International Journal of Advance and Applied Research
www.ijaar.co.in
ISSN – 2347-7075 Impact Factor – 8.141
Peer Reviewed Bi-Monthly
Vol. 7 No. 5 January – February - 2026

Barriers to Greening: A Diagnostic Study of Challenges in Maharashtra's University Libraries

Mr. Yogesh Jadhav[1], & Dr. Smita Vedpathak[2]

[1]Research Scholar, BVDU, Yashwantrao Mohite College of Arts, Science and Commerce, Erandwane Campus, Pune-411038.

[2]Research Guide, BVDU, Yashwantrao Mohite College of Arts, Science and Commerce, Erandwane Campus, Pune-411038.

Corresponding Author – Mr. Yogesh Jadhav

DOI - 10.5281/zenodo.18919254

Abstract:

As the academic world is grappling with concerns about climate change, degradation of the environment, and calls for more sustainability, the whole concept of "green libraries" is actually getting more and more relevant. Libraries which are the heart of the intellectual activities in a university can take the lead in demonstrating eco-friendly practices and at the same time, raise the users' awareness about sustainability. Even though the awareness has increased, green library practices are still not adopted in India entirely, and the process is also very slow and uneven, especially in the university libraries of Maharashtra. This study takes a diagnostic approach to find out what the barriers are and why they are blocking the state's university libraries from going green. The information was collected primarily through semi-structured interviews with the head librarians, university administrators, and finance officers of four schools—University of Mumbai, Savitribai Phule Pune University, SNDT Women's University, and NMIMS (Deemed-to-be University)—and then through a qualitative multiple-case study methodology. The analysis reveals that the progress towards sustainability is severely limited through various means such as minimal user interaction, administrative and policy restrictions, lack of specialized knowledge, and the problems of adapting older buildings for modern needs. The authors of the article argue that the sustainability of libraries is not simply a matter of technology but rather the institution with its culture, plus a list of challenges that are to be overcome. Thus, by revealing such important areas that need to be handled, this paper provides a lot of useful advice to power, university heads, and library personnel who are keen on making the sustainability an essential quality of the higher education libraries in Maharashtra state.

Keywords: Green libraries; sustainability; university libraries; Maharashtra; academic libraries; barriers

Introduction:

It is becoming increasingly required of universities to operate as socially conscious establishments with an emphasis on environmental stewardship in addition to teaching and research. Libraries have a unique place in this context. University libraries have a duty and a chance to set an example for sustainable practices since they are resource-intensive, high-use facilities that serve a variety of user communities. This changing role is reflected in the emergence of the green library concept, which emphasizes ecologically conscious operations, design, and services. (Antonelli 42).

The growth of higher education in India over the last 20 years has been most noticeable in areas like Maharashtra, which has a high concentration of deemed, public, and private institutions. But a large portion of the university library's current infrastructure was built long before institutional planning began to include sustainability. Therefore, rather than creating

specially designed sustainable facilities, greening initiatives frequently entail modifying old buildings. Despite the growing recognition of sustainability in professional discourse, university libraries continue to adopt sustainability in a limited and unequal manner. (Patil and Pradhan 211).

The main research question of this paper is: What obstacles stand in the way of Maharashtra university libraries successfully implementing green practices? Instead, then concentrating only on successful models, the study takes a diagnostic approach, looking at challenges in the areas of finance, administration, technology, infrastructure, and behaviour. The research aims to offer context-specific insights that represent the realities of Maharashtra's higher education ecosystem by basing the analysis on qualitative case studies.

Literature Review:

The scholarly works on green libraries are located at the intersection of sustainable design, library and information science, and environmental management. Initially, the concept of green libraries was limited to ecologically friendly constructions. Slowly, the researchers have expanded the idea to include environmental advocacy, ethical information practices, and sustainable services. Antonelli argues that a real green library should not only impact the physical infrastructure but at the same time, influence the cultural practices within the institution and the users' behaviour(44).

Lifecycle costing has been recognized as a strong argument for green infrastructure, based on international studies. Research from North America and Europe has shown that the long-term operational benefits often compensate for the higher initial cost of eco-friendly buildings (Aulisio 95). However, these benefits are reliant on a significant institutional commitment and the integration of sustainability into the routine operations and governance.

The research brings forth several difficulties in developing nations like lack of finance, unclear legislation, and misunderstanding of priorities in development. In such a scenario, Jankowska and Marcum (165) argue that the academic libraries are usually performing symbolic or partial green practices like digitization to a limited extent or conducting awareness campaigns without making any major changes. This trend is largely similar to the Indian context of higher education.

Most of the Indian research conducted on green libraries has focused mainly on awareness levels, best practices, and the role of digitization. Kumbhar, however, points out that the absence of institutional structures to back total sustainability measures is one reason why he cites waste management, energy saving, and paper reduction as good entry points for Indian libraries (49). A more recent study states that, in Indian university libraries, sustainability programs are often led by individuals rather than being mandated by institutional policies (Sharma and Singh).

Maharashtra's current research is primarily directed at the digital repositories, namely INFLIBNET's N-LIST, and the ICT transformation. However, scholars do not support the comparison of digitization with greening, even though these projects in an indirect way contribute to sustainability through the reduction of paper consumption. Among others, Patil and Pradhan argue that this kind of misunderstanding, which is in the form of comparing digitization with greening, obscures the real underlying problems related to building design, water management, and energy use (216).

The absence of diagnostic studies, which are supported by empirical data and uncover the reasons behind the non-implementation of sustainability initiatives in academic libraries,

even if they are known to the public, is a significant research gap that this study points out. To narrow down this gap, the present research focuses not on the theoretical models but on the institutional and structural barriers that impact the adoption of green libraries in Maharashtra.

Conceptual Framework:

Categorizing Financial Constraints:

In the green libraries' literature, financial limitations are the biggest barriers often referred to, particularly in developing countries. High upfront costs are associated with energy-efficient lighting systems, solar energy, rainwater harvesting, and sustainable retrofitting, which are all examples of green infrastructure projects. The Indian public university system allows very little scope for long-term sustainability planning, as library spending is most often absorbed in the larger institutional allocations (Patil and Pradhan 214). Even at private universities, sustainability projects are often evaluated through the lens of short-term return on investment criteria, which hinders their adoption.

Administrative and Policy Hurdles:

The policy and administrative context are the major factors influencing sustainability outcomes. Libraries operate mostly in hierarchical governance systems that branch out with government or university level decisions regarding finance, procurement, and infrastructure. Without any clear sustainability demands in the laws of the university or library policy, the initiatives are scattered and non-uniform. The federal and state level frameworks may encourage innovation but often do not impose any legally binding rules on the operations of libraries.

Lack of Expertise and Professional Training:

The insufficient expert knowledge of sustainable resource management, environmental audits, and green building design in the library profession is another important difficulty. In India, the primary focus of LIS education has always been the so-called "traditional" subjects (cataloguing, information services, and digital technologies), while sustainability competencies have been given little attention. Consequently, the libraries depend a lot on external consultants, which not only increases the costs but also lessens the institutional ownership of the sustainability projects (Jankowska and Marcum 168).

Infrastructural Limitations of Existing Buildings:

In Maharashtra, a significant quantity of university libraries are located within old buildings which were constructed many years ago, long before sustainability became one of the major factors in the architectural design of buildings and practices. These buildings are usually deprived of natural lighting, energy efficiency, water reuse, and waste management. Their retrofit both financially and technically remains an issue. Urban density, particularly in cities like Pune and Mumbai, further restricts the installation of renewable energy systems and the creation of green spaces.

User Engagement and Behavioural Challenges:

User behavior is among the prime determinants of sustainability outcomes. Failing to implement digital resources, cutting back on printing reluctantly, and not joining in eco-friendly programs are some of the user behavior patterns that cause the failure of green initiatives. The users' ongoing awareness and the gradual shift in their opinions about the environment will ensure that green initiatives are more than just symbolic, but actually part of the truth. This factor not only points to the importance of libraries as actual locations, but also their role as facilitators for environmental awareness and cultural shifts in society, thus their great contribution. A single framework consisting of

these five categories has been created which serves as a guide for collecting and analyzing data in this research. The framework suggests that obstacles are a combined strength, therefore they must be tackled in conjunction with a holistic and united method rather than in isolation.

Research Methodology:

Research Design:

The research applies a multiple-case qualitative design that is ideally fitted to investigate the complex institutional events in their natural locations. Qualitative methods make

Data Analysis:

The interview data underwent transcription and thematic analysis according to the categorized barrier framework. Recognizing trends and differences between institutions aimed at determining the extent to which governance and financial models are sustainability affectors. The latter mentioned analytical method facilitated the recognition of not only universal systemic barriers but also institution-wise difficulties.

Ethical Considerations:

There were no deviations from the approved ethical research practices. All subjects were given proper explanations of the experiment, and their names were made secret so that they would feel free to give honest answers. The names of the institutions are mentioned exclusively for putting the results in perspective, not for assigning to a particular person the statements that can be identified.

Table 1. Profile of Selected University Libraries in Maharashtra

University	Type	Age of Institution	Nature of Library Building
University of Mumbai	Public	Pre-independence	Legacy structure
SPPU	Public	Mid-20th century	Mixed (old + new)
SNDT Women's University	Public	Early 20th century	Legacy structure
NMIMS	Deemed/Private	Late 20th century	Modern infrastructure

Findings and Discussion:

This part of the paper reveals and interprets the results obtained from the qualitative case studies conducted at four different universities in Maharashtra: The University of Mumbai, Savitribai Phule Pune University (SPPU), SNDT Women's University, and NMIMS (Deemed-to-be University). The conversation follows the five-barrier diagnostic framework that was previously established. The results indicate that although there is a general understanding of sustainability among the institutions, very few can put it into practice due to the various interdependent and complex challenges.

Table 2. Comparative Analysis of Barriers Across University Types

Barrier	Public Universities	Private/Deemed University
Financial	Budget rigidity, grant dependence	ROI-driven decisions
Administrative	Centralized approvals	Faster but policy-light
Expertise	Limited training	Consultant-dependent
Infrastructure	Severe retrofitting limits	Partial sustainability
User Engagement	Large, diverse resistance	Moderate engagement

Financial Constraints as the Primary Barrier:

In all the institutions under study, financial constraints were the most significant and frequent hurdle to making libraries environmentally friendly. Heads of libraries at public universities pointed out that new libraries mostly make the same expenditures every year which are journal subscriptions, licensing for databases, staff, and maintenance since these consume library budget. So, sustainability projects like the ones which need to upgrade infrastructure, usually, will be on the backburner.

People at The University of Mumbai and SPPU said that whenever proposals for solar panels, energy-saving HVACs, or rainwater harvesting are put up, the first thing that is pointed out is money and that is why these things do not get the go-ahead very often. Even though the administration sees the potential for savings in the long run from green technologies, unavailability of designated funds for supporting sustainability discourages the investments. This situation corresponds to Patil and Pradhan's remark that Indian academic libraries find it difficult to make the case for long-term sustainability expenditure within the short-term budget cycles (215).

At NMIMS, there is relatively more financial flexibility; however, the sustainability projects are assessed through return-on-investment models. The finance officers observed that only when green initiatives give rise to immediate financial gains or locating the institution's reputation as branding will they be prioritized. This indicates that the financial barriers are not just the result of a lack of resources but also the result of the institution's low regard for sustainability.

Administrative and Policy Hurdles:

The administrative organization has a very important impact on sustainability decisions. Librarians in public universities have said that they have little say in matters concerning the infrastructure, procurement, and future planning. The big sustainability projects need to be approved by many layers of administration which makes the process slow and the project less intense.

At SNDT Women's University, those interviewed said that even though sustainability is conceptually supported, the lack of formal policies at the library level for sustainability leads to initiatives that are not coordinated. Decisions related to sustainability often become part of the general campus development plans, where the library's specific needs are given very little attention.

The situation is made worse by the fact that there are no clear-cut sustainability mandates in university rules or regulations. While state and national policies support innovative practices, they do not usually result in libraries having to comply with specific operational guidelines. This gap in administration strengthens the argument made by Jankowska and Marcum that sustainability is bound to fail if governance does not assign and institutionalize the responsibility (167).

Lack of Expertise and Professional Training:

Interviews revealed a common problem - not having any experts in green building design, environmental auditing, and sustainable facilities management. A majority of librarians admitted that they did not get the sustainability planning or environmental management competencies training during their LIS education.

This is the reason why libraries are depending greatly on outside consultants when it comes to green initiatives. Although this method brings in the required expertise, it also raises the costs and decreases the internal capacity building.

University librarians in the public sector voiced their worries that projects driven by consultants would not be able to support the integration of sustainability in the long term because of the minimal involvement of planners and evaluators.
Even at the NMIMS where the accessibility to consultants is more, respondents said that the library operations still did not get the sustainability knowledge embedded but it remained externalized. These results confirm the need for combining sustainability education into the LIS curricula and continuing professional development, which is in line with the recommendations made by IFLA and Indian LIS scholars.

Infrastructural Limitations of Existing Buildings:

In older public universities, the problem of infrastructure-related barriers was extremely noticeable. Libraries located in old buildings must deal with structural limitations that prevent them from using energy-saving systems, natural light, and water-saving devices. Besides, it takes not just a lot of money but also technical feasibility assessments to retrofit such buildings.

People from the University of Mumbai pointed out the space constraints, electrical load capacity, and heritage building regulations as the main problems. In densely populated areas, the installation of solar panels or waste segregation units is usually impossible.

On the other hand, NMIMS is in buildings that are relatively new and thus sustainability features are easier to integrate. Interviews, however, indicated that modern buildings still only partly adopt sustainability and this is mainly through digitization and basic energy-saving measures. This implies that infrastructure alone is not a guarantee for sustainability unless there is commitment from the institution.

User Engagement and Behavioural Challenges:

User actions turned out to be a barrier that was not easily recognized but still had a great impact. librarians in different institutions shared their incidences of resistance to not printing, still going for hard copies, and contributing very little to the sustainability programs. Diversity of user populations and huge daily turnout put large public universities in a spot of extra challenges.
Libraries that tried to make people aware of the digital resources and paperless workflows often had to deal with opposition from both the students and the faculty. It is so with the awareness campaigns that are not prolonged that the users don't feel the environmental impact of their information practices. This observation affirms Antonelli's view that green libraries must tackle not only the technical barriers but also the cultural and behavioural ones(44).

Besides those libraries that have had a go at the awareness initiatives—including campaigns on sustainability, displays, and reduced printing—most have reported limited impact in the long run resulting from lack of institutional backing. Thus, user engagement continues to be a neglected factor in the green library movement's priorities.

Comparative Summary of Barriers:

The comparative analysis uncovers that although the character of barriers differs among institutional types, their effect is summative. State colleges exhibit a higher theoretical commitment yet suffer from strict management and physical limitations.

On the other hand, private institutions have more room for makeovers but are not encouraged by any policies to make sustainability a priority in their agenda. The major point of the results is that barriers are interdependent. Money problems restrict getting professionals; shortage of qualified people lowers the quality of project

applications; weak applications do not get the green light of management; and little involvement of users makes the upsides of sustainability investments less visible.

This cycle is the reason why sometimes greening activities do not progress despite the increase in the number of people who are aware of the issue.

Implications for Policy and Practice:

The results derived from this research imply that making university libraries in the state of Maharashtra eco-friendly cannot be realized just by applying technological remedies or adopting symbolic sustainability practices. On the contrary, sustainability should be nourished in the roots of institutional governance, policy and practice. The identified barriers are acting on different levels—financial, administrative, infrastructural, professional and behavioral—showing the requirement for synchronized and holistic responses.

Implications for Policymakers:

At the level of policy, libraries continue to be mostly unnoticed in the sustainability planning for higher education. The national and state policies promoting innovation and quality improvement still do not lead to library-specific mandates sustainability objectives. Hence, it is necessary for the decision-makers to acknowledge the academic libraries as the key sustainability points because of their resource consumption and educational impact.

Embedding green library standards in funding, accreditation, and quality assurance would be a strong push for the institutions towards sustainability. In addition, specially allocated funds for library sustainability projects, especially for retrofitting, would solve the main financial problem highlighted by this study.

Implications for University Administration:

The university's management has the greatest influence on the achievements of sustainability practices. The results show that a highly centralized administration usually curtails the power of the librarians to start or even just to keep the environmental practices going. Helping the libraries to have more power in planning their future buildings and using their budgets for this purpose, the transition to sustainability can be quickened.

Moreover, sustainability should be considered an integral part of the institutional development plans and not just a secondary issue. Supporting library greening actions with the university's sustainability objectives will ensure consistency and the best usage of resources. Besides, the universities should not only look at the short-term costs involved but also apply lifecycle-based assessment models for their sustainability investments.

Implications for Library Professionals:

The changes to green libraries for the libraries' professional people represent the enlarging of their professional identity. The librarians of today have to be sustainability advocates, teachers, and partners in planning for institutions more than ever before. Nevertheless, the expansion of this role cannot be realized without proper training and support.

The research highlights the critical necessity for sustainability skills to be included in Library and Information Science curriculum and continuing education for the professionals. If libraries do not have in-house experts, they will keep depending on outside consultants who will restrict institutional learning and the impact of the library in the long run.

Recommendations:

Based on the diagnostic findings, the following **actionable recommendations** are proposed to address identified barriers systematically:

Financial and Structural Recommendations:

- Establish **dedicated sustainability funds** for university libraries at state and institutional levels.
- Introduce **phased retrofitting strategies** for older library buildings to minimize financial burden and operational disruption.
- Encourage public–private partnerships for renewable energy and water conservation projects in university libraries.

Policy and Governance Recommendations:

- Develop **state-level guidelines for green library operations** aligned with GRIHA and IGBC standards.
- Integrate sustainability indicators for libraries into accreditation and quality assurance frameworks.
- Mandate sustainability reporting for large academic libraries as part of annual institutional reviews.

Professional Capacity Building:

- Incorporate **green library planning, sustainability auditing, and environmental ethics** into LIS curricula.
- Organize regular training workshops and certification programs for practicing librarians.
- Encourage interdisciplinary collaboration between librarians, architects, engineers, and environmental experts.

User Engagement and Behavioral Interventions:

- Design sustained environmental literacy programs targeting students and faculty.
- Promote responsible information practices, including reduced printing and digital-first workflows.
- Use library spaces as demonstration zones for sustainability through signage, exhibitions, and interactive displays.

Table 3. Barrier–Recommendation Alignment Matrix

Barrier Identified	Recommended Intervention
Financial	Dedicated sustainability grants
Policy	State-level green library guidelines
Expertise	LIS curriculum integration
Infrastructure	Phased retrofitting
User Engagement	Environmental literacy programs

Final Conclusion:

The current state of eco-friendly practices in Maharashtra's universities' libraries is being discussed in this case study as not primarily due to ignorance or unwillingness to accept the concept of sustainability but as the result of deeply rooted structural, institutional, and cultural limitations. Even though the green libraries initiative got the attention of the library staff and the university administration, the awareness did not result in the expected systematic action—the financial restrictions, administrative fragmentation, infrastructural rigidity, lack of necessary skills, and users' behavioural challenges—converging conditions that were obstacles to such action.

The findings are very clear, i.e., sustainability in academic libraries cannot be considered merely a matter of improvement in tech conditions or a mere environmental measure

done for show. On the other hand, it should be accepted as a long-term institutional change that involves policy alignment, constant funding, skill upgrading of professionals, and behavioural changes. The making of decisions in a divided way—where the finance, infrastructures, and library services departments operate independently—comes out as the major hindrance that ruins even the most sustainable project with good intentions.

One major point of this study is that it provides a thorough classification of limitations, which not only identifies the root causes of the non-acceptance and slow adoption of green practices by libraries, but also illustrates the whole scenario through various university contexts, namely public, specialized, and private. The study not only points out the differences in the constraints' nature according to the institution type, but also says that the overall impact remains the same. Public universities are ideologically more committed but at the same time are more affected by bureaucratic delays and lack of the necessary infrastructure; on the other hand, private institutions are more flexible administratively but are not very much committed to sustainability at the policy level.

From a policy standpoint, the examination underlines that it is a must to translate national and global sustainability pledges into the operational directions for library services in the university sector. The National Education Policy (NEP) 2020 along with the United Nations Sustainable Development Goals (SDGs) are good examples of such frameworks which, while creating a very solid moral jurisdiction, still make it less of a concern the libraries' ability to change the outside world if they do not take part in the planning for sustainability, accreditation and budgeting. A shift to the perspective of libraries as organizations that drive the process of sustainability—rather than just rendering supporting services—implies a fundamental change of the whole system.

Ultimately, university libraries occupy a unique position of being both resource-intensive physical places and the main factors in disseminating knowledge and wielding cultural power. If all the mentioned hurdles can be removed through a carefully coordinated policy intervention, institutional dedication, professional empowerment, and continuous user engagement, libraries will not only be able to reach the level of incremental and symbolic actions but also to take the real leadership in sustainability. Considering the expanding higher education sector in Maharashtra, the green library transition is not just an upgrade for the universities that want to be eco-friendly and up to date but a strategic necessity too.

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