

Partnering Preservation with Sustainability

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ABSTRACT

As the archival profession is inextricable from future-focused thinking, sustainable preservation must be incorporated into archival practice. Sustainable thinking considers the economic, environmental, social, and cultural needs of both present and future generations, without privileging one factor over another. This article investigates the existing literature on sustainable preservation practices in archives. Sustainability presents a challenge to the archival mission. Becoming more sustainable begins with changing practices, which requires investing time, money, and energy to learn new information. The imperative to provide care for cultural resources is an argument for proceeding with caution. Nevertheless, the reality of the climate crisis and an ever-growing body of evidence from the archives field suggest that archives can and should adopt more sustainable practices. Research indicates that preservation goals may be more effectively met through sustainable practices, leading to more reliable preservation environments and financial savings for the institution as a result of reduction in energy use. This article identifies opportunities for action archives can take to become more sustainable through building design, learning from cultural preservation traditions, rethinking the role of archivists, and reconsidering the impact of practices, both small and large. In the 1980s, Hugo Stehkämper drew attention to principles for natural air-conditioning reliant upon building design, but civilizations have been developing procedures for preserving cultural heritage materials for centuries prior to the advent of so-called modern technology. In the current century, archives, libraries, and museums are continuing to discover a multitude of effective sustainable methods. Drawing upon decades of study, successes, and failures will allow archivists to assess and rethink practices.

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KEY WORDS

Archives building design, Archives collection management, Ecological design,
Energy conservation, Environmentalism, Green movement,
Sustainable preservation

Sustainability presents a challenge to the archival mission. Becoming more sustainable means changing practices. Changing practices begins with an investment of time, money, and energy to learn new information. The imperative to provide care for the cultural resources of communities is an argument for proceeding with caution. Nevertheless, an ever-growing body of evidence suggests that archives can and should adopt more sustainable practices.

The archival profession is inextricably linked to the future as much as it is to the past. The Society of American Archivists's (SAA) Core Values state that archivists preserve materials for the "benefit of the future more than for the concerns of the past."¹ To preserve cultural heritage, archivists battle against the evils that would destroy it: temperature, humidity, light, insects, vermin, mold, fungus, vandals, thieves, and natural disasters. In modern times, combating the environmental factors that threaten collections has meant employing chemicals to destroy paper-eating pests and fossil fuels to run heating, ventilation and air-conditioning (HVAC) systems that maintain the appropriate temperature and relative humidity. As society at large examines approaches to limiting pollutants and decreasing energy use, for nothing less than the long-term preservation of life on earth, archivists must do the same. There is no benefit in preserving materials while sacrificing the health and survival of the people to whom those materials are meaningful.

According to the SAA Core Values, archivists do not preserve materials for the sake of the materials themselves, or out of nostalgia for the past, but to "better comprehend the past, understand the present, and prepare for the future."² With a thought toward preparing for the future, archivists must consider Jessica Phillips's 2015 warning that "as more institutions attempt to 'go green,' the high-energy consumption of the archives' climate control systems may well come under scrutiny."³ As I write this, the high-energy consumption of archives already has come under scrutiny, especially given evidence that viable alternatives exist for reducing the resources archival repositories consume. Now is the right time for archives to take action for a more sustainable future.

One of many aspects of sustainability is the health of the natural world. In her article, "The Green Archivist," Heidi N. Abbey offers a definition of sustainability that originated with the Brundtland Commission⁴ as "meeting the economic, environmental, social and cultural needs of the present without compromising the same needs of future generations."⁵ Preservation of the environment is not privileged above other considerations. Sustainability does not demand sacrificing the well-being of collections, or the functions of institutions, for the sake of the environment. It *does* demand examining practices with consideration of all the spheres affected. Sustainability means looking at how current practices will affect future generations.

This is something archivists, as members of a profession in service to the future, should be comfortable with. The question that follows is how to meet the preservation needs of the materials while enacting sustainable practices.

The Society of American Archivists' 2009 publication *Archival and Special Collections Facilities* provides comprehensive information on the many aspects of creating a building that cares for workers and visitors as well as the materials it houses.⁶ Within its pages, the one reference to the possibility of sustainable building design cautions that if a particular sustainability goal runs contrary to archival preservation standards, priority should be given to adhering to the archives standards.⁷ This publication reflects the standards for preservation facilities at the time it was written and did not yet include guidance on incorporating sustainable practices and materials. The new edition of these SAA archival facility standards will reflect the most current research and thinking on sustainability in archival design, operations and practices.⁸ Rather than considering preservation concerns first and then addressing environmental impact, archivists can weigh the "economic, environmental, social and cultural needs"⁹ together from the outset. Rather than seek a perfect preservation environment, archivists must seek the best possible preservation environment at the least energy cost that is sustainable over time.¹⁰

The work of archivists, conservators, and architects from the distant and more recent past, as well as the present, reveals that not only can archivists meet preservation needs sustainably, but that sustainable preservation can be less costly and more effective than other methods. Although Hugo Stehkämper drew attention to principles for natural air-conditioning reliant upon building design in the 1980s, civilizations have been developing procedures for preserving cultural heritage materials for centuries prior to the advent of so-called modern technology. In the current century, archives, libraries, and museums have discovered a multitude of effective sustainable methods for everything from climate control to appraisal methods to pest management. Drawing upon decades of study, successes, and failures will allow archivists to assess and rethink practices.

Each archives functions in a unique context. Each involves particular materials, particular staffing circumstances, particular facilities, climates, budgets, and advisory boards. No approach is going to be right for every institution, but there is much opportunity to learn from and build upon the work that has been done thus far. The following ideas are presented as fodder for future conversations and are not intended to be prescriptive. They are also not comprehensive. New research continues. Library and Archives Canada (LAC) is in the process of building "the first Net Zero Carbon archival centre in the Americas."¹¹ In California, San Diego County is building "the country's first zero net energy archive facility."¹² The National Archives¹³ and the Smithsonian¹⁴ have both

committed to sustainable practices with concrete action plans that have not only reduced their energy consumption and waste production, but in some cases produced improved preservation environments for their materials.¹⁵ The introduction to the 2009 edition of *Archival and Special Collections Facilities* likewise encourages the information inside to be built upon and revised as archivists learn from putting ideas into practice.¹⁶ These ongoing investigations into the possibilities of partnering preservation with sustainability are changing the standards by which archivists operate.

The Stehkämper Method

Building design can play a definitive role in an archives' ability to reduce energy use by taking certain factors into account. Hugo Stehkämper, former director of the Historical Archive of the City of Cologne, advocated for the potential of mitigating the need for mechanical air-conditioning through thoughtful building design. He identified four interactive features used in the design of the Cologne Archives to maintain a stable and appropriate internal climate and therefore achieve preservation without the need for mechanical intervention. These four features were wall design, building materials, window arrangement, and shelving design.¹⁷

According to Stehkämper, triple wall design with appropriate building materials contributes to maintaining stable internal temperature and humidity. The design consists of a double-thick brick wall, an air space of seven centimeters, and an outer wall of granite. The outer granite wall protects the brick layer from both the heat of the sun and the moisture brought by rain and humid air. The air space prevents the brick from absorbing too much heat.¹⁸ The materials themselves are as important as how they are used. Brick reacts slowly to heat. This reaction is further slowed by the mass of the doubled layers, enabling it to absorb large amounts of heat when necessary without transmitting it to the interior. "This capacity and the fact that it is removed from the most turbulent disruptions of the elements outside enable the brick wall to exchange heat and humidity slowly. Only balanced climatic values are transmitted to the stacks."¹⁹ These walls, however, represent only part of what is necessary to achieve natural air-conditioning.

The arrangement of windows contributes to controlling heat, light, and air circulation. Stehkämper advocates for keeping windows small, to maintain the insulating mass of the brick wall and prevent the infiltration of too much light. Additionally, by keeping some windows strategically open, the archives can achieve natural ventilation and air circulation.²⁰ However, this strategy assumes that there are windows in the archival facility in the first place. In the case of the Historical Archive of Cologne, this was part of the design.

Shelving is another crucial factor that can either interrupt or enhance the circulation of air. Stehkämper argues that archives should stop using *Kompaktus* shelving, which many of us know as compact shelving. Though space saving, the design can trap heat and moisture, and inhibit air circulation.²¹ However, others offer solutions beyond eliminating compact shelving. Architect France Saïe-Belaïsch, writing about approaches to sustainable design in French archives, briefly mentions compact shelving in the context of the importance of air circulation. According to Saïe-Belaïsch, manufacturers are designing compact shelving so that it allows for the passage of air throughout its structure.²² Lisbit Bailey, archivist at the San Francisco Maritime National Historical Park, shared that a common practice with compact shelving has been to leave the shelves slightly spaced overnight to allow for ventilation when not in use.²³ Regardless of the approach, there seems to be general agreement on the benefits of permitting natural circulation of air in combating heat and moisture, and with them mold growth, insect infestation, and other threats of deterioration.

One example of dissent in the argument for the free circulation of air comes from Tim Padfield and Poul Klenz Larsen. They argue that appropriate relative humidity cannot be achieved in well-ventilated buildings, preferring a different approach:

... a nearly airtight building with moderate thermal inertia combined with large moisture inertia can hold a steady climate long enough to allow it to be refreshed with outside air during occasional advantageous moments in the unpredictable variation of atmospheric temperature and water vapour concentration.²⁴

Ultimately, Padfield and Klenz Larsen do not argue against the advantageous effects of air circulation, but rather for it to be used more strategically and not permitted to flow through archival storage constantly.

Another challenge raised by the Stehkämper method is the risks involved in having windows, even small ones, in an archival storage area. Sarah Kim presents the issue that windows can be entry points for undesirable pollutants.²⁵ However, Kazuko Hioki, in describing the design of the new wing for the Archives of the Imperial Household, highlights the use of windows fitted with filters to mitigate this issue.²⁶

The Stehkämper Method, also known as the Cologne Model, has been used throughout Northern Europe with high levels of success in maintaining internal climate without the need for energy-consuming mechanical air-conditioning. Stehkämper highlights examples in the archives of The Hague, the Zürich State Archives, and the Koblenz Federal Archives.²⁷ Each example includes some variation in one of the factors outlined, whether it be the measurement of the air space, the materials of the wall, or the placement of windows. The question

then arises whether this method can work in climates with more extreme temperatures and humidity levels.

Attempts to apply the Stehkämper Method in other climates have brought mixed results. The existing literature suggests that there have been more studies of the method's success in moderate and hot climates than in climates with extremely cold temperatures. Sandra Rowoldt addresses the work of Stehkämper and how it might be enacted beyond a Northern European context. She considers how South African archives might learn from archives in Israel—from both successes and missteps—as a country with a similar climate that has taken significant steps toward implementing natural air-conditioning methods. The Central Zionist Archives in Jerusalem built underground storerooms using the triple-wall design promoted by Stehkämper, however, the air space was sealed, causing it to trap humidity. Rowoldt highlights the potential success of this design if waterproofing had been employed on the outer walls, or if grilles had been installed to permit evaporation.²⁸

The Steven Spielberg Jewish Film Archive was housed successfully for twenty-two years in a thick-walled, underground facility with no mechanical air-conditioning system. Rowoldt tells us, “Given that film and video requires more stringent climatic standards than do paper-based archives, the success of this natural conservation is remarkable.”²⁹ In 1996, the archives moved into a modern, state-of-the-art facility at the Hebrew University of Jerusalem. Unfortunately, archivists soon began to struggle to maintain the necessary indoor climate that had come so easily in the past.³⁰ Taking this information into account, Rowoldt considers the similarities and differences in the issues archives face in South Africa.

One example of the successful application of Stehkämper's method in South Africa comes from Stellenbosch University's large, underground library. Built using a triple-wall design, with substantial attention paid to waterproofing and drainage, it achieves the goal of being slow to react to changes in temperature and humidity. Although mechanical air-conditioning is part of the design, the building's ability to maintain a stable climate without this intervention keeps energy costs, and energy use, low.³¹

Rowoldt sees great potential in the use of natural air-conditioning methods for archives in South Africa. She concludes, “There can be no doubt that the Cologne or Stehkämper principles are effective and there can be no doubt that Southern African archivists and archival architects should consider how they may be implemented in the Southern African environment.”³² Though she concedes the higher costs of initial building, Rowoldt puts forth that this investment will result in savings by minimizing expenditures for air-conditioning systems and ensuring appropriate and sustainable environments for the preservation of materials.³³

Learning from Traditional Practices

As Rowoldt discusses the potential for applications of Stehkämper principles in South Africa, she raises two important points regarding historical preservation traditions. She reminds us that Stehkämper advocates for the use of local building materials whenever possible. With this in mind, archivists can learn from the many traditional practices developed in different parts of the world and adapted to various unique climates.³⁴ Stehkämper insists, “Archivists and librarians should not need to be told that the cultural assets they guard have kept splendidly for many centuries even without technology . . .”³⁵ Although we have lost much of the historical record due to lack of good preservation practices, we can learn much from the materials that have been well preserved throughout time, in that if they were preserved without modern technology before, they can be again.

There is good reason to incorporate traditional wisdom into archival practice. This does not mean that every traditional practice can or should be implemented without modifications, but understanding traditional approaches can inform current practice. Published remarks from a presentation at the 68th Annual International Federation of Library Associations (IFLA) Conference in Glasgow in 2002 by John F. Dean from the Department of Preservation and Conservation at the Cornell University Library include an acknowledgment of the limits of HVAC:

Generally, HVAC can be very effective in cooling spaces, but in climates with extremely high levels of humidity, it does not function well enough as a dehumidifier to ensure effective climate control, and must often be used in combination with dehumidifiers. This is because the cooler temperature obtained by HVAC can actually increase the relative humidity.³⁶

HVAC limitations in humid regions can be mitigated,³⁷ but the limits of twenty-first-century technology can also encourage archivists to look beyond it for other solutions.

A project led by Miriam Centeno, preservation and digitization strategist at Ohio State University, holds great promise in expanding on archival tools for sustainable preservation. Named for a Japanese tradition that translates to “drying bugs,”³⁸ the Mushiboshi Project is dedicated to discovering and disseminating preservation practices used for centuries as part of cultural traditions.³⁹ In her preliminary survey, Centeno has come across practices that both explicitly and implicitly promote sustainable preservation of materials.

The Japanese tradition of *mushiboshi* focuses on controlling the humidity of the materials themselves, rather than the climate of the building alone. By unrolling and airing out scrolls and textiles in the autumn, following the heat and humidity of summer, accumulated moisture evaporates, reducing the

threat of mold and insects. This practice also evolved at a time when people could visit temples and homes to see these materials on display.⁴⁰ The tradition of Mushiboshi, therefore, creates opportunities for both preservation and outreach.

The Joanina Library of Portugal provides an especially intriguing example of sustainable pest management. Since approximately the eighteenth century, the librarians have been allowing a colony of bats to roost in the building. At night, library staff covers the furniture to protect it from guano, and the bats take flight, feeding on insects that would otherwise menace the collection.⁴¹ The Joanina Library is not alone. A second Portuguese library, at the National Palace of Mafra, does the same, though each library has attracted different species of bats.⁴² These libraries have engaged in a partnership with their natural environments in their efforts to preserve their collections.

Neither natural air-conditioning nor water-resistant building materials are new ideas. The Haeinsa Temple in Korea was designed as early as the thirteenth century to allow for the free circulation of air. Its wooden pillars were placed on stone platforms to prevent the infiltration of moisture from the ground.⁴³ Designed with consideration for the climate, the temple has maintained successful preservation conditions for centuries.

People across the planet have developed building practices that function under specific climatic conditions. Rowoldt highlights the South African practice of building homes with wide, overhanging eaves that protect the indoors from the heat and light of the sun as one that South African libraries and archives would be wise to adopt. She questions why large South African institutions use designs developed for European climates when locally developed designs have proven, for generations, to be more effective in controlling indoor temperature.⁴⁴ The best design for one climate is rarely the best design for another.

Kazuko Hioki's description of the project to design a new east wing for the Archives of the Imperial Household in Tokyo supplies evidence for the wisdom of these traditional preservation practices.⁴⁵ The Imperial Household Agency, having studied the effectiveness and reliability of HVAC systems in other museums and archives, determined that it would be preferable to design the new wing with the goal of passive climate control.⁴⁶ It modeled the design after the traditional Japanese Shosoin Treasure House, which includes features such as a floor on stilts that helps provide air circulation and limits the incursion of insects, long overhanging eaves to protect the building from the heat of the sun,⁴⁷ and the use of local building materials—in this case, Japanese cypress⁴⁸—which, when correctly cut and seasoned, allows for excellent moisture control, without the concern of air pollution from acids in the wood.⁴⁹

Enough information is available to move away from the mindset that one kind of building and one set of practices should be used by every archives

everywhere. Rather than exporting North American or Northern European preservation standards around the world, archivists should learn what practices work best in the context of each unique climate and culture. Because traditional practices developed prior to the widespread use of fossil fuels, they tend to be both low energy and low cost.⁵⁰ The sustainability of these practices is partly evidenced by the many centuries they have remained in use. The archival profession will be greatly enhanced by continued attention to and study in this area.

Opportunities for Action

Without concrete and achievable solutions, professionals are less likely to take action. It is the rare archivist who is blessed enough to be able to design a building from the ground up. Rarer still is she who comes across a colony of bats with whom to collaborate in pest management. Fortunately, archives can employ a multitude of approaches to take steps toward becoming more sustainable. They involve differing degrees of effort, disruption of the existing building, or financial investment, but evidence suggests that even the smallest of these actions can become transformative.

Factors in addition to maintaining climate and pest control can work together to ensure an archive functions sustainably. Mark Wolfe suggests that “recordkeeping environments, like natural environments, are complex ecologies.”⁵¹ Rethinking processes can be an important first step. Wolfe advises archives to reconsider acquisitions policies with an eye toward limiting growth. “Archives that measure organizational growth and success through acquiring and processing collections will be at odds with ensuring the goals of becoming more environmentally sustainable.”⁵² Much the way the rising population of the planet poses challenges to living everyday life sustainably, the growth of archival storage will make it more difficult for archives to achieve sustainability goals.

One approach to bring more sustainability to archives may be to engage, when possible, with the recordkeeping process before materials are brought to the archives, lending expertise to the management of the system and not just its outputs.⁵³ This is a concept echoed by Terry D. Baxter:

The deference of responsibility to the originating agency clouds the responsibility to act sustainably in two areas. The first of these is the responsibility to deal with the records in our care in a sustainable manner. The second is the responsibility as record policy makers to promote recordkeeping practices that are sustainable.⁵⁴

These ideas are facets of postcustodialism. As Wolfe describes it, “post-custodialism asks that archivists relinquish control of managing the costly

archival infrastructure that custodialism requires” and instead contribute to educating records creators in managing their own records.⁵⁵ This could lead to more community archives and materials being deaccessioned and returned to their “cultural owners,” rather than being absorbed into large archival institutions.⁵⁶ Wolfe suggests that maintaining more dispersed, small-scale collections is more sustainable environmentally, economically, and socioculturally than maintaining massive, centralized facilities. “Bigger collections require bigger repositories, which exact costs through building materials and energy use.”⁵⁷ Discovering whether smaller, dispersed collections have less negative impact than large centralized ones would require research currently unknown to me. However, the overall implication stands that improved sustainability requires a massive shift in thinking about what archivists do.

Before Wolfe, F. Gerald Ham criticized the custodial approach to archival practice in 1975⁵⁸ and then, in 1981, trumpeted the rise of the postcustodial era,⁵⁹ warning that archivists are losing control of the historical record, largely due to the ease with which records can be created, duplicated, shared, and altered with the advent of modern technology and the digital age.⁶⁰ In this environment, he suggests that archivists must take deliberate steps toward “planned proliferation and decentralization.”⁶¹

Baxter and Wolfe both confront the notion that digitization is the solution to decrease the resources required to care for collections of paper-based records. In fact, the preservation of both digitized and born-digital materials brings with it a unique set of sustainability concerns. Wolfe introduces the idea of Jevons’ Paradox, “an observation that *efficiency* enhancements to a system or a process can actually increase overall usage of a resource instead of decreasing it.”⁶² As an example, he proposes that an archives that succeeds in clearing its backlogs by employing more efficient processing strategies will feel emboldened to increase, rather than decrease, its rates of acquisition.⁶³ Wolfe cautions that “the proliferation of digital information and widespread access to inexpensive storage have emboldened archivists to preserve electronic records to a degree that contrasts greatly with comparable paper records.”⁶⁴ This emboldened attitude may be reflected less in the work of archivists and more in the general public’s desire for more digitization and more digital archiving. As described by Pendergrass et al., the proliferation of digital collections takes its own toll on the environment. Computers require electricity and are manufactured using plastics among other materials. As Pendergrass et al. put it, “the materials alone have a significant negative environmental impact, before even a single component is powered up.”⁶⁵ When they have passed the age of usefulness, they contribute to the accumulation of both general waste and toxic chemicals. Additionally, digital records require that a great deal of time and energy be expended in migration and emulation as technology evolves over time.⁶⁶ Though digitization of records

might reduce the use of resources needed to care for paper records, this technology is also responsible for its own share of consumption. This implies the need for restraint both in digitizing paper records and making decisions about the acquisition of born-digital materials.

While Wolfe, Ham, and Baxter argue for a reconsideration of approach on a theoretical level, others provide less philosophy-shifting ways to create a healthy archival ecology. Both Padfield et al.⁶⁷ and Saie-Belaïsch⁶⁸ discuss the buffering potential found in a full box of paper in that the water content of paper and the bulk of paper-filled boxes create conditions that are slow to react to changes in surrounding temperature and humidity. This means that the simple act of keeping archival boxes full and densely shelved can aid in maintaining a stable climate in the storage rooms. Kosta Ntanos and Sarah VanSnick confirm this in the results from their 2011 project to reduce the amount of energy used at the National Archives of the United Kingdom. By placing environmental data loggers into boxes filled with paper and subjecting them to changes in surrounding relative humidity, they were able to observe this buffering in action. According to their study, papers packed densely inside boxes can take three weeks to match a 10 percent change of relative humidity in the room where they are stored.⁶⁹ This means that filling archival boxes, in addition to using space efficiently and protecting papers from bowing, can permit preservation of materials in less strictly controlled environments.

Dean offers a long list of recommendations for archives, a few of which I will repeat here. He recommends reducing heat by covering east- and west-facing windows to control the infiltration of direct sunlight, as well as planting trees around the building for shade. This echoes the benefits of creating shade as in the practice of building with overhanging eaves referenced by Rowoldt and Hioki. In agreement with Stehkämper's discussion of the benefits of allowing airflow, Dean notes that breezes permitted through south- and north-facing windows, screened against insects and birds, can provide a beneficial increase in air circulation. Stehkämper's ideas about small window size and Hioki's description of windows fitted with filters would also be important factors in using this strategy. Dean suggests using reflective colors on the roof to limit heat absorption. He goes on to offer suggestions for mold and insect infestation, including prevention and treatment.⁷⁰ Although his focus is on sustainable solutions for tropical climates, many are applicable to less hot and humid regions. Most notably, his solutions can be enacted within existing institutions without the need for rebuilding from the ground up.

Other ways to reduce consumption of energy and other resources involve changing the materials used in the archives. Replacing lightbulbs with LEDs, ideally motion or sound activated and programmed to turn off when the space is not occupied, can reduce energy use.⁷¹ Some archives use zoned lighting,

training staff to turn lights off when they are not needed. Replacing disposable gloves with reusable ones decreases archival contributions to landfill,⁷² though it may increase water use in the washing of cotton gloves. Purchasing supplies from local vendors⁷³ not only supports the local economy, but also saves the fuel used in shipping products. These are small changes with the potential to have aggregate impact as more archives adopt them.

It may also be wise for the archivist to avoid trying to become an expert on sustainability when others in the community are prepared to serve in this role. As Ntanos et al. conducted their project at the National Archives of the United Kingdom, they discovered that an unexpected benefit of their work was “a stronger and closer working relationship between staff responsible for the care of the collections and those who manage the estates and facilities.”⁷⁴ Similarly, Abbey promotes the opportunities presented by partnering with green consultants with the goal of producing an institutional culture of sustainability.⁷⁵ By collaborating with experts outside of the archives, archivists can more efficiently meet sustainability goals, contribute knowledge and expertise in the arenas with which they are most well acquainted, and make connections with the wider community, potentially cultivating new allies and advocates.

Eliminating HVAC systems altogether in favor of passive climate control may not be the right step for every institution. Ntanos et al. discovered that they could significantly reduce energy use at the National Archives by seasonally cycling their system. At certain times of the year, the building does not need the HVAC running to maintain necessary temperature and humidity. Working with their facilities managers, they reprogrammed the system accordingly, resulting in an energy savings of 43 percent.⁷⁶ This colossal achievement demonstrates how even a small change can have a significant and long-term impact.

Another investigation into using limited mechanical intervention for air-conditioning comes from Shin Maekawa and Franciza Toledo at the Historic Archive of the Canary Islands.⁷⁷ In this context, the challenge was that heat and humidity threatened to have adverse effects on the preservation of materials, inviting fungal and insect infestation, but the building itself was of historic value, limiting the alterations they could make. Therefore, Maekawa et al. sought to achieve the relative humidity levels necessary to prevent damaging agents without disrupting the building’s structure more than necessary. This was partially achieved by taking advantage of the ways the building design already permitted passive ventilation. They rearranged storage shelving and displays to allow for optimal air flow and strategically installed residential fans and space heaters—with antimicrobial filters—to achieve the necessary balance between temperature and humidity in the various microclimates they discovered in their study of the building. Moreover, these mechanical interventions were set to automatically turn off when necessary levels were reached, thus

reducing the energy they consumed.⁷⁸ Maekawa et al. approached this project strategically, using environmental monitors to learn the climatic patterns of the different spaces in the building. Their solution was tailored to the unique needs determined by the location. They were able to maintain preservation conditions that were also economically and environmentally sustainable.

Further opportunities exist in pursuing costlier and more invasive, but well-studied and supported interventions. LEED (Leadership in Energy and Environmental Design) is a certification program offered by the United States Green Building Council that provides a comprehensive approach to assessing and improving the sustainability of both the physical building and the business practices of the institution. Though not exclusively designed for archives, many archives, libraries, and museums have been certified through the program. Certification requires both the payment of fees and the work to meet identified goals, but the program provides valuable guidance in taking meaningful steps toward sustainability, as well as a certain amount of prestige for the institutions that participate.⁷⁹

Contemporary conversations in building science support the potential for achieving low-energy climate control. Weihong Guo, for example, discusses the ability to learn how to maximize the potential for natural ventilation using computer simulations designed with an understanding of the surrounding environment, building shape, and building envelope.⁸⁰ Computer simulations allow architects to investigate how different configurations of architectural elements will affect natural airflow through the building. Wang Li provides an overview of the history of the green building movement⁸¹ and describes the key elements of environmentally friendly building design with a focus on the importance of designing for the particular natural environment of the building site.⁸² Boris Bielek differentiates between “green” and “low-energy” buildings, calling low-energy buildings a first step.⁸³ “Green buildings” require more rigorous practices, such as saving water and other material resources in addition to energy, relying on renewable sources of energy, and using nontoxic building materials. Bielek also discusses the potential in multilayer wall design.⁸⁴ These studies in the field of building science reveal a dynamic conversation with which archivists can engage, especially when discussing the possibilities of sustainable preservation environments with building managers and architects. It is important to participate in these conversations collaboratively, knowing that architects have one particular area of expertise, as do building managers and archivists. Everyone involved in the conversation must speak from their expertise and be open to the expertise of others. Jeremy Linden emphasizes the importance of this collaboration in a webinar series for the Image Permanence Institute.⁸⁵ Sustainability requires true partnership among everyone involved in caring for the collections and the building that holds them.

Whether preparing to undertake small or large changes toward sustainability, it is important for archives to think strategically, recording goals, creating action plans, and following up with assessments of progress. Without taking these steps, any action will have limited effect and may not be sustainable when confronting changes in leadership and staffing. Proceeding strategically will also make it more likely that achievements can be disseminated for the benefit of the archival profession at large.

Benefits of Sustainability

Sustainability offers benefits for archives on multiple levels. An initial investment can potentially produce long-term financial savings. Money may be saved in reducing monthly energy bills and spending less on the maintenance of a mechanical system.⁸⁶

Examples such as the Historical Archive of the City of Cologne and the Archives of the Imperial Household in Tokyo suggest that a well-designed passive system can be more reliable than a mechanical one. A building designed for climate control and requiring less maintenance than a mechanical system can result in more favorable conditions for preservation. If a mechanical system needs repair, time may lapse between the discovery and correction of the issue. During this lapse, materials are at risk for deterioration. A passive system offers less risk of such a lapse.

The dangers posed to preservation by a not-quite-perfect mechanical system are revealed in Rowoldt's discussion of the Steven Spielberg Jewish Film Archive. When the materials were transferred from the facility where they had been well preserved for twenty-two years to the new modern facility at the Hebrew University of Jerusalem, they found that they had to call on engineers "repeatedly, to help them adjust the temperature and relative humidity (RH) levels."⁸⁷ Every instance in which engineers are called upon to adjust the system represents paid hours and use of resources.

Sustainability can mean being better prepared for natural disasters and other unexpected crises. A long list of events could result in an HVAC system not functioning. These include earthquakes and hurricanes shutting down power grids, as well as financial factors. It is not difficult to imagine a future in which institutions are asked to shut down mechanical systems to save money and energy. In such a future, lacking access to energy sources, archives that have been designed for passive air-conditioning will be better able to endure.

Miriam Centeno of the Mushiboshi Project and Jeremy Linden of Linden Preservation Services, Inc., highlighted this point in the June 25 session of the American Library Association's 2018 Annual Conference, *Preservation Showdown, Environmental Edition*.⁸⁸ Centeno and Linden shared their experiences in Puerto

Rico. Centeno discussed the renovation of the Archivo General (General Archives). Housed in a historic building designed by the Spanish in the colonial period to allow for passive ventilation, the building was retrofitted with the intention of being better able to preserve archival materials. It was sealed, and an HVAC system was installed. In 2008, the HVAC system shut down as a result of the government failing to pay the maintenance contract.⁸⁹ Without either the HVAC system or passive ventilation, the building became toxic and the materials had to be removed.⁹⁰ Linden discussed the situation in Puerto Rican libraries following Hurricane Maria. With power outages across the island, HVAC systems could not run. As a result, buildings sealed to be airtight trapped moisture and grew mold, whereas those that had passive ventilation fared better. Linden further shared that even when archivists and librarians in buildings designed for HVAC opened windows to allow for the free flow of air, as long as they were also able to protect materials from moisture, the materials were less likely to grow mold.⁹¹

In this era of climate crisis, archivists must consider the reality of more frequent extreme weather and natural disasters. This provides two very good reasons to reduce reliance on energy for preserving cultural resources. First, reducing energy consumption, especially by large institutions, is an important factor in slowing climate change. Second, less reliance on energy consumption can mean being better prepared to maintain preservation conditions in the face of a range of possible calamities.

Becoming more sustainable benefits society as a whole and may generate financial benefits for archives while ensuring a more stable preservation environment for archival materials. While it demands an investment of time and money at the outset, the possibility that long-term benefits may outweigh initial costs deserves further study. By committing to sustainable practices, archivists increase the potential for the survival of archives and the materials they hold.

Concerns and Considerations

William P. Lull suggests that high energy use is necessary and justifiable in the care of collections.⁹² He reviews a number of initiatives in cultural heritage institutions that were touted to produce energy savings through the use of daylighting. According to his calculations, changes perceived to result in energy savings may actually bring negative trade-offs that cancel out any benefit from lowering the use of energy. He specifically addresses loss of productivity in sub-optimal climatic conditions⁹³ and the cost of repairing and restoring collections damaged due to suboptimal storage.⁹⁴ He claims that “daylighting rarely works for task lighting” and that it “can often be counter-productive by creating veiling reflections on the task areas.”⁹⁵ He cautions that this can result in a loss of

productivity, though notably, the specific cases he mentions did not include productivity studies. He presents a hypothetical situation to demonstrate the ways in which a financial savings from daylighting can be nullified by the financial losses in diminished productivity. He does not account for the potential positive or negative environmental, social, or cultural impacts in his calculations.⁹⁶ Lull also presents numbers based on the cost of maintaining ideal storage conditions versus the cost of repairing damage to collections, though once again, the examples he provides of institutions adjusting their storage conditions do not detail any damage to collections as a result. His plea for caution is grounded in an assumption that these storage conditions will negatively impact the lifespan of the materials. Lull estimates that, on average, one square foot of stacks can hold materials that “would cost \$2,600 to preserve by reformatting instead of environmental preservation.”⁹⁷ Compared to the potential savings in using less energy for less stringent preservation environments, Lull argues that more stringent preservation environments ultimately save the institution money.⁹⁸ Lull’s argument offers an interesting challenge to the definition of sustainability used throughout this article. While sustainability means balancing needs of both the present and the future, considering economic, environmental, social, and cultural factors, Lull insists that meeting the economic, social, and cultural needs served by our institutions requires the high use of energy. However, the emphasis of the literature introduced thus far has been that excellent preservation is possible while reducing the use of energy and other resources. Lull also makes these arguments prior to developments such as the National Archives demonstrating that allowing its preservation environments to fluctuate seasonally within particular parameters both drastically reduces its energy use and improves preservation conditions such that computer modeling predicts a 20 percent increase in the expected life of the materials.⁹⁹ With the evidence at hand and current concerns about the environmental impact of resource consumption, I cannot agree that the high energy use of archives is a necessity, but it is useful to consider that saving energy is not as simple as turning off the lights. Lull’s descriptions of the potential for sustainable initiatives to fall short of their promise reminds archivists of the complications in implementing more sustainable practices.

Sarah Kim offers an informative discussion of the benefits and risks involved in taking steps toward sustainability. She reviews and builds upon many of the strategies discussed by others. For example, while natural air-conditioning can produce savings when it comes to energy bills, and more certain preservation of materials in the face of mechanical system failures, it can also allow the entrance of humidity and pollutants. Planting trees near an archives building can provide shade and support the maintenance of desired temperature but can also attract insects and animals better kept at a distance from the

facility. Rainwater catchments can create a sustainable water supply but can also create issues of water leakage.¹⁰⁰ Kim concludes, “Benefits and risks of a certain green construction method for archival facilities can be widely different according to the financial situation, the outdoor climate and environmental setting, the unique characteristics of archival holdings, and the mission of individual archives.”¹⁰¹ Understanding the risks and benefits of sustainable preservation practices, and learning how to mitigate the risks, is a critical aspect of taking action responsibly.

Conclusion

If sustainability means “meeting the economic, environmental, social and cultural needs of the present without compromising the same needs of future generations,”¹⁰² archival work already includes consideration of many facets of sustainability. Archivists consider the economic implications of decisions when looking at the potential costs for processing, storing, or digitizing collections. Archivists consider social and cultural needs when appraising the enduring value of a potential donation or engaging in a new outreach endeavor. Archivists even consider environmental factors when it comes to the best conditions for preserving collections. Little in sustainable thinking is unfamiliar to archival practice.

A sustainable approach to preservation requires thinking broadly about environmental factors, in balance with economic, social, and cultural needs. Rather than creating ideal preservation conditions for today, employing any means necessary, archivists must investigate how to create conditions for preservation that can outlast the present day. Based on both current research and the legacy of traditional practices, this may best be achieved by reducing reliance on consumption of energy and other resources and by designing buildings and practices to consume less and reuse more.

Knowing that redesigning buildings is not in every archivist’s future, it is important to consider the myriad ways that archivists can employ sustainable practices, reducing consumption of energy and resources, reducing reliance on oil for fuel and plastics, while still maintaining high-quality and reliable preservation of cultural resources and fulfilling responsibilities to the community now and in the future. Many researchers are working to establish a path for action, with special consideration for the unique needs of archives. From Stehkämper’s and Rowoldt’s investigations of the potential of triple-wall design, to Ham’s, Wolfe’s, and Baxter’s calls to postcustodialism, to Centeno’s and Hioki’s proposals for learning from cultural traditions, there are many opportunities for reimagining practices and taking steps toward becoming more sustainable. The work of Ntanos et al. and Maekawa et al. demonstrates the ways in which even

small changes in practice can significantly impact sustainability efforts, and we can follow the lead of institutions such as Library and Archives Canada and the United States' National Archives.

The information available on both the necessity and practicality of employing sustainable preservation practices raises the question of why more archives are not doing so. The archival community will benefit from more research into best practices for sustainable preservation as well as research into what prevents archivists from taking action in this area. Linden acknowledges that the feasibility of creating sustainable preservation conditions requires more study and remains an area of some contention.¹⁰³ While doubt persists about whether passive climate control and other sustainable methods can meet preservation needs, additional barriers may inhibit changes to archival practice. Habit can play an important role, as can time, money, and knowledge. Learning and implementing new approaches requires time to study and practice new methods; money for education, materials, and salaries; and, ultimately, knowledge about what to do. Lacking any one of these factors results in continuing to do what seems to have been working all along.

The majority of this article focuses on literature written by archivists in consideration of archival collections. However, as the world at large is grappling with the issue of sustainability, much additional wisdom can be gained from the work of other cultural institutions, as well as the potential to enact greener office practices alongside the changes to preservation practices in our storage areas.

Archival work demands consideration of the future, and, therefore, thinking in terms of sustainability is not new. The more sustainable the practice, the better archivists will succeed in preserving materials and serving future generations. Opportunities for action abound, and new studies are in progress. Even a small step forward creates momentum in the right direction.

NOTES

¹ Society of American Archivists, "SAA Core Values Statement and Code of Ethics," <https://www2.archivists.org/statements/saa-core-values-statement-and-code-of-ethics>.

² Society of American Archivists, "SAA Core Values Statement and Code of Ethics."

³ Jessica Phillips, "A Defense of Preservation in the Age of MPLP," *American Archivist* 78, no. 2 (2015): 478, doi.org/10.17723/0360-9081.78.2.470.

⁴ "Our Common Future, Chapter 2: Towards Sustainable Development" (United Nations), 2019, <http://un-documents.net/ocf-02.htm>.

⁵ Heidi N. Abbey, "The Green Archivist: A Primer for Adopting Affordable, Environmentally Sustainable, and Socially Responsible Archival Management Practices," *Archival Issues* 34, no. 2 (2012): 92, <http://digital.library.wisc.edu/1793/72389>.

⁶ Michele F. Pacifico and Thomas P. Wilsted, eds., *Archival and Special Collections Facilities: Guidelines for Archivists, Librarians, Architects, and Engineers* (Chicago: Society of American Archivists, 2009).

⁷ Scott C. Teixeira, "Building Site," in *Archival and Special Collections Facilities: Guidelines for Archivists, Librarians, Architects, and Engineers* (Chicago: Society of American Archivists, 2009), 14.

- ⁸ Michele Pacifico, personal communication with author, January 2, 2020.
- ⁹ Abbey, "The Green Archivist," 92.
- ¹⁰ Jeremy Linden, "Becoming Sustainable: Real World Approaches" (October 14, 2015), <https://www.youtube.com/watch?v=QENlb1YaWiE&feature=youtu.be&hd=1>.
- ¹¹ Plenary, "Plenary Consortium to Preserve Canada's Heritage in Iconic New Building" (June 18, 2019), <https://plenarygroup.com/news-and-media/news/2019/plenary-consortium-to-preserve-canadas-heritage-in-iconic-new-building>.
- ¹² Dees Stribling, "San Diego County Building the Nation's First Zero Net Energy Archive," Bisnow, December 6, 2018, <https://www.bisnow.com/san-diego/news/sustainability/san-diego-county-building-the-nations-1st-zero-net-energy-archive-95718>.
- ¹³ National Archives, "Sustainability Plan," last modified September 12, 2016, <https://www.archives.gov/about/plans-reports/sustainability>.
- ¹⁴ Smithsonian, "Sustainability," https://www.sifacilities.si.edu/ae_center/design-sustainability.html.
- ¹⁵ Mark Ormsby, *Going Green at NARA: Realizing Preservation Goals and Energy Savings*, Preservation EXPOsed (National Archives and Records Administration, 2013), YouTube, <https://www.youtube.com/watch?v=K-u4YqoF9k8>.
- ¹⁶ Pacifico and Wilsted, *Archival and Special Collections Facilities*, 6.
- ¹⁷ Hugo Stehkämper, "'Natural' Air Conditioning of Stacks," *Restaurator* 9, no. 4 (1988): 163–77, doi.org/10.1515/rest.1988.9.4.163.
- ¹⁸ Stehkämper, "'Natural' Air Conditioning of Stacks," 168.
- ¹⁹ Stehkämper, "'Natural' Air Conditioning of Stacks," 168.
- ²⁰ Stehkämper, "'Natural' Air Conditioning of Stacks," 168.
- ²¹ Stehkämper, "'Natural' Air Conditioning of Stacks," 168.
- ²² France Saïe-Belaïsch, "Sustainable Development and Archives Buildings in France," *International Preservation News*, no. 44 (2008): 11.
- ²³ Lisbit Bailey, personal communication with author, July 25, 2018.
- ²⁴ Tim Padfield and Poul Klens Larsen, "Low Energy Air-Conditioning of Archives," *Journal of the Society of Archivists* 27, no. 2 (2006): 213, doi.org/10.1080/00379810601101293.
- ²⁵ Sarah Kim, "Green Archives: Applications of Green Construction to Archival Facilities," *The Primary Source* 28, no. 1 (2009): 3, doi.org/10.18785/ps.2801.03.
- ²⁶ Kazuko Hioki, "From Japanese Tradition: Is Kura a Model for a Sustainable Preservation Environment?," in *From Gray Areas to Green Areas: Developing Sustainable Practices in Preservation Environments Symposium Proceedings*, ed. Melissa Tedone (Austin: University of Texas, September 2008), 7.
- ²⁷ Stehkämper, "'Natural' Air Conditioning of Stacks," 168–70.
- ²⁸ Sandra Rowoldt, "Going Archival Green: Implications of Doing It Naturally in Southern African Archives and Libraries," *South African Journal of Library & Information Science* 66, no. 4 (1998): 144, doi.org/10.7553/66-4-1425.
- ²⁹ Rowoldt, "Going Archival Green," 144.
- ³⁰ Rowoldt, "Going Archival Green," 144–45.
- ³¹ Rowoldt, "Going Archival Green," 145.
- ³² Rowoldt, "Going Archival Green," 146.
- ³³ Rowoldt, "Going Archival Green," 146.
- ³⁴ Rowoldt, "Going Archival Green," 145.
- ³⁵ Stehkämper, "'Natural' Air Conditioning of Stacks," 166.
- ³⁶ John F. Dean, "Environment and Passive Climate Control Chiefly in Tropical Climates," *Preservation and Conservation Workshop* (presented at 68th IFLA Council and General Conference, Glasgow, Scotland, 2002), 3.
- ³⁷ Whole Building Design Guide, National Institute of Building Sciences, "HVAC System Design for Humid Climates," <https://www.wbdg.org/resources/hvac-system-design-humid-climates>.
- ³⁸ Miriam Centeno, "Following the Practice of Mushiboshi or 'Drying Bugs': Why Airing out Your Dirty Laundry Can Lead to Good Preservation Practices," *Ideals* (2014), <https://www.ideals.illinois.edu/handle/2142/55795>.

- 39 Miriam Centeno, Jeremy Suratt, Heather Weltin, Jeremy Linden, and Kara McClurken, "Preservation Showdown: Environmental Edition" (panel discussion, June 25, 2018).
- 40 Centeno, "Following the Practice of Mushiboshi or 'Drying Bugs.'"
- 41 Centeno, "Following the Practice of Mushiboshi or 'Drying Bugs.'"
- 42 Julie H. Case, "These Portuguese Libraries Are Infested with Bats—and They Like It That Way," *Smithsonian Magazine*, June 7, 2018, <https://www.smithsonianmag.com/travel/these-portuguese-libraries-are-infested-batsand-they-it-way-180969276>.
- 43 Centeno, "Following the Practice of Mushiboshi or 'Drying Bugs.'"
- 44 Rowoldt, "Going Archivaly Green," 145.
- 45 Hioki, "From Japanese Tradition: Is Kura a Model for a Sustainable Preservation Environment?"
- 46 Hioki, "From Japanese Tradition: Is Kura a Model for a Sustainable Preservation Environment?," 1–2.
- 47 Hioki, "From Japanese Tradition: Is Kura a Model for a Sustainable Preservation Environment?," 2.
- 48 Hioki, "From Japanese Tradition: Is Kura a Model for a Sustainable Preservation Environment?," 3.
- 49 Hioki, "From Japanese Tradition: Is Kura a Model for a Sustainable Preservation Environment?," 10.
- 50 Centeno, "Following the Practice of Mushiboshi or 'Drying Bugs.'"
- 51 Mark Wolfe, "Beyond 'Green Buildings': Exploring the Effects of Jevons' Paradox on the Sustainability of Archival Practices," *Archival Science* 12, no. 1 (2012): 41, doi.org/10.1007/s10502-011-9143-4.
- 52 Wolfe, "Beyond 'Green Buildings,'" 44.
- 53 Wolfe, "Beyond 'Green Buildings,'" 45.
- 54 Terry Baxter, "Measurable Impacts of Recordkeeping on the Environment," paper presented at the Annual Meeting of the Northwest Archivists, Corvallis, Oregon, 2002, http://web.archive.org/web/2018101123356/http://lib.org/progarchs/pdf/sustainable_archives.pdf.
- 55 Wolfe, "Beyond 'Green Buildings,'" 45.
- 56 Wolfe, "Beyond 'Green Buildings,'" 46.
- 57 Wolfe, "Beyond 'Green Buildings,'" 36.
- 58 F. Gerald Ham, "The Archival Edge," *American Archivist* 38, no. 1 (1975): 7, doi.org/10.17723/aarc.38.1.7400r86481128424.
- 59 F. Gerald Ham, "Archival Strategies for the Post-Custodial Era," *American Archivist* 44, no. 3 (1981): 207, doi.org/10.17723/aarc.44.3.6228121p01m8k376.
- 60 Ham, "Archival Strategies for the Post-Custodial Era," 211.
- 61 Ham, "Archival Strategies for the Post-Custodial Era," 212.
- 62 Wolfe, "Beyond 'Green Buildings,'" 36.
- 63 Wolfe, "Beyond 'Green Buildings,'" 44.
- 64 Wolfe, "Beyond 'Green Buildings,'" 41.
- 65 Keith L. Pendergrass et al., "Toward Environmentally Sustainable Digital Preservation," *American Archivist* 82, no. 1 (2019): 174, doi.org/10.17723/0360-9081-82.1.165.
- 66 Baxter, "The Measurable Impact of Recordkeeping on the Environment."
- 67 Padfield and Larsen, "Low Energy Air-Conditioning of Archives," 214.
- 68 Saïe-Belaïsch, "Sustainable Development and Archives Buildings in France," 7.
- 69 Kostas Ntanos and Sarah VanSnick, "Understanding the Environment in an Archive Store," *International Preservation News*, no. 55 (2011): 15–20.
- 70 Dean, "Environment and Passive Climate Control Chiefly in Tropical Climates."
- 71 Abbey, "The Green Archivist," 106.
- 72 Abbey, "The Green Archivist," 106.
- 73 Abbey, "The Green Archivist," 101.
- 74 Ntanos and VanSnick, "Understanding the Environment in an Archive Store," 20.
- 75 Abbey, "The Green Archivist," 107.

- ⁷⁶ Ntanos and VanSnick, "Understanding the Environment in an Archive Store."
- ⁷⁷ Shin Maekawa and Franciza Toledo, "Sustainable Climate Control for Historic Buildings in Hot and Humid Regions," *International Preservation News*, no. 44 (2008): 24–29.
- ⁷⁸ Maekawa and Toledo, "Sustainable Climate Control for Historic Buildings in Hot and Humid Regions," 24–29.
- ⁷⁹ US Green Building Council, "LEED Rating System," <https://new.usgbc.org/leed>.
- ⁸⁰ Weihong Guo, Xiao Liu, and Xu Yuan, "Study on Natural Ventilation Design Optimization Based on CFD Simulation for Green Buildings," *Procedia Engineering* 121 (2015): 573–81, <https://doi.org/10.1016/j.proeng.2015.08.1036>.
- ⁸¹ Li Wang, "A Study on Building Energy Efficiency and Green Building," *Advanced Materials Research* 724–25 (2013): 1808, doi.org/10.4028/www.scientific.net/AMR.724-725.1608.
- ⁸² Wang, "A Study on Building Energy Efficiency and Green Building," 1611–12.
- ⁸³ Boris Bielek, "Green Building—Towards Sustainable Architecture," *Applied Mechanics and Materials* 824 (2016): 755, doi.org/10.4028/www.scientific.net/AMM.824.751.
- ⁸⁴ Bielek, "Green Building—Towards Sustainable Architecture," 758.
- ⁸⁵ Linden, "Becoming Sustainable: Real World Approaches."
- ⁸⁶ Stehkämper, "'Natural' Air Conditioning of Stacks," 173.
- ⁸⁷ Rowoldt, "Going Archivaly Green," 144.
- ⁸⁸ Centeno et al., "Preservation Showdown: Environmental Edition."
- ⁸⁹ "En peligro de extinción el Archivo General," *El Nuevo Día*, November 22, 2008, <https://www.elnuevodia.com/noticias/locales/nota/enpeligrodeextincionelarchivogeneral-493864>.
- ⁹⁰ Centeno et al., "Preservation Showdown: Environmental Edition."
- ⁹¹ Centeno et al., "Preservation Showdown: Environmental Edition."
- ⁹² William P. Lull, "Everything Old Is New Again: What Works, What Does Not Work," in *From Gray Areas to Green Areas: Developing Sustainable Practices in Preservation Environments Symposium Proceedings*.
- ⁹³ Lull, "Everything Old Is New Again," 3.
- ⁹⁴ Lull, "Everything Old Is New Again," 4–5.
- ⁹⁵ Lull, "Everything Old Is New Again," 2.
- ⁹⁶ Lull, "Everything Old Is New Again," 3.
- ⁹⁷ Lull, "Everything Old Is New Again," 4.
- ⁹⁸ Lull, "Everything Old Is New Again," 5.
- ⁹⁹ Ormsby, *Going Green at NARA: Realizing Preservation Goals and Energy Savings*.
- ¹⁰⁰ Kim, "Green Archives," 3–4.
- ¹⁰¹ Kim, "Green Archives," 5.
- ¹⁰² Abbey, "The Green Archivist," 92.
- ¹⁰³ Centeno et al., "Preservation Showdown: Environmental Edition."

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