Towards Sustainable Knowledge: integrating open access principles with green library initiatives

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Abstract

In an era marked by environmental concerns and the quest for knowledge accessibility, the convergence of Open Access (OA) principles and Green Library Initiatives (GLIs) presents a promising avenue for advancing sustainability in scholarly communication. This study explores the intersection of these two paradigms, examining their potential synergies and implications for creating a more environmentally conscious and inclusive knowledge ecosystem. By promoting unrestricted access to scholarly outputs while minimising the environmental footprint of information dissemination, this integrated approach holds the promise of fostering a more sustainable future for academia and society at large. Through a review of current literature and case studies, this paper elucidates the challenges and opportunities in aligning OA principles with GLIs, offering insights into practical strategies for libraries, publishers, and researchers to adopt sustainable practices in knowledge dissemination. Ultimately, this synthesis of OA and GLIs not only contributes to the mitigation of environmental impacts but also facilitates equitable access to knowledge, thereby fostering a more sustainable and inclusive scholarly landscape.

Keywords: Digital repositories, Green library, Knowledge sharing, Open access, Open access journals, Open educational resources, Preprint repositories, Sustainability

1. Introduction

This study is an exploration of the intersection of two critical areas in the academic and library realms: open access and sustainability. In this study, an attempt has been made to delve into the importance of adopting open access principles to promote equitable access to scholarly information while also considering the environmental impact of traditional publishing models. By merging the principles of open access with green library initiatives, innovative strategies have been proposed for libraries to not only expand access to knowledge but also minimise their ecological footprint. Through this integration, a more sustainable future has been envisioned for scholarly communication that prioritises both accessibility and environmental responsibility.

2. Literature review

Open Access, characterised by unrestricted access to scholarly research outputs, stands as a catalyst for democratising knowledge and enhancing research impact (Suber, 2012). By eliminating barriers such as paywalls, OA promotes global collaboration and innovation, aligned with sustainability principles by minimising environmental costs associated with traditional publishing models (Houghton & Sheehan, 2009). In 2022 Biswas and Das Biswas very extensively justified the potential of OA as a global performing agent and a driving force for progressive learning as

well as a roadmap to achieve sustainable development goals.

Concurrently, green library initiatives have gained momentum, focusing on reducing the environmental footprint of library operations and advocating for eco-conscious practices (Jackson & Kanellos, 2013). Strategies encompass energy-efficient building designs, waste reduction, and the adoption of digital technologies to mitigate paper consumption, thereby aligning library operations with broader sustainability objectives (Janes, 2017). It was also discussed that green libraries are planned carefully according to the green building code. To achieve this, the library building needs to be constructed with provisions for water conservation, energy efficiency (Sengupta, 2020), waste management, and a healthy indoor environment. Further more, three different methods of collecting materials and developing collections have been discussed in green libraries, namely, selecting materials that raise awareness of environmental issues, de-selection processes that emphasise the need and method for reusing and recycling materials, and selecting information sources (print or electronic) that emit less CO2.While green services are more likely to consume less paper and energy (Biswas, 2019).

The ICT must also be transformed into green information communication technology (GICT) for the library to be green. It aims to reduce carbon footprint, ICT disposal, and energy consumption as well as conserve natural resources by designing, manufacturing, using, and disposing of ICT efficiently and effectively (Biswas, 2021).

Despite the potential benefits, challenges hinder seamless integration. Financial constraints pose a significant barrier for libraries, particularly in transitioning towards OA models and implementing green infrastructure upgrades (Ouzounian & Lockwood, 2011). Concerns regarding data privacy, copyright, and digital preservation also require careful consideration when adopting new technologies and OA frameworks.

3. Significance of the study

The significance of the study lies in its potential to address pressing environmental and accessibility challenges facing libraries and knowledge institutions. By integrating open access principles with green library initiatives, this study offers a novel approach to promoting sustainability, equity, and innovation in the dissemination of knowledge. Thus, the study has the potential to drive positive change and contribute to a more sustainable and equitable knowledge ecosystem.

4. Objectives

i. To identify opportunities for integrating open access principles with green library initiatives, seeking to leverage synergies between these two approaches to promote both accessibility and environmental sustainability in scholarly communication

ii. To propose practical strategies and guidelines for libraries to integrate open access principles with green initiatives, including recommendations for promoting open access publishing, reducing paper consumption, and adopting sustainable collection development practices

iii. To advocate for the adoption of sustainable practices within the library community and raise awareness about the benefits of integrating open access principles with green initiatives among librarians, researchers, publishers, and policymakers.

5. Methodology

The methodology for this study has been designed to rigorously investigate and analyse the intersection of open access principles and green library initiatives. The following methodologies have been used for this study:

Literature review

A comprehensive review was conducted of existing literature on open access principles, green library initiatives, and the environmental impact of traditional publishing models. Key concepts, challenges, and successful case studies related to sustainability and open access in library settings were identified.

Case studies

Case studies were collected and analysed from libraries that have successfully implemented green initiatives, focusing on their strategies, challenges, and outcomes. It also explored the case studies of institutions embracing open access principles and evaluated their impact on accessibility and environmental sustainability.

Development of integration strategies

Integration strategies were also developed based on the identified opportunities and challenges, incorporating input from experts, stakeholders, and the findings from the literature review and case studies.

6. Findings and discussion

6.1 *Digitisation and digital repositories*

Green libraries can prioritise digitisation of resources to reduce the need for physical copies, thus saving paper, energy, and space. Open access materials can be hosted in digital repositories, making them freely accessible to anyone with an internet connection, thereby reducing the need for printing and shipping physical copies. Digitisation involves converting physical materials such as books, journals, and manuscripts into digital formats, reducing the need for physical copies and promoting sustainability. Digital repositories serve as centralised platforms where these digitised resources can be stored, managed, and accessed by users worldwide.

The University of California, Berkeley, Library (https://www.lib.berkeley.edu/) has launched a green library initiative to reduce its environmental impact. As part of this initiative, they aim to digitise a significant portion of their collection, reducing the demand for new physical materials and promoting sustainability.

In alignment with the green library initiative, UC Berkeley Library also promotes open access principles by making digitised materials freely available to the public through their digital repository, the UC Berkeley Digital Library. By digitising resources and making them openly accessible, they reduce the environmental footprint associated with printing, shipping, and storing physical copies while enhancing global access to knowledge.

A rare manuscript housed in UC Berkeley's collection, previously accessible only to a limited number of onsite visitors, is digitised and made available online through the library's digital repository. Researchers, scholars, and enthusiasts worldwide can now access the manuscript digitally, eliminating the need for travel to the library and reducing carbon emissions associated with transportation.

By integrating open access principles with the green library initiative through digitisation and digital repositories, UC Berkeley Library not only reduces its environmental footprint but also enhances the accessibility and impact of its collections. Researchers and students from around the

world can now engage with rare and valuable materials without relying on physical copies, contributing to a more sustainable and equitable knowledge ecosystem.

The Indian Institute of Technology (IIT) libraries have also digitised rare books and manuscripts, making them available online through their digital repositories. The Indian Institute of Science (IISc) Digital Repository also hosts a vast collection of research publications, theses, and dissertations in digital format. By providing open access to scholarly works online, IISc promotes sustainable knowledge dissemination while minimising the environmental footprint associated with traditional print collections. On the other hand, central repositories of CSIR, ICAR and DST-DBT are providing a good number of scholarly contents in OA mode which plays a crucial in the scholarly communication process in a sustainable way (Biswas, A., 2023; Biswas, A., 2023).

6.2 *Promotion of open access journals and publications*

Green libraries can advocate for and support the publication of research in open access journals. By doing so, they reduce the environmental impact associated with traditional publishing processes, such as printing, distribution, and disposal of unsold copies. This also enhances the accessibility of scholarly works, benefiting researchers worldwide.

Open access eliminates the need for printing and shipping physical copies of journals and publications. By making research freely accessible online, it significantly reduces the environmental footprint associated with traditional publishing methods. Libraries can actively promote open access platforms and repositories to encourage scholars to publish their work in environmentally friendly formats.

The Directory of Open Access Journals (DOAJ) is a community-curated online directory that indexes and provides access to high-quality, open access, peer-reviewed journals. Libraries can advocate for researchers to publish their work in journals listed on the DOAJ, thus supporting sustainable knowledge dissemination.

Open access publications are often archived in digital repositories, ensuring long-term accessibility and preservation of scholarly knowledge. This digital preservation eliminates the need for physical storage space and reduces the environmental impact associated with maintaining print collections.

The Digital Public Library of America (DPLA) (https://dp.la/) is an example of a digital repository that aggregates digital collections from libraries, archives, and museums across the United States. Libraries can contribute to and promote the use of digital repositories like DPLA to preserve and provide open access to scholarly publications sustainably.

Indian libraries are also supporting open access journals and publications to make research freely available to the public. This reduces the environmental impact associated with traditional publishing processes and enhances accessibility. For instance, the Indian Council of Agricultural Research (ICAR) encourages researchers to publish their findings in open access journals, promoting green access to agricultural research (Biswas & Das Biswas, 2023; Biswas, 2024).

The preprint repositories like AgEcon Search, arXiv, bioRxiv, ChemRxiv, ECONSTOR, ERIC, MedRxiv, OSF preprints, Zenodoetcarethe widely used platform for sharing research in agricukture, physics, mathematics, computer science, medicine and other fields. By providing open

access to preprints, the repositories promote sustainable research practices by accelerating the dissemination of scholarly knowledge and fostering collaboration among researchers worldwide (Das Biswas, & Biswas, 2023).

6.3 *Open Educational Resources (OER)*

Green libraries can curate and promote OER, which are educational materials openly licensed for free use, adaptation, and distribution. By embracing OER, libraries can reduce the demand for new textbooks, which often involve the consumption of resources like paper and ink. This promotes sustainability while making educational resources more accessible to students and educators.

The University of British Columbia (UBC) Library (https://www.library.ubc.ca/) has launched a green library initiative to reduce its environmental impact. As part of this initiative, they aim to promote the use of Open Educational Resources (OER) to reduce the demand for new textbooks and printed materials, thus lowering paper consumption and waste generation.

UBC Library collaborates with faculty members to identify existing OERs or develop new ones that align with course curricula. These resources are made freely available through the library's website or OER platforms, ensuring equitable access for students regardless of their financial resources. By integrating open access principles with the green library initiative through the adoption of OER, UBC Library reduces its environmental footprint while enhancing the affordability and accessibility of education for students. The use of OER not only eliminates the production and disposal of physical textbooks but also empowers faculty members to customise learning materials to meet the specific needs of their students, fostering a culture of innovation and collaboration in teaching and learning.

Indian libraries are promoting the use of Open Educational Resources (OER) to reduce the demand for printed textbooks and enhance access to educational materials. For example, the National Programme on Technology Enhanced Learning (NPTEL), e-PG Pathshala, Consortium for Educational Communication (CEC), Spoken Tutorial, Virtual Labs, Free and Open Source Software in Education (FOSSEE), Shodhganga, Quantum and Nano Computing Virtual Center, Open Source Courseware Animations Repository (OSCAR), E-Kalpa, Pedagogy Project and National Digital Library of India (NDLI) offers free online courses and study materials (Biswas, & Das Biswas 2023), reducing the need for printed textbooks and promoting sustainable access to education.

6.4 *Collaboration and knowledge sharing*

Green libraries can collaborate with other institutions to share resources and reduce duplication. Open access principles encourage collaboration and knowledge sharing, as researchers are more likely to share their findings when they are freely accessible. By facilitating such collaboration, libraries can reduce redundant efforts and promote more efficient use of resources.

The National Library of Scotland (NLS) (https://www.nls.uk/) has launched a green library initiative to reduce its environmental impact and promote sustainability. As part of this initiative, NLS aims to collaborate with other libraries, universities, and research institutions to share resources, expertise, and best practices for reducing energy consumption, waste generation, and carbon emissions. NLS recognises the importance of open access principles in promoting equitable access to knowledge and reducing barriers to information sharing. They advocate for open access policies and initiatives that facilitate the free exchange of scholarly research,

educational materials, and cultural resources among libraries and institutions worldwide. NLS partners with the British Library and several universities across the UK to establish a collaborative network for sharing digitised collections, research data, and scholarly publications. Through this network, libraries can collectively pool their resources to digitise rare and valuable materials, making them freely accessible to the public through open access repositories and digital platforms.

By integrating open access principles with the green library initiative through collaboration and knowledge sharing, NLS and its partners enhance the accessibility and impact of their collections while reducing their environmental footprint. Researchers, scholars, and the general public benefit from access to a wealth of digital resources, spanning diverse disciplines and historical periods, without the need for physical travel or resource-intensive printing and distribution processes.

Indian libraries are collaborating with open access advocates, academic institutions, and funding agencies to advance open access policies and practices. This includes advocating for green access initiatives and raising awareness about the benefits of open access and environmental sustainability. For example, the Confederation of Open Access Repositories (COAR) collaborates with Indian libraries to promote the adoption of open access repositories and advocate for policies that support sustainable access to scholarly research.

6.5 *Advocacy and education*

Green libraries can educate their patrons about the environmental impact of traditional publishing practices and the benefits of open access. By raising awareness and advocating for open access policies, libraries can empower researchers, educators, and students to make informed choices that support sustainability and accessibility.

The Toronto Public Library (TPL) (https://www.torontopubliclibrary.ca/) has launched a green library initiative to reduce its environmental impact and promote sustainability. As part of this initiative, TPL aims to advocate for open access policies at the local, national, and international levels and educate library users about the benefits of open access for both individuals and society as a whole. TPL hosts a series of workshops, seminars, and public lectures on the topic of open access and its relevance to libraries, education, and research. These events feature guest speakers, panel discussions, and interactive activities to engage library users and raise awareness about the importance of open access in promoting sustainability, accessibility, and innovation. By integrating open access principles with the green library initiative through advocacy and education, TPL empowers library users to become advocates for open access and sustainability in their communities. By raising awareness and providing information about open access policies and practices, TPL fosters a culture of collaboration, transparency, and knowledge sharing that benefits individuals, institutions, and society as a whole.

Libraries can also play a crucial role in promoting open access principles and raising awareness about the environmental benefits of sustainable knowledge practices through outreach programmes, workshops, and educational resources which can empower researchers, students, and the general public to embrace open access and contribute to a more sustainable knowledge ecosystem. The Scholarly Publishing and Academic Resources Coalition (SPARC) (https://sparcopen.org/) is an international alliance of academic and research libraries working to promote open access, open education, and open data. Libraries can partner with

organisations like SPARC to advocate for policies and initiatives that support sustainable knowledge practices at the institutional and global levels.

Indian libraries are providing education and training opportunities for library staff, researchers, and students on open access principles and sustainable library practices. This includes workshops, webinars, and online resources to support skill development and capacity building in areas such as copyright, licensing, and digital preservation. For example, the National Digital Library of India (NDLI) offers training programmes on digital preservation and open access publishing to librarians and researchers across the country.

The Digital Empowerment Foundation (DEF) operates community information resource centres across India, also providing access to digital resources and promoting digital literacy among marginalised communities. By fostering open access and digital inclusion, DEF contributes to sustainable knowledge dissemination and environmental conservation.

6.6 *Green infrastructure and operations*

In addition to promoting open access materials, green libraries can also adopt environmentally friendly practices in their infrastructure and operations. This can include energy-efficient lighting, sustainable building materials, waste reduction and recycling programmes, and promoting alternative transportation options for staff and patrons.

The Seattle Public Library (SPL) (https://www.spl.org/) has launched a green library initiative to minimise its environmental impact and promote sustainability. As part of this initiative, SPL renovates its main library building to incorporate green building technologies and design features, such as energy-efficient lighting, heating, and cooling systems, solar panels, and rainwater harvesting systems. They also implement waste reduction and recycling programs, promote alternative transportation options for staff and patrons, and prioritise the use of sustainable materials and practices in library operations. By integrating open access principles with the green library initiative through green infrastructure and operations, SPL reduces its environmental footprint while enhancing the accessibility and impact of its collections and services. Library users benefit from improved access to digital resources and online services, while the community as a whole benefit from reduced energy consumption, lower operating costs, and a healthier environment.

In India, some green library initiatives are Anna Centenary Library (ACL), Chennai, Karnataka University Library, Dharwad, NIT Library, Silchar, Perma Karpo Library, Ladakh (Biswas, 2019). By integrating open access principles with the concept of a green library, institutions can not only reduce their environmental footprint but also promote equitable access to knowledge and contribute to the advancement of scholarship and education on a global scale.

7. *Challenges and considerations*

It is true that green libraries can leverage open access initiatives to expand their reach and impact, providing equitable access to digital resources and services to diverse communities, including under served populations and remote regions. However, there are some challenging issues which are:

- it's essential to consider the environmental footprint of digital infrastructure, including data centres and electronic devices, and ensure renewable energy sources power them to maximise sustainability benefits

- digital divide and disparities in internet access must be addressed to ensure that open access truly enhances accessibility for all users
- issues related to intellectual property rights, licensing agreements, and author incentives may hinder collaboration and limit the potential impact of open access initiatives
- resistance from publishers, funding agencies, and other stakeholders with vested interests in traditional publishing models may pose challenges to the widespread adoption of open access policies and practices

Integrating open access principles with green library initiatives requires careful planning, investment in digital infrastructure, staff training, and ongoing maintenance to ensure the sustainability and effectiveness of digital repositories and online platforms.

Libraries must balance the desire to promote open access with the need to preserve and protect intellectual property rights, cultural heritage, and sensitive information, implementing robust policies and security measures to safeguard digital collections and user privacy.

Collaboration with stakeholders, including publishers, authors, researchers, funding agencies, and policymakers, is essential to address legal, financial, and technical challenges and develop sustainable solutions that benefit all parties involved.

8. Conclusion

The integration of OA principles with GLIs presents a compelling pathway toward sustainable knowledge ecosystems. By leveraging digital innovation and eco-conscious practices, libraries can enhance scholarly information accessibility while minimising environmental impact. Addressing financial, legal, and technological challenges is imperative to realising the full potential of this integration. Collaborative efforts among stakeholders are crucial for advancing towards a sustainable and inclusive knowledge landscape.

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