

Green Libraries and Sustainable Information Services: Global Trends and Best Practices

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ABSTRACT

Green libraries and sustainable information services have become important areas of library and information management because libraries are increasingly expected to support environmental responsibility, social inclusion and sustainable community development. This descriptive narrative review examines the concept of green libraries, major green initiatives, sustainable information services, global trends, best practices, challenges and future directions. The review synthesizes scholarly and professional literature on green library buildings, environmental management, digital sustainability, sustainable library services, environmental literacy and the role of libraries in supporting the Sustainable Development Goals. The reviewed literature shows that green libraries are not limited to energy-efficient buildings; they also include sustainable collections, digital-first services, waste reduction, environmental education, community engagement and policy-based sustainability planning. Global examples indicate that libraries can act as environmental learning spaces, community resilience centers and models of sustainable institutional practice. However, several challenges remain, including limited budgets, weak policy implementation, low environmental awareness, lack of staff training, infrastructure constraints and difficulty measuring sustainability outcomes. The article concludes that libraries can strengthen sustainable information services through green policies, professional development, community partnerships, sustainable technologies and continuous evaluation of environmental impact.

Keywords: *Green Libraries; Sustainable Information Services; Environmental Literacy; Sustainable Development; Academic Libraries; Public Libraries; Green Buildings; Digital Sustainability; Information Management; Library Best Practices*

INTRODUCTION

Sustainability has become a major concern for educational, cultural and information institutions because environmental change, resource depletion and social inequality affect communities across the world. In libraries, sustainability refers to more than reducing energy use or constructing environmentally friendly buildings. It also includes responsible management of resources, inclusive access to information, environmental education, digital sustainability, community engagement and long-term institutional resilience. A green and sustainable library may therefore be understood as a library that considers environmental, economic and social sustainability in its buildings, operations, collections, services and community role (International Federation of Library Associations and Institutions [IFLA], 2026).

The concept of green libraries developed from the wider green movement and from growing concern about the environmental impact of public institutions. Antonelli (2008) described the green library movement as an emerging professional response to environmental concerns, including green buildings, sustainable operations and environmental awareness. Similarly, Rowley (2006) argued that libraries should engage with environmental management because their buildings, collections, technologies and services all consume resources and influence institutional sustainability.

Green libraries are relevant to information management because libraries organize, preserve and provide access to knowledge. They influence how people learn, make decisions and participate in society. Through sustainable information services, libraries can provide environmental information, promote sustainability literacy, support community programmes, reduce paper-based practices and make digital resources more accessible. In this way, libraries contribute not only to environmental protection but also to social responsibility and community development.

The role of libraries in sustainability is also connected with the United Nations Sustainable Development Goals. Libraries support education, access to information, digital inclusion, community participation and environmental awareness. The United Nations (2015) emphasized that sustainable development requires integrated action across social, economic and environmental dimensions. Libraries can contribute to this agenda by becoming green institutions and by helping communities access reliable information about climate change, environmental protection, sustainable living and civic participation.

This article examines green libraries and sustainable information services as an emerging area of library and information management. It focuses on global trends, best practices, challenges and future directions. The article argues that a green library should not be viewed only as an eco-friendly building, but as a sustainable information institution that combines responsible infrastructure, sustainable services, environmental literacy and community engagement.

Green Initiatives in Libraries

Green initiatives in libraries usually begin with the physical environment. Library buildings require lighting, heating, cooling, ventilation, furniture, computer systems and preservation facilities. These operations can consume large amounts of energy and resources. Therefore, energy-efficient infrastructure is one of the most common dimensions of green libraries. Sustainable library buildings may include natural lighting, energy-efficient lighting systems, solar panels, efficient air-conditioning systems, water-saving devices, improved insulation and environmentally responsible construction materials.

Jones and Wong (2016) argued that green library development should go beyond the construction of a green building. Their case study of the Chinese University of Hong Kong Library showed that sustainability requires integrated strategies involving building design, operations, staff engagement

and user awareness. This is an important point because a library may have a green building but still operate unsustainably if its policies, services and behaviors are not aligned with environmental goals.

Eco-friendly materials are another important part of green library initiatives. Libraries can use recycled paper, sustainable furniture, low-emission paints, reusable signage and environmentally responsible cleaning products. They can also reduce waste by encouraging recycling, reusing materials, reducing unnecessary printing and improving collection management practices. Print management is especially relevant in academic libraries, where printing, photocopying and paper-based communication can create waste. Digital services can reduce paper use, but they must also be managed carefully because digital systems consume electricity and depend on hardware that produces electronic waste.

Digital-first services are increasingly associated with sustainable libraries. Online catalogues, electronic resources, digital repositories, virtual reference services, online renewals and remote access services can reduce travel, printing and physical storage needs. However, digital sustainability requires attention to the environmental cost of servers, devices, cloud storage and long-term digital preservation. Chowdhury (2016) argued that digital libraries and information services also have energy and environmental costs, and therefore sustainability in libraries must include the responsible management of digital systems.

Green information technology is therefore an important area of sustainable library practice. Libraries can reduce energy consumption by using energy-efficient computers, automatic shutdown systems, shared printing policies, cloud optimization, responsible e-waste disposal and environmentally conscious procurement. Sustainable technology planning helps libraries balance digital access with environmental responsibility.

Green initiatives also include sustainable collection development. Libraries can provide collections on climate change, biodiversity, environmental law, renewable energy, sustainable agriculture, recycling and sustainable lifestyles. In public and academic libraries, these collections can support environmental learning and community awareness. Beutelspacher and Meschede (2020) found that libraries can promote environmental sustainability through collections, tools and events. This shows that sustainability is not only a building-management issue but also a service and education issue.

Sustainable Information Services

Sustainable information services refer to library services that support environmental awareness, social inclusion, long-term access to information and responsible use of resources. These services include environmental literacy programmes, green information guides, sustainability workshops, community events, digital access services, green policies and partnerships with schools, universities, local governments and civil society organizations.

One of the most important sustainable information services is environmental literacy. Libraries can help users understand environmental issues by providing reliable information about climate change, energy conservation, waste management, water conservation, sustainable agriculture and biodiversity. Environmental literacy programmes may include book displays, lectures, exhibitions, documentary screenings, reading clubs, makerspaces, seed libraries, recycling campaigns and sustainability-themed information sessions. Beutelspacher and Meschede (2020) showed that libraries can promote environmental sustainability through collections, tools and events, which confirms the educational role of libraries in sustainability.

Community programmes are also central to sustainable information services. Libraries are trusted public spaces where people from different social and educational backgrounds can gather. This gives libraries a strong opportunity to support community-based sustainability initiatives. Public libraries may organize workshops on household energy saving, plastic reduction, urban gardening, composting,

repair culture and disaster preparedness. Academic libraries may support sustainability research, green campus initiatives, environmental awareness campaigns and student-led sustainability projects.

Green policies are necessary for sustainable information services. Without written policies, green initiatives may remain temporary or dependent on individual staff interest. Green library policies can cover energy use, procurement, printing, waste management, digital services, collection development, community programming, building maintenance and sustainability reporting. Rowley (2006) argued that environmental management should be part of library management, which means sustainability should be integrated into planning, operations and evaluation.

Sustainable information services also support social equity. A library that provides free access to environmental information, digital resources, community learning spaces and sustainability education can help reduce information inequality. This is important because environmental challenges often affect vulnerable communities more severely. Libraries can support social sustainability by making information accessible to all users, including students, elderly people, low-income groups, people with disabilities and rural communities.

Digital inclusion is another dimension of sustainable information services. Libraries provide access to computers, internet, digital collections and online learning resources. These services help users participate in education, employment, research and civic life. However, libraries must ensure that digital inclusion is supported by sustainable technology practices. This includes energy-efficient equipment, responsible hardware replacement, e-waste management and user education on sustainable digital behavior.

Global Trends and Case Studies

Global trends show that green libraries are moving from isolated building projects toward broader sustainability strategies. Earlier discussions of green libraries often focused on architecture and energy-efficient buildings. More recent discussions emphasize sustainability as a whole-library approach involving buildings, operations, collections, staff behavior, community engagement, digital services and policy development. IFLA's green library framework also reflects this wider understanding by linking green libraries with environmental, economic and social sustainability (IFLA, 2026).

One important global trend is the growth of green library awards and sustainability benchmarks. The IFLA Green Library Award recognizes libraries and projects that demonstrate commitment to environmental sustainability. The award criteria emphasize whole-library involvement, reduction of carbon footprint, green resources and services, and measurable results (IFLA, 2026). This shows that global best practice is not limited to symbolic environmental activities; it requires practical, visible and measurable sustainability outcomes.

The Chinese University of Hong Kong Library is often discussed as an important case because it demonstrates that green library work can combine building design, organizational strategy and service development. Jones and Wong (2016) argued that sustainability requires more than a green building; it requires active planning and a wider organizational culture. This case provides an important lesson for libraries that want to move from infrastructure-based sustainability toward integrated green strategies.

Public libraries in Europe have also been recognized for their role in environmental education and sustainability literacy. Beutelspacher and Meschede (2020) examined libraries as promoters of environmental sustainability and showed that public libraries can support sustainability through collections, tools and events. Their work suggests that even libraries without large budgets for green buildings can contribute to sustainability through programming, information access and community engagement.

User centered green library studies also show that sustainability initiatives must be visible and meaningful to users. Demirtas Dogan and Gurpinar (2023) examined green libraries from the user's perspective and highlighted the importance of user awareness and perception. This is important because a library may implement green initiatives, but if users do not understand or participate in them, the community impact may remain limited.

In developing countries, green library initiatives are often shaped by resource limitations, infrastructure gaps and awareness challenges. However, these contexts also show strong potential because libraries can support environmental education, low-cost sustainability practices and community resilience. Adjei (2025) examined green library practices and environmental awareness in African academic libraries and linked green libraries with sustainable information services, waste management and awareness creation. Such studies show that sustainability should not be understood only through expensive green buildings; it can also be advanced through education, policy, behavior change and local innovation.

MATERIALS AND METHODS

This article adopted a descriptive narrative review approach to examine green libraries and sustainable information services. This approach was suitable because the purpose of the study was to describe, interpret and synthesize existing literature on global trends, green initiatives, sustainable services, challenges and best practices rather than to conduct a systematic review or statistical meta-analysis. The literature was searched through major academic and professional sources, including Google Scholar, Scopus, Web of Science, Library and Information Science Abstracts, Emerald Insight, Taylor & Francis Online, Science Direct, Sage Journals, IFLA resources, United Nations documents and relevant library science journals. The search focused on scholarly articles, professional guidelines, case studies, policy documents, institutional reports and review papers related to green libraries and sustainability in library and information services. The main search terms included "green libraries," "sustainable libraries," "sustainable information services," "environmental sustainability in libraries," "green library buildings," "libraries and sustainable development goals," "environmental literacy libraries," "green library practices," "digital libraries and sustainability," and "green information services."

The literature mainly covered publications from 2006 to 2026. Earlier foundational literature was included where necessary because green library scholarship developed before the recent expansion of sustainability research. More recent literature from 2020 onward was given greater attention because sustainability, climate action and Sustainable Development Goals have become more visible in library and information management.

Broad literature selection criteria were used. Sources were included if they focused on green libraries, sustainability in library management, environmental information services, green buildings, sustainable library operations, digital sustainability, environmental literacy, community programmes and global green library practices. Sources were excluded if they were unrelated to libraries, purely technical environmental engineering studies without library relevance, duplicate materials, non-scholarly opinion pieces without professional value, or sources unrelated to sustainable information services. Since this article is a descriptive narrative review, PRISMA-based systematic screening, statistical meta-analysis and formal quality appraisal were not conducted. Instead, the selected literature was analyzed thematically to identify major patterns related to green initiatives, sustainable information services, global trends, challenges and best practices.

Challenges and Limitations

Despite the growing interest in green libraries and sustainable information services, several challenges limit implementation. The first major challenge is budget. Energy-efficient buildings, solar systems, sustainable furniture, improved ventilation, smart lighting and digital infrastructure often require

financial investment. Many libraries, especially in developing countries or underfunded public institutions, may not have sufficient budgets to implement advanced green technologies.

A second challenge is lack of awareness. Library staff, users and institutional administrators may not fully understand the meaning of green libraries. Some may think that a green library only means planting trees or reducing paper use. However, the literature shows that green libraries include buildings, services, collections, policies, digital systems, community education and long-term environmental management (IFLA, 2026; Rowley, 2006). Without proper awareness, sustainability may remain superficial.

A third challenge is weak policy implementation. Many libraries may support sustainability in principle but lack formal green policies, implementation plans or evaluation indicators. Without written policies, responsibilities and measurable targets, green initiatives may depend on individual enthusiasm rather than institutional commitment. This can make sustainability efforts inconsistent and difficult to sustain over time.

A fourth challenge is infrastructure limitation. Some libraries operate in old buildings that are difficult to redesign for energy efficiency. Others may lack reliable electricity, internet access, waste management systems or digital platforms. These limitations make it difficult to implement advanced green library models.

A fifth challenge is staff training. Sustainable library management requires knowledge of environmental literacy, green procurement, energy saving, digital sustainability, waste reduction, community programming and sustainability reporting. Many librarians may not have received formal training in these areas. Therefore, professional development is necessary for successful implementation.

Another limitation is measurement. Libraries may implement green programmes, but they may not measure energy savings, waste reduction, user participation, carbon reduction or community impact. Without evidence, it becomes difficult to evaluate success, justify funding or improve future strategies. The IFLA Green Library Award criteria emphasize measurable results, which shows that assessment is becoming important in global green library practice (IFLA, 2026).

Digital sustainability is also a complex challenge. Digital-first services can reduce paper use and travel, but digital systems consume energy and generate electronic waste. As Chowdhury (2016) noted, digital libraries and information services have environmental costs. Therefore, libraries must avoid assuming that all digital services are automatically sustainable.

RESULTS AND DISCUSSION

The descriptive review shows that green libraries and sustainable information services are becoming increasingly important in library and information management. The reviewed literature indicates that sustainability in libraries has moved beyond green buildings toward a broader model that includes environmental management, sustainable services, user education, digital responsibility, community engagement and institutional policy. This shift is important because libraries are not only physical spaces but also information, learning and community institutions. One major lesson from the literature is that green libraries require a whole-library approach. Sustainable buildings are important, but they are only one part of the green library model. Jones and Wong (2016) showed that green strategies must include operations, services, staff engagement and user awareness. Similarly, IFLA (2026) emphasizes that green libraries should consider environmental, economic and social sustainability. Therefore, libraries should avoid treating sustainability as a single project and instead embed it into everyday management and service delivery.

Another important result is that libraries can promote sustainability through information services. Environmental literacy, sustainability collections, green exhibitions, community workshops, online guides and educational events allow libraries to influence user awareness and behaviour. Beutelspacher and Meschede (2020) demonstrated that libraries can promote environmental sustainability through collections, tools and events. This means libraries can contribute to climate awareness and sustainable living even when they do not have advanced green buildings. The review also shows that sustainable information services must balance print and digital practices. Digital services can reduce paper consumption, improve remote access and support wider information sharing. However, digital systems have environmental costs, including energy use, equipment replacement and electronic waste. Chowdhury (2016) argued that the sustainability of digital libraries and information services should be assessed by considering their energy and environmental costs. Therefore, libraries need green digital strategies, not only digital expansion.

A further finding is that user participation is essential. Green initiatives are more effective when users understand and support them. Recycling programmes, print reduction, energy saving, environmental events and green collections require user awareness. Demirtas Dogan and Gurpinar (2023) highlighted the importance of user perspectives in green library development. This suggests that libraries should not only implement sustainability policies internally but also communicate them clearly to users. The review also indicates that green libraries can support the Sustainable Development Goals. Libraries contribute to education, information access, environmental awareness, social inclusion and community resilience. The United Nations (2015) emphasized that sustainable development requires integrated social, economic and environmental action. Libraries can contribute to this integrated agenda by supporting environmental literacy, digital inclusion, lifelong learning and public access to sustainability information. However, implementation remains uneven. Wealthier institutions may build energy-efficient library buildings and advanced digital systems, while under-resourced libraries may rely on low-cost green practices such as awareness campaigns, recycling, reduced printing, environmental displays and community partnerships. This indicates that green library development should be flexible and context-sensitive. A small rural or college library can still become a green library if it adopts practical sustainability measures suited to its resources and community.

Overall, the discussion shows three major patterns. First, green libraries are becoming broader than green buildings and now include policies, services, collections, digital sustainability and community engagement. Second, sustainable information services are essential because libraries can educate users and support environmental literacy. Third, successful implementation depends on funding, policy commitment, staff training, user participation and measurable outcomes. Therefore, green libraries should be understood as strategic institutions for sustainable information management and community development.

RECOMMENDATIONS

- Libraries should develop clear green library policies that include energy use, waste reduction, procurement, printing, digital services, community programmes and sustainability reporting.
- Library buildings should be improved through energy-efficient lighting, natural ventilation, water-saving systems, sustainable furniture, recycling spaces and environmentally responsible maintenance.
- Libraries should promote environmental literacy through workshops, exhibitions, reading lists, online guides, book displays, documentary screenings and sustainability awareness campaigns.
- Academic and public libraries should integrate sustainability topics into information literacy programmes, research support services and community education activities.

- Libraries should adopt green digital practices, including energy-efficient equipment, responsible printing policies, e-waste management, sustainable digitization and careful monitoring of digital storage.
- Library staff should receive professional training on sustainability, green library management, environmental information services, green procurement and community engagement.
- Libraries should collaborate with schools, universities, local governments, environmental organisations and community groups to support sustainability programmes.
- Libraries should measure and report sustainability outcomes, including energy savings, waste reduction, user participation, environmental events and community impact.
- Under-resourced libraries should begin with low-cost practices such as reducing paper use, promoting recycling, creating environmental information corners and organizing awareness sessions.
- Future research should examine green library practices in developing countries, rural libraries, school libraries, college libraries and non-English information environments.

CONCLUSION

Green libraries and sustainable information services are becoming important components of modern library and information management. The descriptive review shows that green libraries are not limited to environmentally friendly buildings. They include sustainable infrastructure, responsible operations, digital sustainability, environmental literacy, community engagement, green policies and inclusive access to information. Libraries can contribute to sustainability by reducing their environmental impact and by helping communities understand and respond to environmental challenges.

The review also shows that sustainable information services are central to the future of libraries. Through collections, programmes, digital services and community partnerships, libraries can promote environmental awareness and support the Sustainable Development Goals. However, several barriers remain, including limited budgets, weak policies, lack of awareness, insufficient training, infrastructure constraints and difficulty measuring impact.

The article concludes that libraries should adopt a whole-library approach to sustainability. This means combining green buildings, sustainable operations, environmental education, digital responsibility and community participation. If libraries develop clear policies, train staff, engage users and evaluate outcomes, they can become powerful institutions for sustainable information services and community transformation.

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