruvananthapuram, the capital of Kerala, such as Kerala University Library (KUL), State Central Library (SCL), Kerala Legislature Library (KLL), Regional Cancer Centre Library (RCCL), VSSC library (VSSCL) and Centre for Development Studies Library (CDSL). A sample of 300 users was identified through stratified random sampling method and questionnaires were distributed among them. Out of 300 questionnaires distributed to users, 259 duly filled up and returned. The data were also collected through observation and interview with chief librarian of each library under study. The attitude of the librarians and users towards greening concepts was analyzed using a five point Likert Scale.

The major green concepts used for the study are taken from the parameters listed by LEED such as site location, water conservation method, energy efficiency, materials, indoor air quality and design of the building. The methods and techniques for greening the libraries are analysed based on:

- Materials such as wood structure, equipment, recycling, green roof, avoiding water wastage, lights, geothermal heater etc.

- Energy concerns reduce electricity, natural light, solar energy etc.

- Wastage-reduce waste, waste management.

  The data collected are tabulated and interpreted using various statistical tools.

For ranking of Libraries the variables considered are:

- Use of recycled materials used for the construction of Library building

- Library is painted with light coloured paint or not

- Types of computer monitors used

- Proper ventilation

- Library is Air conditioned or not

- Types of lights used in the Library

- Use of solar energy

- Use of pesticides for preserving materials

- Rain water harvesting

- Use of e- resources

- E- governance in the library

Value Points of above variables are given below

- No response is treated as '0' point

- Use of recycled materials used for the construction of Library building, for 'Yes' 10 points given and for 'No' 0 point.

- Library is painted with light coloured paint or not, for 'Yes' 10 points given and for 'No' 0 point.

- Types of computer monitors used, for LED – 10 points, LCD – 5 points, CRT – 0 point

- Proper ventilation, for 'Yes' 10 points given and for 'No' 0 point.

- Library is Air conditioned or not, for 'No' 10 points for 'Yes' 0 point

- Types of lights used in the Library, for LED – 10 points, CFL – 7.5 points, Tube light – 5 points, Bulb – 2.5 points.

- Use of solar energy, for 'Yes' 10 points given and for 'No' 0 point.

- Use of pesticides for preserving materials, for 'No' 10 points for 'Yes' 5 points.

- Rain water harvesting, for 'Yes' 10 points given and for 'No' 0 point.

- Use of e- resources, for 'Yes' 10 points given and for 'No' 0 point.

- E- Governance in the library, for 'Yes' 10 points given and for 'No' 0 point.

For measuring attitude of users, Likert 5 point scale was used. The scoring points for the opinion is calculated as Strongly Agree- 5 points, for Agree – 4 points, for No opinion – 3 points, for Disagree – 2 points, for Strongly Disagree – 1 point.

5. Analysis and Discussion

The analysis of the data collected is given here.

5.1 Green Concepts- Infra Structure Facilities

The infrastructure and facilities includes independent building, area, furniture, IT enabled infrastructure etc are analyzed here.

5.2.1 Building

Kerala University Library is the largest library situated very near to the National Highway in the heart of Trivandrum city with a plinth area of 8500 sq. meters. Among the libraries three libraries viz. Kerala University Library, K.N Raj Library and State Central Library have independent building. K.N Raj Library of the Centre for Development Studies is

located in a residential area in the northern outskirts of Thiruvananthapuram. VSSC Library, Kerala Legislature Library and Regional Cancer Centre Library are attached to their parent organization buildings. State Central Library is located just 30 meters away from the National Highway with a plinth area of 7,500 sq. meters and all other libraries are positioned away from the main road having an area below 5,000 sq. meters. VSSC library is situated about 1.5 KM away from the main road. Air pollution may be more in the libraries which are functioning very near to the main road.

5.2.2 Computers

The analysis of data revealed that all the six libraries are using computers for their house keeping operations and information technology enabled services. KN Raj Library and VSSC Library have 32 and 35 computers respectively and least number of computers is in Kerala Legislature Library and Regional Cancer Centre Library with 22 and 11 respectively. Kerala University library has more number of computers with 65 followed by State Central Library with 40 computers. The average number of computers used in the libraries under study is 33. The type of monitors of the computers in each library is given in Table-1

Table 1: Type of monitors used by the libraries

Libraries	LCD	LED	CRT	Total
Kerala University Library	55(84.62)	-	10(15.38)	**65(100)**
State Central Library	31(77.50)	-	9(22.50)	**40(100)**
VSSC Library	13(37.14)	17(48.57)	05(14.29)	**35(100)**
K. N. Raj Library(CDS)	32(100)	-	-	**32(100)**
Kerala Legislature Library	4(18.18)	18(81.82)	-	**22(100)**
Regional Cancer Centre Library	2(18.18)	8(72.73)	1(09.09)	**11(100)**
Total	**137(66.83)**	**43(20.96)**	**25(12.21)**	**205(100)**

The type of computer monitors used in the libraries revealed that most of the libraries are having LCD and LED monitors than CRT monitors. Kerala University Library has 84.62 % LCD monitors while State Central Library has 77.5 %. K.N Raj Library and Kerala State Legislature library have only LCD and LED monitors. In RCC library more than 90% of the monitors are either LCD or LED. The analysis shows that Kerala Legislature library is on top followed by RCC library and VSSC library in energy saving with respect to the type of monitors they are using.

5.2.3 Working Hours

Kerala University Library, State Central Library and Regional Cancer Centre Library are working in day and night time. But K. N. Raj Library (CDS), Kerala Legislature Library and VSSC Library are functioning only in day time. The power consumption is less and use of natural lighting is more in the libraries working in day time only.

5.2.4 Number of Staff

Kerala University Library has maximum number of staff with 110 followed by State central Library (104), Kerala legislature Library (39), VSSC library (32) and K.N Raj library has 28 staff. RCC library has least number of staff (15).

5.2.4 Membership and number of users visit the library

State Central Library has occupied the top position with 22,500 members followed by 18,500 in Kerala University Library and 1250 in CDS library. All other libraries have less than 1000 members since they are special libraries. Around 750 to 1000 members visit daily in the Kerala University Library and State Central Library. VSSC Library is another important library with about 500 to 750 users visit regularly. While K. N. Raj Library

(CDS), Kerala Legislature Library, and Regional Cancer Centre Library have 250 to 500 users daily.

5.3 Green Factors

5.3.1 Usage of recycled/reused materials for the construction of Library Building.

No library except K.N Raj Library used any kind of recycled/reused materials for the construction of their library building. The K.N Raj Library building, designed by the renowned architect, Dr. Laurie Baker, exemplify the cost-effective techniques in construction. It is also have a green campus with a prize-winning garden.

5.3.2 Types of paint used in library building

Light colored paints were used in the Kerala University Library, Vikram Sarabhai Space Centre (VSSC) Library, Kerala Legislature Library and Regional Cancer Centre Library. State Central Library has a new heritage model building and its outside walls are not plastered but the interior walls are painted with light color paint. K.N Raj Library has an unplastered brick building.

5.3.3 Indoor air ventilation and Natural ventilation

The indoor air ventilation and natural ventilation of the libraries are evaluated on the basis of the opinion of the users of the libraries under study. It was revealed that 96.55 % of the users in VSSC library are very satisfied with the existing ventilation while only 37.04 % and 36.36 % of users in State central library and Kerala Legislature library respectively opined that they are very satisfied with ventilation and natural light. More than 90 % of the users except in Kerala University Library and State Central Library are either very satisfied or satisfied with the existing indoor air ventilation.

Table2: Satisfaction level of indoor air and natural ventilation of Library

Libraries	Very satisfied	Satisfied	Average	Less satisfied	Least satisfied	Total	Total Score	Mean score	SD	Rank
Kerala University Library	36 (42.86)	22 (26.19)	25 (29.76)	1 (1.19)	0 (0.00)	84 (100)	345.0	4.1	74.1	6
State Central Library	30 (37.04)	35 (43.21)	14 (17.28)	2 (2.47)	0 (0.00)	81 100)	336.0	4.1	73.0	5
K. N. Raj Library(CDS)	12 (52.17)	9 (39.13)	2 (8.70)	0 (0.00)	0 (0.00)	23 (100)	102.0	4.4	26.7	3
Vikram Sarabhai Space Centre (VSSC) Library	28 (96.55)	1 (3.45)	0 (0.00)	0 (0.00)	0 (0.00)	29 (100)	144.0	5.0	62.2	1
Kerala Legislature Library	12 (36.36)	18 (54.55)	2 (6.06)	1 (3.03)	0 (0.00)	33 (100)	140.0	4.2	35.0	4
Regional Cancer Centre Library	5 (55.55)	4 (44.45)	0 (0.00)	0 (0.00)	0 (0.00)	9 (100)	41.0	4.6	11.7	2
Total	**123 (47.49)**	**89 (34.36)**	**43 (16.60)**	**4 (1.54)**	**0 (0.00)**	**259 (100)**	**1108.0**			

Based on the mean score VSSC library is on top followed by RCC library and Kerala University Library is at the bottom.

5.3.4 Air-conditioned facility and Type of Lights

All libraries under the study have air conditioned facility. Kerala University Library and K. N. Raj Library (CDS) use LED's, CFLs and Tube lights. But State Central Library uses only tube lights. Kerala University Library and Vikram Sarabhai Space Centre (VSSC) Library are using solar energy as an alternative to electric energy.

5.4 Green Methods

5.4.1 Use of Fan, use of natural pesticides for preservation

The analysis shows that Kerala University Library, Vikram Sarabhai Space Centre (VSSC) Library and Regional Cancer Centre Library have 0 to 50 fans. But K. N. Raj Library (CDS), State Central Library and Kerala Legislature Library are not using any pesticides

for the preservation of books from biological hazards. Among six libraries, only K N Raj Library and Kerala Legislative Library use natural pesticides for preservation of books.

5.4.2 Rain water Harvesting facility and Waste Management System

From the data, it is revealed that only K N Raj Library has rain water harvesting system and State Central Library has Waste Management System. No other library any of these systems.

5.4.3 Plastic materials in the Library

Kerala University Library and State Central Library are using plastic borrower's tickets and membership tickets. Pouch for membership card of K. N. Raj Library (CDS) is plastic. Kerala Legislature Library has plastic membership tickets. While Regional Cancer Centre Library has plastic borrower's tickets.

5.4.4 Alternate energy source of library

The study revealed that Kerala University Library has solar and battery energy sources, K. N. Raj Library (CDS), State Central Library, Kerala Legislature Library and Regional Cancer Centre Library have no alternate sources of energy, while Vikram Sarabhai Space Centre (VSSC) Library has solar energy source.

5.4.5 Use of E- Resource in the library

All libraries except State Central Library have E- resources. Kerala University Library has e-books, e-Journals, and digitalized rare books. K. N. Raj Library (CDS), Vikram Sarabhai Space Centre (VSSC) Library, Kerala Legislature Library and Regional Cancer Centre Library have e- resources. This information is not provided by State Central Library.

5.4.6 E-governance system

It was found that K. N. Raj Library (CDS), Vikram Sarabhai Space Centre (VSSC) Library and State Central Library have E-governance system. But Kerala University Library, Kerala Legislature Library and Regional Cancer Centre Library have no E-governance system.

5.4.7 Furniture/Shelves of the library

Table 3 shows the preference to the type of materials of the furniture of the library.

Table3: Preference of furniture/shelves for Library

Libraries	Shelves			Chairs			Tables		
	Plastic	Wooden	Steel	Plastic	Wooden	Steel	Plastic	Wooden	Steel
Kerala University Library	-	42	170	120	40	-	10	85	-
State Central Library	-	42	250	175	85	-	-	125	15
K. N. Raj Library(CDS)	-	-	300	10	100	120		100	15
Vikram Sarabhai Space Centre (VSSC) Library	-	15	500	-	-	100	-	40	-
Kerala Legislature Library									
Regional Cancer Centre Library	-	9	23	4	5	42	1	13	6
Total	**0**	**66**	**993**	**134**	**145**	**262**	**11**	**238**	**21**

Kerala University Library has 120 plastic and 40 wooden chairs. K. N. Raj Library(CDS) has 10 plastic, 100 wooden and 120 steel chairs. Vikram Sarabhai Space Centre (VSSC) Library has only 100 steel chairs. Regional Cancer Centre Library has 4 plastic, 5 wooden and 42 steel chairs. State Central Library and Kerala Legislature Library didn't give any information regarding this question.

Kerala University Library has 10 plastic and 85 wooden tables. K. N. Raj Library(CDS) has 100 wooden and 15 steel tables. 40 wooden tables use in Vikram Sarabhai Space Centre (VSSC) Library. Regional Cancer Centre Library has 1 plastic, 13 wooden and 6 steel tables. State Central Library and Kerala Legislature Library didn't give any information.

Kerala University Library has 42 wooden and 170 steel shelves. 300 steel shelves are used in K. N. Raj Library(CDS). Vikram Sarabhai Space Centre (VS SC) Library has 15 wooden and 500 steel shelves. Regional Cancer Centre Library has 9 wooden and 23 steel shelves. State Central Library and Kerala Legislature Library didn't respond to this question.

5.4.8 Printers used in the Library

K. N. Raj Library (CDS) has three printers and the cartridges are refill after use. Kerala Legislature Library has nine printers and its cartridges are refill after use. Regional Cancer Centre Library use three printers, cartridges are disposable type. Kerala University Library has six printers and in four printers they use refill cartridges. Vikram Sarabhai Space Centre (VSSC) Library use disposable type cartridge for their printers, they didn't specify the no. of printers. State Central Library has not responded to this question.

5.4.9 Weeding out of books

Kerala University Library has no weed out policy but they have weeded out 45,000 damaged and worn out books recently. Vikram Sarabhai Space Centre (VSSC) Library has weeded out their books once in a year. Regional Cancer Centre Library has weeded out books once in two years. K. N. Raj Library (CDS) has not weeded out their books since its inception. State Central Library and Kerala Legislature Library have not responded to this question.

5.4.10 Number of vehicles used and public transport system in the library campus

The data shows that 100 to 200 vehicles are being used by users in Kerala University Library, State Central Library and Regional Cancer Centre library campus daily. VSSC Library and all other libraries have no allowed any private vehicle in their campus. It was found that K. N. Raj Library (CDS) and VSSC have their own public transport system for library professionals. But Kerala University Library, State Central Library, Kerala Legislature Library and Regional Cancer Centre Library have no public transport system.

5.5 Ranking of Libraries

The libraries are graded based on the value points are given in Table 4.

Table 4: Grade Points obtained through the scoring system and the Rank of libraries

Libraries	Grade	Rank
Kerala University Library	67.5	2
State Central Library	20	6
K. N. Raj Library(CDS)	62.5	3
Vikram Sarabhai Space Centre (VSSC) Library	80	1
Kerala Legislature Library	50	5
Regional Cancer Centre Library	60	4

From the Table 4 it is clear that Vikram Sarabhai Space Centre (VSSC) Library has occupied the top position followed by Kerala University Library on the adoption of green concepts. The third position occupied by K. N. Raj Library (CDS) and Regional Cancer Centre Library is in fourth position. Kerala Legislature Library and State Central Library are in the fifth and sixth position respectively.

5.5 Awareness of 'Green Library' concept

Information regarding Awareness of users on Green Library concept is given in Table 4.

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Table 4: Awareness in 'Green Library' concept

Libraries	Not at all	Slightly	Some what	Mode rately	Extre mely	Total	Total Score	Mean	SD	Rank
Kerala University Library	10 (11.9)	16 (19)	35 (41.7)	17 (20.2)	6 (7.1)	84 (100)	245	2.9	11.1	3
State Central Library	12 (14.8)	19 (23.5)	28 (34.6)	18 (22.2)	4 (17.2)	81 100)	226	2.8	8.9	5
K. N. Raj Library(CDS)	1 (4.3)	3 (13)	4 (17.4)	7 (30.4)	8 (34.8)	23 (100)	87	3.8	2.9	1
Vikram Sarabhai Space Centre (VSSC) Library	2 (6.9)	8 (27.6)	5 ((17.2)	12 (41.4)	2 (6.9)	29 (100)	91	3.1	4.3	2
Kerala Legislature Library	10 (30.3)	10 (30.3)	4 (12.1)	4 (12.1)	5 (15.2)	33 (100)	83	2.5	3.1	6
Regional Cancer Centre Library	2 (22.2)	1 (11.1)	4 (44.4)	1 (11.1)	1 (11.1)	9 (100)	25	2.8	1.3	4
Total	37 (14.3)	57 (22)	80 (30.9)	59 (22.8)	26 (10)	259 (100)	757	2.9	21.0	

The users of KN Raj Library are more aware about green concepts followed by VSSC library. Users of State Central Library and Kerala Legislature Library are least aware about the green concepts.

5.6 Attitude towards Green Library concept

Table 5 shows that the users of State Central library followed by Kerala Legislature library have a positive attitude towards the introduction of green concept in libraries. The attitude of the users of Regional Cancer Centre Library and Kerala University Library are not much favored in the adoption of green concepts when compared to the perception of the users of other libraries.

Table 5: Attitude of users towards the introduction of greening concepts

Libraries	Strongly Dis agree	Disagree	No Opinion	Agree	Strongly Agree	Total	Total Score	Mean	SD	Rank
Kerala University Library	5 (6.0)	8 (9.5)	10 (11.9)	47 (56.0)	14 (16.7)	84 (100.0)	309	3.7	17.2	5
State Central Library	2 (2.5)	4 (4.9)	5 (6.2)	40 (49.4)	30 (37.0)	81 (100.0)	335	4.1	17.6	1
K. N. Raj Library(CDS)	1 (4.3)	4 (17.4)	3 (13.0)	9 (39.1)	6 (26.1)	23 (100.0)	84	3.7	3.0	4
Vikram Sarabhai Space Centre (VSSC) Library	1 (3.4)	2 (6.9)	5 (17.2)	12 (41.4)	9 (31.0)	29 (100.0)	113	3.9	4.7	3
Kerala Legislature Library	0 (0.0)	4 (12.1)	2 (6.1)	17 (51.5)	10 (30.3)	33 (100.0)	132	4.0	6.9	2
Regional Cancer Centre Library	1 (11.1)	2 (22.2)	3 (33.3)	2 (22.2)	1 (11.1)	9 (100.0)	27	3.0	0.8	6
Total	10 (3.9)	24 (9.3)	28 (10.8)	127 (49.0)	70 (27.0)	259 (100.0)	1000	3.9	47.6	

6. Findings of the study

The first objective of the study is, "To analyze the greening factors exist in the libraries in Trivandrum".

1. All libraries except Kerala University Library and State Central Library are located away from the main road

2. Most of the libraries in this study are painted with light colour paint. This helps to utilize more natural light during day time.

3. More than 75% of the monitors of the computer in all the libraries are either LCD or LED. These types of monitors have low energy consumption.

4. Libraries taken for this study are properly ventilated. More than 90 % of the users in all libraries except in Kerala University Library and State Central Library are either very satisfied or satisfied with the existing indoor air ventilation.

5. Most of the libraries are lighted with CFL and Tube lights. The use of LED lights is minimum in libraries

6. Kerala University Library and Vikram Sarabhai Space Centre (VSSC) Library have utilized solar energy as an alternative to electric energy.

The second objective of the study is, "To analyze the methods and techniques adopted by the libraries for greening the libraries". The major findings are:

1. Only K N Raj Library has rain water harvesting system and waste management system in State Central Library

2. Among six libraries, only K N Raj Library and Kerala Legislative Library are using natural pesticides for preservation of books.

3. Plastic Borrower's tickets and membership cards are widely used in all the libraries except VSSC library.

4. All libraries except State Central Library have E- resources.

5. K. N. Raj Library (CDS), Vikram Sarabhai Space Centre (VSSC) Library and State Central Library have E-governance system

6. Majority of the tables, chairs and shelves used in the libraries are made of either wooden or steel.

7. Majority of the libraries are using refilled cartridge for printers.

8. All the libraries are weeded out unwanted or damaged books frequently

9. On an average 100 to 200 vehicles are being used by users in Kerala University Library, State Central Library and Regional Cancer Centre library campus daily. K. N. Raj Library and VSSC have their own public transport system for library professionals.

The third objective of the study is, "To grade the libraries in Trivandrum based on green concepts", it was found that Vikram Sarabhai Space Centre (VSSC) Library is at the top position followed by Kerala University Library on the adoption green concepts. The third and fourth positions occupied by K. N. Raj Library(CDS) and Regional Cancer Centre Library respectively. Kerala Legislature Library and State Central Library are at the bottom level with fifth and sixth place respectively.

The fourth objective of the study is, "To identify the attitude of the users and librarians towards the greening of the libraries for sustainable development", the findings are:

1. The librarians have a positive attitude towards the introduction of greening concepts in the library. They opined that the library can be shifted from roofed building to natural vegetation, hard copy of books changed to e-resources, natural light is used instead of electric light and natural air ventilation facilities used instead of fans.

2. Users of State Central library followed by Kerala Legislature library have a positive attitude towards the introduction of green concept in libraries. The users of Regional Cancer Centre Library and Kerala University Library are not very much favorable to the adoption of green concepts when compared to the users of other libraries

7. Suggestions

Based on the study the following are the suggestions

1. Use renewable energy resources, such as solar and wind instead of electricity.

2. Adopt a policy statement to build green garden library(Open space for reading)

3. Use of LED monitors & lights to reduce power consumption

4. Support access to alternative transportation like mass transit and bicycles

5. Green concept should be adopted at the time of library building design and construction.

6. Introduced outdoor reading in controlled environment.

7. Library should spread awareness about the library's green activities through social media or other methods regularly.

8. Identify and reduce the use of hazardous chemicals in the cleaning and maintenance routine of the library.

9. Libraries can use a variety of tools to popularize the 'green concept' and educate their patrons about the features of their green buildings. These include in-library displays, publications, and library programs relevant on 'going green'.

10. Create a green team by identifying the librarians who are willing to promote green library techniques and encourage them.

11. Sustainability in library buildings should be taught to LIS students so that new generation librarians will adapt these ideas.

12. Make better use of cloud computing services in order to avoid print materials.

13. Government should take steps to promote green libraries through award and financial aid to maintain such libraries.

14. Government/Universities should make all the efforts to transform Libraries into green buildings/Libraries, wherever it is possible.

8. Conclusion

The study shows that the green concepts adopted at a moderate level in the libraries in Trivandrum. The attitude of the librarians and users towards the adoption of green concepts in their libraries is a good sign for a green library movement. Librarians should focus on the chance to transform an adaptable library and its services to a high level eco-

friendly. Libraries can use variety of tools to popularize the 'green concept' and educate their users about the features of their green buildings. The Library is committed to promote an awareness of environmental and sustainability issues amongst staff and users. All the libraries should have a dedicated Green Group and all Library staff members are encouraged to be environmentally aware through initiatives such as recycling, energy efficiency, and the purchase of environmentally friendly products. Librarians should act as role models for sustainability by providing suitable and relevant information related to green issues and concerns. The time has come to move beyond environmental sustainability exemplified by various practices of "greening libraries" and focus on the proactive steps to guarantee future sustainable development of libraries.

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