

# Promoting Accountability in Green Technology and Sustainability: Insights from Perpustakaan Tun Abdul Razak (PTAR), Universiti Teknologi MARA in Community Welfare through Islamic Principles

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## Promoting Accountability in Green Technology and Sustainability: Insights from Perpustakaan Tun Abdul Razak (PTAR), Universiti Teknologi MARA in Community Welfare through Islamic Principles

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**Abstract:** *The integration of green technology and sustainable practices within academic libraries is crucial for fostering environmental awareness, enhancing educational quality, and effectively serving the surrounding community. This article critically assesses the impact of these strategies at Perpustakaan Tun Abdul Razak (PTAR) of Universiti Teknologi MARA (UiTM). We examine PTAR's pioneering paperless initiatives, including extensive resource digitization and the transition to digital literature, thereby reducing reliance on physical books and minimizing paper waste. This article highlights the implementation of advanced eMeeting platforms (eMesyuarat), demonstrating how these technologies streamline administrative processes and reduce carbon footprints from traditional meetings. Furthermore, we emphasize the significant advantages of adopting eco-friendly library management practices, which contribute to environmental sustainability while enhancing operational efficiency and user experience. Our analysis also explores the role of Islamic principles of accountability (mas'uliyah) in supporting these sustainability efforts, providing a comprehensive and culturally aligned framework for environmental stewardship within an academic library context.*

**Keywords:** Green technology; Sustainability; Community; Islam; Library and Information Management

### 1. INTRODUCTION

The increasing focus on green technology and sustainability underscores the imperative for accountability to ensure these initiatives yield comprehensive benefits for society. Accountability, in this context, transcends environmental preservation, integrating social responsibility and community welfare as essential elements [1]. This study explores the significant role those academic libraries, particularly through the perspective of Islamic principles, can play in promoting accountability within sustainability efforts.

The primary aim is to evaluate the innovative green technology initiatives of PTAR—such as their groundbreaking paperless system—through the lens of an Islamic accountability framework. The uniqueness of this approach lies in the fusion of cultural values with technological advancements to foster sustainable practices.

In the context of green technology and sustainability, accountability is vital for ensuring transparency, effectiveness, and fairness among all stakeholders [2]. It encompasses prudent resource management, adherence to ethical standards, and active community involvement. Within the Islamic tradition, accountability or Mas'uliyah emphasizes one's duty to God, self, and society, necessitating responsible conduct and aligning actions with moral and social obligations [3].

### 2. ROLE OF ACADEMIC LIBRARIES

Academic libraries significantly influence public understanding and practices concerning environmental and sustainability issues. As knowledge centers, they have the unique capacity to guide behavior and foster awareness through their sustainable practices and

educational initiatives [4]. An excellent example of this role is demonstrated by Perpustakaan Tun Abdul Razak (PTAR) at Universiti Teknologi MARA (UiTM).

#### 2.1 Sustainable Practices at PTAR

PTAR emphasizes its commitment to sustainability and holistic academic support through various services [5]. By providing extensive access to e-journals and online databases, PTAR reduces reliance on physical books, supporting advanced research while minimizing paper waste. Orientation sessions and specialized workshops enhance information literacy, equipping users with essential research skills. The use of eMeeting Platforms (eMesyuarat) streamlines administrative processes, reducing the carbon footprint associated with traditional meetings. Additionally, eco-friendly management practices, such as resource digitization, contribute to environmental sustainability by reducing paper use.

Moreover, PTAR's Supply System Publication Services ensure efficient management and timely distribution of scholarly resources. Current Awareness Services keep the academic community informed about the latest developments in their fields, while Selective Dissemination Information offers tailored information delivery. Themed Exhibitions engage patrons by highlighting special collections or topical issues.

### 3. CASE REPORT: PTAR'S GREEN INITIATIVES

PTAR exemplifies academic excellence through its Innovative & Creative Group (KIK), established in 2004 under UiTM's Quantity-Quality Balance Policy [6]. The KIK drives continuous improvement within the library, aligning institutional goals with sustainable practices to deliver world-class services while minimizing ecological footprints.

### 3.1 Methodology

To capture a comprehensive picture of PTAR's sustainability efforts, data was collected from multiple sources. Insights from staff actively engaged in sustainability projects provided direct implementation perspectives [5, 6]. Analysis of internal documents, including sustainability reports, tracked progress and evaluated impact. First-hand observations offered insights into the operational efficacy of deployed technologies, and secondary data from UiTM conference reports provided broader contextual understanding and highlighted successful practices.

In short, PTAR's dedicated approach to sustainability through KIK and alignment with Islamic principles demonstrates an effective model for other academic libraries. By adhering to stringent accountability standards, PTAR ensures that its green technology initiatives are environmentally sound and socially responsible, benefiting the wider community while setting a benchmark for academic excellence.

## 4. FINDINGS AND DISCUSSIONS ON INEFFICIENCIES IN ICT AND LIBRARY MANAGEMENT SYSTEMS

Enhancing an organization's operational effectiveness necessitates the identification and systematic evaluation of problems based on their current impact and urgency for resolution. This assessment prioritizes issues that, if addressed, promise significant improvements. Problems were evaluated based on two key criteria: the system's current effectiveness, measured by its operational functionality, and the criticality of resolution, indicating its importance and urgency [5].

### 4.1 Problem Identification and Analysis

PTAR has identified critical inefficiencies within library operations. The identified issues include an outdated ICT equipment lending system, inaccurate management of attendance information for information skills classes, a lack of visitor data in the library gallery, insufficient accessibility of information on musical materials in the library, and low external membership.

The existing ICT equipment lending system is cumbersome and outdated. This results in extended wait times, difficulty in tracking borrowed items, and a lack of proper scheduling tools, disrupting workflow and causing frustration among users who depend on timely access to these resources for academic or research activities.

The current method for recording and managing attendance for information skills classes is flawed due to frequent data discrepancies, leading to unreliable attendance records. This issue impedes accurate monitoring of student participation and hinders informed decision-making based on attendance trends.

The library gallery lacks a comprehensive system for documenting visitor information, making it challenging to track usage, understand demographics, and gather essential feedback for enhancing exhibits and services.

Without this data, tailoring offerings to meet visitors' needs remains difficult.

There is a notable deficit in accessible information regarding the library's collection of musical materials. Patrons struggle to locate specific sheet music or recordings due to inadequate cataloging and indexing. This deficiency hampers researchers, music students, and enthusiasts from effectively utilizing the library's full range of musical assets.

Low external membership challenges PTAR's outreach efforts. Contributing factors may include a lack of awareness about membership benefits or insufficient amenities attracting potential members. Addressing this problem is crucial for enhancing the library's network engagement.

Accurate scoring assists in streamlining prioritization by enabling targeted strategies to address pressing issues effectively. The scoring methodology is as follows:

1. Ability Score: Reflects the effectiveness of existing systems (scale: 0-10).
2. Importance Score: Indicates the urgency/necessity for resolution (scale: 0-10).

Scores are calculated using:

1. Average Ability Score:  $\frac{\text{Sum of Ability Scores}}{\text{Number of Scores}}$
2. Average Importance Score:  $\frac{\text{Sum of Importance Scores}}{\text{Number of Scores}}$

Table 1(a) and 1(b) display identified problems with their respective ability scores, indicating current effectiveness levels, while importance scores highlight the urgency of resolution [5]

Table 1(a). Problems List Voting Matrix: Ability Scores [5]

Problem Description	Votes by Members	Average Score	Ability
1. Loan System: Inefficient ICT equipment lending system	4 + 8 + 6 + 8 + 6 = 32	32/5= 6.4	Effective
2. Management Information and Attendance Sheet: Inaccurate Information Skills classes' information	4 + 8 + 6 + 8 + 6 = 32	32/5= 7.4	Very Effective
Absence of visitor information in the gallery library	4 + 8 + 6 + 8 + 6 = 32	32/5= 2.6	Less Effective
Lack of information about musical materials in the library	4 + 8 + 6 + 8 + 6 = 32	32/5= 2.0	Effective
Low external membership	4 + 8 + 6 + 8 + 6 = 32	32/5= 6.8	

Table 1(b). Problems List Voting Matrix: Importance Scores [5]

Problem Description	Votes by Members	Average Score	Importance
1. Loan System: Inefficient ICT equipment lending system	4 + 8 + 6 + 8 + 6 = 32	32/5= 6.2	Important
2. Management Information and Attendance Sheet: Inaccurate Information Skills classes' information	4 + 8 + 6 + 8 + 6 = 32	32/5= 7.6	Very Important
3. Absence of visitor information in the gallery library	4 + 8 + 6 + 8 + 6 = 32	32/5= 3.4	Less Important
4. Lack of information about musical materials in the library	4 + 8 + 6 + 8 + 6 = 32	32/5= 1.6	Not Important
5. Low external membership	4 + 8 + 6 + 8 + 6 = 32	32/5= 7.0	Very Important

Table 1(c). Scale [5]

Ability Score	Importance Score	Range of Score
Very Effective	Very Important	8-10
Effective	Important	6-7
Less Effective	Less Important	3-5
Not Effective	Not Important	0-2

Table 1(a) and 1(b) refer to the Problem List Voting Matrices that provide a detailed breakdown of several issues faced by the library, along with votes cast by group members and their average scores, leading to the identification of the effectiveness and importance levels of each problem.

In Table 1(a), Loan System (ICT Equipment Inefficient) received votes of 4, 8, 6, 8, and 6, resulting in an average score of 6.4. This score categorizes the problem as "Effective," indicating a significant level of concern but not the highest priority.

The Management Information and Attendance Data (Information Skill Class' Information is Not Exact) was voted on with scores of 7, 6, 10, 7, and 7, leading to an average score of 7.4. This categorizes it as "Very Effective," showing it is one of the top priorities that needs immediate attention and action.

The issue of Absence Information Visitors at Library Galler garnered scores of 3, 2, 3, 1, and 4, with an average score of 2.6. It falls under the "Less Effective " category, indicating that it is a lower priority compared to other issues listed.

The Lack of Information About Musical Material at Library received votes of 3, 2, 2, 2, and 1, averaging 2.0, placing it in the "Not Effective " category. This suggests that this issue is not critical and might be addressed later.

The concern of Low External Membership garnered votes of 7, 7, 8, 5, and 7, resulting in an average score of 6.8, which categorizes it as "Effective." This indicates that while it is significant, it does not require the same immediate action as the top-priority issues.

A subsequent round of voting with a different group revisited the average scores and importance levels:

In Table 1(b), the Loan System maintained an average score of 6.2, still classifying it as "Important." The Management Information and Attendance Data scores led to an average of 7.6, reaffirming its status as "Very Important." Absence Information Visitors at Library Gallery received an updated average score of 3.4, still categorized as "Less Important." The Lack of Information About Musical Material at Library maintained an average score here was 1.6, maintaining its "Not Important" status. The concern of Low External Membership garnered a slightly higher average score of 7.0, classifying it as "Very Important" in this round of voting.

Table 1(c) provides clearly defined the Ability and Importance scales:

1. Scores from 8-10 indicate "Very Effective" | "Very Important" issues.
2. Scores from 6-7 denote "Effective" | "Important" issues.
3. Scores from 3-5 indicate "Less Effective" | "Less Important" issues.
4. Scores from 0-2 classify as "Not Effective" | "Not Important."

## 4.2 Problem Descriptions

### 1. Inefficient ICT Equipment Lending System

**Current Process:** The method for lending Information and Communication Technology (ICT) equipment, such as laptops, LCD projectors, and audio systems, is manual and inefficient. Borrowers complete handwritten application forms, which ICT staff manually verify for equipment availability. Following verification, applications require approval from higher authorities, further prolonging the process.

**Consequences if Unaddressed:** The redundancy of this manual system can lead to misplaced forms, untracked loans, and significant challenges in identifying available equipment. This hampers operational efficiency and affects the reliability of equipment management.

**Support Data:** A 2018 internal report (Form PTAR(BSTM)Equipment Loan/01/2005) highlighted inefficiencies: out of 102 applications received, only 51 were successfully approved. This data underscores significant delays or losses during processing.

## 2. Inaccurate Management of Attendance Information for Skills Classes

Current Process: Attendance recording for skills classes is managed manually, with staff compiling participant lists by hand. This often results in discrepancies when cross-referenced with IT Center records.

Consequences if Unaddressed: The manual system increases the time required to compile accurate attendance statistics and introduces potential errors in reporting. Such inaccuracies affect the evaluation and effectiveness of skills classes.

Support Data: Examination of Form PTAR(BPR)PPP Attendance List/03/2012(Pind.) revealed 106 discrepancies among 3,060 attendance records.

## 3. Absence of Visitor Information in the Gallery Library

Current Process: Visitor information within the Gallery Library is not systematically recorded or analyzed, leading to inconsistent visitor management.

Consequences if Unaddressed: Without systematic tracking, valuable opportunities for visitor engagement are missed, hindering the optimization of visitor experiences and resource utilization.

Support Data: Evaluation metrics show a low capability score for visitor tracking against a moderate importance score.

## 4. Lack of Information about Musical Materials in the Library

Current Process: The management and dissemination of information pertaining to musical materials are insufficiently organized.

Consequences if Unaddressed: Poor management affects resource dissemination to users, which may reduce user satisfaction over time due to inefficiencies in management systems.

Support Data: Assessment scores indicate that while this issue is not critical, it holds considerable importance for effective resource management.

## 5. Low External Membership

Current Process: Processes related to managing external memberships have been identified as an area with moderate proficiency but high importance.

Consequences if Unaddressed: Failure to enhance external membership skills could lead to diminished engagement, lower resource utilization, and an inability to effectively expand the library's reach to serve a broader user base.

Support Data: Evaluation indicates that skills management is critically important, with a necessity for improvement evident from derived scores, emphasizing the need to develop and enhance these skills to better serve external members.

Promoting accountability is crucial for the success of projects with significant resource investments or transitions toward eco-friendly operations. PTAR can establish a transparent and accountable framework by adopting robust stakeholder engagement mechanisms, implementing rigorous performance monitoring and reporting protocols, integrating advanced technologies, and fostering a culture of continuous improvement. This comprehensive approach enhances PTAR's ambitious sustainability objectives, ensuring alignment with broader institutional and societal goals, mitigating the impact of climate change, and paving the way for a sustainable future for subsequent generations.

### 5.2 Stakeholder Impact and Root Cause Analysis

University management demands comprehensive and accurate reports essential for strategic decision-making. The impact on university management is significant; precise data is crucial for making informed decisions that shape the institution's future. Students, another key internal stakeholder group, expect efficient tracking of modules registered in the e-KKM system. The impact on students is moderate but critical, as it directly affects their academic performance and learning outcomes. Accurate and timely data entry in the e-KKM system is essential for tracking their progress and meeting academic requirements.

A primary challenge in library operations is the inconsistency in attendance data for Information Skills Classes, stemming from several underlying factors. Methodological issues, such as reliance on manual statistics provision, present significant challenges due to inherent complexities and potential inconsistencies in manual processes. Human factors, including errors introduced by staff due to divided attention among diverse duties or lapses in diligence, exacerbate accuracy problems in manual recording processes. Students also contribute to inaccuracies by providing incomplete information or misunderstanding attendance requirements, complicating recorded data integrity.

Material issues further compound these problems. Paper records, prone to damage or loss, lack structured systems, leading to inefficiencies that hinder effective data management and result in inaccurate attendance tracking. Spatial issues create confusion in congested environments, and the absence of designated registration areas impedes the effectiveness and accuracy of the record-keeping process.

### 5.3 Proposed Solutions

Several strategic solutions have been proposed to address these multifaceted issues within PTAR effectively:

**Digitization of Attendance Recording:** Transitioning from manual methods to digital systems significantly reduces errors, enhancing the overall efficiency and accuracy of data collection, and ensuring reliable attendance records.

**Standardized Procedures:** Implementing uniform procedures for recording and storing attendance data streamlines the process, guarantees consistency and accuracy, and minimizes discrepancies, enabling easier maintenance and retrieval of necessary information to support operational needs effectively.

**Designated Spaces for Registration:** Creating specific areas dedicated solely to registration simplifies the process, reduces confusion, significantly improves the accuracy of records, and facilitates a smoother user experience. A better-organized environment promotes effective record-keeping practices, higher levels of accountability, and transparency within the organizational framework, supporting broader sustainability objectives and the long-term success of PTAR's initiatives. These efforts are aligned with institutional and societal goals, mitigating the impacts of climate change and fostering a sustainable future for subsequent generations.

#### 5.4 Verification and Validation Methods

Implementing robust verification and validation methodologies is critical to ensuring the reliability and efficacy of proposed solutions at PTAR. The preparation of a comprehensive statistics manual is paramount, detailing procedures for direct observation and thorough review of record files and applications. This ensures the highest levels of data accuracy and reliability are consistently upheld across all processes.

Key methods include manual attendance recording evaluations, wherein meticulous inspections of application forms confirm the accurate recording and maintenance of attendance data. To further ensure efficiency, monthly statistical reports will be rigorously compared with actual attendance records. This rigorous comparative analysis will identify discrepancies and areas for improvement, establishing a robust and reliable attendance tracking system.

By adhering to these stringent verification and validation measures, PTAR promotes higher standards of operational excellence, transparency, and accountability. These practices align with industry benchmarks and support broader sustainability objectives, organizational goals, and a long-term vision that resonates with societal and institutional priorities. PTAR's adherence to Islamic principles and ethical frameworks fosters positive impacts on the wider community and stakeholders involved in its initiatives.

The library's commitment to excellence, innovation, and continuous improvement underpins its role in environmental stewardship and the promotion of sustainable development. Responsible resource

management and transparency are integral to successful strategy implementation, fostering awareness and adoption of green technologies and practices. This approach ensures long-term societal and environmental benefits, preserving ecosystems for future generations and promoting a harmonious relationship between humanity and nature.

Overall, PTAR exemplifies the role of academic libraries in championing sustainability, accountability, and ethical stewardship. These values are integral to its mission and operational ethos, positioning PTAR as a model of excellence, innovation, and leadership in library science and information management.

## 6. IMPACT AND BENEFITS OF THE GREENATION PROJECT

Addressing inefficiencies within PTAR's ICT and Library Management Systems is critical for ensuring operational effectiveness and sustained growth. Ultimately, identifying, evaluating, and prioritizing issues based on their impact and urgency enables targeted intervention and promotes accountability and sustainability in organizational practices, as well as contribute to broader positive impacts at both academic community and societal levels.

Here is the detailed impact and benefits of the Greenation Project in Table 2:

Table 2. Impact and Benefits of the Greenation Projects at PTAR.

Category	Before e-KKM Implementation	After E-KKM Implementation
Productivity Impact	Average time spent on KKM info management per session: 4,397 minutes	Average time spent per session: 5.08 minutes
	Staff members: Librarian, Program Planner	Staff involved: Librarian, Program Planner
	Total monthly salary costs: MYR 2,989.96	Management cost per session: MYR 3.45
	Management cost per session: MYR 2,989.96	Annual cost savings (Jan-Dec): MYR 23,892.05
Quality Impact	Storage relied on physical filing cabinets	Storage transitioned to a digital system housed on a single server Enhanced accessibility for Librarian and Assistant Librarian Saved physical space, improved efficiency in

Category	Before e-KKM Implementation	After E-KKM Implementation
Cost Impact	Without in-house project development, outsourcing incurred miscellaneous hardware expenses	information management Integration with other UiTM systems, aligning with Industry 4.0 technologies like Big Data, IoT, and Cyber Security Improved library services and data-handling capabilities Development costs covered database creation with MSSQL, web interface development, and registration module implementation Significant savings from developing in-house versus outsourcing Operationally economical across campuses Internal maintenance costs reduced Net annual savings by avoiding external contracts Digitizing attendance lists significantly reduced the use of traditional paper-based forms Registration process for KKM sessions improved Automated log-in scanning with cards now completes in mere seconds Process meets ISO standards, ensuring document
Paper Usage Reduction	Manual distribution and recording of attendance lists took several minutes	

Category	Before e-KKM Implementation	After E-KKM Implementation
		control, infrastructure reliability, and alignment with organizational requirements

This table captures the productivity, quality, cost impacts, and paper usage reduction benefits of implementing the Greenation Project at PTAR, Universiti Teknologi MARA (UiTM), as described further below.

### 6.1 Productivity Impact

The e-KKM system's primary goal was to streamline the management of Skills Class information, significantly reducing both time and costs. Prior to its implementation, managing KKM information averaged 4,397 minutes per session and involved two staff members—a Librarian and a Program Planner—costing a total of RM 6,500 monthly. The cost per session was approximately RM 2,989.96.

Post-implementation, the average time per management session decreased dramatically to 5.08 minutes, with the same staff involvement but a new, significantly reduced cost of RM 3.45 per session. This optimization led to annual cost savings of RM 23,892, demonstrating substantial improvements in productivity and operational efficiency.

### 6.2 Quality Impact

Transitioning from physical filing cabinets to digital storage has enhanced accessibility and efficiency in information management, centralizing records on a single server. This advance aligns with Industry 4.0 technologies, including Big Data, IoT, and Cyber Security. The improved library services integrate seamlessly with other UiTM systems such as SiMS and STAR, heightening data-handling capabilities and supporting operational needs more effectively.

PTAR's strategic initiatives promote sustainability, accountability, and innovation, fostering an ecosystem where technological advancements support academic research activities. These efforts contribute positively to service delivery, enhancing the user experience and promoting higher standards of operational excellence.

### 6.3 Cost Impact

In-house development of the e-KKM system saved PTAR RM 89,724 compared to outsourcing. Additionally, internal maintenance strategies reduced operational costs across campuses by RM 361,500 annually. These significant cost savings highlight the financial efficiency realized through PTAR's innovative approach.

### 6.4 Paper Usage Reduction

By digitizing attendance lists with the e-KKM system, PTAR notably decreased paper consumption. This initiative supports PTAR's commitment to environmental sustainability, contributing to resource conservation and minimizing the library's ecological footprint.

## 6.5 Additional Impacts

The registration process for KKM sessions has significantly improved through the implementation of automated log-in and scanning card systems, reducing the process time from several minutes to mere seconds. Additionally, the e-KKM system adheres to ISO standards, enhancing document control infrastructure reliability in line with international quality benchmarks. This advancement increases operational transparency and accountability, ensuring consistent service delivery excellence across all PTAR processes.

These enhancements significantly bolster operational efficiency and user satisfaction, positively impacting the broader community and stakeholders. The streamlined processes and accurate data management support academic research activities more effectively and efficiently, promoting higher standards of operational excellence, innovation, and accountability.

Moreover, the successful implementation strategies and initiatives of PTAR foster increased awareness and adoption of green technologies and practices. This alignment with sustainable development goals ensures long-term benefits for society and environmental preservation. The commitment to these practices' positions PTAR as a model of excellence in academic libraries, championing sustainability, ethical stewardship, and community engagement.

PTAR's initiatives contribute positively to environmental stewardship and promote responsible resource management. In doing so, they align with institutional and societal goals aimed at mitigating climate change impacts and fostering a sustainable future. This commitment ensures that future generations can enjoy a thriving ecosystem in a balanced and harmonious relationship with nature.

Central to PTAR's mission and operational ethos are the values and guiding principles of sustainability, accountability, and ethical stewardship. PTAR exemplifies these principles, demonstrating leadership and innovation in the fields of library science and information management. The positive transformative impact on society and the environment underscores PTAR's role in advancing knowledge dissemination and fostering community engagement.

## 7. SUSTAINABILITY PROMOTION AND COMMUNITY WELFARE EFFORTS

PTAR has undertaken multiple initiatives aimed at promoting sustainability and enhancing community welfare, reflecting a comprehensive and strategic approach. These efforts encompass educational programs, resource provision, and community engagement, all of which are meticulously aligned with Islamic teachings that emphasize environmental stewardship (Khilafah) and the care of creation (Hima) [7].

### 7.1 Educational Programs

PTAR organizes a variety of workshops and seminars focused on topics such as green technology and sustainable living. These programs are designed not only to disseminate technical knowledge but to foster an

ethical mindset among participants. By integrating principles from Islamic environmental ethics, these educational initiatives ensure that attendees are well-versed in both the practical and moral aspects of sustainability. For instance, lecture series and hands-on workshops explore renewable energy solutions, waste management techniques, and ecological conservation, all framed within the context of Islamic values that advocate for responsible guardianship of the Earth.

### 7.2 Resource Provision

The library at PTAR offers extensive electronic resources in the fields of environmental science and sustainability. This includes access to a wide range of academic journals, e-books, and databases, which are indispensable for research and learning. The availability of these resources underlines PTAR's commitment to making information on sustainable practices accessible to all. The library's curated collections seek to inform researchers, students, and community members about the latest developments in sustainability, thereby fostering a well-informed populace capable of contributing to environmental conservation efforts.

### 7.3 Community Engagement

PTAR collaborates closely with local communities through outreach programs that emphasize the significance of sustainable practices. By partnering with local mosques, schools, and community organizations, PTAR extends its influence beyond the academic sphere. These collaborations often include community workshops, public lectures, and joint initiatives such as urban greening projects and waste reduction campaigns. The objective is to inculcate a culture of sustainability that resonates with both scientific understanding and religious morals. These initiatives are a testament to PTAR's holistic approach in advocating for community welfare and environmental stewardship.

## 8. ISLAMIC PRINCIPLES AS A FRAMEWORK

Islamic environmental ethics offer a comprehensive framework for promoting accountability and sustainability efforts. This framework is founded on several key principles that align with contemporary sustainability goals while adding an ethical dimension rooted in spiritual beliefs.

### 8.1 Tawhid (The Oneness of God)

Tawhid emphasizes the unity and interconnectedness of all creation. This principle calls for humans to maintain harmony with nature, acknowledging that every element of the ecosystem is interconnected and interdependent. Hence, any harm inflicted upon the environment is viewed as a transgression against this fundamental unity.

### 8.2 Khilafah (Stewardship)

According to Islamic teachings, humans are appointed as stewards (Khalifah) of the Earth. This stewardship entails a responsibility to protect and preserve the environment. As stewards, humans are expected to act as guardians of all creation, ensuring that natural resources are used sustainably and equitably.



### 8.3 Adl (Justice)

Adl, or justice, in the context of environmental ethics, requires the equitable distribution of resources without exploitation or harm. This principle advocates for fairness in how natural resources are utilized and distributed, ensuring that the needs of both present and future generations are met without compromising the health of the planet.

These principles provide a robust ethical foundation that enriches modern sustainability goals with a spiritual motivation, encouraging broader participation in environmental conservation efforts [8].

## 9. INSIGHTS FROM PTAR INITIATIVES

By incorporating Islamic principles into its operations and outreach programs, PTAR exemplifies how academic libraries can play a pivotal role in advancing community welfare and fostering sustainable practices.

### 9.1 Educational Outreach

PTAR's educational programs underscore the importance of not only imparting technical knowledge about green technologies but also integrating ethical considerations derived from Islamic values. This dual approach ensures that participants are well-equipped to implement sustainable practices with an understanding of their ethical imperatives.

### 9.2 Community Engagement

Through strategic partnerships with local mosques and schools, PTAR effectively extends its reach beyond the campus, fostering greater community involvement in sustainability initiatives. These collaborations help create a cohesive community effort aimed at achieving environmental and social well-being.

### 9.3 Resource Accessibility

PTAR provides free access to a wealth of digital resources related to environmental science and sustainability. These resources are made available via open-access platforms, ensuring that both students and the surrounding community have the tools necessary to stay informed about the latest advancements in green technology and sustainable practices [9]. This democratization of information is critical for creating an informed citizenry capable of making responsible decisions concerning environmental stewardship.

### 9.4 Open-Access Resources

The library has curated a diverse collection of open-access journals, e-books, and databases that focus on various aspects of sustainability, including renewable energy, waste management, and climate change. These resources are available to anyone with internet access, effectively removing barriers to knowledge acquisition and fostering an inclusive approach to education [10].

### 9.5 Digital Literacy Programs

To enhance the impact of these resources, PTAR offers digital literacy programs designed to teach users how to efficiently find and use online information. These programs are particularly beneficial for community members who may lack experience with digital tools but are eager to learn about sustainable practices.

## 9.6 Collaborations and Partnerships

PTAR's commitment to promoting accountability and sustainability extends beyond its immediate user base through strategic collaborations with other institutions, NGOs, and government bodies.

### 9.7 Institutional Partnerships

By collaborating with other universities and research institutions, PTAR shares best practices in green technology implementation and resource management. Joint research projects foster innovation and develop tailored solutions to local environmental challenges [11], thereby amplifying the impact of sustainability efforts.

### 9.8 Community Organizations

Partnerships with local NGOs enable PTAR to support grassroots initiatives aimed at enhancing community welfare through sustainable practices. Joint efforts may include organizing cleanup drives, conducting tree-planting activities, and other community-based environmental projects that promote both ecological health and a sense of communal responsibility [12]. These initiatives are emblematic of the broader urban and sustainable development dynamics, where community involvement and environmental stewardship are integral to achieving long-term sustainability goals [13].

## 10. MEASURING IMPACT: ACCOUNTABILITY METRICS

For any initiative aimed at promoting accountability in green technology sustainability, it is essential to have robust metrics for measuring impact. The PTAR employs several methods to achieve this purpose effectively.

Surveys: Regularly conducted surveys assess various aspects such as user satisfaction with educational programs and the overall accessibility of resources. By collecting and analyzing this data, PTAR can pinpoint strengths and weaknesses in their offerings, ensuring they meet user needs.

Usage Statistics: Utilization rates of digital resources are tracked through advanced data analytics. This data provides valuable insights into which resources are most frequently accessed, revealing user preferences and areas of high demand. Consequently, PTAR can allocate resources more efficiently.

Community Feedback: Town hall meetings offer a platform for community members to voice their opinions and concerns regarding library initiatives. These gatherings invite open dialogue, fostering a sense of community involvement and transparency. Feedback collected in this manner is instrumental in making necessary adjustments and enhancements to PTAR's programs and services.

Collectively, these accountability metrics help ensure that PTAR's efforts are meeting their intended goals. They provide critical insights into areas that may require improvement, enabling the library to adapt and evolve continuously. By doing so, PTAR not only enhances its own offerings but also promotes a more sustainable and accountable approach to green technology.

## 11. CONCLUSION

Promoting accountability in green technology and sustainability is a multifaceted endeavor that requires both an ethical commitment and practical action. The PTAR exemplifies how academic libraries can play a crucial role in this process by leveraging educational programs, resource accessibility, community engagement, and strategic partnerships, all guided by Islamic principles.

By integrating these elements into their operations, academic libraries like PTAR advance the cause of sustainability and contribute significantly to community welfare. They act as stewards of knowledge grounded in ethical responsibility and have the potential to inspire broader societal shifts towards more accountable practices in green technology.

The PTAR model showcases an actionable pathway for other academic libraries to follow. It underscores the importance of a holistic approach, where several interconnected strategies work in unison to promote environmental accountability and sustainability. By doing so, PTAR not only addresses the immediate needs of its users but also sets higher standards for institutional responsibility in the realm of green technology. This comprehensive strategy not only aims to enhance library services but also serves as a beacon of how education intertwined with ethical principles can lead to a more sustainable future for all.

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