

## **Sustainable Practices of Environmental Management in the Preservation of Archives in Public Libraries in Rivers State**

**Hilda Eno Obi (Ph.D, CLN)**

*Department of Library and Information Science, Faculty of Education, University of Port  
Harcourt*

**Abstract:** This study investigated sustainable practices of environmental management in the preservation of archives in public libraries in Rivers state. Two objectives and its corresponding research questions and hypotheses guided this study. The descriptive survey design was adopted for this study. The population of interest in this study was 514 library staff from the Rivers state library board and staff from the Jubilee library in Port Harcourt. The sample size of this study was 399 library staff, of which 227 were from the board of the Rivers state library and 172 were from the Port Harcourt branch of the Jubilee library. The sample size was calculated by Taro Yamane's formula, and a two-stage sampling method was employed to select the sample size. Stratified and simple random sampling were used in the process. A self-structured instrument titled sustainable practices of environmental management in the preservation of records questionnaire was employed for data collection. Face and content validation was ensured by three experts. The instrument yielded reliability coefficients of 0.81 with the use of Cronbach Alpha reliability method. Mean and Standard Deviation were used in answering research questions while z-test was used for the inferential statistics. The findings revealed that Sustainable practices for environmental management in public libraries in Rivers state include using acid-free folders, having large sculptures shielded from elements, and having the archives environment protected from flooding. Microforms are not used to shield delicate unpublished documents and artworks are not stored in enclosures made of acrylic plexiglass. It was concluded and recommended that archivists in the libraries should be supported by the government to employ sustainable practices such as microforms, acrylic plexiglass, ultraviolet filtering windows and low-velocity vacuum systems to protect both unpublished and published materials from degradation.

**Keywords:** Sustainable Practices, Environmental Management, Preservation, Archives, Public Libraries.

### **Background to the Study**

A sustainable library is one that conserves and uses natural resources wisely. It ensures that the services it provides meet current demand while conserving energy and reducing waste. A sustainable library is also an ethical library that promotes reading and encourages citizens to help conserve resources. The concept of sustainability refers to the ability to maintain a system without destroying it or having it destroyed. Hence in relation to environmental management, it is the process of managing the environment, such as air and water quality, so that organizations and establishments such as public libraries can meet their environmental objectives (Welford,

2016). It encompasses environmental planning, environmental assessment, environmental protection, and pollution prevention activities. Environmental management also deals with issues such as waste disposal, hazardous materials management, and energy conservation. It is important for library organizations to have an effective environmental management system in order to reduce their environmental impact( Mathiasson & Jochumsen, 2022), comply with regulations, and protect archives from the wider environmental impacts (Karioja, 2013). Archives are an essential part of a public library's mission. They provide historical information about a community, its people, and its history. Archival collections are often unique and irreplaceable records that provide a window into the past and help inform the present. Archives are a valuable source of evidence for research, education, cultural heritage preservation, and community development (Obi, 2023). They help to preserve memories, document events, and tell stories.

Environmental management can influence the preservation of archives in public libraries in multiple ways. Temperature and humidity levels are expected to be maintained within specific ranges to ensure that records are not damaged or destroyed by heat or moisture buildup over time. Proper ventilation is expected to be provided to prevent mold growth on paper documents (Harvey, et al., 2020). Additionally, light exposures are expected to be limited to avoid fading or discoloration of documents, photos, and other materials. Pest control measures are also expected to be taken to protect archives from insects and other pests that could damage them. When effective environmental management strategies are employed in public libraries, it can have an immense impact on the preservation of archives. Proper temperature and humidity levels can extend the life of documents significantly by preventing degradation due to heat or moisture buildup over time.

Furthermore, ventilation systems can reduce the risk of mold growth that can damage paper documents. Additionally, limiting light exposure can prevent fading or discoloration of materials and pest control measures can protect archives from damage caused by insects or other pests. It is important for public libraries to take steps to improve their environmental management practices in order to ensure the preservation of archives (Kirby, 2014). It is premised on the foregoing that environmental management becomes vital to the preservation of archives in public libraries, as it helps to ensure that these valuable resources will remain accessible to researchers and patrons for generations to come. Through careful planning and implementation of sustainable practices, libraries can ensure that their archives are properly maintained, protected, and preserved for future use. This study therefore sought to ascertain the sustainable practices of environmental management in the preservation of archives in public libraries in Rivers state.

### **Statement of the Problem**

Around the world, resources are being managed more inefficiently, which has led to side effects including climate change, biodiversity loss and pollution. As the effects of this crisis are felt by the existence of humans, so are the libraries' public archives affected. It may be beneficial to note that humans are actually more negatively affected by this progression. The history of humanity is being eroded by the exposure of archives in public libraries to this reality; the loss of archival materials is the loss of pertinent historical information that is essential to the continued existence of nations. Similar to many countries in the 20th century, archives were not cared for in a sustainable manner. As a result, the motivation for the researcher was to investigate if the government of Rivers state is collaborating with librarians and administrators of public libraries in the state to implement sustainable practices in environmental management in the preservation of archives in public libraries in the state.

### **Aim and Objectives**

This study was aimed at investigating sustainable practices of environmental management in the preservation of archives in public libraries in Rivers state. Specifically, the objectives were to:

1. identify the sustainable practices of environmental management in the preservation of unpublished materials in the archives of public libraries in Rivers state.
2. ascertain the sustainable practices of environmental management in the preservation of published materials in the archives of public libraries in Rivers state.

### Research Questions

1. What are the sustainable practices of environmental management in the preservation of unpublished materials in the archives of public libraries in Rivers state?
2. What are the sustainable practices of environmental management in the preservation of published materials in the archives of public libraries in Rivers state?

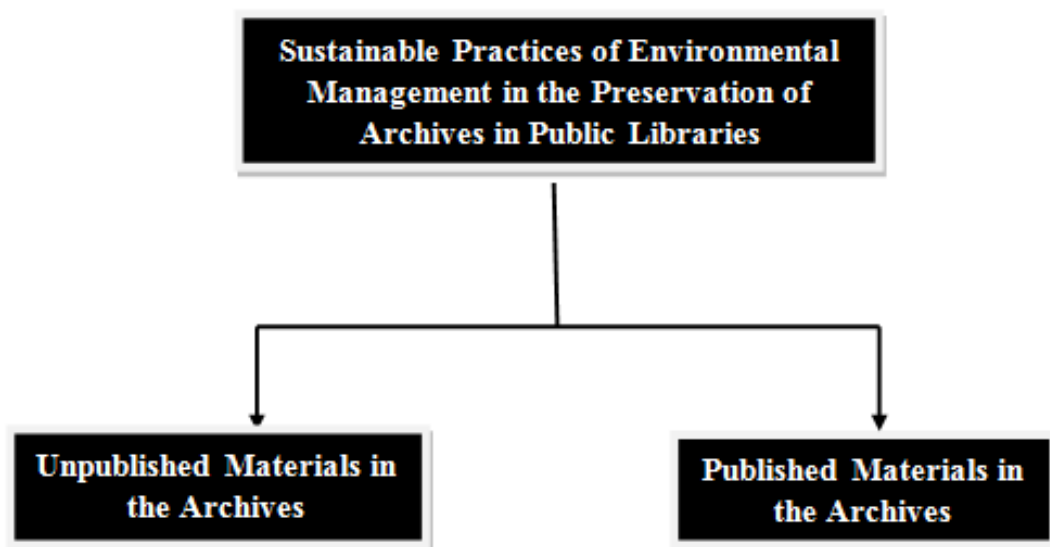
### Hypotheses

The following two (2) hypotheses were tested at 0.05 alpha level.

1. There is no significant difference in the mean scores of staff from Rivers State library board and staff from Jubilee library Port Harcourt on the sustainable practices of environmental management in the preservation of unpublished materials in the archives of public libraries in Rivers state.
2. There is no significant difference in the mean scores of staff from Rivers State library board and staff from Jubilee library Port Harcourt on the sustainable practices of environmental management in the preservation of published materials in the archives of public libraries in Rivers state.

### Conceptual Framework

The concept of this study is situated on sustainable practices of environmental management in the preservation of archives in public libraries in Rivers state as diagrammatically represented in figure 1 below.



Source: Researcher's conceptualization (2023)

### Conceptual Review

#### Concept of Sustainable Practices

Sustainable practices are an important part of an establishment's day to day activity and can provide a host of benefits. Simply put, sustainable practices are those that are focused on minimizing negative environmental impacts, reducing waste, and providing a better quality of life for living things (Rieckmann, 2018). This type of practice can apply to the production of

goods, the delivery of services, and even how a company or an institution is run. From an environmental standpoint, organizations can benefit from sustainable practices by reducing energy use, decreasing water use, and reducing emissions. This can be accomplished through the use of renewable energy sources (Dursun, 2015), investments in energy efficient systems and processes (Sorrell, 2015), and improved waste management practices (Higgins, 2018). In turn, these activities can help reduce costs and increase profits, as well as provide companies with a competitive advantage over their competitors.

The implementation of sustainable practices can also help increase employee morale by providing a better work environment (Opara, et al., 2021) as well as giving staff members an opportunity to engage in meaningful work that can help protect the environment (Baker, 2015). Sustainable practices can also provide economic benefits (Ortiz-de-Mandojana & Bansal, 2016), such as increasing a business access to new markets, reducing the cost of doing business, and creating more jobs (Doppelt, 2017 Benn, et al., 2014). From a social standpoint, sustainable practices can help businesses build relationships with their customers and stakeholders, as well as improving the reputation of the business (Evans, et al., 2017). This can be achieved through transparent and honest communication, compliance with laws and regulations, and actively engaging with the local community. Overall, sustainable practices can provide organizations and businesses with numerous benefits, both short-term and long-term. By reducing the environmental impact of their operations, organizations and businesses can help to protect the planet, create a better workplace for their employees, and increase their bottom line.

### **Sustainable Practices and Environmental Management**

Environmental management, as defined by different authors, is a process of evaluating (Yang, et al., 2023) controlling (Glicksman, et al., 2023) and updating (Graham, 2023) environmental policies, practices, and procedures to prevent, reduce, or eliminate negative environmental impacts (Glicksman, et al., 2023; Graham, 2023; Yang, et al., 2023). It helps organizations to better manage and protect their environment through scientific knowledge and innovation. According to Welford (2016) sustainable practices are crucial for promoting environmental management, as they provide the tools and guidance necessary to maintain the ecosystems and preserve natural resources. Shaikh et al (2017) added that sustainable practices, such as energy efficiency, water conservation, and green building practices, create an integrated system that encourages continual improvements towards a sustainable future. This was corroborated by Ragheb et al (2016) and Amaral et al (2015) that the main types of sustainable practices are energy efficiency, water conservation, and green building practices. Energy efficiency focuses on reducing energy use and increasing efficiency through more efficient technologies. Water conservation looks at ways to reduce water use and increase water savings. Green building practices involve using efficient technologies and materials to reduce the environmental impacts of building and construction. In the same vein, Paramati et al (2022) observed that energy efficiency not only reduces energy costs, but also helps to reduce environmental pollution. By reducing energy demand, fewer greenhouse gas emissions are released into the atmosphere, subsequently reducing global warming potential.

Further, utilizing efficient technologies, such as light-emitting diode (LED) lightbulbs and insulation, can reduce energy consumption and prolong the life of these technologies (Cuce, et al., 2016). Also, water conservation actively reduces water consumption and wastewater production, since it leads to more efficient water usage and reuse. As remarked by Christian et al (2016), water conservation measures, such as rainwater harvesting, water efficient appliances, and eco-friendly landscaping, help to reduce water consumption and maintain water sources. Notably, green building practices is one of the sustainable practices of environmental management in any given place because it strives to reduce the environmental impacts of building and activities being carried out in such building.

## **Sustainable Practices of Environmental Management in the Preservation of Unpublished and Published Materials in the Archives of Public Libraries**

The role played by public libraries in the archives of information materials is incontrovertible. From rare paper-based documents to artworks and recordings on compact discs (CDs), archives of public libraries serve as reliable stores of information for their communities (Prytherch, 2016). To ensure that these records are preserved for future reference and use, Harvey and Mahard (2020) acknowledged that archivists in public libraries are expected to adhere to certain best practices for their preservation. Thus, the preservation of both unpublished and published materials in the archives of public libraries is the task of preserving materials that have exceptional value, not easily accessible to the general public and are expected to last as long as the earth remains. This can include but not limited to sketches, journals, textbooks, original manuscripts, recordings, and other works that may have cultural or financial value. Archives in public libraries are important in this regard, as they can provide long-term preservation of these materials, ensuring they are available long after their initial creation (Kilmarx, et al., 2020). This goes in line with Smith-Yoshimura et al (2014) that many types of unpublished materials are archived in public libraries. Manuscripts, sketches, and recordings are some of the most common, but other items like photographs, artwork, and correspondence can also be found. Depending on the age and context of the material, De Kosnik s(2021) concurred with Ormond-Parker and Sloggett (2012) as well as Ross (2012) that items may be archived for historical, legal, educational, or financial purposes. Archiving these materials allows them to be safely preserved for future generations, preserving their cultural and financial value.

In recent years, scholars have emphasized the importance of sustainable practices of environmental management in the preservation of unpublished materials in the archives of public libraries has been increasingly highlighted (Hodges, 2022; Balogun & Kalusopa, 2021; Yun, et al., 2021). To support long-term preservation and access of these materials, library institutions are expected to actively monitor the environment in their collections. Ngulube (as cited in Rakemane & Mosweu, 2021) corroborated the foregoing by submitting that environmental management is a vital consideration for archival preservation of materials, both published and unpublished.

Archives of public libraries must practice sustainable environmental management in order to ensure the preservation of materials for current and future generations. Henderson (2013) admitted that sustainable practices of environmental management include monitoring and controlling the temperature, humidity, pollutants and light levels within the archives. Similarly, Prytherch (2016) agreed with Clanchy (2012) and Garvey (2012) that published materials or items that have been printed, written or composed for public circulation, often have value far beyond their initial publishing date which made them eligible for archives. For example, books on ancient history, long-gone practices or events, or documents on policy-changing decisions may all be valuable resources to researchers. To ensure that these items remain intact and accessible, Jaillant (2019) agreed with Prytherch that preservation techniques must be employed. These techniques can vary, depending on the type of material being preserved. For example, for paper-based documents, such as magazines and books, preservation strategies can include archival binding, acid-free folders, and photocopying. For digital materials, such as online journals and ebooks, the strategies can include copying, conversion, validation and emulation. Madumere (2022) averred that whatever the information material in the archive of public libraries may be, it should be stored in a safe, secure, and dry environment to ensure its longevity. In addition to preservation techniques, Kadaifciler (2017) remarked that public libraries should also consider the environment in which archived materials are stored. It is essential that the temperature and humidity in the room remain at optimal levels, as this will help to conserve materials and prevent them from deteriorating. Also, Pentecost (2015) observed in agreement with McCann (2013) that humidity and temperature should be closely monitored, and the use of appropriate storage materials such as acid-free boxes and folders can help prevent



further damage and corrosion. Dust, ultra violet (UV) light, and pests can also be sources of damage, and thus must be addressed to ensure the integrity of the materials over time. To this end, Wilson and VanSnick (2017) averred that archivists in public libraries can employ the use of methods such as air-filtration systems and the sealing of collection storage areas. Dust must be actively removed—for instance, with the use of a low-velocity vacuum system—to avoid its further accumulation and persistence. Faulkner-Brown (1999) submitted that the optimal temperature for archival preservation is between 18-21 degrees Celsius and the humidity should be kept between 45-55%. More so, it is important to keep pollutants, such as volatile organic compounds (VOCs), away from the archives by using air filtration, and to limit the exposure of published materials to light via UV blockers on windows and careful location of light sources as reported by Cincinelli et al (2016). For the preservation of unpublished materials, such as manuscript collections or research papers, sustainable environmental practices also include properly storing the items. Additionally, Roberts (2007) remarked that the use of ultraviolet-filtering film on windows and other light sources can be helpful in preventing damage from UV radiation to archives. The use of integrated pest management systems is also vital in the preservation of library materials.

Proper sanitation and storage conditions can help prevent the presence of pests, but in the case of an infestation, the use of pest control measures is essential for safeguarding collection items (Sloane & Elsworth, 2018). Organizations can also assess the need for specialized storage materials, such as microfilm and microfiche, to protect particularly fragile documents. Sahoo (2004) contended that the use of appropriate storage materials, dust management measures, UV light filtering, and integrated pest management systems are essential to protecting these materials from damage and deterioration. Archivists should use acid-free folders, board and paper, and store paper materials in a cool, dark and dry storage environment, away from dust, insects, rodents and other pests. This is in the same vein with University of Washington Libraries. (n.d) that the removal of dust and dirt from unpreserved papers should be done through gentle means, such as vacuuming or air purging, as these are less likely to cause damage to the items than using abrasive cleaning materials.

## **Theoretical Framework**

### **Robinson's Theory of Sustainable Practices**

The theoretical framework in sustainable practices was first propounded by John Robinson in 2004. The theory averred that sustainable practices should be treated holistically and that society should not view them in silos (Robinson, 2004). According to Robinson, we should consider sustainability as a three-dimensional construct, including environmental, economic, and social dimensions. We must recognize that maximizing the gains in any one of these dimensions alone cannot deliver long-term sustainability. Robinson also notes that in order to achieve sustainable practices, it is important to consider the entire system – from natural resources, production, and distribution to the final disposal – and the impacts on the environment and society. As such, sustainability requires a systemic approach to understanding how all the components of the system interact. More so, Robinson states that the full value of sustainability can only be seen when its benefits extend across generations. To support his theory, Robinson cites the research of several authors, such as Dai (2010) and Ekins (2006), who stress the need for a holistic approach to sustainability and emphasize the three-dimensional framework of economic, environmental and social sustainability. Robinson's theory of sustainability practices is well-supported by the research of these authors and provides a solid foundation for the implementation of sustainable practices. In application to this study, John Robinson's theoretical framework on sustainability practices shows that proper environmental management planning with a long-term consideration is key to the life and relevance of unpublished and published materials in public libraries. Since the main concept of archives is to have evergreen historical records, be it published or unpublished and in whatsoever format or shape, then Robinson's theory of sustainable practices reiterates that the first step to take in achieving this goal is proper sustainable practices for environmental management.

## Methodology

The descriptive survey design was adopted for this study. The target population of the study comprised 514 library staff drawn from Rivers State library board and staff from Jubilee library Port Harcourt. The sample size for this study was 399 library staff comprising 227 staff from Rivers State library board and 172 library staff from Jubilee library Port Harcourt representing 44.16% and 33.46% of the population respectively. The sample size was determined using Taro Yamane sample size determination formula while a two-stage sampling technique of stratified and simple sampling techniques was used to select the sample size. An instrument titled, ‘Sustainable Practices of Environmental Management in the Preservation of Archives Questionnaire (SPEMPAQ)’ was used for data collection. Face and content validation was ensured by three experts. The SPEMPAQ consists of twenty (10) items of two (2) sections. This was coded in the four-point Likert type scale of: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD) and weighted as 4, 3, 2, and 1 respectively. The instrument (SPEMPAQ) yielded reliability coefficients of 0.81 with the use of Cronbach Alpha reliability method. Mean and standard deviation was used in answering research questions while z-test was used in testing the null hypotheses at 0.05 alpha level. After the administration of the respective copies of questionnaire to the respondents, 192 of the copies were completely filled and retrieved from Rivers State library board staff representing 84.58% return rate while 161 of the copies were completely filled and retrieved from Jubilee library Port Harcourt staff representing 93.61% return rate.

## Results

### Answer to Research Questions

**Research Question 1:** What are the sustainable practices of environmental management in the preservation of unpublished materials in the archives of public libraries in Rivers state?

Table 1: Mean and Standard Deviation scores on the sustainable practices of environmental management in the preservation of unpublished materials in the archives of public libraries in Rivers state.

S/N	Items	Rivers State Library Board Staff (n =192)		Jubilee Library Port Harcourt Staff (n =161)		Mean Set	Remarks
		$\bar{x}$	sd	$\bar{x}$	sd	xx	
1.	Acid-free folders are being used to store unpublished paper-based documents in the library’s archive.	2.71	1.65	2.73	1.65	2.72	Agreed
2.	Microforms are being used to protect fragile unpublished documents in the library’s archive.	2.50	1.58	2.48	1.58	2.49	Disagreed
3.	Artworks are stored in enclosures with acrylic plexiglass the library’s archive.	2.44	1.56	2.48	1.58	2.46	Disagreed
4.	Big sculptures are kept on wooden slabs in the library’s archive.	2.78	1.67	2.63	1.62	2.71	Agreed
5	The library’s archive environment is largely shielded from flood.	2.62	1.62	2.56	1.60	2.59	Agreed
	<b>Cluster Mean</b>	2.61	1.62	2.58	1.61	2.60	Agreed

Results in Table 1 showed the weighted mean values for the response of Rivers state library board staff and Jubilee library Port Harcourt staff on the sustainable practices of environmental management in the preservation of unpublished materials in the archives of public libraries in Rivers state. All of the items were agreed by the respondents (xx, > 2.5) except items 2 and 3.

The items that were agreed on demonstrated sustainable practices in environmental management for the preservation of unpublished materials in the archives of public libraries in Rivers state. However, the items that were disagreed on demonstrated expected sustainable practices in environmental management for the preservation of unpublished materials in the archives of public libraries in Rivers state. As a result, the mean set cluster value of 2.60 for all of the items implies that some forms of environmental management that is sustainable in the preservation of unpublished materials exist in the archives of public libraries in Rivers state.

**Research Question 2:** What are the sustainable practices of environmental management in the preservation of published materials in the archives of public libraries in Rivers state?

Table 2: Mean and Standard Deviation scores on the sustainable practices of environmental management in the preservation of published materials in the archives of public libraries in Rivers state.

S/N	Items	Rivers State Library Board Staff (n =192)		Jubilee Library Port Harcourt Staff (n =161)		Mean Set	Remarks
		$\bar{x}$	sd	$\bar{x}$	sd		
6	The library windows to the archive are provided with ultraviolet-filtering film to keep published materials safer from ultra violet radiation.	2.45	1.57	2.53	1.59	2.49	Disagreed
7	There are Janitors to ensure proper sanitation of the library archive environment every day to prevent infestation.	3.04	1.74	2.92	1.71	2.98	Agreed
8.	All published materials in the library's archive are stored in a cool and dry environment.	3.04	1.74	3.00	1.73	3.02	Agreed
9.	Dusts are actively removed from published materials in the library's archive with the use of a low-velocity vacuum system.	2.13	1.46	2.22	1.49	2.18	Disagreed
10	The process of digitizing published materials in the library's archive is ongoing.	2.65	1.63	2.58	1.61	2.62	Agreed
	<b>Cluster Mean</b>	2.66	1.63	2.65	1.63	2.66	Agreed

Results in Table 2 showed the weighted mean values for the response of Rivers state library board staff and Jubilee library Port Harcourt staff on the sustainable practices of environmental management in the preservation of published materials in the archives of public libraries in Rivers state. All of the items were agreed by the respondents (xx, > 2.5) except for items 6 and 9. The items that were agreed on demonstrated sustainable practices in environmental management for the preservation of published materials in the archives of public libraries in Rivers state. Conversely, the items that were disagreed on demonstrated expected sustainable practices in environmental management for the preservation of unpublished materials in the archives of public libraries in Rivers state. As a result, the mean set cluster value of 2.66 for all of the items is indicative of some sustainable practices in environmental management regarding the preservation of published materials in archives in the archives of public libraries in Rivers state.

### Test of Hypotheses

**Hypothesis 1:** There is no significant difference in the mean scores of staff from Rivers State



library board and staff from Jubilee library Port Harcourt on the sustainable practices of environmental management in the preservation of unpublished materials in the archives of public libraries in Rivers state.

Table 3: z-test analysis on the mean difference between the responses of staff from Rivers state library board and staff from Jubilee library Port Harcourt on the sustainable practices of environmental management in the preservation of unpublished materials in the archives of public libraries in Rivers state.

Status	N	$\bar{x}$	sd	Df	z-cal	z-crit value	Alpha Level	Decision
Rivers State Library Board Staff	192	2.61	1.62	351	1.98	1.96	0.05	Significant difference
Jubilee Library Port Harcourt Staff	161	2.58	1.61					

Results in Table 3 showed that Rivers State library board staff has mean and standard deviation scores of 2.61 and 1.62 while Jubilee library Port Harcourt staff has mean and standard deviation scores of 2.58 and 1.61. With a degree of freedom of 351, the z-calculated value of 1.98 was higher than the critical z-test value of 1.96. Therefore, the null hypothesis was not retained. By implication, there was a significant difference between the mean responses of staff from Rivers state library board and staff from Jubilee library Port Harcourt on the sustainable practices of environmental management in the preservation of unpublished materials in the archives of public libraries in Rivers state.

**Hypothesis 2:** There is no significant difference in the mean scores of staff from Rivers State library board and staff from Jubilee library Port Harcourt on the sustainable practices of environmental management in the preservation of published materials in the archives of public libraries in Rivers state.

Table 3: z-test analysis on the mean difference between the responses of staff from Rivers state library board and staff from Jubilee library Port Harcourt on the sustainable practices of environmental management in the preservation of published materials in the archives of public libraries in Rivers state.

Status	N	$\bar{x}$	sd	Df	z-cal	z-crit value	Alpha Level	Decision
Rivers State Library Board Staff	192	2.66	1.63	351	0.81	1.96	0.05	No significant difference
Jubilee Library Port Harcourt Staff	161	2.65	1.63					

Results in Table 4 showed that Rivers State library board staff has mean and standard deviation scores of 2.66 and 1.63 while Jubilee library Port Harcourt staff has mean and standard deviation scores of 2.65 and 1.63. With a degree of freedom of 351, the z-calculated value of 0.81 was lower than the critical z-test value of 1.96. Therefore, the null hypothesis was retained. By implication, there was no significance difference between the mean responses of staff from Rivers state library board and staff from Jubilee library Port Harcourt on the sustainable practices of environmental management in the preservation of published materials in the archives of public libraries in Rivers state.

### Discussion of Findings

The findings of this study are discussed under the following subheadings:

## **Sustainable Practices of Environmental Management in the Preservation of Unpublished Materials in the Archives of Public Libraries in Rivers State**

It was found that certain sustainable practices of environmental management in the preservation of unpublished materials in archives exist in the archives of public libraries in Rivers state while a few does not exists. Also, there was a significant difference between the mean responses of staff from Rivers state library board and staff from Jubilee library Port Harcourt on the sustainable practices. Those practices of environmental management that are sustainable in preserving unpublished materials in archives that are located in the archives of public libraries in Rivers state include the practice of using acid-free folders to store unpublished paper-based documents in the libraries' archives, having large sculptures in the libraries' archives shielded from the elements by being placed on wooden slabs, and having the libraries' archives environment protected from flooding. Unrealistic sustainable practices include the practice of utilizing microforms to shield delicate unpublished documents in the libraries' archives and storing artwork in enclosures made of acrylic plexiglass. This finding supports the finding of Epemu et al (2022) that information materials are faced with a number of threats and agents that lead to their deterioration and damage such as biological agents like insects, rats, termites, poor shelving, poor ventilation system of the building, water damage, air pollution, temperature and humidity, dirty and dust. Hence, the need to implement sustainable practices such as use of good quality storage tools and proper environment for archives.

## **Sustainable Practices of Environmental Management in the Preservation of Published Materials in the Archives of Public Libraries in Rivers State**

It was ascertained that certain practices of environmental management that are sustainable in the preservation of published materials in archives are present in the archives of public libraries in Rivers state, while other practices are absent. Additionally, there was no significant difference in the responses of staff from board of the Rivers state library and the staff from the Jubilee library in Port Harcourt regarding the identified sustainable practices. Sustainable practices in environmental management that are employed to preserve published materials in archives that are located in the archives of public libraries in Rivers state include having all published materials in the libraries' archives stored in a cool and dry environment, having Janitors take care of ensuring that the proper sanitation of the libraries' archives environment is maintained every day in order to prevent infestation, and ongoing digitization of published materials in the libraries' archives. Expected sustainable practices that are not employed include making the libraries' windows to the archives ultraviolet-filtering, and actively removing dust from published materials in the archives with the use of a low-velocity vacuum system. The findings of this investigation support those of Intellectual Reserve, Inc. (2016) and Pymm (2014) that library archives should be kept in a climate as cool and dry as possible. Additionally, the examination affirms Pymm's observation that information material such as writeable CDs have a life expectancy of up to 200 years if held in archival conditions - cool, dry, and away from light.

### **Conclusion**

Based on the findings of this study, it can be concluded that archives of public libraries in Rivers state employ a variety of sustainable practices to protect both unpublished and published materials from degradation and the majority of staff from the two public libraries are familiar with sustainable practices for environmental management in archives' preservation. Though there is a consensus that further action can be taken with devices such as microforms, acrylic plexiglass, ultraviolet filtering windows and low-velocity vacuum systems.

### **Recommendations**

The following recommendations were made based on the findings of the study

1. The Rivers State Government should provide more support in the areas of facility upgrade to public libraries in the state.

2. The Chief Library Officers in the two libraries should collaborate with government agencies that have an interest in environmental sustainability in the preservation of published and unpublished materials in the libraries' archives.
3. The libraries directors should ensure that more efforts are devoted to the process of digitizing all published materials in the libraries' archives.

## References

1. Amaral, L. P., Martins, N., & Gouveia, J. B. (2015). Quest for a sustainable university: a review. *International Journal of Sustainability in Higher Education*, 16(2), 155-172.
2. Balogun, T., & Kalusopa, T. (2021). A framework for digital preservation of Indigenous knowledge system (IKS) in repositories in South Africa. *Records Management Journal*, 31(2), 176-196.
3. Benn, S., Edwards, M., & Williams, T. (2014). *Organizational change for corporate sustainability*. Routledge.
4. Besser, H. (2013). Audiovisual patrimoine for libraries. *Progressive Librarian*, (41), 67.
5. Christian A. C., Rahman, A., & Mwangi, G., J. (2016). Economic analysis and feasibility of rainwater harvesting systems in urban and peri-urban environments: A review of the global situation with a special focus on Australia and Kenya. *Water*, 8(4), 149.
6. Clanchy, M. T. (2012). *From memory to written record: England 1066-1307*. John Wiley & Sons.
7. Cuce, E., Harjunowibowo, D., & Cuce, P. M. (2016). Renewable and sustainable energy saving strategies for greenhouse systems: A comprehensive review. *Renewable and Sustainable Energy Reviews*, 64, 34-59.
8. De Kosnik, A. (2021). *Rogue archives: Digital cultural memory and media fandom*. MIT Press.
9. Doppelt, B. (2017). *Leading change toward sustainability: A change-management guide for business, government and civil society*. Routledge.
10. Epemu, G., Abenakyo, S., & Akello, S. (2022). *Preservation manual for Jinja public library* (Doctoral dissertation, Makerere University).
11. Evans, S., Vladimirova, D., Holgado, M., Van Fossen, K., Yang, M., Silva, E. A., & Barlow, C. Y. (2017). Business model innovation for sustainability: Towards a unified perspective for creation of sustainable business models. *Business Strategy and the Environment*, 26(5), 597-608.
12. Faulkner-Brown, H. (1999). Some thoughts on the design of major library buildings. *IFLA publications*, 88, 9-32.
13. Garvey, E. G. (2012). *Writing with scissors: American scrapbooks from the Civil War to the Harlem Renaissance*. Oxford University Press.
14. Graham, A. (2023). *Managing airports: An international perspective*. Taylor & Francis.
15. Harvey, D. R., & Mahard, M. R. (2020). *The preservation management handbook: a 21st-century guide for libraries, archives, and museums*. Rowman & Littlefield Publishers.
16. Hodges, J. A. (2022). Transcoding authenticity: preserving unreleased gaming software outside of memory institutions. *Journal of Documentation*, 78(2), 320-333.
17. Intellectual Reserve, Inc. (2016, February). Successful storage of archival materials (National Institute).

[https://www.familysearch.org/en/wiki/Successful\\_Storage\\_of\\_Archival\\_Materials\\_\(National\\_Institute\)](https://www.familysearch.org/en/wiki/Successful_Storage_of_Archival_Materials_(National_Institute))

18. Karioja, E. (2013). How to evaluate libraries' sustainability? An approach to an evaluation model and indicators. *Bibliopolis*, 50(4), 40-49.
19. Kilmarx, B. T., Bubenik, C., Periasamy, M., Phillips, M., Vincent, H., Garcia-Monge, A. H. L., & Tan, H. (2020). *Competency guidelines for rare books and special collections professionals*. International Federation of Library Associations and Institutions.
20. Kirby A. J. (2014). Environmental conditions for the safeguarding of collections: A background to the current debate on the control of relative humidity and temperature. *Studies in Conservation*, 59(4), 205-212.
21. Madumere, C. P. (2022). Challenges of maintenance practices of paper based archival information materials and strategies for enhancement in academic libraries in Nigeria. *Library Philosophy & Practice*, 1-19
22. Mathiasson, M. H., & Jochumsen, H. (2022). Libraries, sustainability and sustainable development: a review of the research literature. *Journal of Documentation*, 78(6), 1278-1304.
23. Obi, H. E. (2023). Availability of disaster preparedness and digitization in archives preservation in public libraries in Rivers state. *Partners Universal International Innovation Journal*, 1(1), 24-33.
24. Ormond-Parker, L., & Sloggett, R. (2012). Local archives and community collecting in the digital age. *Archival Science*, 12, 191-212.
25. Ortiz-de-Mandojana, N., & Bansal, P. (2016). The long-term benefits of organizational resilience through sustainable business practices. *Strategic Management Journal*, 37(8), 1615-1631.
26. Paramati, S. R., Shahzad, U., & Doğan, B. (2022). The role of environmental technology for energy demand and energy efficiency: Evidence from OECD countries. *Renewable and Sustainable Energy Reviews*, 153, 111735.
27. Pentecost, A. (2015). Collections care at Pond Spring in Courtland, Alabama. *North Alabama Historical Review*, 5(1), 8.
28. Prytherch, R. (2016). *Harrod's librarians' glossary and reference book: a directory of over 10,200 terms, organizations, projects and acronyms in the areas of information management, library science, publishing and archive management*. Routledge.
29. Pymm, B. (n. d.). Keeping the culture: archiving and the 21st century. *Vala*, 1-10.
30. Ragheb, A., El-Shimy, H., & Ragheb, G. (2016). Green architecture: A concept of sustainability. *Procedia-Social and Behavioral Sciences*, 216, 778-787.
31. Rakemane, D., & Mosweu, O. (2021). Challenges of managing and preserving audio-visual archives in archival institutions in Sub Saharan Africa: A literature review. *Collection and Curation*, 40(2), 42-50.
32. Rieckmann, M. (2018). Learning to transform the world: Key competencies in Education for Sustainable Development. *Issues and Trends in Education for Sustainable Development*, 39, 39-59.
33. Roberts, E. A. (2007). *Crash course in library gift programs: The reluctant curator's guide to caring for archives, books, and artifacts in a library setting*. Greenwood Publishing Group.

34. Robinson, J. (2004). Squaring the circle? Some thoughts on the idea of sustainable development. *Ecological Economics*, 48, 369–384. doi: 10.1016/j.ecolecon.2003.10.017
35. Robinson, J. (2004). Squaring the circle? Some thoughts on the idea of sustainable development. *Ecological Economics*, 48(4), 369-384.
36. Sahoo, J. (2004). Preservation of library materials: Some preventive measures. *The Orissa Historical Research Journal*, 47(1), 105-114.
37. Smith-Yoshimura, K., Godby, C. J., Koffler, H., Varnum, K., Yakel, E., & Holley, R. (2014). Social Metadata for Libraries, Archives and Museums. Part 2: Survey Analysis. <http://hdl.handle.net/10760/16448>
38. Sorrell, S. (2015). Reducing energy demand: A review of issues, challenges and approaches. *Renewable and Sustainable Energy Reviews*, 47, 74-82.
39. University of Washington Libraries. (n.d.). Stacks cleaning procedures. <https://www.lib.washington.edu/preservation/preservation-services/preventive-preservation/clean>
40. Welford, R. (2016). *Corporate environmental management 1: Systems and strategies*. Routledge.
41. Wilson, H., & VanSnick, S. (2017). The effectiveness of dust mitigation and cleaning strategies at The National Archives, UK. *Journal of Cultural Heritage*, 24, 100-107.
42. Yang, M., Chen, L., Wang, J., Msigwa, G., Osman, A. I., Fawzy, S., & Yap, P. S. (2023). Circular economy strategies for combating climate change and other environmental issues. *Environmental Chemistry Letters*, 21(1), 55-80.
43. Yun, B., Yue, Z., & Yaolin, Z. (2021). Topic structure and evolution patterns of documentary heritage preservation and conservation research in China. *Library Hi Tech*, 40(3), 805-827.