

CRITICAL EVALUATION OF SUSTAINABLE MONITORING IN PHILADELPHIA  
MUSEUMS

By

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## ABSTRACT

Sustainability needs to be a prioritization of museum maintenance moving forward in order to protect cultural heritage, the structure of the museum, and its integrity. This means being aware of and improving upon shortcomings that prevent museums from being sustainable. This work acts as a case study for evaluating the extent to which museums in Philadelphia meet sustainable goals outlined by an Environmental, Social, and Governance (ESG) investment framework. While the word sustainability is commonly associated with the environment, various social and administrative assets are also considered in evaluating how each museum interacts positively (or negatively) with its community, which ultimately contributes to museum longevity. These data are evaluated by in-person museum visits, where monitoring is performed based on an ESG-based sustainability metric checklist. As a result of this monitoring, it can be inferred that some museums operate more sustainably than others, though there is great variation in performance aspects. Even if some museums have shortcomings in some metrics but strengths in others, Philadelphia museums must be aware of and respond to sustainable needs, especially to protect both cultural heritage and the visitor audience. Many of the weaknesses these museums face rely on lack of transparency in interpersonal relations with societal and political stances as well as data clearance; in addition, many systems infrastructures should be upgraded, especially since emissions and energy data are not available to analyze.

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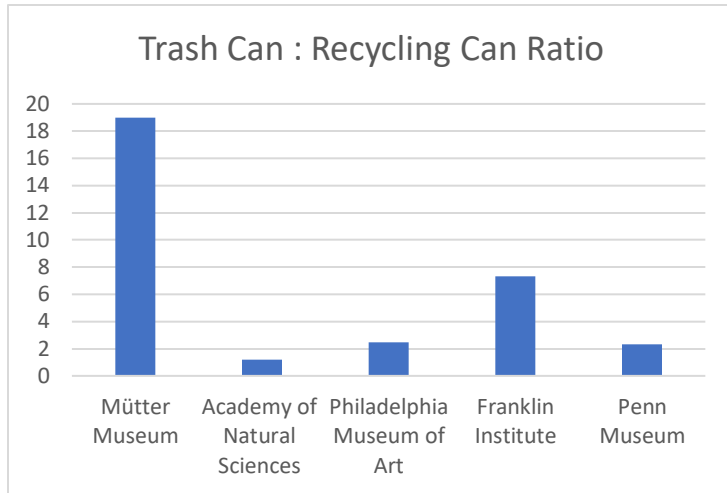
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Figure 1. A schematic which represents ESGs in three categories: environmental, social, and governance.

Waste Equality	
Museum	Trash Can : Recycling Can Ratio
Mütter Museum	19
Academy of Natural Sciences	1.2
Philadelphia Museum of Art	2.5
Franklin Institute	7.3
Penn Museum	2.3



a.

b.

Table 1 (a). A table demonstrating the waste equality between trash cans and recycling bins.

Figure 2 (b). A bar chart signaling the disparities between trash cans and recycling cans in Philadelphia museums.

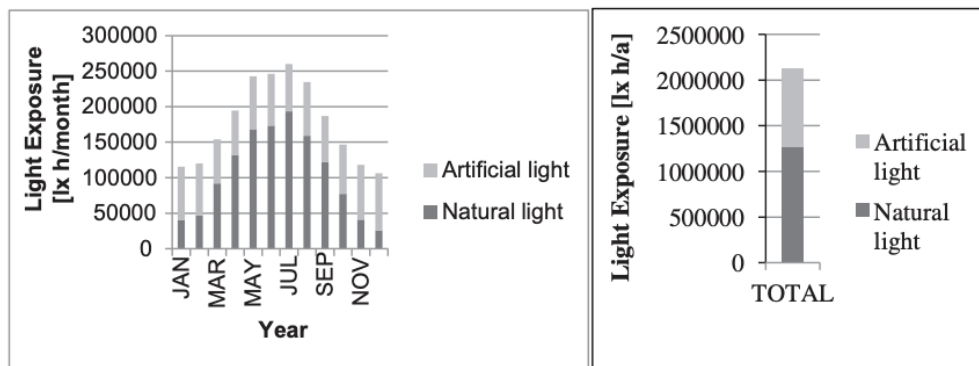


Figure 3. Monthly and Annual internal exposure [lx h] in a 2012-2013 case study for illuminance measurements in a German fine arts museum (T. De Graaf et al. 2014, 32).

<b>Food Packaging</b>					
Museum	Minimal Packaging? (7.3)	Biodegradable Materials? (7.5)	Made from recycled material? (7.6)	Recycling options in food hall? (7.7)	Use by dates readily visible? (7.10)
Philadelphia Museum of Art	No	Yes	Yes	Yes	No
Franklin Institute	No	No	Yes	Yes	No
Penn Museum	No	Yes	Yes	Yes	No

Table 2. Outline of several food packaging criteria per three museums that offered food and beverage.

<b>Products Packaging</b>				
Museum	Minimal Packaging? (8.2)	Recycling options for packaging? (8.4)	Are goods made of recyclable material? (8.6)	Are price tags made of recyclable material? (8.7)
Mütter Museum	No	Yes	Yes	Yes
Academy of Natural Sciences	No	Yes	Yes	Yes
Philadelphia Museum of Art	No	Yes	Yes	Yes
Franklin Institute	Yes	Yes	Yes	Yes
Penn Museum	No	Yes	No	Yes

Table 3. Outline of several products packaging criteria for gift shop goods.

<b>Covid-19 New Enforced Safety Protocols Beginning 2020-2021</b>					
	Mütter Museum	Academy of Natural Sciences	Philadelphia Museum of Art	Franklin Institute	Penn Museum
Face Coverings	Yes	Yes	Yes	Yes	Yes
Social Distancing	Yes	Yes	Yes	Yes	Yes
Hand Sanitizer Installment	Yes	Yes	Yes	Yes	Yes
Reduced Capacity	Yes	Yes	Yes	Yes	Yes
Timed Tickets	Yes	Yes	Yes	Yes	Yes
No-Touch Temperature Scanning	No	No	Yes	Yes	No
Streamlined Spaces	No	No	Yes	Yes	Yes
Daily Cleaning Protocols	No	Yes	Yes	Yes	Yes
Plexiglass Partitions	No	Yes	Yes	Yes	No
Proof of Vaccination	No	No	No	No	Yes
Reduced Hours	No	Yes	Yes	Yes	Yes

Table 4. A comprehensive yes/no list of enforced safety protocols at the height of the COVID-19 pandemic.

<b>Covid-19 Current Enforced Safety Protocols (2024)</b>					
	<b>Mütter Museum</b>	<b>Academy of Natural Sciences</b>	<b>Philadelphia Museum of Art</b>	<b>Franklin Institute</b>	<b>Penn Museum</b>
Face Coverings	No	No	No	No	No
Social Distancing	No	No	No	No	No
Hand Sanitizer Installment	Yes	Yes	Yes	Yes	Yes
Reduced Capacity	Yes	No	No	No	No
Timed Tickets	Yes	Yes	No	No	No
No-Touch Temperature Scanning	No	No	No	No	No
Streamlined Spaces	No	Yes	Yes	Yes	Yes
Daily Cleaning Protocols	Yes	Yes	Yes	Yes	Yes
Plexiglass Partitions	No	Yes	No	No	No
Proof of Vaccination	No	No	No	No	No
Reduced Hours	No	No	No	No	No

Table 5. A comprehensive yes/no list of currently enforced safety protocols near the end of the COVID-19 pandemic (2024).

<b>Health and Safety</b>						
<b>Museum</b>	<b>No. Fire Extinguishers (14.1)</b>	<b>No. Hand Sanitizer Stations (14.2)</b>	<b>No. elevators (14.4)</b>	<b>Available wheelchairs? (14.6)</b>	<b>Sq ft</b>	<b>No. Visitors</b>
Mütter Museum	10	10	1	no	15,072	130,000
Academy of Natural Sciences	16	13	2	yes	53,000	200,000
Philadelphia Museum of Art	17	4	4	yes	633,825	800,000
Franklin Institute	14	8	4	yes	400,000	1,000,000
Penn Museum	15	14	4	yes	300,000	180,000

Table 6. Outline of quantifications representing various aspects of health and safety regulations.

Number of Toilets and Sinks per Museum/Visitor/Sq Ft/Year					
Museum	Number of Toilets (including men's, women's, and gender neutral) (12.1)	Number of Sinks (including men's, women's, and gender neutral) (12.2)	Visitor/Sq Ft/Year	Toilet/Visitor/Sq Ft/Year	Sink/Visitor/Sq Ft/Year
Mütter Museum	12	11	8.625265393	1.391261538	1.27532308
Academy of Natural Sciences	26	22	3.773584906	6.89	5.83
Philadelphia Museum of Art	109	47	2.319148936	47	20.266055
Franklin Institute	55	27	2.037037037	27	13.2545455
Penn Museum	50	38	1.315789474	38	28.88

Table 7. A table of quantities and ratios tracking the distribution of toilets and sinks per visitor/sq/ft/year.

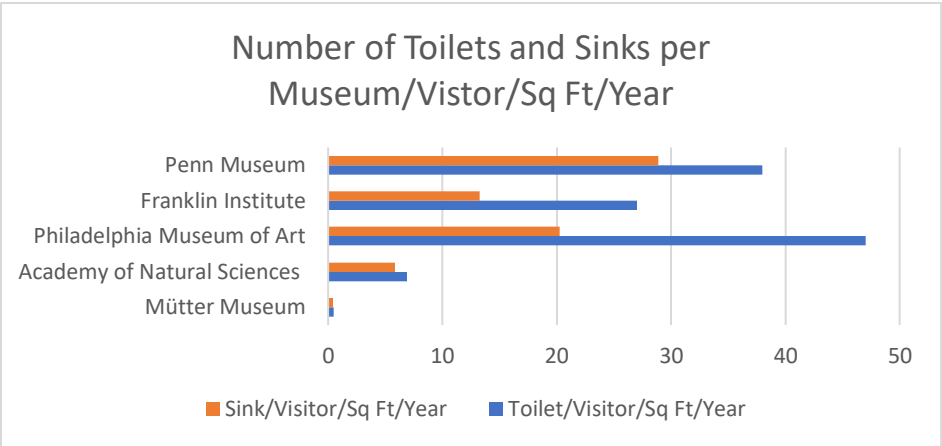


Figure 4. A visual representation of the accessibility of toilets and sinks.

Visitors/Sq Ft/Year			
Museum	Visitors/year	Sq ft	Visitor/Sq Ft/Year
Mütter Museum	130,000	15,072	8.625265393
Academy of Natural Sciences	200,000	53,000	3.773584906
Philadelphia Museum of Art	800,000	633,825	1.262178046
Franklin Institute	1,000,000	400,000	2.5
Penn Museum	180,000	300,000	0.6

Table 8. Derivation of the Visitor/Sq/Year values.



<b>Mütter Museum Operating Revenue FY22</b>	
<b>Operating Revenue</b>	<b>FY 2022</b>
Contributions and Grants	2068298
Fellowship Dues	315842
Investment Income/Loss (Net)	-4097168
Museum Admission and Store/Library Services	2996975
Rental Income/Other	1047014
<b>Total</b>	<b>2330861</b>

Table 9. An overview of the Mütter Museum’s Operating Revenues in \$USD for FY22.

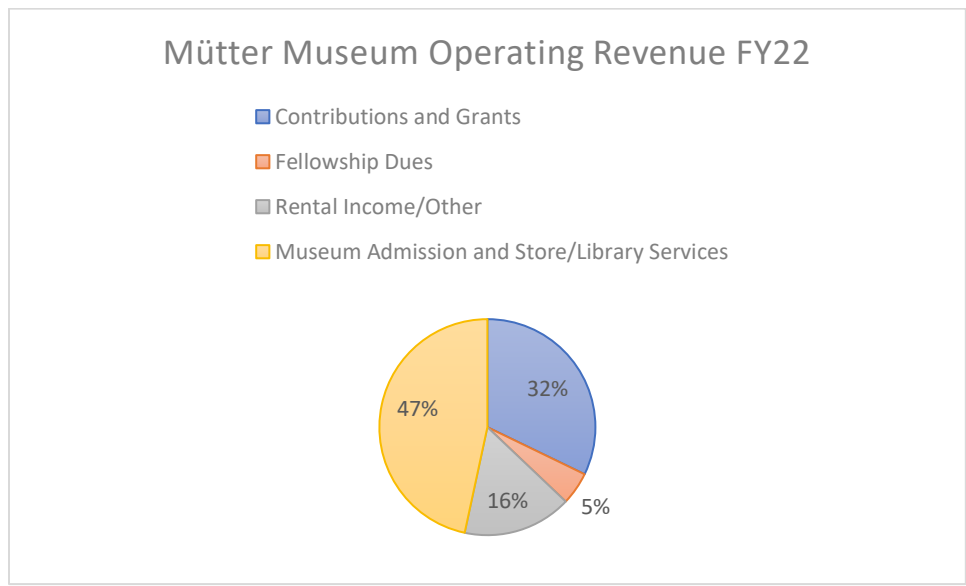


Figure 5. An overview of the Mütter Museum’s Operating Revenues in \$USD for FY22. The pie chart shows a distribution of the percentages of each contributing income, highlighting museum admission.

Academy of Natural Sciences Operating Revenue FY22	
Operating	FY 2022
Grants and contracts	6414000
Contributions	3367000
Allocation of endowment spending from financial capital	3742000
Investment Income, net	371000
Auxiliary Enterprises	1407000
Other Income	6166000
Total revenues and releases	21467000

Table 10. An overview of the Academy of Natural Science’s Operating Revenues in \$USD for FY22.

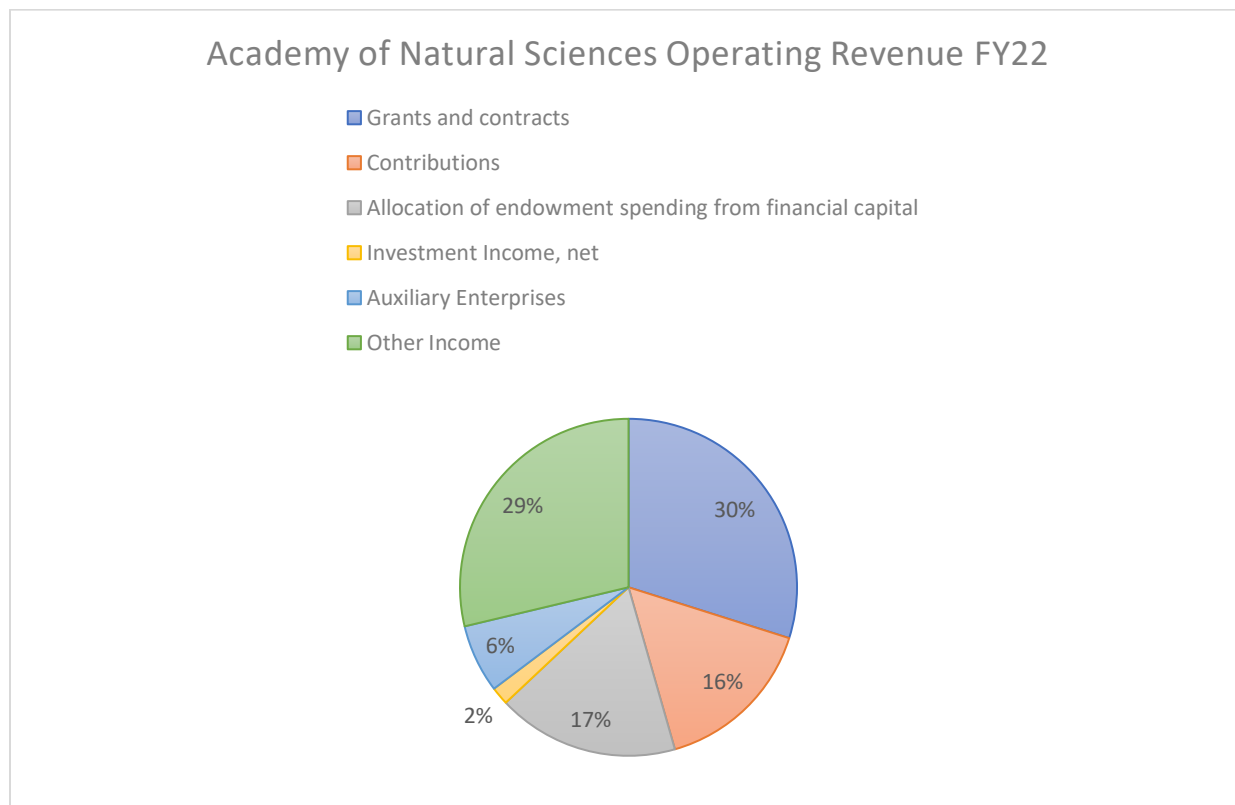


Figure 6. An overview of the Academy of Natural Science’s Operating Revenues in \$USD for FY22. The pie chart shows a distribution of the percentages of each contributing income. Museum admission is not outlined.

Philadelphia Museum of Art Operating Revenue and Support FY22	
Operating Revenue and Support	FY 2022
Endowment, trusts, and estates income	26912181
Contributions and grants	10290191
Memberships	4075326
Admissions	5317092
Retail Sales	3035500
Funding provided for operations	2040000
Value of utilities provided	3686996
Other revenue and support	3399702
Net assets released from restrictions to fund operating expenses	-
<b>Total</b>	<b>58756988</b>

Table 11. An overview of the Philadelphia Museum of Art’s Operating Revenues and Support in \$USD for FY22.

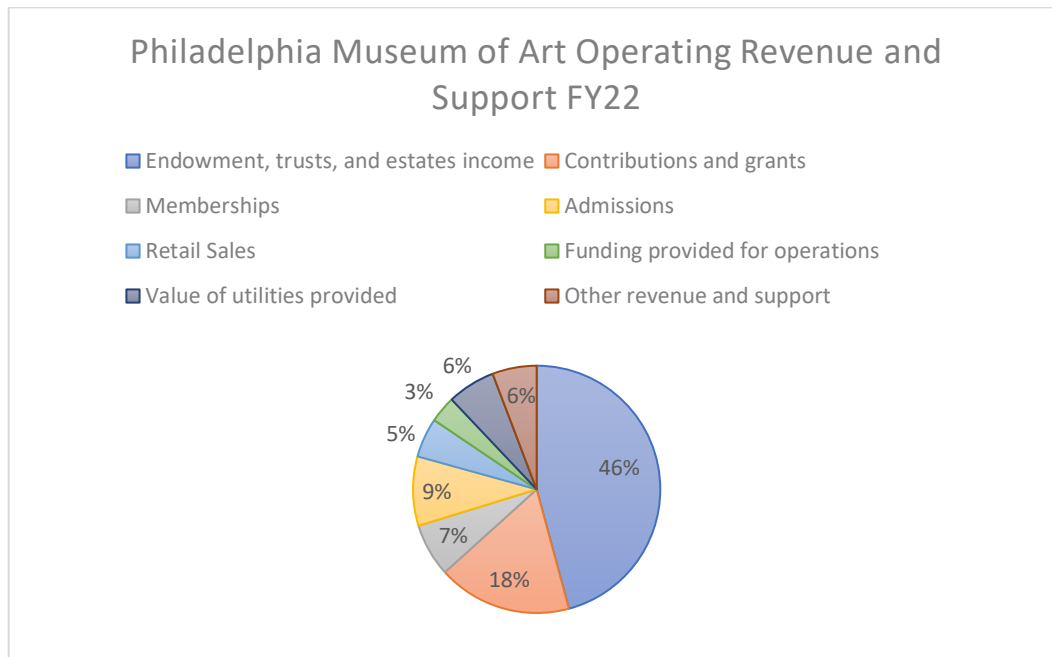


Figure 7. An overview of the Philadelphia Museum of Art’s Operating Revenues in \$USD for FY22. The pie chart shows a distribution of the percentages of each contributing income. Museum admission is noted at a 9% contribution.

Franklin Institute Revenue FY22	
Revenue	FY 2022
Contributions and grants	11662555
Program service revenue	21937448
Investment income	1893222
Other revenue	550089
Total revenue	36043314

Table 12. An overview of the Franklin Institute’s Revenue in \$USD for FY22.

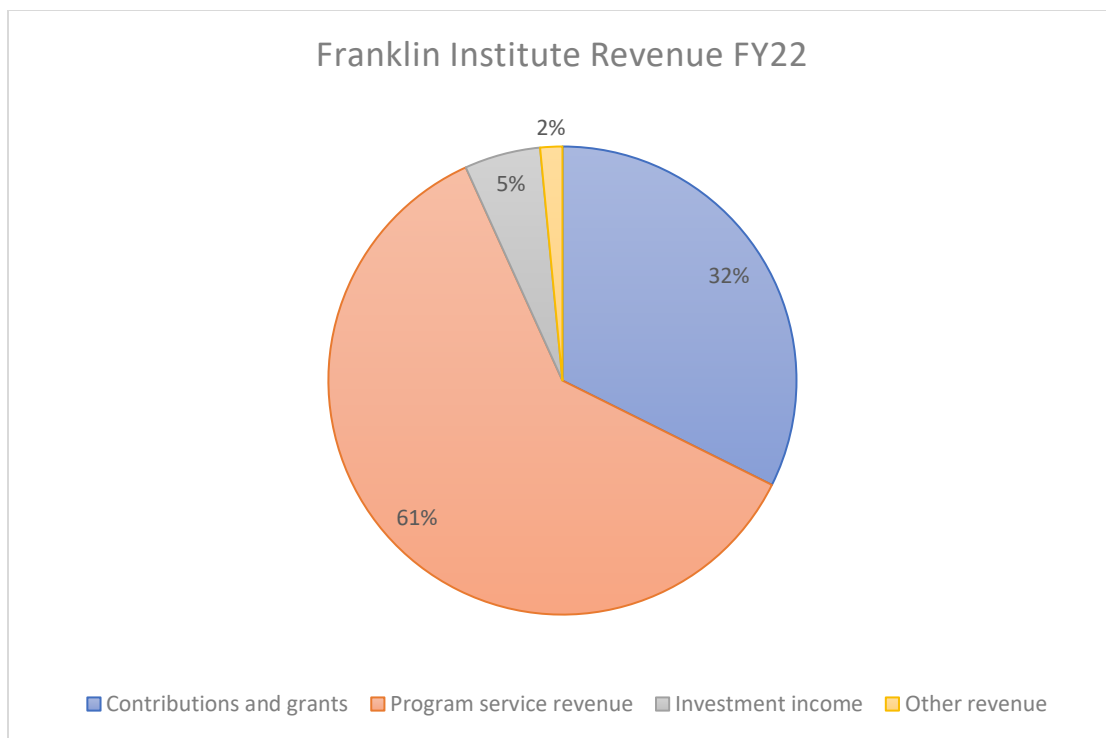


Figure 8. An overview of the Franklin Institute’s Revenue in \$USD for FY22. The pie chart shows a distribution of the percentages of each contributing income. Museum admission is not included in the budget.

Penn Museum Revenue FY19	
Source	FY19
Investment Income	\$5,032,623
Gift Income	\$7,564,342
Sponsored Program Revenue	\$679,705
University Subvention	\$9,636,000
Earned Revenue and Resource Transfers	\$1,542,965
<b>Total Revenue</b>	<b>\$24,782,635</b>

Table 13. An overview of the Penn Museum’s Revenue in \$USD for FY19.

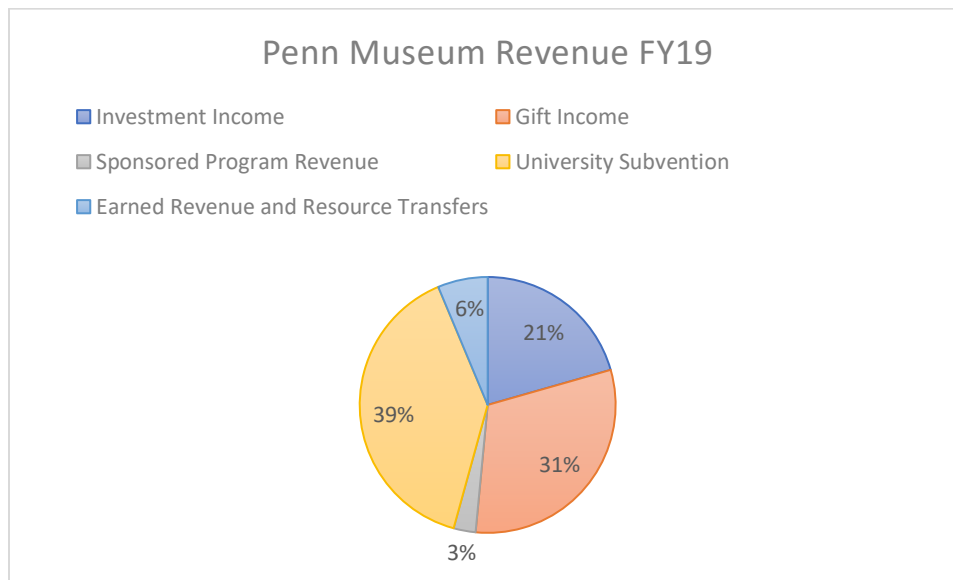


Figure 9. An overview of the Penn Museum’s Revenue in \$USD for FY19. The pie chart shows a distribution of the percentages of each contributing income. Museum admission is not included in the budget.

General Entry Fees (In \$ USD)					
Museum	Child	Military	Student	Adult	Senior
Mütter Museum	15	18	15	20	18
Academy of Natural Sciences	23	24	24	27	24
Philadelphia Museum of Art			14	30	28
Franklin Institute	21			25	
Penn Museum	13		13	18	16

Table 14. General Entry Fees for museums.

$$\begin{aligned} \Pi_{\text{admission}} &= P_a A_l + m(P_s S_l + P_r R_l) - C \\ \Pi_{\text{free}} &= (0)A_h + m(P_s S_h + P_r R_h) - \tilde{C} \end{aligned} \quad (1)$$

Where

- $P_a$  = admission fee
- $A_l, A_h$  = low and high elasticity attendance, respectively
- $m$  = profit margin in the shop and restaurant
- $P_s$  = shop price (a composite price)
- $P_r$  = restaurant price (a composite price)
- $S_l, S_h$  = low and high elasticity shop sales (a composite quantity)
- $R_l, R_h$  = low and high elasticity restaurant sales (a composite quantity)
- $C$  = operating costs on normal days
- $\tilde{C}$  = operating costs on free days

Figure 10. Two models for optimal admission fee pricing based on admission days and free admission days (Steiner 1997, 310).

Mütter Museum Discounted Rates	
PA ACCESS Card	Admission for tickets up to 4 people at \$2 each with PA ACCESS card and photo ID (sponsored by Art Reach)
One Ticket, Two Museums	A ticket can be purchased at a discounted rate to gain entry to both the Mütter Museum and the Penn Museum.
Library Partner Pass	Free admission to those with select library memberships and a Library Partner Pass.

Table 15. Entry fee discounts for the Mütter Museum.

<b>Academy of Natural Sciences Discounted Rates</b>	
STAMP Pass	Any Philadelphia high school student can enter for free with high school ID (sponsored by Art Reach).
Philadelphia CityPASS	CityPASS tickets save up to 47% on admission to either 3, 4, or 5 attractions (including the Franklin Institute) over a 9 day period
The Philadelphia Pass	Discounted rates for Philadelphia Pass users holding a valid pass.
Association of Science-Technology Centers	Free admission for those affiliated with another science or technology museum outside of Philadelphia with the ASTC Passport Program.
PA ACCESS Card	Admission for tickets up to 4 people at \$2 each with PA ACCESS card and photo ID (sponsored by Art Reach)
Online Purchase Tickets	Save \$2 on each ticket when purchased online.
DrexelCard Holders	Free admission is offered with those who hold DrexelCards.
After 3 p.m. Admissions	\$10 admission per person after 3 p.m. on weekdays only.
SEPTA Key Perks	\$4 off general admission using promo code #septa when purchasing tickets online.

Table 16. Entry fee discounts for the Academy of Natural Sciences.

<b>Philadelphia Museum of Art Discounted Rates</b>	
Pay What You Wish	First Sunday of the Month (10:00 am - 5:00 pm) and every Friday night (5:00 pm - 8:45 pm)
Free Admission for PA ACCESS & EBT Cardholders	Free admission for 4 adults with PA ACCESS card (sponsored by Art Reach) or EBT card (sponsored by Museums for All) and photo ID
Free Summer Admission for Military Personnel	Active-duty military personnel and families receive free admission from Armed Forces Day through Labor Day (sponsored by Blue Star Museums)
Membership Rates with Reciprocal Museums	Members belonging to a reciprocal/partnering museum can enter for free by showing a membership card or verifying their membership status.
SEPTA Key Perks	\$2 off up to four adult general admission when presenting valid SEPTA Key card

Table 17. Entry fee discounts for the Philadelphia Museum of Art.

<b>Franklin Institute Discounted Rates</b>	
Special Group Pricing	Discounted rates for groups of 15 or more.
Philadelphia CityPASS	CityPASS tickets save up to 47% on admission to either 3, 4, or 5 attractions (including the Franklin Institute) over a 9 day period
Free Admission for Teachers	Free admission on next visit with an Educator Pass Request Form.
PA ACCESS Card	Admission for tickets up to 4 people at \$2 each with PA ACCESS card and photo ID (sponsored by Art Reach)
STAMP Pass	Any Philadelphia high school student can enter for free with high school ID (sponsored by Art Reach).

Table 18. Entry fee discounts for the Franklin Institute.

<b>Penn Museum Discounted Rates</b>	
PennCard holders	Free admission is offered for those who hold PennCards.
Free Admission for Active U.S. military personnel and veterans	Free admission for those who hold these statuses and a corresponding ID.
Free Admission for Teachers	Free admission for those who hold this status and a corresponding ID.
\$2 Admission for PA ACCESS & EBT Cardholders	\$2 admission for 4 adults with PA ACCESS card (sponsored by Art Reach) or EBT card (sponsored by Museums for All) and photo ID
Free Admission for Teens	Teens (13-19) Tuesday-Friday, 3:00-5:00 pm; all day Saturday-Sunday, 10:00 am-5:00 pm. Walk up and mention birthdate, zip code, and the school you attend.
Free Admission for College Students	College students Tuesday-Friday, 3:00-5:00pm. Walk up and show your college ID.
One Ticket, Two Museums	A ticket can be purchased at a discounted rate to gain entry to both the Mütter Museum and the Penn Museum.
SEPTA Key Perks	\$2 off admission when presenting valid SEPTA Key card
Community Library Pass	Complimentary admission for 2 adults and children under 18 upon presenting the Community Library Pass.

Table 19. Entry fee discounts for the Penn Museum.

<b>Mission Statements of Philadelphia Museums</b>		
Museum	Statement	Source
Mütter Museum	"America's finest museum of medical history, the Mütter Museum displays its beautifully preserved collections of anatomical specimens, models, and medical instruments in a 19th-century "cabinet museum" setting. The museum helps the public understand the mysteries and beauty of the human body and to appreciate the history of diagnosis and treatment of disease."	(Mütter Museum "About" 2023)
Academy of Natural Sciences	"The Academy of Natural Sciences of Drexel University advances research, education, and public engagement in biodiversity and environmental science. The Academy also has an explicit goal to promote positive human impacts through the communication and application of rigorous science."	(ANS "Where We Stand" 2018)
Philadelphia Museum of Art	"The Philadelphia Museum of Art—in partnership with the city, the region, and art museums around the globe—seeks to preserve, enhance, interpret, and extend the reach of its great collections in particular, and the visual arts in general, to an increasing and increasingly diverse audience as a source of delight, illumination, and lifelong learning."	(PMA "About Us" 2024)
Franklin Institute	"In the spirit of inquiry and discovery embodied by Benjamin Franklin, the mission of The Franklin Institute is to inspire a passion for learning about science and technology."	(Franklin Institute "Mission & History" 2023)
Penn Museum	"Our mission is to be a center for inquiry and the ongoing exploration of humanity for our University of Pennsylvania, regional, national, and global communities, following ethical standards and practices."	(Penn Museum "Our Story" 2022)

Table 20. Addressed mission statements for each museum, reflecting a standard of ethical code.



<b>Executive Compensation (2021)</b>			
Museum	Executive Compensation (in \$ USD)	Percentage (%) of Executive Compensation on Total Expenses	Total Expenses (In \$ USD)
Mütter Museum	437,646	7.8	5,581,981
Academy of Natural Sciences	895,722	5.2	17,281,895
Philadelphia Museum of Art	2,619,793	4.1	64,241,193
Franklin Institute	3,039,097	12.2	24,980,303
Penn Museum			

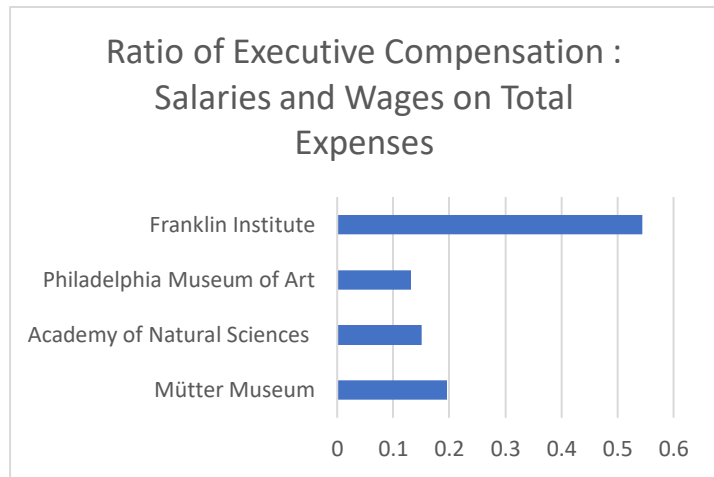
Table 21. List of executive compensations and their makeup of the total expenses.

<b>Salaries and Wages (2021)</b>			
Museum	Salaries and Wages (in \$ USD)	Percentage (%) of Salaries and Wages on Total Expenses	Total Expenses (in \$ USD)
Mütter Museum	2,232,829	40	5,581,981
Academy of Natural Sciences	5,935,286	34.3	17,281,895
Philadelphia Museum of Art	19,913,412	31	64,241,193
Franklin Institute	5,579,706	22.3	24,980,303
Penn Museum			

Table 22. List of employee salaries and wages and their makeup of the total expenses.

<b>Wage Inequity Indicator</b>	
Museum	Ratio of Executive Compensation : Salaries and Wages on Total Expenses
Mütter Museum	0.196005158
Academy of Natural Sciences	0.150914716
Philadelphia Museum of Art	0.131559222
Franklin Institute	0.544669737
Penn Museum	

a.



b.

Table 23 (a). Ratio indicating the inequality of worker and executive compensations.

Figure 11 (b). A visual representation of executive : worker compensation rates.

Type	Area (m <sup>2</sup> )	No. floors	F-F (m)	F-C (m)
Small	511	1	3.05	3.05
Medium	4982	3	3.96	2.74
Large	46320	12+(basement)	3.96	2.74

Table 24. Reference Building Parameters. (Yassaghi and Hoque 2019, 69)

Reference Building Parameters in Philadelphia Museums			
Museum	Sq Footage	Area (m <sup>2</sup> )	Classification of Building Size (Yassaghi and Hoque 2019)
Mütter Museum	15072	1400.2346	Small
Academy of Natural Sciences	53000	4923.8611	Small
Philadelphia Museum of Art	633825	58884.2693	Large
Franklin Institute	400000	37161.216	Medium
Penn Museum	300000	27870.912	Medium

Table 25. Reference Building Parameters in Philadelphia Museums (based on Yassaghi and Hoque 2019).

## CHAPTER 1: INTRODUCTION

We need museums as institutions. They are bastions of education, research, reflection, culture, entertainment, and representation (Davis 2011, 8; Gordon 1911, 5). As social beings, we naturally interact with each other and the environment to form personalized cultures, based on the tangible and intangible meanings we give to certain things or traditions (Mendoza, Franco, and Gómez 2023, 1059; Newman and McLean 2006, 61; 64). The museum acts as a vessel for preserving and sharing this cultural heritage, or any thing, tangible, or intangible, that has value (Gražulevičiūtė 2006, 78; Scott and Soren 2009, 191). Therefore, if we want museums to continue to preserve cultural heritage, they must adopt sustainable practices.

Alarming is that museums are always at risk of fading out of relevancy. This is especially true of the museum in question is a nonprofit that relies on external funding, gifts, grants, and other contributions to operate. They must consistently argue that they should remain open. But their reasoning is at question here: why should museums stay open? Why should they remain relevant? That is up for the museums to decide. The tone of this study is not quite urgent, but more of a warning. Not even the most seemingly stable institutions, like governments, post offices, fire stations, etc., have any guarantee to remain as they are – let alone museums.

We also must ask why people like museums. I casually asked some of my loved ones why they like museums, or why they find them important. Several said they appreciate how museums preserve history; others said they like being able to relax and reflect. Building imagination, from being up close to objects especially in childhood, was another popular answer. The point is that museums serve a lot of personal functions. What people experience from a museum is not any less important than its objective purpose. Although not all museums directly

relate to human history, they all spark a connection with the human experience; that is, who we are and how we have, and still do, interact with the world.

Some of the primary questions that inspired this research rely on defining and understanding relevant terms. These include the meanings of sustainability, cultural heritage, and museums as institutions. In addition to definitions, one of the most important questions is determining how all of these intersect to create a setting in which cultural heritage can last sustainably in museums. To ask this quandary, and to justify this research: Is this happening now? And if not, how can it happen?

Simply put, sustainability is complex. It is argued that there are over three hundred definitions (Bonevac 2010, 84). But, the most well-known definition of sustainability, known as Brundtland-sustainability from the Brundtland Commission in the 1987 *Our Common Future* work, is “meeting the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations, 2023). This refers not only to consumption, but also systems that are in place. When most people think of sustainability, their initial reaction is to correlate it with the environment. But that is only one facet of sustainability; environmental, social, and economic factors all play an equal role in its facilitation. The relationship between what is known as the ‘three pillars’ as described above assesses how human wellbeing can be sustained. There are several ultimate goals of humanity; achieving wellbeing, or a comfortable way of living, is very well important to maximally ensure. Wellbeing can include both societal standards, where basic needs are met, and human health (EPA 2012, 5). But sustainability is not just about wellbeing – it’s about survival. Section 2 [42 USC § 4321] of the National Environmental Policy Act of 1969 outlines this concept in more detail:

“The purposes of this Act are: To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality.” (Cong. 1969).

Though these three pillars, environmental, social, and economic, have been well established in literature, it has been suggested that there should be introduced a fourth pillar: cultural. While initially it may seem so, cultural and social are not the same, even if they are closely related; nor is one enveloped within the other. Cultural can also have a dedicated connection with environmental and economic, especially the latter, when considering the cultural aspects of wealth and prosperity (Erlewein 2015, 72). Commercialization also can, when monetizing the arts and intangible cultural heritage (Sabatini 2019, 35).

Museums are no exception to this. It is no secret that tourism fuels the museum economy. Sometimes tourists do not visit to learn, but rather to be entertained (DesRoches 2015, 3). But that does not necessarily discriminate the phenomenon from being cultural; finding entertainment and how someone spends their free time can both vary per individual but also represent a group mentality. Museums exist all over the world. But at least in the United States, according to the American Alliance of Museums, among the most frequent museum visitors in 2023, 82% have a college degree, 84% identify as white, and 33% are adults with children. By contrast there is not much difference in demographics of those who visited at least one museum in the past year; 27% were white, 27% were African American or black, 31% were Hispanic or Latine, and 40% were Asian or Asian American (Wilkening 2023). This means that, while educated white parents (and presumably white children, who were not included in the study)

were the most frequent visitors, people of many different backgrounds visit museums. These statistics represent American visitors, which compose a diverse population; demographics can greatly change and appear more homogenous, or perhaps even more diverse, based on the country. Regardless, museums are available to enjoy, and the act of enjoying is, in essence, cultural, as per the fifteenth article International Covenant on Economic, Social, and Cultural Rights: “(a) To take part in cultural life; (b) to enjoy the benefits of scientific progress and its applications,” which will be discussed in further detail later in this study (General Assembly resolution 2200A 1966).

In terms of what is considered sustainable, and what is not, is a bit of an arbitrary question. In reality, nothing is truly sustainable; only actions can be ‘more sustainable’ than others, comparatively. Resources are finite. Sustainability cannot “grow” because resources will be depleted (Bonevac 2010, 86). Instead, it prolongs resource use in systems so that future generations may experience the same consumption rates as previous and current generations. What is also at stake is our current needs. It is often described that our consumption rates are *unsustainable*. But what does that mean? At the rate we are consuming, future generations will not be able to consume at the same rate, according to the Brundtland definition. But does that represent our needs? In the context of Philadelphia, in Western society, consumption, consumerism, commercialization, and ultimately, capitalism, are societal. But we do not *need* to consume at this rate. Just as much as we define sustainability, we must define our needs. Among many, protecting cultural heritage is one of them.

But because of the way many institutions developed, especially in such a historical city like Philadelphia, there are many challenges to be faced during the transition to greater sustainability. A substantial roadblock is sustainability education; that is, getting people to

understand and care. There are many studies that prove that sustainable alternatives can be just as, if not more, efficient than traditional systems. And that word – “alternative” – should no longer be associated. Sustainable development should be a priority. In order for that to happen, people need to know why. Many, if not most, people know that to some degree, our actions must change in some way in order to avoid severe consequences. The problem is that the consequences are largely also unknown, whether they be environmental, beyond rising temperatures, sea level rise, loss of biodiversity, total resource depletion, etc., which shape social and economic factors. And as such, people are afraid to commit to these changes, especially rapidly (Conard 2013, 3370; 3377). There are also those that simply don’t believe in the concept of climate change. Others have no regard for future generations and only care about their own – living in the now. Younger generations who are in schooling now or at least recently graduated have luckily adopted more sustainable practices than older generations, but institutional change still needs to occur, even if there is a more widespread understanding, or at least familiarity. How that change can happen is being debated every day.

As one of the most popular and influential cities in the US for maintaining flourishing, historical museums as attractions, Philadelphia has an important role in advocating for sustainability. Its present performance acts as a model for future performance in other cities’ museums across the nation. For instance, the Academy of Natural Sciences is the oldest natural history museum in the western hemisphere and should thus set a precedent for a natural history museum standard (ANS “About Us” 2018). Seeing as though it is quite old, there can be some barriers to achieving sustainability; but with continual museum upkeep means opportunities for inserting efficient but clean systems. Following that, museums can continue to preserve cultural heritage and all its associated values that we, as humans, assign and need.

If we apply the concept of cultural heritage to the definition of sustainability, I will modify the definition in this context to be as follows: “to preserve past and present cultural heritage without compromising the ability of future generations to preserve cultural heritage.” Here I essentially replaced ‘needs’ with ‘cultural heritage’ -- because it is a need. Humans inherently need an identity; and cultural heritage, through “perspectives of regulation, representation, consumption, and production” invokes ‘identity construction’ as Andrew Newman and Fiona McLean coin (Newman and McLean 2006, 61; 64) through tangible and intangible meanings. Like cultural heritage, it includes material and non-material needs, all under the premise of, according to the Max-Neef model, “being, doing, having, and interacting” (O’Mahony 2022, 5). If these tenets are satisfied, then well-being is met. We want to last; we want our culture to last, and our museums.

Cultural heritage is not uniform. Each individual museum must establish their own cultural or heritage resource (O’Neill 1999, 42). For example, the heritage of the Academy of Natural Sciences, as a natural history museum, is not the same as the Philadelphia Museum of Art, an art museum. Even though instead of being human-made, much of the content in the Academy of Natural Sciences is based on nature, namely wildlife as displayed in the dioramas, as well as fossils, and rocks and minerals. We inhabit nature, and humans have a constant and well-established relationship with the environment. Culture is shaped by nature. Given human nature, which involves extraction and destruction of the environment for resources, natural history museums preserve those natural resources and reconstructions of landscapes (Johnels 1973, 55). On the other hand, the Philadelphia Museum of Art exhibits a variety of media of art, all created, designed, and conceptualized by humans from a diverse range of cultures and time



periods. There is little to no argument that art is considered a diagnostic facet of expressing culture and defining many historical movements.

This study seeks to determine through the research design of conducting an in-person museum visit, quantifying various Environmental, Social, and Governance (ESG) metrics with a monitoring checklist (fig 1). ESGs typically quantify sustainable investment opportunities for businesses. As institutions that generate funds, ESGs are applicable to serve as a framework for organizing the analysis of the metric data gathered in museums. Susanna Arvidsson and John Dumay report that “empirical research examining ESG quantity, ESG quality and ESG performance is minimal and conflicting in its focus, methodologies and results” (Arvidsson and Dumay 2021, 1092). Furthermore, the ESG impacts on the importance of preservation of cultural heritage will also be emphasized, as this is one of the primary functions of a successfully operating museum.

ESG investing is generally seen as an ethical practice, on part of both businesses and their clients. Since environmentalism and ethical consumption are becoming more widely recognized and advocated for, ESG adoption strategies are an appropriately beneficial method of securing investors and subsequently minimizing financial risks. It also speaks to long-term stability, as the discussion of sustainability is focused on maintaining the existence of an existing institution, especially in the midst of climate change.

There are many studies that quantify ESG metrics with measurable numerical values. As an example, Sakis Kotsantonis and George Serafeim of Harvard Business School use statistics on employee health and safety to demonstrate some critiques of how ESGs are measured and evaluated. In this case, accidents with fatal consequences, rate of injury per 200,000 hours worked, and occupational injury rate-related fatalities are recorded with numbers, while lost-time

incident frequency rate, injury rate, and total case incident rate are recorded with percentages, with the rates first determined by numbers (Kotsantonis and Serafeim 2019, 52). These data are simple to analyze, except with a few caveats. The authors also argue the complication of “data gaps,” especially in the context of comparing ESG scores across several companies. Data gaps occur when there are missing values, which are assumed to be zero (Kotsantonis and Serafeim 2019, 54). This can not only complicate but also manipulate macro analyses of different companies in each industry. Certainly, this problem is faced in the museum industry while comparing the five museums discussed in this study. Some data cannot be recovered and thus precisely and thoroughly assessed because there is an unfortunate lack of public reporting. This is why there is included a ‘Don’t Know’ category in the evaluation metric checklist, to minimize data manipulation and provide further clarity.

Kotsantonis and Serafeim also introduce the Input-Output Model, which is an “approach to estimating overall performance of a company on a given ESG metric [which] relies on relevant industry-specific and macroeconomic level data” (Kotsantonis et al 2019, 55). This study attempts to avoid estimations as much as possible, with some necessary exceptions (especially regarding bathroom equipment and use). Yet it is still a valuable approach, given that specific data are not always available to ESG reporters when an industry-average is generally available.

As a disclaimer, this research is still preliminary and offers an overview of many factors that pertain to sustainability. Various data are also not often available to the public and are thus unfortunately not considered in analyses. The purpose of this study is to evaluate the available information that reveals sustainable practices and to subsequently offer suggestions for improvements that museums in Philadelphia may choose to implement.

## CHAPTER 2: REVIEW OF LITERATURE

Sources for consultation of background considerations and data synthesis were not limited to conventional scholarly resources. While much, if not most, of the literature includes verified, peer-reviewed publications, a significant amount of information about Philadelphia museums themselves are available on the official website pages. For example, ‘about us’ pages, history and foundations, staff and trustees, events, admissions prices, and collections pages were all considered and cited within this research due in part to the official status of the website for well-established institutions. Admittedly there is bias in many of the written works in these pages; a museum website is as much as an advertisement as it is an informative resource. Yet, some of the only information available about museums is posted on the own website, so it must be consulted for further context to assess the data and their standings on sustainability. Other than museum websites, other well-known institutions such as the EPA, AAM, USGBC, etc., produced valuable, easily accessible, up-to-date information on their websites that was heavily assessed with complimenting raw data for statistical analysis.

To return to the discussion of scholarly publications, many formed the basis of the intellectual framework behind the body of content within this study. Published books and editorials contributed much to museological perspectives that apply to forward-thinking green initiatives, social issues, ethics, and building operations and management. Technical subjects, such as engineering, conservation, and statistics, are also based on these sources as well as peer-reviewed journals. Sustainability understanding and science are frequently discussed in a variety of journals that focus on more specified topics than what is presented in this study.

Official publications are included as well. Analytical and overview reports from institutions provided both data and inspiration for ESG reporting and the construction of the

metric checklist. Example spreadsheets from consulting firms, towns, and even the Penn Museum influenced which metrics were chosen and how the checklist was organized.

Also, within the category of official publications, legal acts and regulations act as a basis for cultural heritage definitions and described protections to validate the rights and ethics of museums and their responsibilities. Historical precedence and the relationship between law and museums are critical, as sustainability is becoming more of a discussed topic in politics and legislature.

Another wealthy source of information comes from news articles about the museums. However, a careful assessment of news reliability was conducted to minimize the risk of misinformation and poor journalism. Many of the sources feature the city of Philadelphia news, which happen to cover content about the discussed museums. Comparative news articles about museums outside of Philadelphia were sometimes considered, but only to highlight differences in Philadelphia museum practices.

There are multiple case studies that focus on investigating a particular topic using museums in a specified region, such as with economics, entry fees, cultural behavior post Covid-19; etc. This study similarly uses Philadelphia museums to advance the idea of achieving more sustainable solutions in a comprehensive overview. Research includes gathering empirical data, much like the other case studies, which is subsequently followed by an analysis which draws heavily upon said case studies and other external information.

### CHAPTER 3: METHODOLOGY

A basal literature review was conducted to understand and later quantify different sustainable practices in institutional, structural buildings. This included consultation from articles, journals, books, reports, and some news sources. These practices are denoted by ESGs quantifications.

After the literature review was completed, a metric monitoring checklist was created in Microsoft Excel. Each of the cells are designed to have an 'x' checked in a certain column. Columns will include 'yes,' 'no,' 'don't know,' 'answer in note,' and 'N/A.' A note section provides further information about a metric, to supplement quantitative analysis. To create this checklist, several templates from various entities (towns, businesses, LEED certifications) proved to serve as the basis for how the checklist was formatted. Each metric was evaluated based on what ESG values could be visibly monitored with a museum visit.

Circling the museum to specifically check for the criteria was the primary source of data collection in this category. This involved asking docents for clarifying information, though this will not be treated as an interview or participation using human subjects; this is only to supplement missing information that cannot be obtained independently or with an interview. Museum visits lasted for less than 3 hours and were conducted on weekends, independently. This could result in unintended bias in which some observations may have been overlooked with a single observer. The data is not expected to be entirely accurate or representative of how the museum operates sustainably as much of the internal operations are invisible to the general visitor.

If information is not available, or cannot be determined by the museum visit, then interviews and data sourcing occurred. This includes outreach via phone, email or in-person visits, in which a response would garner an informal interview. Due to the nature of untimely or non-existent

responses, most of this data collection is from data sourcing, especially follow-up literature review. Only one informal interview (Academy of Natural Sciences) was conducted; two museums did not respond (Franklin Institute and Mutter Museum); one rejected the interview request (Philadelphia Museum of Art); and one provided data on their own assessment of environmental monitoring without an interview (Penn Museum).

Once all the data was collected, it was analyzed and compared among all the museums to determine suggestions for ESG improvements based on the evaluated shortcomings. Tables, graphs, and figures were created to visualize the raw data from the checklist. Extended literature review supplemented these findings for greater impact on significance, as well as supporting other ESG metrics that could not be measured with a museum visit.

## CHAPTER 4: RESULTS

These are only a few examples for environmental criteria that can be accurately assessed without major extrapolations. They generally consist of actions that consider climate change mitigations, which can include, but are not limited to, monitoring waste, conservation issues such as lighting and temperature, packaging issues such as food and products, and LEED certified buildings. In this research environmental criteria data was largely able to be captured with on-site visits, with some data sourcing for fact-checking. In much of literature environmental criteria alludes to energy and greenhouse gas emission; however, no sourcing for energy or emissions auditing or monitoring could be retrieved.

Social criteria emphasize community and equity, both within the museum sphere and outside, whether it pertain to staff or visitors. Adherence to what the public and visitors need for an adequate museum experience, or alternatively, a workplace environment for staff, requires deep consideration for social values. Law is heavily integrated into protecting social criteria, as regulations can provide a more socially conscious atmosphere in cultural institutions and elsewhere. Discussed in this research are human rights, health and safety standards, bathrooms, and sustainable community visibility performance.

Governance is less clear regarding evaluating on-site and interview data collection but is somewhat available through data sourcing. The extent to which information is available will be discussed further in the paper. The museum acting as an institution, its influence, and leadership, all exemplify governance. Meanwhile internal operations and fiscal responsibilities largely reflect governance criteria, which describes in the context of a museum: fiscal performance and its relationship to entry fees, ethics, political contributions, and executive compensation.

## *Environmental Criteria*

### **I. Waste**

The more waste produced, generally, the less sustainable. It is nearly impossible, as a human, to not produce waste. Even thousands of years ago, without the dooming influence of mass production and industrialization, waste management occurred – discarding bones, pottery, structures, and many other things that archaeologists uncover. Sometimes waste is on display in museums. The definition of waste is inherently of human value; things that are of no use, low value, or toxic are discarded. This can be at the individual, household level; industrial; biomedical; agricultural; construction; mining; nearly every entity produces waste in some way (Reno 2015, 560).

So, would the natural solution be to produce less waste? To reduce means less energy and fewer resources, thereby reducing the institutional carbon footprint (Brophy and Wylie 2013, 71; 104). It would also mean saving money, as there are both volume and weight-based programs that charge for waste collection (EPA “Volume vs. Weight Based Programs” 2016). As such waste source reduction stands at the top of the waste hierarchy, followed by reuse, recycling/composting, recovery, and treatment/disposal (EPA “Sustainable Materials Management” 2023; Pongrácz 2002, 29)

Thousands of visitors produce millions of tons of waste in museums per year. The museums themselves in the material design and construction of new exhibits, as well as their general operations, produce even more. MSW (municipal solid waste) is “what most people mean when they refer to garbage, trash, or discard” (Reno 2015, 560). This includes one of the primary waste types that museums would accumulate and dispose of. As institutions, this is no small amount. For example, the Museum of Modern Art in New York City, which is now 11.7%



larger than the Philadelphia Museum of Art, produced 250 combined trash and organics and 120 tons of recyclables in 2022, reducing their waste by 66% and 73% respectively, since 2018 (Franklin 2019; MoMA, “Materials and Waste” 2022). MoMA’s dedication towards exhibition design sustainability is also admirable, with a 74% decrease in exhibition, construction, and demolition waste production in 2022 since 2018 (MoMA, “Materials and Waste” 2022). The important takeaway from this data is that MoMA records this data. Little to no information about institutional waste data throughout any of the museums is available. There is a 2013 student report that the Penn Museum café sends food waste to a pig farm in Sewell, New Jersey to be composted (Jick 2013). In 2022 the Academy of Natural Sciences launched a Plastic-free Philly Initiative to “raise awareness of plastic pollution and clean water” by advocating for reduction of plastic bottles, waterway cleanups, donations, waste education, and tips for businesses (ANS “Plastic-free Philly” 2022). However, no numbers for waste tonnage are reported.

Like the MoMA, Philadelphia museums can better track and subsequently reduce waste if waste data were collected; this would allow for waste targeting, reducing carbon emissions, and avoiding financial losses. These data are known as waste audits, ideally measured weekly, to determine costs of waste removal more succinctly (Brophy and Wylie 2013, 69; 104). Furthermore “changing the design, manufacture, purchase, or use of materials or products,” says Energy Star, will also advance waste prevention strategies (Energy Star 2023) – which of course requires information for change. A more generalized way to promote sustainability is through reducing carbon emissions. General waste removal involves landfill dumping and the release of methane, contributing to greenhouse gas concentrations (Buzby 2022). Instead recycling uses less energy from mining or extracting to create new materials (Acuff and Kaffine 2013, 84-85; King County 2023).

Diversifying waste receptacles, such as adopting more recycling bins and compost solutions in cafés, would also lower MSW tonnage, given that proper training on waste segregation is given to staff and encouraged for visitors. It would also optimize solid waste management (SWM) handling and processing, thereby enforcing the balance of the waste hierarchy; or, prevention, reuse, recycling, and recovery (Kihila et al. 2021, 1).

That is, if the recycling is properly segregated, as per the City of Philadelphia Recycling Program requires (City of Philadelphia 2023). But in reality, the vast majority of material in the recycling bin is not actually recycled or is contaminated. Only #1 and #2 plastics can reliably be recycled (Circular Philadelphia 2023). And although all the museums can do better to segregate the recyclable material, the City of Philadelphia should ultimately improve their infrastructural system to send recyclable materials more reliably into use. Recycling options are still important, especially if museums have control over restrictions of food and drink in the galleries, typically for conservation purposes.

The Mütter Museum, the Academy of Natural Sciences, and the Franklin Institute oddly all had waste bins inside of the exhibits, despite these restrictions. Both waste and recycling bins were noted. Table 1 and figure 2 are representations of the ratio of trash cans to recycling bins. A lower number indicates a more even proportion signaling higher rates of recycling consideration. Higher recycling rates and/or consideration means more energy and resource conservation on part of the institution. It also ultimately contributes to carbon emission reductions. The Academy of Natural Sciences has the lowest ratio at 1.2, almost an equal number of trash cans to recycling. The Penn Museum (2.3) and the Philadelphia Museum of Art (2.5) are not far behind. Seeing as though these two offer food and beverage serving at least one café, more recycling options for packaging (to be discussed later) could be a major improvement towards waste equality.

## **II. Conservation: Lighting and Temperature**

As Guo et al. state, “Heritage is a non-renewable resource” (Guo et al. 2023, 110665).

Conservation science is a complex subject, especially in regard to sustainability. But for the purposes of maintaining and protecting cultural heritage, efforts to best preserve objects must be made under the philosophies of restoration of past alterations, remedial conservation for current damage, and preventive conservation for future losses, respectively (Lucchi 2018, 180). For the purposes of visible, on-site sustainability performance, lighting and temperature in galleries and halls were recorded and analyzed.

### *A. Lighting*

As an essential asset of conservation needs, lighting is crucial to monitor in museums. Of course, lighting choice can be made for aesthetic and accessibility reasons, but in most cases, lighting is set to best preserve and protect the wellbeing on objects on display. Generally, the less optical radiation there is, the less damaging light will be to objects. It is a difficult balance to maintain viewer visibility and conservation, in addition to electricity consciousness. While natural lighting is one of the most cost-effective sources of lighting, it is not always compatible with conservation (Sansoni 2015, vii). Seasonal lighting changes coupled with museum hours are extremely variable, which is inconsistent with ideal stable preservation conditions. Furthermore, more intense natural lighting during the summer can be damaging with higher rates of optical radiation (fig. 3) (T. De Graaf et al. 2014, 32). If natural lighting were to be used to illuminate galleries, dimming or shade over windows or other natural light sources would have to be installed (Sansoni et al., 2015, 233). Many Philadelphia museums implemented this with shades (paper, woven, net) or semi-opaque paint over the windows (2.1). While this does not entirely

allow for stable light control, this solution still provides some lighting that prevents direct radiation damage to galleries. It also accounts for temperature control, as radiative temperature differences from day to night are subdued and results in less energy use for heating and cooling to maintain a stable temperature (Carroon 2010, 186).

A more effective approach for balancing sustainable conservation is adjustable, low-energy lighting strategies (2.2). This can include dimming, whether through natural lighting windows or artificial lighting with a wired, adjustable dimmer switch. Some museums implemented purposeful dimming in certain vulnerable exhibits, such as the Philadelphia Museum of Art's textile gallery, as well as for the fabrics in the Penn Museum's Native American collections, both of which were notably dark. The Mütter Museum also had accessible dimmer switches in the main and art galleries. All museums had unused and minimal light sourcing; i.e., not all lights were turned on. However, in places where there is dimmed natural lighting, artificial lighting is still in use; this is true for several galleries and hallways in the Penn Museum, the Philadelphia Museum of Art, and the Franklin Institute.

Of the accessible, cost-effective lighting source choices, LED lights are increasingly becoming more efficient for power saving. Given that the luminaires transform electric energy to luminous energy with an appropriate color rendering for object conservation, LED lights should be considered in new exhibit installation projects as well as exhibit maintenance (Sansoni 2015, xii). Nearly all display cases throughout all the museums used LED lighting except for the Academy of Natural Sciences, which implemented incandescent lighting in the dioramas. Though, the halls throughout the diorama exhibit were minimally lit with LED can lights. The dioramas themselves were installed between the 1930s-1950s, so the use of incandescent bulbs is likely a reflection of purposeful minimal upkeep, perhaps to prevent disturbing the arrangement

(ANS “Dioramas” 2023). Thus, it seems Philadelphia museums are aware of energy efficient, cost effective, and by extension, environmentally conscious lighting sources.

### *B. Temperature*

The museums covered in this research all have different kinds of objects on display, so there is no one suggested temperature for optimal conservation conditions (13.1). Aside from the temperature itself, climate control and temperature stability are crucial to protect objects on display from decay, as temperature fluctuations exaggerate thermal stresses (Guo et al. 2023, 110665). If needed, the interior of cases will sometimes be climate controlled independently of the rest of the gallery. Case temperature readings were sparse except for in the outer space exhibit in the Franklin Institute, where several cases containing space gear were in the range of 65°-70°F (13.2). This is quite low for fabrics and textiles, ideally set at 68°-75°F (Museum of the Albemarle 2023) but is not necessarily alarming as the fabric blending in space gear may fare well to these temperatures, as ordained by the museum conservator. Climate control does take substantial energy use, especially in summer and winter months; and solutions such as nightly shutdowns can save energy; but this would be at the cost of great relative humidity (RH) and temperature fluctuations. Upgrading to newer energy efficiency technology should be a consideration of balancing eco-friendly initiatives and object conservation.

In general museums did not display the indoor temperature on thermostats, likely to prevent visitors from tampering with the controls. A handheld thermometer was not used to evaluate temperature because visibility and direct disclosure of temperature is of interest in this research. Furthermore, while there is a close relationship with RH and temperature, RH was not recorded due to the lack of hygrometers in sight. The only noted temperature readings were

67.5°F near the entrance to the Egypt Gallery in the Penn Museum, 68°F in the main downstairs gallery in the Mütter Museum, and 70°F on the second floor and 69°F on the third floor of the Academy of Natural Sciences. All of these fall within the general suggested range in museum galleries between 15°C (59°F) and 25°C (77°F), nearing the idealized human comfort temperature 21°C (69.8°F), according to Stefan Michalski of the Getty Conservation Institute (Michalski 2007, 3).

### **III. Packaging: Food and Products**

This section includes two criteria classifications: food (A) and products (B). They are coupled together because the primary motive behind both investigations is examining eco-friendly packaging types, which reflects sustainable values in ethical supplier choice. It must be noted that two museums at the time of monitoring did not have food halls, be it a café, restaurant, snack center, etc. The Mütter Museum had no indication of food availability. The Academy of Natural Sciences has a café inside, but it was closed, apart from snack and drink vending machines; the former was filled with unrecyclable plastic packaging and the latter with recyclable aluminum cans. None of the museums permitted food or drink in the galleries.

#### *A. Food*

All three museums with food halls used substantial packaging without visible use by dates, yet also recyclable material, and recycling receptacles (table 2). Substantial packaging can include to-go containers when the food could be served on washable plates, utensils, or beverage containers, or individual condiment packets, for example (Lee, Fassler, and Claybon, 2023). However, overuse of packaging is not deemed ‘unnecessary’ given the post-Covid culture of

health consciousness. If the packaging is recyclable and/or biodegradable, as it is for the Philadelphia Museum of Art and the Penn Museum, then the packaging adheres to acceptable sanitization standards. But, reducing waste is inherently more sustainable than advancing the production of waste, even if the material is comparatively less toxic to the environment and consumption than unrecyclable packaging and aggregated food waste (Marsh and Bugusu 2007, 45; Pleissner 2018, 39). Furthermore, the recyclable packaging often must be thrown with landfill waste because of the presence of food debris, which cannot be recycled (US EPA 2023), as well as the lack of waste and recyclables segregation as explored earlier. This makes biodegradable packaging preferred, as it is typically removed with landfill waste. An expansion of biodegradable material use for products such as chip bags, beverage containers, wrappers, etc., would be a remarkable step towards sustainability, in addition to the advocacy for re-usable silverware.

Visible use-by dates could also act as an incentive for reducing food waste by consumer choice and employee responsibility for providing fresh food. Not included in the table is the use of composting, for which the Penn Museum reports engagement in the Penn Green Office Checklist (Mazzoco and Penn Green Office 2023). Composting is a green solution to food waste, as it technically acts as a recycling method to create fertilizer for further food production (Marsh and Bugusu 2007, 45). It is unknown whether the Philadelphia Museum of Art or the Franklin Institute composts food during meal preparation.

### *B. Products*

Gift shops are some of the most profitable sources of income in museums, and these five are no exception. There is a vast selection of goods in each of the gift shops (table 3). Some of the

more common items include jewelry, books, t-shirts and sweatshirts, hats, mugs, other beverage containers, plush and plastic toys, postcards, postcards, etc. Some museums have handmade goods, notably the Philadelphia Museum of Art and the Penn Museum, though the sources are not always local or known to be ethical.

Only the Franklin Institute implemented minimal packaging. Aside from toys, board games, etc., that required packaging, many of the products were not wrapped nor came in external packaging, such as paper, cardboard, plastic film, etc. The other four museums, including all four of the Philadelphia Museum of Art's gift shops, used excessive packaging, such as plastic bags for keychains, wraps over books, cases for cheap jewelry, etc. However, in most cases the packaging and price tags were made of recyclable material, although the adhesive on some of the sticker tags on products is generally not recyclable. Paper tags with plastic or string hooks were noted to be more common. Some of the products for sale themselves were made of recycled material, such as animal plushies at the Academy of Natural Sciences, posters, shirts, and canvas bags at the Mütter Museum, and textile/cloth goods at the Philadelphia Museum of Art.

#### **IV. LEED Certified Buildings**

Leadership in Energy and Environmental Design (LEED) ratings quantify how green a building system performs. By green building, the US Green Building Council means “the planning, design, construction (and demolition), and operations of buildings with several central, foremost considerations: energy use, water use, indoor environmental quality, material selection, site and location within the surrounding community” (USGBC 2022). While green has a connotation of environmental, LEED ratings seek to involve all three pillars of sustainability.



There are several different LEED rating systems based on the type of building function, as well as operations, management, development, cities and communities, etc.

The LEED system is a point-based denomination, based on different sustainable credits. For reference, for most systems, such as v 2009 and v4, the ‘certified’ certification requires 40-49 points; silver 50-59 points; gold 60-79 points; and platinum 80+ points (USGBC 2024). However, the LEED-NC v2.2 system has ‘certified’ certification as 26-32 points; silver 33-38 points; gold 39-51 points; platinum 52-69 points (USGBC 2005). This rating system has been suspended as of June 27, 2015, the same month the silver certification was awarded to the Franklin Institute Addition (DiPietro 2015).

For the LEED BC+C New Construction v2009 rating system, there are seven categories: sustainable sites, water efficiency, energy and atmosphere, material and resources, indoor environmental quality, innovation, and regional property credits (USGBC 2012; 2018). The LEED ID+C Commercial Interiors v4 has some slightly different categories; continuing water efficiency, energy and atmosphere, material and resources, indoor environmental quality, innovation, and regional property credits, but adding location and transportation and integrative process credits (USGBC 2021). Finally, LEED BC+C New Construction v2.2 includes the same as the v2009 system with the exception of the lack of the regional property credits (USGBC 2015).

As of December 2023, there are four LEED certified museum sectors in Philadelphia: the Harrison Auditorium in the Penn Museum, the Museum of the American Revolution, the Franklin Institute addition, and the Barnes Foundation (Lee 2022). First, under the LEED 2009 New Construction rating system, The Museum of the American Revolution received a gold certification in 2018, earning 63/110 points, and the Barnes Foundation received a platinum

certification in 2012, earning 83/110 points (USGBC 2012; USGBC 2018). Unfortunately, the museums in this study performed more poorly; the LEED-NC 2.2 rating system gave the Franklin Institute Addition a silver certification in 2015 earning 33/69 points, and the LEED v4 ID+C Commercial Interiors rating system granted the Penn Museum Harrison Auditorium a silver certification as well, in 2021, earning 56/110 points (USGBC 2015; USGBC 2021).

Interestingly the Penn Museum proudly displays their silver certification medal at the front entrance of the museum, though it does not specify that it qualifies for the Harrison Auditorium and, according to Penn Sustainability, the Penn Museum has 1 project for the Harrison Auditorium and the Lower Egypt gallery restorations (Penn Sustainability 2021). This false advertising is questionable and misleading, where visitors may assume the entire building is certified, which is far from the case. The Lower Egypt gallery renovation is also not mentioned in the USGBC LEED ratings scorecard nor website. Currently the Egyptian galleries are under reconstruction, and will not be completed for a few years; certainly there is a possibility that the plans are capable of LEED certification but there is no evidence of this. Penn Sustainability claims it “received points for long-term commitment to sustainable resources and construction and demolition waste management,” which is true based on the LEED scorecard (Penn Sustainability 2021; USGBC 2021).

## ***Social Criteria***

### **I. Human Rights**

‘Human rights’ is a broad term that is widely misunderstood and variable based on country and culture. Since this paper examines museums in Philadelphia, a city of Philadelphia and broader United States context will be primarily applied, though international considerations are

heavily considered. There is an extensive history on the adoption and development of human rights in the United States. One of the more relevant examples in this history is from the Declaration of Independence signed in 1776, also in Philadelphia. The preamble famously states “We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty, and the pursuit of Happiness” (Jefferson et al, 1776). Therefore, by association Philadelphia as a city and within its institutions should collectively uphold one of the most iconic declarations of human rights. However, of course, these rights endowed to “all men” Jefferson and company referred to here did not extend to most inhabitants in what was considered the United States at the time, including indentured servants, African Americans, women, and children (Billington “Creating the United States” 2024).

Here I define ‘human rights’ as the support of the ability to exercise rights. To be more specific, the United Nations defines them as:

“Rights inherent to all human beings, regardless of race, sex, nationality, ethnicity, language, religion, or other states. Human rights include the right to life and liberty, freedom from slavery and torture, freedom of opinion and expression, the right to work and education, and many more. Everyone is entitled to these rights without discrimination.” (UN “Human Rights” 2024)

Furthermore, there exists a universally agreed upon set of human rights, known as the International Human Rights Law, adopted by the UN on December 10, 1948 (UN “Foundation of International Human Rights Law” 2024). Following is the International Covenant on Economic, Social, and Cultural Rights (ICESCR) and the International Covenant on Civil and Political Rights (ICCPR), both formally enacted in 1976, each with First and Second Optional Protocols

(UN “Human Rights” 2024). Each of the covenants hold UN States responsible for enforcing protections for civil freedoms and human rights.

The ICESCR is particularly relevant to museum implementation of human rights. Namely, it primarily protects in five parts and thirty-one articles: “the right to work in just and favorable conditions; the right to social protection, to an adequate standard of living and to the highest attainable standards of physical and mental well-being; the right to education and the enjoyment of benefits of cultural freedom and scientific progress” (UN “Human Rights” 2024; General Assembly resolution 2200A 1966). Of interest is the right to cultural freedoms and education. This is outlined in Article 15, “(a) To take part in cultural life; (b) to enjoy the benefits of scientific progress and its applications; (c) to benefit from the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author” (General Assembly resolution 2200A 1966). Indeed, these protections expand upon Article 27 of the UDHR, “1. Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits; 2. Everyone has the right to the protection of the moral and material interests resulting from any scientific, literary, or artistic production of which he is the author” (United Nations General Assembly 1948).

But ‘cultural life’ and ‘to participate’ are not expressly defined. Henry McGhie of *Curating Tomorrow* interprets ‘cultural life’ as “an explicit reference to culture as a living process, historical, dynamic, and evolving, with a past, a present, and a future” (McGhie 2020, 45). The function of museums inherently carries out this goal. Although UN States are explicitly addressed to hold these protections liable, museums are morally obligated to adopt these protections in the name of cultural life and human rights. Moral implications will be discussed in

more detail further in this study, but it must be noted that human rights and morality are deeply intertwined.

For Philadelphia specifically, human rights, especially in the context of the American civil rights movement, is remarkable. The city became the first in the nation to implement a human relations agency, The Philadelphia Commission on Human Relations, in its Home Rule Charter in 1951; from there in the coming years, the commission famously published information on African American-based housing projects, Puerto Rican culture, marital status, and many more initiatives in the midst of contemporary discriminatory events across the nation (PCHR 2021). On October 27, 1955, the Pennsylvania Human Relations Act was introduced to protect against discrimination based on identity and culture, notably for housing, employment, public accommodations, accessibility, and multicultural education (General Assembly of the Commonwealth of Pennsylvania 1955). Today there are many NGOs dedicated to protecting, educating, and enforcing human rights in Philadelphia, with the largest being the Philadelphia Human Rights Clinic and Human Rights Campaign of Greater Philadelphia, in addition to the ever-present PCHR.

If a museum has a statement of human inclusion and human rights, it will be noted. To ensure the wellbeing and social responsibility of all, then human rights is a core tenet of social sustainability. All museums fortunately hold a statement on equity, inclusion, accessibility, leadership, and diversity, or all the above. In addition, the Penn Museum, the Philadelphia Museum of Art, and the Academy of Natural Sciences all have posted Land Acknowledgement Statements regarding the occupation of traditional Leni Lenapehokink land. The Penn Museum and the Mütter Museum should be considered more closely, especially for their retention and repatriation of human remains.

Human rights are completely contested at the Mütter Museum. The entire concept of displaying human remains makes many uncomfortable, enough to call for its dissolution to an extent. To justify its existence the Mütter offers consultation to the International Council of Museums Code of Ethics for Museums, the American Alliance of Museums Code of Ethics, and the International Council of Museums Code of Ethics for Natural History Museums for further resources on exhibition reasonings. In addition, feedback reports and a strict no photography policy that is in place attempt to safeguard human rights for the average visitor and the respective individuals on display. Repatriation efforts are still being determined (as well as the Penn Museum) and unfortunately only 4% of the reported Native American remains at the Mütter are made available to return (Bender and Gammage 2023). It is difficult to grapple with the question of human rights when the entire museum is dedicated to a purpose that essentially dehumanizes individuals as objects on display.

The Penn Museum publicly offers three statements relating to human rights and equity: the Human Remains Policy, Our Social Responsibility, and NAGPRA Compliance. The Human Remains Policy interestingly refers to protections of “human dignity,” one of the museum’s expressed priorities (Penn Museum “Human Remains Policy” 2022). Dignity is not unrelated to human rights. The Stanford Encyclopedia Philosophy briefly defines dignity to “denote a kind of basic worth or status that purportedly belongs to all persons equally, and which grounds fundamental moral or political duties or rights” (Debes “Dignity” 2023). The choice to use the word ‘dignity’ here is unknown. It is true that, based on this definition, human dignity and human rights must coexist together; one is not merely a part of another – but they are not synonyms. Human rights are heavily tied to legal structures and binding codes, whereas human dignity is more abstract and personally understood. Perhaps the Penn Museum wanted to

transcend law and ‘rights’ to give authority to both the identities of the remains and the living. However, this is just conjecture. The ‘Our Social Responsibility’ page similarly does not use the term ‘human rights’ but rather outlines their Strategic Visioning Goal to centralize diversity, equity, inclusion, and accessibility (DEIA). NAGPRA is a legal act that enforces appropriate Native American repatriation processes and rights to culture, which Penn claims to take seriously and continues to implement well into 2024 (Scolnick 2024).

## **II. Health and Safety**

It is the responsibility of the institution for the sake of worker and visitor wellbeing that healthy and safe practices in the museum are in place. The main issue at hand is preventing risk. The Health and Safety Authority defines risk as “the likelihood that a person may be harmed or suffers adverse health effects if exposed to a hazard” (HSA 2023). Just like at any workplace, museums are always subject to hazards, or the sources of said harm and adverse health effects. There are, generally, three categories of those affected by risks: premises, affected by physical attack, emergencies, and arson/fire; collections, affected by theft, damage, vandalism, and fire; and people, affected by violence, personal injury, and fraud (Osborne 1999, 218). Advising a consultant is highly recommended when physically, electronically, and technically securing a building and especially during the construction of new exhibitions (Osborne 1999, 219-220).

Emergency preparedness plans should also be both established and shared with staff and visitors in some way. Ideally, preparedness is conveyed through staff training and accessible diagrams, such as fire escape route maps visible at every doorway and emergency numbers to accompany them, for example (Genoways and Ireland 2017, 236). Defining which events are considered emergencies and dedicating steps to properly address risk minimization is the core

step to drafting emergency preparedness by each museum. There are many guidelines for disaster preparedness available to consult. Federal institutions enforce museums and other entities to execute their plans in case of an emergency, followed by inspections (ICOM 2018). The United States requires a several different codes for such operations, including Occupational Safety and Health Administration (OSHA) under Industry Group 841, National Fire Protection Association (NFPA), the Americans with Disabilities Act (ADA), and the International Building Code (IBC). Because these codes are legally bound, it is assumed that each museum in this study successfully follows these regulations.

Furthermore, museum staff should have different trainings per department; for example, procedures for conservation should be handled differently than facilities, which should differ from management. In addition a standardization type may be in place, particularly for any person's safety. Collections preparedness on the other hand requires more specialty training and knowledge, so it is vital conservators, curators, and other staff that handles objects are aware of and consistently implement safe practices during their work.

An important and relevant instance of unprecedented emergency response relates to the recent Covid-19 pandemic. The pandemic has absolutely changed cultural landscapes, even beyond the context of cultural heritage in museums. In essence it has created its own 'pandemic culture' that can be observed by a variety of behaviors that emerged. The first images that come to mind of many are masks, hand sanitizers, social distancing, quarantine, remote communications, and elevated social interaction fears, to name a few. So many institutions – federal, educational, financial, etc – struggled to adapt, perhaps because their emergency preparedness was not fully developed as suggested.



The (almost) immediate response for Philadelphia museums was to shut down. All of the museums in this study shut their doors mid-March, as well as all of the Parkway museums, Old City, Society Hill, and other cultural entities (Salisbury and Gray 2020; Dobrin and Salisbury 2020). Reopening dates, while planned, usually by the end of March or mid-April, were not necessarily promises. By July many museums in Philadelphia reopened, but some extended their closures until January, such as the Mütter Museum, which reopened on January 15, 2021 (Dickinson 2021). Even after temporarily reopening in July, some museums closed again; for example, the Penn Museum, which opened on July 28, 2020, closed in November 2020 and planned to open in January 2021 after being advised by the city due to a resurgence in new strains (DiSanto 2020; Tang 2020).

During this shutdown time, presumably, staff made emergency plans. New regulations for staff and visitors were introduced upon reopenings. Table 4 displays which protocols museums implemented in their new safety procedures in 2020 and early 2021, many of which are universally required as per the Centers for Disease Control and Prevention, the Pennsylvania Department of Health, the Philadelphia Department of Public Health, and other self-guided regulations. The latter of which applies; unlike other museums, the Penn Museum offered styluses to allow visitor interactions with touchscreens (DiSanto 2021).

Even about four years after the beginning of the pandemic, when these restrictions have lifted over time, many museums continue to take precautions against viral spreads. Table 5 shows which policies have continued or discontinued from a few years prior. Masks are now optional, social distancing is unenforced, and proof of vaccination is not required for entry at all museums, which have adapted largely from widespread vaccinations and declining Covid-19 numbers. However hand sanitizers and daily cleaning protocols have continued and have been

observed for maximal sanitation standards. Cleaning staff were present at all museums upon visit at different locations; for example, the restrooms at the Academy of Natural Sciences, the Franklin Institute, and the Mütter Museum, as well as floors in galleries and hallways in the Penn Museum and the Philadelphia Museum of Art. Even though the pandemic has softened now, Covid-19 and other diseases are still present and can be transmitted at museums, especially those with highly dense capacity relative to the square footage, such as the Mütter Museum. It is essential that hygiene standards continue in place to ensure the safety of visitors and staff, as the impact and culture of Covid-19 has nearly permanently changed the way institutions operate.

Hand sanitizer stations were counted as a proxy for health and sanitation (table 6). Among the five, the Mütter Museum offers the highest rate of stations per square foot. As discussed a small space with a large quantity of visitors per year requires higher standards. It is also important to mention the adherence to their own message. In November 2019, conveniently months before the start of the pandemic, the Mütter Museum opened an exhibit about the spread of viral diseases called ‘Going Viral.’ Several topics are explored, such as the 1918 Spanish flu, toxic miasma, the gradual understanding of germs throughout time, and humoral theory. Admittedly it is disingenuous to not follow the most optimal safety and health standards following the installation of this exhibit with contemporary pandemic issues, and the curators and staff are fully aware. On the other hand the two largest museums, the Philadelphia Museum of Art and the Franklin Institute, have a shockingly low number of stations per square footage and yearly number of visitors. The Franklin Institute is the most visited museum in the entirety of Pennsylvania as of 2023, as well as a major attraction for children, a demographic who happens to harbor many diseases and thus needs appropriate reinforcement for preventing viral spread (Franklin Institute “Mission & History” 2023; Godoy 2023). While the audience for the

Philadelphia Museum of Art is broader, it also has a significant number of visitors per year and a substantial building size. Only offering four sanitizing stations is not enough to meet the visitor rate demands.

The implication of having hand sanitizer stations in museums, however, reflects encouragement of physical visitor interaction with content. It was noted that the Philadelphia Museum of Art has several touchscreens and handheld headphones to bolster engagement, but the lack of accessible sanitization in the immediate vicinity of these interaction spaces is frankly inconsiderate of health and safety. There are handwashing options, such as in the restrooms, but exiting the exhibit to properly wash hands disturbs intentionally systematic museum flow and thus visitor experience. The Franklin Institute has a multitude of exhibits that involve physical touch, such as touchscreens, games, and other tangible educational devices, again which primarily attracts children's attention. Even though the Franklin Institute claims to clean spaces daily, the spread of germs is nearly encouraged given the small amount of hand sanitizer stations. The Penn Museum and Academy of Natural Sciences appear to have appropriately spaced and placed hand sanitizer stations throughout the museum and exhibits relative to their size and visitor number, with about one per exhibit space and several throughout hallways, eating spaces, and common areas. While there are several bathrooms available in both of these museums, especially on different floors and near exhibits, hand sanitizer stations are a much more convenient and accessible option for prevention of diseases and execution of proper hygiene in the event that visitors choose to interact with touchable installations in exhibits.

Another major risk is fire prevention (table 6). There are a number of ways to address this – fire exits, fire exits maps (as discussed), frequent electrical equipment monitoring, sprinkler installation, clearance of emergency staircases, and most obviously, accessible fire extinguisher

placement. As a disclaimer not all fire extinguishers will be visible in public space. According to 55 Pa. Code § 2800.131 regarding fire extinguishers,

“(a) There shall be at least one operable fire extinguisher with a minimum 2-A rating for each floor, including public walkways and common living areas every 3,000 square feet, the basement and attic.

(b) If the indoor floor area on a floor including the basement or attic is more than 3,000 square feet, there shall be an additional fire extinguisher with a minimum 2-A rating for each additional 3,000 square feet of indoor floor space” (55 Pa. Code § 2800.131, 2011)

It can be assumed that all museums follow state regulations. The rate of fire extinguishers adjusted to sq footage cannot entirely indicate that some museums prioritize health and safety over others. For example, much of the space in the Philadelphia Museum of Art is unoccupied in terms of viewing content; resting areas, large hallways, and grand entranceways, for example, pose less fire risk to visitors, objects, and space. This results in a low visible rate compared to a smaller, more densely populated museum such as the Mütter, which has the highest fire extinguisher to space ratio of all museums. If the museums were to abide by 55 Pa. Code § 2800.131 (a), then the Mütter would require at minimum approximately 2 extinguishers throughout the galleries (two floors), contrasting with the observed 10. There is also the implication that museums with lower rates could have extinguishers that have little visibility that could be missed; however, this is a major fire hazard and could prevent quick response times in the event of an emergency. Fire extinguisher ratings were not recorded but are assumed to abide by state code.

Each of the museums claim accessibility is a high priority (table 6). All except the Mütter Museum have wheelchairs available and visible in or near the entryway if needed; that being

said, the Mütter Museum website assures that wheelchairs are available behind the admissions desk, though it is not readily apparent for visitors (Mütter Museum “Accessibility” 2024). Visitors with unseen disabilities may not be aware of this, so wheelchair availability at the Mütter Museum should be advertised more clearly. Following wheelchairs, elevators are also essential for providing optimal accessibility. All museums have at least one elevator that allows access to the main galleries, often spaced out if the museum is more widely spread. For abled visitors, the flow of all museums encouraged the use of stairs rather than elevators, which undoubtedly saves energy and associated energy costs as well as lowers safety risks by allowing space for free movement in contrast to an elevator’s confined area to accommodate peak visitation hours.

Health and safety can also extend to fostering safe spaces for oppression. A common example of precautionary measures for ensuring safe spaces includes content warning signage for culturally sensitive topics, especially human remains on display, wherein the objects are shielded with some reinforcement, like a curtain, door, or separate room with low visibility. Warnings allow visitors to choose whether to view the object. But it also assumes the identity of the museum visitor and if they could experience trauma with viewing (Anderson 2021, 9). Consequently the exhibition of these culturally sensitive materials may reflect poorly on the museum itself, despite precautions. Belonging is also essential, as some museums may host an environment that creates a hostile environment for certain visitors. Museum staff can very well take part, as attempts to guide visitors, especially those marginalized, can be misconstrued and also lead to many assumptions about knowledge and identity (Ronning et al 2023). Museums already provide a service to welcome, as any public entity does; but belonging, instead of inclusion, requires participation and self-guided experiences (Price and Applebaum 2022, 141).

In other words, community input should be encouraged to lower the risk of exclusion and seclusion – and museums can do this by incorporating hands-on displays in which visitors can physically and thus culturally interact with the content they are learning from and enjoying (Ronning et al 2023).

### **III. Bathrooms**

While bathrooms are hubs for high water and energy use, they are considered for social criteria rather than environmental criteria for a discussion of accessibility and human rights. It is also difficult to accurately estimate the quantities of water and energy use. The different models of toilets within each museum contributes to different gallon per flush rates, automatic sink dispensers last for different times and exert different amounts of water, and visitor bathroom use data is unkept; there are countless other factors that prohibit an appropriate analysis.

Another slight inhibitor is access to men's bathrooms. This study estimates the number of toilets in men's, women's, and unisex bathrooms because men's bathrooms were not visited. If there is a certain number of toilets and sinks in the women's bathroom, then the number in the adjacent men's bathroom is matched, counting urinals as 'toilets.' Furthermore, bathrooms in private spaces, offices, academic wings, research facilities, etc., were not considered in this study as these areas are not part of the general visiting experience.

A cross-study evaluating the number of toilets and sinks per museum, for every visitor count per year considering its square footage, was analyzed to approximate accessibility (table 7 and fig 4). A higher ratio number indicates more bathroom availability to resolve overcrowding, increase sanitation, and support visitor needs of all types. Represented in the data is the inclusion

of all gender bathrooms with the binary gender except for the Academy of Natural Sciences, which only has men's and women's bathrooms.

Here we see the Mütter Museum has a high ratio given its small size and age, countered with the relatively small amount of bathroom spaces throughout the museum. There is only nearly 1 toilet and sink per visitor, which can congest waiting times and disrupt positive visitor experience. On the other hand, museums like the Philadelphia Museum of Art have a massive number of toilets and sinks – to the point where crowd solutions, sanitation, and accessibility are undoubted, but overuse of energy and water consumption may be. It may be possible to install more bathrooms in the Mütter Museum with the supposed plan introduced a few years ago to expand the galleries by an additional 5,000 sq ft (Haas 2019). In contrast it would be a waste of available space and resources if bathroom stalls were closed in the Philadelphia Museum of Art. Overall more energy, water, and waste monitoring needs to be conducted and reported as to evaluate if bathrooms are maximally efficient, as well as successfully socially serving to their visitors. This is true across all museums; not just the Mütter Museum and Philadelphia Museum of Art.

For the ratio of visitors/sq ft/year, Charlie Trautmann of the Sciencenter suggests that for “interactive museums in the U.S. typically see about six visitors/sq ft/year [e.g. Franklin Institute], with children's museums slightly higher than average and less-interactive natural history museums [e.g. Academy of Natural Sciences] slightly below average (table 8). Be wary of any estimate for a new museum of greater than eight visitors/sq ft/year, and of greater than two to four visitors/sq ft/year for an addition to an existing museum” (Trautmann 2020). Here a higher ratio indicates the opposite of the previous metric: more crowding, less sanitation, and less overall accessibility. Again, the Mütter Museum stands out with its high ratio, as well as

Penn Museum's seemingly low ratio. In this case, too low of a ratio indicates more space than people, which leads to more overall energy and resource consumption, especially in bathroom upkeep. Further social engagement with the community to enhance the number of visitors per year is a smart step to achieving greater sustainability and the fulfilling of the museum's inherent duty to educate.

#### **IV. Sustainable Community Engagement and Performance**

Museums, as intrinsic advocates for education, hold power and credibility as institutions. It is therefore their responsibility to espouse and thus share environmentally sustainable practices, to make a lasting impression upon the visitor.

The Mütter has limited interactions publicly. There is a response letter to the Philadelphia Inquirer which refutes the claim that some temporary exhibition cases were accessioned and later discarded, when they were later repurposed (Mütter Museum "Response to Philadelphia Inquirer Article," 2023). An event was also held earlier this year, "Philadelphia Grand Rounds: Addressing Climate Change with Innovation," which involved a zoom discussion (Mütter Museum "Philadelphia Grand Rounds," 2023).

In their 2021 Report the Academy of Natural Sciences primarily focused on the shift into adapting to the pandemic, though they announced that 2021 was their "Climate Year" – their "first thematic year to address the big issues of our time. And this year's focus was climate change" in which they "presented yearlong environmental justice programming, virtual events and workshops" (ANS Annual Report 2021, 14-15). The Academy of Natural Sciences is also the only museum to officially acknowledge climate change as an issue, with much of their research at the Patrick Center for Environmental Research dedicated towards water and biodiversity (ANS



“Where We Stand” 2023). They also advocate for a Plastic-free Philly initiative starting in 2022 to raise awareness about plastic waste and water (ANS “Plastic-free Philly” 2023) and write monthly sustainability blog posts under “Small Actions Spark Big Changes, with November’s theme centering composting (ANS “Small Actions Spark Big Changes” 2023).

The Philadelphia Museum of Art Is one of the top energy users in the city, and thus was targeted to bring Philadelphia’s carbon emissions by 80% by 2050 with a \$11.3M dollar project (Johnson Controls 2019). As a result, “with the completion of the project in late 2020, greenhouse gas emissions from the PMA are projected to decrease by nearly 2,400 metric tons of CO2 equivalent annually. The building is expected to save 4.8 million kWh of electricity (28% reduction), 16,000 Mlbs of steam (21% reduction), and 1.2 million gallons of water (8% reduction), for an annual cost savings of \$750,000” (City of Philadelphia Energy Office, 2021).

The Franklin Institute tries at addressing sustainability on an online blog with a teacher education cohort program, partnered with the School District of Philadelphia (Valletta 2019). Beyond this, and an exhibit about electricity sponsored by PECO, there is little message about sustainability at all. This is unfortunate as it is a science and technology museum, both of which are massively influential in sustainability science.

The Penn Museum does make effort; it introduced the Inaugural Seeds of Change earlier this year, meant to educate the public about education crises (DiSanto 2023). But more importantly it has achieved a Level 4 in the Certification in the Penn Green Office Program, which is the highest score and requires at least 180 points in a dedicated monitoring checklist, which is inaccessible to the public. The checklist includes evaluations of waste, purchasing, events, energy, water, human health, transportation, and involvement; the certification is valid for 3 years and was last conducted in 2021 (Mazzocco and Penn Green Office 2023). As of 2021 it

scored 358 points, which is unchanged compared to the 2018 score. It is unclear based on the qualitative construction of the checklist if the Penn Museum has improved its standards for sustainability compared to 2018; that is, the extent to which sustainable initiatives are conducted to a higher degree.

## ***Governance Criteria***

### **I. Entry Fees**

Culture is not free. Operating museums comes at a heavy cost. To supplement this, museums secure funding from a variety of sources and/or stakeholders. Tables 9-13 and figures 5-9 display where each of the five museums generates income for fiscal year 2022 and fiscal year 2019 for Penn Museum. While museums are primarily funded by private or government trusts, grants, donations, plus other smaller revenue incomes as shown here, they ultimately serve the public – and so the public should be able to access the museum at a fair cost. This cost is known as an entry fee. Entry fees for each museum is outlined in table 14. It is hard to say what a ‘fair’ cost is quantitatively, as relative socioeconomic status can bias the visitor’s view on the price. A lower price logically means greater accessibility to the visitor but may hinder the museum’s fiscal performance. Here lies the question: is it more sustainable to grant visitors greater access with lower prices, or to better support museum governance with higher prices?

The question of sustainability is complicated and of course needs to be evaluated in some way to find a balance. While there is no one correct answer, Faye Steiner posed two formulas to help visualize how museums can determine the best entry fee pricing, based on a comparison of income models on days with entry fee charges and those without (fig 10)(Steiner 1997, 310).

Immediately we encounter a few obvious assumptions. While the museum assessed in Steiner's study includes them, not all museums have restaurants and shops; the Mütter Museum and the Academy of Natural Sciences do not have currently operating food and beverage retail. There are also many other sources of revenue to consider in addition to shops and restaurants – membership fees are one such important example as they directly influence the price of the entry fee, given that the visitor holds a membership. Museums may also not offer free days, unless on certain special occasions. Some of the other assumptions Steiner discussed related to elasticity of demand; that is, as simplified, if visitor demand increases as a result of the drop of entry fees, corresponding to increases in pricing in shops and restaurants. The extent of this measurement is highly variable and cannot be entirely estimated, especially when considering weekdays and weekend days and visitor demographics.

Elasticity highly depends on the audience. In the context of Philadelphia, it is difficult to determine who is a visitor and who lives in the city or metropolitan area. While there are vastly different income levels based on neighborhood, the median income in Philadelphia should greatly affect the consideration of entry fee prices. For instance the 2022 median income in Philadelphia was \$57,537, and nationwide median income was \$75,149 (U.S. Census Bureau "QuickFacts" 2022). This is important to consider because although the neighborhoods these museums are located in tend to have higher median incomes, there are visitors from all over and outside of the city. A University of Pennsylvania student called for free admission to the Penn Museum for all Philadelphian citizens (Chen 2023). But it is not so linear. The idea that elasticity is only based on socioeconomic demand is, according to Volker Kirchberg, a *ceteris paribus* assumption, where lower income levels negate higher demands due to a fixed price (Kirchberg 1998, 2). Other sociological factors, such as occupation and education, affect attendance rates in

addition to income level – therefore, Kirchberg views socioeconomic barriers as subjective. The context of this study, however, considers German museums in the late 90s, who offered no fees or very low fees, despite the contemporary financial crises Germany faced (Dustmann et al 2014, 167). Kirchberg’s findings insist that, indeed, if museums raised prices then the composition of museum visitors would skew towards the wealthy, thus inciting a subjective socioeconomic barrier. This is simply not sustainable, as one of the core tenets of sustainability is social equity; everyone, no matter the economic background, should be able to enjoy cultural heritage. If museums must raise prices to compensate losses then they should also implement more equitable elastic solutions. Tables 15-19 show preexisting discount rates that the investigated museums offer. Notice that those with higher revenues and more diverse revenue sourcing trend towards offering more discounts.

The museum with the fewest amount of discounted rates, though, has the lowest entry fee costs. We can see a dramatic increase in the reliance of admission fees for the Mütter Museum’s income, for example. But their prices remain relatively low compared to some of the other museums. This is the result of trusts and grants dropping from \$3,906,970 in 2021 to \$2,068,298 in 2022, as well as an investment income change from \$10,102,606 in 2021 to an income loss of \$4,097,168 – so this is unlikely representative of average annual performance and more so the possibility of controversies affecting attendance and financial support (College of the Physicians of Philadelphia 2022). Regardless, the Mütter Museum’s dedication to maintaining a relatively affordable price, compared to the proportionally alike other museums, especially the Philadelphia Museum of Art with the highest absolute prices, remains noted for some demonstration of sustainability accountability.

There is commentary in Figures 5-9 that highlight some of the amount that entry fees contribute to museum income. However it is not always clear. The Philadelphia Museum of Art reports 9% of their FY22 revenue comes from admissions, and the Mütter Museum combines museum admissions and store/library services as 47% of their income. The others do not explicitly outline entry fees contributions. The Franklin Institute includes ‘program services’ at 61%, but it is not clear what falls under this category. In terms of nonprofits, program service revenue generally refers to a charge “for a service directly related to its mission” (Charitable Allies 2024) which may or may not include entry fees. The only other suitable category includes ‘other income’ at 2%. Entry fees likely fall under ‘other income’ as well at the Academy of Natural Sciences, which amounts to 29%, presumably alongside shop income. Earned Revenue and Resource Transfers is the most probably category for entry fee inclusion at the Penn Museum, at 6%. From these numbers originating from vague categories, it is difficult to determine the impact that entry fees have on the overall operation of these museums, though given the amount of other revenue streams, it is safe to assume that no one museum is overly reliant. The one exception may be the Mütter Museum, which again experienced a major drop in trusts and grants income in one year.

Certainly Covid-19 alongside inflation have complicated income disparity and museum revenue, and museums are still adapting. Only about a third of museums in the US have recovered 100% attendance rates compared to pre-Covid (AAM National Snapshot 2023, 4). It is simpler to offer fixed prices in a turbulent economy. But visitors are adapting too. It may be necessary to increase prices after massive losses of long periods of time for closure, and price increases for most other goods and services to accommodate but as attendance rates are rising, more sustainable, accessible, elastic pricing should be reconsidered. This especially depends on

if museums are frequently changing exhibits. The most recent example is The Art of the Brick exhibit which opened on February 17, 2024 at the Franklin Institute – there is a \$20 admission fee to view this exhibit exclusively in the evening, and an additional fee on top of the regular entry price, which varies per age group but is around a \$15 increase. Since this is a traveling, seasonal exhibit, which closes on September 2, 2024, and is focused on a theme that the primary demographic, children, are presumably interested in, the Franklin Institute is keenly taking advantage of a high price. By comparison there is currently an Art of the Brick Expo in Miami, open since January 27, 2024, which costs \$22.90 for adults and \$15.90 for children over 4 years old (The Art of the Brick 2024).

The Philadelphia Museum of Art also invested \$11.3 million dollars for energy savings renovations (Philadelphia Energy Office 2021). This may seem like a significant loss to revenue, but subsequently, the museum raised \$455 million dollars to fund the \$525 million dollar renovation project known as the It Starts Here Campaign, in which the highlighted goals are “attracting younger and more diverse audiences; enhancing the visitor experience by making much-needed physical improvements to the museum; activating the collection through gallery reinstallations and innovative programming; and strengthening the museum’s commitment to civic engagement” (PMA Press Room “\$450 Million” 2019). Of the \$525 million, \$233 million is dedicated towards capital improvements, including the Core Project, which expanded 90,000 square feet of ADA compliant and energy efficient space designed by Frank Gehry (PMA Press Room “\$450 Million” 2019; PMA Press Room 2021). This amount, however, does not include the energy savings project, which is a collaboration between the city of Philadelphia, the Philadelphia Museum of Art, Philadelphia Energy Authority, and Johnson Controls (Philadelphia Energy Office 2021). Not surprisingly, around the same time the fundraising amount was

announced (August 7, 2019), general admission prices rose from \$20 to \$25 to reflect “both the importance of earned income in sustaining the museum’s programs and of maintaining its commitment to providing access” (August 28, 2019)(PMA Press Room “Museum Announces Changes in Admission Pricing” 2019). Only a few years later the Philadelphia Museum of Art raised its prices again, from \$25 to \$30 for general admission as well as member guest admission from \$12 to \$15 and parking from \$10 to \$15, to support pandemic losses (Cartagena 2023). Here we see a dynamic range of reasons for entry fee hikes and price determination; noticeably each increase is by an increment of \$5, a 20% increase just within the most recent installment. The current inflation rate for 2023-2024 is 3.5%, a slight increase from 3.2% in the previous year; given that the rate was 7% in 2021 and 6.5% in 2022, the timing of the price increase for entry fees, membership prices, and parking is not entirely disingenuous, as revenue has slightly increased from the previous fiscal year (FY21 - FY22) and is projected to rise in FY23 to bolster post-pandemic performance (US Inflation Calculator 2024). Rather than lowering the entry fee cost, which can be viewed as ‘cheapening’ the value of the museum, there can be more equitable solutions implemented in the future. For example, in 2019, the Philadelphia Museum of Art granted free admission to EBT and ACCESS card holders, rather than a \$2 fee like other museums (PMA Press Room “Museum Announces Changes in Admission Pricing” 2019).

A few examples for solutions could be PWYW on more days, lowering membership fees and member guest fees or offering discounts on certain days, decreased cost after certain hours or off-peak hours, discounts when ordering tickets online, etc. The Academy of Natural Sciences and the Penn Museum offer many of the solutions above and given that other museums such as the Franklin Institute and Philadelphia Museum of Art generate significantly more revenue, they can afford to introduce more accessible fee options.

Membership is an excellent way for museums to generate revenue, but it is not inherently accessible or equitable. Only few demographics are able to visit museums regularly, as previously discussed, to take advantage of the reduced entry costs. Memberships, based on the museum, have different target audiences. For example, the Academy of Natural Sciences explicitly quotes “A family of five pays \$123.00 in general admission each time they visit the museum. An Academy Family membership starts at just \$135 and includes free, unlimited general admission and many more special member benefits for an entire year” – and that “membership pays for itself in two visits” (ANS “Admission” 2018). As of 2017 the most common model is a membership fee costing about 3-5 times the cost of a single entry fee (Rushton 2017, 205). The Philadelphia Museum of Art’s general member price is about 2.5 times the general admission; The Mütter Museum’s is 2.5; Penn Museum’s is 3.61; The Franklin Institute’s is approximately 1.78 (only dual membership with one member and one guest is available; the cost of two tickets is considered); and the Academy of Natural Sciences’s is 2.4. Except for the Penn Museum each of these are under the common threshold. This is significant because even before the pandemic, from 2016 to 2018, membership across museums in the US has declined -3.6% – and presumably, even more in recent years (CulturalData 2024). Even if members pay for an annual membership, expecting to visit often, statistics show that on average members visit less than one time per year – which benefits the museum revenue more than savings for the visitor (Siemer 2021). Instead the American Alliance of Museums demonstrates that monthly membership models can be profitable as well; it allows the choice of retaining membership, granting the essence of freedom, but studies show that retention rates are between 85-95% (Siemer and Lewis 2021). Even if members do take full advantage of the membership perks and extend into revenue loss from single entry fees, sustainability is still inherently present,



as that individual and potential guests benefit from culture and ultimately contribute to the museum's community. It cannot be fully assumed that demographics that visit museums more often – white, educated adults with children – are the sole benefactors of museum memberships; so the argument that memberships foster elitism is not entirely valid, especially if museums offer more affordable membership rates that establish a cultural community.

If museums frequently analyzed this data using a similar model, then entry fee pricing can be regularly considered and changed for more enhanced accommodation solutions like sliding scales, more discounted rates for more eligible groups, etc. There already exists a “Pay What You Wish” model implemented at many museums across the world, in which case the visitor decides the monetary amount to contribute, sometimes guided by a ‘suggested admission’ cost (Reisman 2018). Despite not needing to pay, it is common that visitors will pay anyway, whether it be the suggested price, a few dollars, or higher than expected, as the social atmosphere of seeing others pay for entry or the amount of money in a clear slot box incentivizes others to as well (Blanding 2015). Out of the investigated museums, the Philadelphia Museum of Art offers a PWYW admission on the first Sunday of each month and every Friday night (PMA “Admission” 2024). As seen in tables x-x many of the Philadelphia museums offer plentiful discounts, especially as sponsored by organizations that advocate for equity – one of the most substantial national groups being Museums for All co-operated by the Institute of Museum and Library Services and the Association for Children's Museums (Museums for All 2024). In general greater financial accessibility for visitors allows more visitors to experience and freely enjoy cultural heritage.

## **II. Ethics**

A rather qualitative ESG metric, ethics constitutes impact. First it must be noted that ethics connotes an element of integrity that must be upheld by the museum and all its constituents, including the visitors (Malaro 1994, 17). Museum ethics may differ by institution based on legal codes that could vary by region. If a museum is a cultural nonprofit, trustees should be held responsible for establishing, enforcing, and disclosing legally obligate policy in good faith as to not abuse its charitable position (Malaro 1994, 18; 22). Ethics codes should also always be subject to review and revision, as ethics values can change throughout time and leadership changes (Stark 2011, 37). Ultimately in the context of sustainability, shared societal ethics held by museum standardization can help promote a longer lasting, cohesive institution.

One prominent way to express ethics is drafting a mission statement. Mission statements for each museum are available in table 20. Purpose is a fundamental component of the museum's existence. While one could say all museums serve the public for educational and cultural access, every museum is its own individual. Composing a mission statement involves gathering relevant legal documents (charter, bylaws, gift instruments) and assessing the capabilities the museum can offer (Malaro 1994, 45). That is, if the individual aligns with the mission. It is very well possible that there may be a conflict of interest, in which one does not feel the need to serve the duty that the museum outlines for its workers; then, the museum fails to serve its mission and practice well-being, since it cannot be achieved (Straughn and Gardner 2011, 44-45). In this scenario the conflict of interest could be deliberate, or misunderstood, perhaps with the lack of shared information that the museum and its workers must provide for professional conduct (Edson 2017, 175). Morals can also be confused with ethics, as in morals are often guided by a

personal higher authority, and ethics are often guided by the standards of the profession to be monitored and mutually held accountable (Edson 2017, 26; Malaro 1994, 20).

The American Alliance of Museum Code of Ethics was adopted in 1993 and amended in 2000 to establish a set of shared values among the American museum community (AAM 2023). Unlike the Human Rights metric, not all museums publicly report an ethics code. The Penn Museum, Academy of Natural Sciences, and unsurprisingly, the Mütter Museum all discuss “ethics, respect, and consent” in some way (Mütter Museum “Mütter Matters,” 2023). Because the Franklin Institute and the Philadelphia Museum of Art are 501(c)3 dedicated cultural nonprofits, they should be “targeted for immediate review,” Marie C. Malaro states, because “openness should be substituted for secrecy. Unless there is a clear right of privacy to be protected (and legal advice should be sought in advance to identify this) the rule should be disclosure” (Malaro 1994, 27).

Further there are numerous organizations that call for the repatriation of objects (UNESCO) and human remains (NAGPRA, for Native American heritage) to which museums must adhere. Both the Mütter Museum and the Penn Museum have faced controversy for their questionable handling of human remains and content presentation: in these cases, “poor” ethics. That is, the overlying restriction of consent brought massive negative media attention to both institutions, which can severely harm their operations. This could look like staff quitting or the questioning of the existence of the museum, in Mütter Museum’s case (Judkis 2023). If there is enough controversy, then visitors will be less inclined to visit and learn, and donors and grants will be less likely to be distributed to total revenues. This greatly shortens the lifespan of a museum and prevents sustainability.

### **III. Political Contributions**

The Mütter Museum has come under scrutiny as of late over its treatment of human remains and online content. As discussed previously, this does influence visitor engagement, but also divides adherents and opposers into certain social groups. A Wall Street Journal Op Ed by Stanley Goldfarb calls the museum leaders “woke elites” for taking down accessible online YouTube videos and expresses fear that the museum exhibit may close with restricted access to physicians only, thereby limiting information to the public (Goldfarb 2023). The Chairman of the College of Physicians of Philadelphia, Julia Haller, assures the public in a follow-up letter on the WSJ titled “Philly’s Mütter Museum Isn’t Getting Political” with the subtitle “We don’t intend a woke ‘deconstruction’” that despite these claims, the board unanimously voted to keep the videos online (Haller and Resta 2023). The Mütter Museum itself released a statement with more information on its official website, certainly in response to the negative press (Mütter Museum, “Mütter Matters” 2023). The letter effectively acknowledges negative political connotations that the label “woke” gives and seeks to relieve themselves of this accusation. While the use of online videos to act as a collections display in lieu of properly repatriated remains could be considered sustainable, it is more important to respond to criticism in a professional manner to maintain a composed image to be more inclusive. Sustainability values stability, and a personal conversation, which should be private, through an opinion section of a popular news source is in no way responsible or mature. To maintain the sustainable integrity of the museum, Mütter Museum public relations conduct must improve moving forward.

Little information about the political contributions of the Academy of Natural Sciences is known to the public, but there are visible position statements. It seems much of the institution’s mission is dedicated towards scientific research and education, which does not inherently have

any political leaning. But the strong support of climate change science, water accessibility, and evolution generally align with liberal values (ANS, “Where We Stand” 2018). This holds true for the political affiliations of each staff member, composing 100% for Democratic Party Representation, including several campaign donations (Zippia, “ANS” 2023). The advancement of science advances sustainability, and active support for the cause further amplifies the impact.

Art is a common way to express sentiment about politics, and the Philadelphia Museum of Art makes no effort to censor politically charged artworks. That does not necessarily mean that the museum administration aligns with the messages on display. It only suggests that it values free speech. They also claim a “commitment to civic engagement” among the administration, which includes a director who takes an interest in “justice, equity, diversity, inclusion, and accessibility,” and the Board of Trustees under the City of Philadelphia (PMA “Administration” 2023). Thus, political statements from the museum are by extension reflective of those of Philadelphia and must be chosen carefully. The public face of the museum advocates for progressive movements, notably Pride in June of 2023 (PMA “PMA Celebrates Pride 2023”), and a Juneteenth celebration (PMA “Museum Community Celebration” 2023) but is privately conflicted. In May 2020, in response to Black Lives Matter movements, museum leadership reportedly sent a letter to employees that condemned “otherwise peaceful protests as ‘compromised by the looting and destruction of property’ while reaffirming that ‘every individual life matters’” (Small 2020). As 100% of the employees of the Philadelphia Museum of Art align themselves with the Democratic Party, including thousands of dollars for individual political donations (Zippia “PMA” 2023), this statement was met with poor reception and resulted in a back-and-forth commentary. Eventually, a call to unionize was won in August 2020 with a 99% vote (Small 2020; Philadelphia Museum of Art Union 2023). As shown, the

Philadelphia Museum of Art employees' commitment to democratic, workers, and civil rights embodies a sustainable approach to social justice and equity.

Like the Academy of Natural Sciences, the Franklin Institute also maintains a muted political stance. Science museums, as discussed, focus on reasoning and the acceptance of new ideas, which is important for a sustainable mindset. It is also important to demonstrate social advocacy. There is no reported information about staff political affiliation. Furthermore, one of the official museum policies or social media engagement is restricting “messages that focus on controversial political, social, or other issues, including health and safety measures” (Franklin Institute “Museum Policies” 2023). While neutrality can be responsible, it also subtly suggests that social issues are not of concern for the institution nor leadership, which should be one of the forefront tenets of the social sector of sustainability. To properly engage with the public, the Franklin Institute should be clearer on what their stance is on social and environmental issues – especially as a science museum.

In addition to their social stances as publicly stated in the Ethics section, which all espouse progressive goals (Penn Museum, “Our Social Responsibility” 2023), the Penn Museum eyes unionizing. Workers voted to unionize and follow the Philadelphia Museum of Art in joining AFSCME District Council 47 and Cultural Workers Local 397 in August 2021, with continued negotiation hearings starting in October 2021 until the present (Bishara 2021; Son and Liu 2023). Progress is difficult given the anti-union warnings spread throughout various kinds of media, such as fact sheets and a video from the museum director suggesting to vote against the union (Bishara 2021). The Penn Museum Workers United group drafted a letter to request union election neutrality for all staff (Penn Museum Workers United, “Support Us” 2021). In this context, neutrality of union information is unbiased and allows for staff to make their own

decisions, executing agency, which is healthy for a sustainable environment. Otherwise, the Penn Museum does not seem to affiliate itself with any specific political movement, and staff party contributions are not visibly recorded. Given their social and ethical statements, the Penn Museum seems to best benefit from public political neutrality.

#### **IV. Executive Compensation**

While executive positions hold greater responsibilities for museum administration, museums are, much of the time, non-profits. To achieve greater sustainability, museum wages should then reflect more equity than a standard for-profit business model, as the workers serve the public, especially for primarily educational purposes (Baldwin 2019; Pratt 2022). Greater pay equity also reflects that the executives value their staff, recognize their efforts, and compensate them appropriately. An Ithaca S+R report concludes that “the majority of art museum directors view pay equity as a high priority at their organization” as well as reporting a high priority for “providing a livable wage for all employees and contractors” in a 2022 survey (Dressel, Harkins, and Sweeney 2023, 8). While the research was aimed at art museum executives, it is likely that executives at other museums would offer similar answers; however, the numbers may not completely reflect their claims.

How executive pay in nonprofit organizations is determined is rather straightforward. In general Title 15 § 9132 of the Pennsylvania General Assembly authorizes “(b) Permitted payments. —A nonprofit association may: (1) pay reasonable compensation or reimburse reasonable expenses to a member or manager for services rendered; (2) confer benefits on or make contributions to a member or manager in conformity with its nonprofit purposes” (Pennsylvania General Assembly “Title 15 § 9132” 2013). What is considered ‘reasonable’ for

executive pay in nonprofits is arranged in a three step process by the IRS (National Council of Nonprofits 2024):

1. An independent body should determine a “comparability review” with a “compensation committee” or other group of board members.
2. The independent body examines “comparable” salary and benefits as other nonprofits with similar missions, budgets, sizes, and locations (i.e. museums of similar size and income within the Philadelphia region).
3. The independent body documents the process and individuals involved in the review as well as any approvals or denials of the fixed compensation amount based on the comparable amounts using IRS Form 990, Part VI, Section B, line 15.

It is recommended that this process occurs yearly and is confirmed within an institutional written policy using available compensation reports (National Council of Nonprofits 2024). This congregation allows for board members, which may include salary or wage workers, personal input on what is considered reasonable within the nonprofit. The composition of the board could generate bias, however, depending on how members are elected internally and the proportion of board of directors that serve similar executive pays. To ensure fairness and sustainability board membership should be open to all nonprofit workers within the organization, in this case a museum.

While executive pay is essentially democratically decided, the number is largely based on roles, work, and services, which differ based on position as well as institutional service type, location, revenue, size, and personnel (JERHR Group 2023). Therefore it cannot be expected



that, despite a comparative analysis, the executives in each museum will be paid the same amount relative to each other.

Table 21 offers executive compensation accounts for not only the CEO/Director but other roles such as CFO, supervisors and officers, vice presidents, etc., which can vary per museum. ‘Salaries and wages’ do not include executive compensation. Higher relative percentages for executive compensation and lower relative percentages for salaries and wages indicate inequity and profiteering, which is damaging to the internal structure of the institution. The Penn Museum was not included in this assessment because the data has not been released to the public as it is associated with the University of Pennsylvania, which only authorizes salary disclosure for the Division of Human Resources and Institutional Research and Analysis (UPenn ISC 2024). As per new regulations by the American Alliance of Museums, US museums must disclose salary amounts on job postings, but executives positions are currently not open for applications (Benzine 2022).

For the ratio of executive compensation and salaries and wages on total expenses, a higher value signals higher amounts of inequality. For example, if the amount of expenses on executive compensation and salaries and wages were the same, giving a 1:1 ratio would mean the disparity between executives and a median salary would be much greater. It is noted that based on reported salaries and wages (table 22), in figure 11 and table 23, the Franklin Institute has a much higher ratio than the other institutions – so, the executives get paid relatively more than the other museums. Again, workers who are comfortably, or at least adequately, paid have overall higher satisfaction rates, which improves efficiency and efficacy of operating a successful museum and expands the museum’s lifespan. The priorities for more equitable pay in the museum hierarchy may not be a priority for employees of the Franklin Institute, but if total,

absolute compensation numbers were to remain the same whilst executive compensation decreases, employees could receive higher pay. The Philadelphia Museum of Art dedicates the most amount of money towards compensation whilst maintaining the lowest percentage of executive compensation, with a wage inequity indicator of 0.1315 – compared to Franklin Institute’s indicator at 0.5446. It also has the second highest average salary estimate (though the Mütter Museum’s estimate is based on an average of four reported salaries, which is a low sample set). Other museums could use these statistic as models for pay raises, especially in the comparative independent body compensation determination process.

The concept of ESG pay is somewhat recent and is becoming more popular at many institutions across the world, at 38% of 4,400 public companies based on an IESE study, although the US is still developing, from 16% in 2022 to a substantial 50% in 2023 (Kiger 2023; IBM 2023, 33). Essentially executive positions that adopt ESG practices and the adjourning pay based on said roles contribute to the institution’s overall sustainability performance. There is some contention, though, since although sustainability can be profitable and reflect future economic projections given long-term investments on infrastructure and positive stakeholder relationships, individual pay has no positive association on asset returns and stock returns can decrease (Ormazabal and Kadach 2023). Therefore it is entirely up to the executive on where their priorities lie; and of course, the council that decides the executive’s pay. ESG metrics that should be prioritized within the responsibilities of the role is also up to the executive’s best interest to serve the institution. In a 2023 IBM CEO study, environmental sustainability is only fifth in the CEO’s view of their organization’s top priorities, compared to third place in 2022; on the other hand, it is reportedly the topmost challenge for the same interviewed organizations (IBM 2023, 32-33).

Greenhouse gas/carbon emissions are frequently cited as a major goal for many institutions, but adopting ESG pay is not shown to decrease emissions unless there is a significant incentive or accomplished, standardized, measurable goal (Kerber 2022; Kiger 2023). Risk management and sustainably conscious shareholder retention are other benefits. If a target were to be based on remuneration, auditing would secure trustworthiness and comparability case studies for other institutions to follow suit with proper disclosure acts – this would only generate positive movements for sustainability across industries, especially museums (Cook, Savage, and Barge 2023). ESG pay is more so an option for long-term investment than short-term gain, which should not be the objective of nonprofits in the first place and is highly compatible with cultural heritage protection. Museum executives should consider adopting ESG pay, even if the ESG metrics begin at a limited capacity. Any change would be beneficial. It is true that museums are still adapting and struggling to reach pre-pandemic levels, but future-oriented plans should be stressed in the event that another emergency, climate related or no, occurs.

## CHAPTER 5: DISCUSSION OF THE RESULTS

As role as educators, museums must be clear on their stance towards anything, which of course includes sustainability – not just climate change, but human rights, accessibility, and ethics as well. While these views are clearer online through reports and on museum websites, not many observations were made towards sustainable promotion during on-site visits. And for example, while the Penn Museum, Franklin Institute, and the Philadelphia Museum of Art may all have biodegradable utensils in their cafes, that does not mean that they are fully committed towards addressing what sustainability means. Sustainability is a science, and so natural history and science museums, such as the Academy of Natural Sciences and the Franklin Institute, should be leaders in fighting for environmental issues (Cerquetti et al. 2023, 2). To an extent the Academy of Natural Sciences makes great effort towards sustainable community engagement and with a clear stance on the environment and its relationship to their research – but the interior of the museum does not always reflect that. The Franklin Institute on the other hand is much less vocal than it should be. Speaking up has its drawbacks, as seen with the Mutter Museum’s inappropriate conduct, but a mature, responsible approach can build trust with the community and stakeholders to uphold the museum socially and financially.

One way to demonstrate sustainability alliance is becoming Leadership in Energy and Environmental Design (LEED) certified. Green buildings that are deemed cost and energy efficient under the US Green Building Council’s standards may become certified and contribute towards the UN Sustainable Development Goals. So, while the Franklin Institute may not be vocal or transparent about their sustainable or environmental stances, they covertly comply with green design. While the Penn Museum is public with their ethics, they could stand to be public about their sustainable architecture as well. Returning to the example before, even advertising

biodegradable materials near the waste receptacles could benefit visitor's views of any of the museums for better awareness. But above all, a formal statement, using the Academy of Natural Sciences as a model, solidifies agreement with sustainable initiatives; the only difference must be that it must be visible online and on-site for most impact.

Essentially any topic that arises in popular culture almost immediately becomes politicized. While it appears more unbiased authorities experience more respect and offer an essence of trustworthiness, the inherent role as an educator negates that premise; museums cannot be unbiased. In fact, neutrality, or lack of a stance, can be damaging in this case as people naturally compose a binary sentiment of 'good' and 'bad' (Iwasa 2010, 153). Museums could also respond to visitor and community feedback to answer any questions; again, while handled poorly, the Mütter Museum was bold enough to follow through with inquiries; their courage should be lauded in some aspect. Solutions like social media make this simple, though on-site interactions should be encouraged, such as inserting anonymous cards into a receptacle to track visitor satisfaction, or even opinions about sustainability (Gao and Yu 2023, 2). Honesty is universally a 'good' trait – so even if museums don't want to be affiliated with a sustainability movement (which according to this research, all of them do, whether it be explicit or implicit), they should be forthright for more credibility.

Transparency also extends into being transparent about data. Much of the analysis in this study could be greatly supplemented with raw monitored data from statistical reports about various indices – especially energy and emissions – but, this information is largely unavailable. Comparative studies available for other museums could benefit in order to produce their own goals, and consulting processes would be more streamlined. News articles may highlight how inefficient – or efficient – these museums are or could be, which only snowballs motion for other

institutions to adopt more sustainable practices. There is frankly no reason to conceal statistical information (unless unauthorized by a municipal energy provider), but other internal data monitoring like waste, packaging, supply chains, etc should absolutely be disclosed for public and private use.

Not all the museums discussed have the budget that the PMA does to afford a \$11.3M project to refurbish construction and energy systems. But there are simple things museums can do. Replacing old fluorescent lighting in cases and bathrooms, install motion sensors where applicable (if conservation allows), choose standby mode for interactive screens, and consider water reuse tanks are just as a few examples. These not only save energy but after investment will save the museum money and improve health and safety (Thumann et al. 2012, 242).

Energy dedicated to preventive conservation and microclimate conditions may be substantial, but there are still ways to minimize carbon emissions through energy audits, especially when retrofitting historical buildings such as those in Philadelphia (Lucchi 2018, 184). There are numerous sources for energy audit procedures; but museums should start with a self-evaluation of what their prioritized energy needs are since they are in greatest use and would benefit most from upgrades. This could vary from museum to museum.

Based on a 2019 case study from Drexel University on the climate change impact of office buildings in Philadelphia, pre-1980 built small and large buildings consume the most energy for heating and cooling in HVAC systems, with small buildings having the “highest variation in energy consumption” (Yassaghi and Hoque 2019, 75). Because all these buildings were built pre-1980, it seems as though all should consider HVAC system upgrades – but especially the Franklin Institute for its large size and revenue, as well as the small Mütter Museum, which has a

very high Visitor/Sq Ft/year ratio, influencing the interior heat with overcrowding (tables 24 and 25).

Since conservation concerns are substantial, and that climate control may be more demanding in older, smaller buildings, it is important to draft plans for future goals. Monitoring systems infrastructure frequently only upholds safety concerns and future projections for further installments – ideally those that are more efficient and cleaner. The priority of cost vs efficiency vs environmentally green options is up to the museum and its associates in the best interest of the cultural resources. Again, if statistics were frequently measured and analyzed, especially in the emissions and energy sector, then internal functioning of operations and physical building integrity can be better understood.

Philadelphia climate is considered “mild and moderate” with high rainfall and humidity (Climate Data 2023). Fortunately, this means that less variability in outdoor climate results in lower and more sustainable energy consumption for object conservation purposes throughout the year (Lucero-Gómez et al 2020, 2). But with climate change, more rainfall, higher relative humidity, and higher temperatures, especially with the influence of the Urban Heat Index affecting the urban locations of these museums, climate variability can dramatically increase. Museums should implement mitigation strategies within energy consumption now before potential damage to cultural heritage can occur in the future with inevitable climate changes.

## CHAPTER 6: CONCLUSION

The purpose of this study was to investigate the extent to which Philadelphia museums are sustainable based on a created metric checklist and further evaluate ways in which these museums could be more sustainable. A brief discussion of two main issues: lack of transparency, and advocacy for energy investing and planning, summarized the issues found within this research.

There is a significant amount of sustainability data that is not covered here: water use, transportation, green spaces, equipment, materials use, and so much more that could be greatly impactful to this study's purpose. These factors were not considered because they are either highly nuanced among each museum or there is insufficient data. For example, initially the number of trees in the green spaces at each museum were counted, but this does not inherently offer any conclusions about how sustainable the green space is. Landscaping in cities is rising in popularity among sustainable experts, and Philadelphia museums indeed should incorporate landscaping within their somewhat established goals for sustainability. It is not a confident claim to say that any of these museums prioritize sustainability beyond some of their more dedicated actions, such as the Philadelphia Museum of Art renovations, sustainable event hosting, and sought LEED certifications.

Instead, this study highlights a few of the major components of each of the three ESGs, which represent essential elements of sustainable investment in institutions, for a brief overview of sustainability in museums. It must be stressed that the point of view from the research was that of a visitor with no insider knowledge of museum operations and thus reflects simple observations within a single museum visit. An aggregated checklist with in-person visits still did not give all the data needed for thorough sustainable monitoring, for which one interview and



abundant literature review data sourcing supplemented the checklist. A more technical report including raw data for emissions and energy usage for each museum is highly recommended for comparative study purposes. Yet, the results were still informative regarding the performance of each museum.

As one of the oldest science museums in the country, the Academy of Natural Sciences, which boasts significant climate research, appears to perform well in all sectors discussed; while the Mutter Museum has some surprisingly good indicators, such as entrance fee accessibility, but abysmal conduct in others – especially ethics, politics, and presumed energy consumption based on older systems in an old, small building. That is not to say that the Academy of Natural Sciences is the ‘most sustainable’ and the Mutter Museum is the ‘least sustainable.’ In truth no ranking can be presumed without explicit statistics. Even then, as explored, sustainability is highly subjective, even if it incorporates heavy technical analyses. The world of post-COVID-19 also dampens the effect that museums have on prioritizing sustainability, as recovery, whether it be financial, cultural, institutional, etc, is more focused on. But with more adaptations museums need to – not just should – begin planning for safeguarding using these criteria and more to ensure that there is indeed a future for these museums, the objects, and the visitors.

In any case these five museums are not representative of all museums in the city, though they are just as representative of a part of Philadelphia culture. So, if these museums are seen to be appropriately sustainable, and consider improvements and community feedback, as well as adopt better energy efficiency solutions and adapt to more comprehensive planning methods – they are on track to last for a long while, satisfying our cultural heritage needs and overall wellbeing, the ultimate goal of humanity.

## REFERENCES CITED

- “AAM Code of Ethics for Museums.” American Alliance of Museums, March 14, 2023.  
<https://www.aam-us.org/programs/ethics-standards-and-professional-practices/code-of-ethics-for-museums/>.
- “About.” 2023. The Mütter Museum of the College of Physicians of Philadelphia. 2023.  
<https://muttermuseum.org/about/overview>.
- “About Museums for All.” Institute of Museum and Library Services, 2024.  
<https://museums4all.org/about/>.
- “About Us.” Academy of Natural Sciences of Drexel University. 2018.  
<https://ansp.org/about/overview/>.
- “About Us.” 2024. Philadelphia Museum of Art. 2024. <https://philamuseum.org/about#mission>.
- The Academy of Natural Sciences of Drexel University, Annual Report 2021/2022,  
<https://ansp.org/~media/Files/ans/annual-reports/ANS%20Annual%20Report%202021-2022%20with%20awards.ashx?la=en>.
- The Academy of Natural Sciences of Drexel University, “Dioramas.” Exhibits. 2023,  
<https://ansp.org/exhibits/dioramas/>.
- “The Academy of Natural Sciences of Drexel University Number of Employees, Statistics, Diversity, Demographics, and Facts.” 2023. Zippia. July 21, 2023.  
<https://www.zippia.com/the-academy-of-natural-sciences-of-drexel-university-careers-1469057/demographics/>.
- The Academy of Natural Sciences of Drexel University, “Small Actions Spark Big Changes,” October 2023, <https://ansp.org/get-involved/small-actions-spark-big-changes/>.
- The Academy of Natural Sciences of Drexel University, “Where We Stand,” 2018,  
<https://ansp.org/about/position-statements/>.
- “Academy of Natural Sciences receives Green Power award,” EurekAlert! For the American Association for the Advancement of Science, Oct 24, 2011,  
<https://www.eurekalert.org/news-releases/615533>.
- The Academy of Natural Sciences of Drexel University Blog, “Drexel Added to University Climate Change Coalition,” April 15, 2021, <https://www.anspblog.org/drexel-added-to-university-climate-change-coalition/>.

- “Accessibility.” Mütter Museum, 2024. <https://muttermuseum.org/visit/accessibility>.
- Acuff, Kaylee, and Daniel T. Kaffine. “Greenhouse Gas Emissions, Waste and Recycling Policy.” *Journal of Environmental Economics and Management* 65, no. 1 (2013): 74–86. <https://doi.org/10.1016/j.jeem.2012.05.003>.
- “Administration.” Philadelphia Museum of Art, 2023. <https://philamuseum.org/about/administration>.
- “Admission.” Philadelphia Museum of Art, 2024. <https://philamuseum.org/visit/admission>.
- American Alliance of Museums. “Annual National Snapshot of United States Museums.” 2023. [https://www.aam-us.org/wp-content/uploads/2023/06/SnapshotReport\\_v3.pdf](https://www.aam-us.org/wp-content/uploads/2023/06/SnapshotReport_v3.pdf).
- Anderson, Suse. “‘We felt unsafe.’ Rethinking risk, harm, and safety in museums.” *Museums and Social Issues* 15 (2021): 4-12. <https://doi-org.proxy.library.upenn.edu/10.1080/15596893.2022.2074639>.
- “The Art of the Brick.” FEVER, 2024. <https://theartofthebrickexpo.com/miami/#:~:text=Price%3A%20Adults%20starting%20at%20%2422.90%20and%20kids%20at%20%2415.90>.
- Arvidsson, Susanne, and John Dumay. “Corporate ESG reporting quantity, quality and performance: Where to now for environmental policy and practice?” *Business Strategy and the Environment* 31, no. 3 (2021): 1091-1110. <https://doi-org.proxy.library.upenn.edu/10.1002/bse.2937>.
- Atwa, Sara, Ibrahim, Mona Gamal Eldin, and Saleh, Ahmed. “Green business parks towards sustainable cities.” *WIT Transactions on Ecology and the Environment* 214 (2017): 9-19.
- Baldwin, Joan. 2019. “Museum CEO – Lowest Full-Time Staff Salaries: Is the Ratio a Question of Numbers or Ethics?” *Leadership Matters*. January 14, 2019. <https://leadershipmatters1213.wordpress.com/2019/01/14/museum-ceo-lowest-full-time-staff-salaries-is-the-ratio-a-question-of-numbers-or-ethics/>.
- “Barnes New Art Education Facility.” US Green Building Council, 2012. <https://www.usgbc.org/projects/barnes-new-art-education-facility>.
- BC Climate Action Toolkit. “Sustainability Checklist.” March 21, 2021, <https://toolkit.bc.ca/tool/sustainability-checklist/>.

Benzine, Vittoria. “U.S. Museums Will Now Be Required to Post Pay Ranges for Job Listings on the Top Professional Organization’s Website.” Artnet, August 23, 2022.

<https://news.artnet.com/art-world/u-s-museums-will-now-have-to-post-pay-ranges-for-job-listings-on-the-top-professional-organizations-website-2164099#:~:text=Museums%20%26%20Institutions-.U.S.%20Museums%20Will%20Now%20Be%20Required%20to%20Post%20Pay%20Ranges,concerted%20efforts%20by%20labor%20activists./>

Better Buildings U.S. Department of Energy. “Celanese Corporation: Sustainability Checklist for Capital Projects.” Celanese, 2021,

<https://betterbuildingssolutioncenter.energy.gov/implementation-models/celanese-corporation-sustainability-checklist-capital-projects>.

Billington, James. “Creating the United States.” National Archives and Records Administration, May 12, 2023. <https://www.loc.gov/exhibits/creating-the-united-states/interactives/declaration-of-independence/equal/index.html>.

Billington, James. “The Declaration of Independence.” National Archives and Records Administration, June 5, 2023. <https://www.archives.gov/founding-docs/declaration#:~:text=We%20hold%20these%20truths%20to,and%20the%20pursuit%20of%20Happiness>.

Bishara, Hakim. 2021. “Penn Museum Workers Accuse Leadership of Union-Busting Tactics.” Hyperallergic. July 16, 2021. <https://hyperallergic.com/662925/penn-museum-workers-accuse-leadership-of-union-busting-tactics/>.

Blanding, Michael. “Pay What You Wish: What Happens When Customers Choose the Price.” Forbes, July 22, 2015.

<https://www.forbes.com/sites/hbsworkingknowledge/2015/07/22/pay-whatever-you-want-when-retailers-let-customers-name-their-price/?sh=68e5aa41ae01>.

Bosteels, Tatiana, Hovorka, Frank, Hartenberger, Ursula, Pfeifer, Stephanie, Reynolds, Fiona, and the Property Working Group of the United Nations Environment Programme Finance Initiative. Sustainability Metrics: Translation and Impact on Property Investment and Management. United Nations Environment Programme, 2014.

Brophy, Sarah S., and Elizabeth Wylie. 2013. *The Green Museum: A Primer on Environmental Practice*. Lanham, MD: AltaMira Press.

Buzby, Posted by Jean. “Food Waste and Its Links to Greenhouse Gases and Climate Change.” USDA, January 24, 2022. <https://www.usda.gov/media/blog/2022/01/24/food-waste-and-its-links-greenhouse-gases-and-climate->



- Cornell Law School. 55 Pa. Code § 2800.131 - Fire extinguishers. 2011.  
<https://www.law.cornell.edu/regulations/pennsylvania/55-Pa-Code-SS-2800-131#:~:text=Fire%20extinguishers%20shall%20be%20kept,event%20of%20a%20fire%20emergency.>
- Davis, Peter. 2011. *Eco-Museums: A Sense of Place*. 2nd ed. New York, NY: Continuum International Publishing Group.
- Debes, Remy. 2023. "Dignity." *The Stanford Encyclopedia of Philosophy*, Edward N. Zalta and Uri Nodelman (eds.). <https://plato.stanford.edu/cgi-bin/encyclopedia/archinfo.cgi?entry=dignity>.
- "Description for 8412: Museums and Art Galleries." Occupational Safety and Health Administration, 2023. <https://www.osha.gov/sic-manual/8412>.
- Dickinson, Grace. "UPDATED: List of Philly area museums and attractions that have reopened." *The Philadelphia Inquirer*, January 8, 2021. <https://www.inquirer.com/philly-tips/philadelphia-museums-attractions-coronavirus-reopening-20201014.html>.
- DiPietro, Dean. "Upcoming sunset dates for LEED v2.0/2.2 projects." US Green Building Council, March 27, 2025. <https://www.usgbc.org/articles/upcoming-sunset-dates-lead-v2022-projects>.
- DiSanto, Jill. "Amid the Resurgence of COVID-19, Penn Museum Temporarily Closes." Penn Museum, November 18, 2020. <https://www.penn.museum/about/press-room/press-releases/amid-the-resurgence-of-covid-19-penn-museum-temporarily-closes>.
- DiSanto, Jill. "Penn Museum Reopens After Restrictions Are Lifted." Penn Museum Press Release, January 2021.  
[https://www.penn.museum/documents/pressroom/JAN\\_2021\\_PENN\\_MUSEUM\\_REOPENING\\_RELEASE.pdf](https://www.penn.museum/documents/pressroom/JAN_2021_PENN_MUSEUM_REOPENING_RELEASE.pdf).
- "Diversity, Equity, Accessibility, and Inclusion Philosophy." The Franklin Institute, October 17, 2023. <https://www.fi.edu/en/about-us/deai-philosophy>.
- Dobrin, Peter, and Stephan Salisbury. "Citing coronavirus, major Philadelphia arts groups make 'heart-breaking' decision to shut down." *The Philadelphia Inquirer*, March 12, 2020. <https://www.inquirer.com/health/coronavirus/kimmel-center-philadelphia-orchestra-mutter-museum-cancel-events-20200313.html>.
- Dressel, Joanna, Deirdre Harkins, and Liam Sweeney. "Living Wages: Art Museum Leaders Confront Persistent Staff Compensation Challenges." ITHAKA S+R, 2023.

<https://sr.ithaka.org/wp-content/uploads/2023/06/SR-Issue-Brief-Living-Wages-Art-Museums-06082023.pdf/>.

Dustmann, Christian, Bernd Fitzenberger, Uta Schönberg, and Alexandra Spitz-Oener. “From Sick Man of Europe to Economic Superstar: Germany’s Resurgent Economy.” *Journal of Economic Perspectives* 28, no. 1 (2014): 167-188.

<https://pubs.aeaweb.org/doi/pdfplus/10.1257/jep.28.1.167>.

Edson, Gary. 2017. *Museum Ethics in Practice*. Abingdon, Oxon: Routledge.

“Ethics and Conduct Policies.” The Academy of Natural Sciences, 2007.

[https://ansp.org/~media/Files/ans/documents/Ethics\\_and\\_Conduct\\_Policy\\_2007-06-15\\_r2010.ashx?la=en](https://ansp.org/~media/Files/ans/documents/Ethics_and_Conduct_Policy_2007-06-15_r2010.ashx?la=en).

“Equity Agenda.” Philadelphia Museum of Art, 2023. <https://philamuseum.org/about/equity-agenda>.

“Executive Compensation.” National Council of Nonprofits, 2024.

<https://www.councilofnonprofits.org/running-nonprofit/governance-leadership/executive-compensation>.

Fiksel, Joseph, Eason, Tarsha, and Herbert Frederickson. 2012. *A Framework for Sustainability Indicators at EPA*. EPA Office of Research and Development and National Risk Management Research Laboratory. <https://www.epa.gov/sites/default/files/2014-10/documents/framework-for-sustainability-indicators-at-epa.pdf>.

“The Foundation of International Human Rights Law.” United Nations, 2024.

<https://www.un.org/en/about-us/udhr/foundation-of-international-human-rights-law>.

“The Franklin Institute Addition.” US Green Building Council, 2015.

<https://www.usgbc.org/projects/franklin-institute-addition>.

Franklin, Sydney. 2019. “Moma Reopens with a \$450 Million Mega-Expansion and Slick Renovation.” *The Architect’s Newspaper*. October 21, 2019.

<https://www.archpaper.com/2019/10/moma-reopens/>.

Gao, Biao, and Shuangshuang Yu. 2023. “Upgrading Museum Experience: Insights into Offline Visitor Perceptions through Social Media Trends.” *Emerging Trends in Drugs, Addictions, and Health* 4: 1–9. <https://doi.org/10.1016/j.etched.2023.100137>.

- GDF SUEZ Energy Resources NA, “Academy of Natural Sciences will Offset Energy Use,” Cision PR Newswire, Dec 7, 2010, <https://www.prnewswire.com/news-releases/academy-of-natural-sciences-will-offset-energy-use-111445349.html>
- General Assembly of the Commonwealth of Pennsylvania. *Pennsylvania Human Relations Act*. P. L. 744, No. 222. October 27, 1955. <https://www.legis.state.pa.us/WU01/LI/LI/US/HTM/1955/0/0222..HTM?1>.
- General Assembly resolution 2200A. *International Covenant on Economic, Social and Cultural Rights*. December 16, 1966. <https://www.ohchr.org/sites/default/files/cescr.pdf>.
- Genoways, Hugh H., and Lynne M. Ireland. *Museum Administration 2.0*. Lanham, MD: Rowman & Littlefield, 2017.
- Glassford, Alec, Andrea Suozzo, and Ash Ngu. 2023. “Academy of Natural Sciences of Philadelphia - Nonprofit Explorer.” ProPublica. November 30, 2023. <https://projects.propublica.org/nonprofits/organizations/231352000>.
- Glassford, Alec, Andrea Suozzo, and Ash Ngu. 2023. “College of Physicians of Philadelphia - Nonprofit Explorer.” ProPublica. November 30, 2023. <https://projects.propublica.org/nonprofits/organizations/231352670>.
- Glassford, Alec, Andrea Suozzo, and Ash Ngu. 2023. “Franklin Institute - Nonprofit Explorer.” ProPublica. November 30, 2023. <https://projects.propublica.org/nonprofits/organizations/231370501>.
- Glassford, Alec, Andrea Suozzo, and Ash Ngu. 2023. “Philadelphia Museum of Art - Nonprofit Explorer.” ProPublica. November 30, 2023. <https://projects.propublica.org/nonprofits/organizations/231365388>.
- Godoy, Maria. “Your kids are adorable germ vectors. Here’s how often they get your household sick.” NPR, January 26, 2023. <https://www.npr.org/sections/health-shots/2023/01/26/1151333478/your-kids-are-adorable-germ-vectors-heres-how-often-they-get-your-household-sick>.
- Goldfarb, Stanley. 2023. “Cancel Culture Comes for Philly’s Weirdest Museum.” *The Wall Street Journal*. June 15, 2023. [https://www.wsj.com/articles/the-mutter-museum-weirdness-goes-woke-philly-research-exhibit-native-americans-9473e659?mod=article\\_inline](https://www.wsj.com/articles/the-mutter-museum-weirdness-goes-woke-philly-research-exhibit-native-americans-9473e659?mod=article_inline).
- Gordon, George Byron. “The Functions of the Modern Museum.” *The Museum Journal* II, no. 1 (March 1911): 2–5. <https://doi.org/https://www.penn.museum/sites/journal/118/>.



- De Graff, T., Dessouky, M., and Helmut F.O. Müller. “Sustainable lighting of museum buildings.” *Renewable Energy* 67 (2014): 30-34. er Ltd.  
<http://dx.doi.org/10.1016/j.renene.2013.11.035>.
- Gražulevičiūtė, Indrė. “Cultural Heritage in the Context of Sustainable Development.” *Environmental research, engineering and management* 37, no. 2 (2006): 74–79.  
<https://doi.org/https://www.researchgate.net/publication/228466259>.
- Green Business Certification Checklist. Green Business Bureau, 2022.
- Guo, Chao, Li Lan, Yige Liu, Naiqing Meng, and Cunming Li. 2023. “Comparison of Environmental Criteria for Conservation and Storage of Collections: A Comprehensive Literature Review.” *Building and Environment* 243: 110665.  
<https://doi.org/10.1016/j.buildenv.2023.110665>.
- Haas, Kimberly. 2019. “Growing Pains Yield Gains for the Mutter Museum.” Hidden City Philadelphia. October 10, 2019. <https://hiddencityphila.org/2019/06/growing-pains-yield-gains-for-the-mutter-museum/>.
- Haller, Julia, and Regina Resta. 2023. “Philly’s Mutter Museum Isn’t Getting Political.” *The Wall Street Journal*. June 18, 2023. <https://www.wsj.com/articles/mutter-museum-philadelphia-goldfarb-9fdbaae5>.
- Health and Safety Authority. “Hazard and Risk.” 2023.  
<https://www.hsa.ie/eng/topics/hazards/#:~:text=When%20we%20refer%20to%20risk>.
- “How Do I Recycle Common Recyclables.” 2023. US EPA. December 1, 2023.  
<https://www.epa.gov/recycle/how-do-i-recycle-common-recyclables>.
- “How to Care for Your Textiles.” 2023. Museum of the Albemarle. 2023.  
<https://www.museumofthealbemarle.com/collections/how-care-your-textiles#:~:text=When%20textiles%20are%20exposed%20to,between%2040%25%20and%2057%25>.
- “Human Remains Policy.” Penn Museum, 2022. <https://www.penn.museum/about-collections/statements-and-policies/statement-on-human-remains#:~:text=The%20governing%20principles%20for%20display,to%20the%20treatment%20of%20human>.
- “Human Rights.” United Nations, 2024. <https://www.un.org/en/global-issues/human-rights>.

- IBM Institute for Business Value. “CEO decision-making in the age of AI.” Global C-suite Series, 28<sup>th</sup> edition. 2023. <https://www.ibm.com/downloads/cas/1V2XKXYJ>.
- “Inclusion, Diversity, Equity, Access and Leadership at the Academy.” The Academy of Natural Sciences, 2023. <https://ansp.org/about/position-statements/ideal/>.
- International Council of Museums. “Guidelines for Disaster Preparedness in Museums.” UNESCO, 2018. [https://patapsco.org/wp-content/uploads/2018/07/ICOMguidelinesdisasters\\_eng.pdf/](https://patapsco.org/wp-content/uploads/2018/07/ICOMguidelinesdisasters_eng.pdf/).
- Iwasa, Noriaki. 2010. “The Impossibility of Political Neutrality.” *Croatian Journal of Philosophy* x (29): 147–55. <https://doi.org/https://philarchive.org/archive/IWATIO#:~:text=There%20are%20many%20agents%20with,is%20neutral%20about%20the%20good.>
- Jick, Jeremy. 2013. “Penn Museum Partners with Pig Farm to Dispose Waste.” *The Daily Pennsylvanian*. February 19, 2013. <https://www.thedp.com/article/2013/02/museum-partners-with-n-j-pig-farm-for-sustainable-waste-management>.
- Johnels, Alf G. 1973. “Role of natural history museums.” *Museum*, XXV, ½: 54-58. <https://unesdoc.unesco.org/ark:/48223/pf00000005167>.
- Johnson Controls, “Case Study: Philadelphia Museum of Art” Report, 2019. [https://www.johnsoncontrols.com/-/media/jci/insights/2020/case-studies/files/philadelphia-moa\\_cs\\_030420.pdf](https://www.johnsoncontrols.com/-/media/jci/insights/2020/case-studies/files/philadelphia-moa_cs_030420.pdf).
- Judkis, Maura. “A Museum’s Historic Human Remains Are Now the Center of an Ethics Clash.” *The Washington Post*, July 27, 2023. <https://www.washingtonpost.com/lifestyle/2023/07/26/mutter-museum-controversy-philadelphia/>.
- Kerber, Ross. “Climate pay links for CEOs do little to cut emissions, study finds.” *Reuters*, September 29, 2022. [https://www.reuters.com/business/sustainable-business/climate-pay-links-ceos-do-little-cut-emissions-study-finds-2022-09-29/#:~:text=Sept%2029%20\(Reuters\)%20%2D%20More,cuts%2C%20a%20new%20study%20shows.](https://www.reuters.com/business/sustainable-business/climate-pay-links-ceos-do-little-cut-emissions-study-finds-2022-09-29/#:~:text=Sept%2029%20(Reuters)%20%2D%20More,cuts%2C%20a%20new%20study%20shows.)
- Kiger, Patrick J. “Does It Pay to Link Executive Compensation to ESG Goals?” *Stanford Graduate School of Business*, July 13, 2023. <https://www.gsb.stanford.edu/insights/does-it-pay-link-executive-compensation-esg-goals>.
- Kihila, Jacob M., Kris Wernsted, and Mengiseny Kaseva. 2021. “Waste Segregation and Potential for Recycling -A Case Study in Dar Es Salaam City, Tanzania.” *Sustainable Environment* 7 (1): 1–13. <https://doi.org/10.1080/27658511.2021.1935532>.

- Kirchberg, Volker. "Entrance Fees as a Subjective Barrier to Visiting Museums." *Journal of Cultural Economics* 22 (1998): 1-13.  
<https://link.springer.com/content/pdf/10.1023/A:1007452808105.pdf>.
- Kotsantonis, Sakis and George Serafeim. "Four Things No One Will Tell You About ESG Data." *Journal of Applied Corporate Finance* 31 (2): 50-58. <https://doi.org/10.1111/jacf.12346>.
- "Land Acknowledgment." Philadelphia Museum of Art, 2023.  
<https://philamuseum.org/about/deia/land-acknowledgment>.
- Lee, Joyce, Jack Fassler, and Lisa Claybon. 2023. "Elevating Sustainability Efforts in Museum Dining Operations." American Alliance of Museums. February 3, 2023. <https://www.aam-us.org/2023/02/03/elevating-sustainability-efforts-in-museum-dining-operations/>.
- Lee, Joyce. 2022. "LEED Certified Museum List." U.S. Green Building Council. October 2022.  
<https://www.usgbc.org/resources/leed-certified-museum-list>.
- "LEED for New Construction v2.2 Rating System." US Green Building Council, October 1, 2005.  
<https://www.usgbc.org/resources/leed-new-construction-v22-rating-system>.
- "LEED Rating System." US Green Building Council, 2024.  
<https://www.usgbc.org/leed#:~:text=LEED%20>.
- Liu, Sophia, and Haley Son. 2023. "Penn Museum Union Advocates for Standardized Pay, Job Security in Contract Negotiations." *The Daily Pennsylvanian*. March 21, 2023.  
<https://www.thedp.com/article/2023/03/penn-museum-union-negotiations>.
- Lucchi, Elena. 2018. "Review of Preventive Conservation in Museum Buildings." *Journal of Cultural Heritage* 29: 180–93. <https://doi.org/10.1016/j.culher.2017.09.003>.
- Lucero-Gómez, Paola, Eleonora Balliana, Francesca Catherina Izzo, and Elisabetta Zendri. 2020. "A New Methodology to Characterize Indoor Variations of Temperature and Relative Humidity in Historical Museum Buildings for Conservation Purposes." *Building and Environment* 185: 1–17. <https://doi.org/10.1016/j.buildenv.2020.107147>.
- Malaro, Marie C. 1994. *Museum Governance: Mission, Ethics, Policy*. Washington, DC: Smithsonian Institution Press.
- Marsh, Kenneth, and Betty Bugusu. 2007. "Food Packaging—Roles, Materials, and Environmental Issues." *Journal of Food Science* 72 (3): 39–55.  
<https://doi.org/10.1111/j.1750-3841.2007.00301.x>.

- Marstine, Janet. 2011. *The Routledge Companion to Museum Ethics: Redefining Ethics for the Twenty-First Century Museum*. Abingdon, Oxon: Routledge.
- “Materials and Waste.” 2022. Museum of Modern Art. 2022.  
<https://www.moma.org/about/sustainability/materials-and-waste>.
- Mazzocco, David. “Green Office Certification.” Penn Sustainability, 2023.  
<https://sustainability.upenn.edu/get-involved/opportunities/green-office-certification>.
- McGhie, Henry. 2020. *Museums and Human Rights: human rights as a basis for public service*. Curating Tomorrow, UK.
- Mendoza, María Antonia, Emiro De La Hoz Franco, and Jorge Eliecer Gómez. “Technologies for the Preservation of Cultural Heritage—a Systematic Review of the Literature.” *Sustainability* 15, no. 2 (2023): 1059. <https://doi.org/10.3390/su15021059>.
- Michalski, Stefan. 2007. Rep. *The Ideal Climate, Risk Management, the ASHRAE Chapter, Proofed Fluctuations, and Toward a Full Risk Analysis Model*. The Getty Conservation Institute.  
[https://www.getty.edu/conservation/our\\_projects/science/climate/paper\\_michalski.pdf](https://www.getty.edu/conservation/our_projects/science/climate/paper_michalski.pdf).
- “Mission & History.” 2023. The Franklin Institute. October 13, 2023. <https://www.fi.edu/en/about-us/mission-history#:~:text=In%20the%20spirit%20of%20inquiry,learning%20about%20science%20and%20technology>.
- “The Museum of the American Revolution.” US Green Building Council, 2018.  
<https://www.usgbc.org/projects/museum-american-revolution/>.
- “Museum Community Celebration Offers Full Weekend of Events Beginning Friday, June 16.” 2023. Philadelphia Museum of Art. June 14, 2023. <https://press.philamuseum.org/museum-to-celebrate-philadelphia-communities-with-a-full-weekend-of-events-beginning-friday-june-16/>.
- “Museum Policies.” 2023. The Franklin Institute. November 6, 2023.  
<https://www.fi.edu/en/museum-policies>.
- Museum Store Association, “Mission Made: How Museum Stores Are Embracing Sustainability and Inclusivity,” May 15, 2023, <http://www.museumstoreassociation.org/Education/MSA-Blog-Post/mission-made-how-museum-stores-are-embracing-sustainability-and-inclusivity-1>.

- “Mütter Matters.” 2023. The Mütter Museum of the College of Physicians of Philadelphia. 2023. <https://muttermuseum.org/mutter-matters>.
- The Mütter Museum, “Philadelphia Grand Rounds: Addressing Climate Change with Innovation: Virtual Event,” 2023, <https://muttermuseum.org/events/philadelphia-grand-rounds-addressing-climate-change-innovation>.
- The Mütter Museum, “Response to Philadelphia Inquirer Article,” Aug 24, 2023, <https://muttermuseum.org/mutter-matters/statement-philadelphia-inquirer-august-24-2023>.
- Netregs, “Business Sustainability Checklist,” Accessed 21 October 2023, <https://www.netregs.org.uk/media/1828/business-sustainability-checklist-1.pdf>.
- Newman, Andrew, and Fiona McLean. “The Impact of Museums upon Identity.” *International Journal of Heritage Studies* 12, no. 1 (2006): 49–68. <https://doi.org/10.1080/13527250500384514>.
- “Nonprofit Executive Compensation.” JER HR Group, March 23, 2023. <https://jerhrgroup.com/nonprofit-executive-compensation-guide/>.
- Office of Sustainability. “Public-Private Partnership Drives Energy Savings at the Philadelphia Museum of Art: Office of Sustainability.” City of Philadelphia, February 18, 2021. <https://www.phila.gov/2021-02-18-public-private-partnership-drives-energy-savings-at-the-philadelphia-museum-of-art/>.
- O’Mahony, Tadhg. “Toward Sustainable Wellbeing: Advances in Contemporary Concepts.” *Frontiers in Sustainability* 3 (2022). <https://doi.org/10.3389/frsus.2022.807984>.
- O’Neill, Mark. “Museums and Their Communities” in *Manual of Museum Planning*, ed. Gail Dexter Lord and Barry Lord, 2nd ed., (Walnut Creek: AltaMira Press, 1999), 21-37.
- Ormazabal, Gaizka, and Igor Kadach. “ESG-linked executive pay is on the rise, which is good news for the planet.” IESE, September 13, 2023. <https://www.iese.edu/insight/articles/esg-linked-executive-pay/>.
- Osborne, Peter. “Safety and Security.” in *Manual of Museum Planning*, ed. Gail Dexter Lord and Barry Lord, 2nd ed., (Walnut Creek: AltaMira Press, 1999), 217-244.
- “Our history.” Philadelphia Commission on Human Relations, May 5, 2021. <https://www.phila.gov/departments/philadelphia-commission-on-human-relations/about/our-history/>.

- “Our Social Responsibility.” The Penn Museum, 2023. <https://www.penn.museum/about/our-social-responsibility>.
- “Our Story.” 2022. Penn Museum. 2022. <https://www.penn.museum/about/our-story>.
- “Penn Museum 2018-2019: Statement of Fiscal Year Activity.” Penn Museum, 2019. <https://www.penn.museum/annualreport/financials/>.
- “Penn Museum – Harrison Auditorium.” US Green Building Council, 2021. <https://www.usgbc.org/projects/penn-museum-harrison-auditorium>.
- Penn Sustainability. “A Growing List of LEED Designations.” The University of Pennsylvania, 2024. <https://sustainability.upenn.edu/news/growing-list-leed-designations>.
- Pennsylvania General Assembly. Title 15 § 9132. 2013. <https://www.legis.state.pa.us/cfdocs/legis/LI/consCheck.cfm?txtType=HTM&ttl=15&div=0&chpt=91&sctn=32&subsctn=0>.
- “Philadelphia Climate.” 2021. Climate Data. 2021. <https://en.climate-data.org/north-america/united-states-of-america/pennsylvania/philadelphia-1690/>.
- “Philadelphia Grand Rounds: Addressing Climate Change with Innovation.” The Mutter Museum of the College of Physicians of Philadelphia, 2023. <https://muttermuseum.org/events/philadelphia-grand-rounds-addressing-climate-change-innovation>.
- “The Philadelphia Museum of Art Celebrates Pride.” 2023. Philadelphia Museum of Art. July 5, 2023. <https://press.philamuseum.org/the-philadelphia-museum-of-art-celebrates-pride/>.
- “Philadelphia Museum of Art Demographics and Statistics.” 2023. Zippia. 2023. <https://www.zippia.com/philadelphia-museum-of-art-careers-158124/demographics/>.
- Philadelphia Museum of Art, “Financial Statements and Report of Independent Certified Public Accountants.” 2021, [https://cdn.sanity.io/files/f23a1pgq/pma\\_production/09d5b60fefc2ecca9a0175bfa07f445fb71e90fc.pdf](https://cdn.sanity.io/files/f23a1pgq/pma_production/09d5b60fefc2ecca9a0175bfa07f445fb71e90fc.pdf)
- “Philadelphia Museum of Art Number of Employees, Statistics, Diversity, Demographics, and Facts.” 2023. Zippia. July 21, 2023. <https://www.zippia.com/philadelphia-museum-of-art-careers-158124/demographics/>.

- Philadelphia Museum of Art Press Room. "Museum Announces Changes in Admissions Pricing and Structure, Effective October 1." August 29, 2019. <https://press.philamuseum.org/museum-announces-changes-in-admissions-pricing-and-structure-effective-october-1/>.
- Philadelphia Museum of Art Press Room. "Philadelphia Museum of Art Surpasses \$450 Million Raised Toward It Starts Here Campaign." August 7, 2019. <https://press.philamuseum.org/philadelphia-museum-of-art-surpasses-450-million-raised-toward-it-starts-here-campaign/#:~:text=August%20%2C%202019%20>.
- Philadelphia Museum of Art Press Room. "Philadelphia Museum of Art to open New Galleries and Public Spaces in Major Renovation and Interior Expansion of its Landmark Main Building." March 29, 2021. <https://press.philamuseum.org/new-galleries-and-public-spaces-in-major-renovation-and-interior-expansion-of-landmark-main-building/>.
- "Philadelphia Museum of Art Union, AFSCME District Council 47." 2023. PMA Union. 2023. <https://www.philadelphiamuseumofartunion.com/>.
- "Plastic-Free Philly." Academy of Natural Sciences, 2022. <https://ansp.org/get-involved/plastic-free-philly/>.
- Pleissner, Daniel. 2018. "Recycling and Reuse of Food Waste." *Current Opinion in Green and Sustainable Chemistry* 13: 39–43. <https://doi.org/https://doi.org/10.1016/j.cogsc.2018.03.014>.
- Pongrácz, Eva. 2002. "Re-Defining the Concepts of Waste and Waste Management: Evolving the Theory of Waste Management." Dissertation, Oulu, NO: Oulun yliopisto. Diss. Oulu: Univ.
- Pratt, Jon. 2022. "It's Complicated: Nonprofit Organizations and Wage Equity - Non Profit News: Nonprofit Quarterly." Non Profit News. Nonprofit Quarterly. March 16, 2022. <https://nonprofitquarterly.org/its-complicated-nonprofit-organizations-and-wage-equity/#:~:text=Employees%20of%20charities%20should%20receive,a%20living%3A%2034%20percent%20agreed>.
- Price, C. Aaron, and Lauren Applebaum. "Measuring a Sense of Belonging at Museums and Cultural Centers." *Curator: The Museum Journal* 65, no. 1 (2022): 135-160. <https://doi-org.proxy.library.upenn.edu/10.1111/cura.12454>.
- "QuickFacts." U.S. Census Bureau, 2022. <https://www.census.gov/quickfacts/fact/table/philadelphiacitypennsylvania,US/HSG86022>  
[2](https://www.census.gov/quickfacts/fact/table/philadelphiacitypennsylvania,US/HSG86022).

- Reisman, Richard. “Making ‘Pay As You Wish’ More Equitable – Sustaining the Met Museum (and Others).” Medium, January 24, 2018. <https://rreisman.medium.com/making-pay-as-you-wish-more-equitable-sustaining-the-met-museum-and-others-aaf4ac88fd3c>.
- Reno, Joshua. 2015. “Waste and Waste Management.” *Annual Review of Anthropology* 44: 557–72. <https://doi.org/10.1146/annurev-anthro-102214-014146>.
- “Response to Philadelphia Inquirer Article.” The Mütter Museum of the College of Physicians of Philadelphia, 2023. <https://muttermuseum.org/mutter-matters/statement-philadelphia-inquirer-august-24-2023>.
- Ronning, Evelyn, Sarah Lukowski, Amy Grack Nelson, and Marjorie Bequette. “Moments That Matter: Toward a Visitor-Centered Understanding of Belonging in Museum Spaces.” American Alliance of Museums, October 26, 2023. <https://www.aam-us.org/2023/10/26/moments-that-matter-toward-a-visitor-centered-understanding-of-belonging-in-museum-spaces/#:~:text=In%20contrast%2C%20visitors%20most%20often,experienced%20microaggressions%20during%20their%20visit/>.
- Rushton, Michael. “Should public and nonprofit museums have free admission? A defence of the membership model.” *Museum Management and Curatorship* 32 no. 3 (2017): 200-209. <https://doi.org/10.1080/09647775.2016.1263969>.
- Salisbury, Stephan, and Ellen Gray. “All of Philadelphia’s Parkway museums shut down to help stem the spread of COVID-19.” The Philadelphia Inquirer, March 13, 2020. <https://www.inquirer.com/health/coronavirus/philadelphia-museum-of-art-barnes-foundation-franklin-institute-coronavirus-closing-philadelphia-20200314.html>.
- Sansoni, Paola, Luca Mercatelli, and Alessandro Farini, eds. 2015. *Sustainable Indoor Lighting*. London: Springer-Verlag.
- Savage, Henry, “Mütter Museum unveils \$3 million dollar renovations to collections and research facilities,” the Philadelphia Inquirer, July 18, 2023, <https://www.inquirer.com/phillys-best/mutter-museum-philadelphia-million-dollar-renovation.html>.
- Scolnick, Emily. “Penn reaffirms commitment to repatriate museum’s Native American cultural objects.” The Daily Pennsylvanian, March 1, 2024. <https://www.thedp.com/article/2024/03/penn-museum-repatriation-native-american-cultural-objects>.



Scott, Carol A., and Barbara J. Soren. "Introduction to the Special Issue – Exploring the Value of Museums." *Museum Management and Curatorship* 24, no. 3 (2009): 189–93.  
<https://doi.org/10.1080/09647770903072815>.

Senate and House of Representatives of the United States of America in Congress assembled. *National Environmental Policy Act of 1969 (P.L. 91-190 U.S.C. 4321-4347)*. 1969. Act. Washington, DC.  
[https://www.energy.gov/sites/default/files/nepapub/nepa\\_documents/RedDont/Req-NEPA.pdf](https://www.energy.gov/sites/default/files/nepapub/nepa_documents/RedDont/Req-NEPA.pdf).

Siemer, Rosie. "Museum membership is down but it's not out." *Museums as Progress*, May 21, 2021. <https://museumprogress.com/letters/museum-membership-is-down-but-its-not-out>.

Siemer, Rosie, and John Lewis. "Monthly Subscriptions Make Membership Easy to Say Yes To." *American Alliance of Museums*, February 24, 2021. <https://www.aam-us.org/2021/02/24/monthly-subscriptions-make-membership-easy-to-say-yes-to/>.

"Small Actions Spark Big Changes." *The Academy of Natural Sciences*, November 2023.  
<https://ansp.org/get-involved/small-actions-spark-big-changes/>.

Small, Zachary. 2020. "Philadelphia Museum Leaders Sharply Criticized after Telling Employees 'Every Individual Life Matters.'" *ARTnews.Com*. June 11, 2020.  
<https://www.artnews.com/art-news/news/philadelphia-museum-of-art-black-lives-matter-controversy-1202690820/>.

Stark, Judith Chelius. 2011. "The Art of Ethics: Theories and Applications to Museum Practice." Essay. In *The Routledge Companion to Museum Ethics: Redefining Ethics for the Twenty-First Century Museum*, edited by Janet Marstine, 26–40. Abingdon, Oxon: Routledge.

"The State of Philadelphia Recycling." *Circular Philadelphia*, June 11, 2021.  
<https://circularphiladelphia.org/the-state-of-philadelphia-recycling/#:~:text=The%20recycling%20participation%20rate%20jumped,can't%20actually%20be%20recycled.>

Steiner, Faye. "Optimal Pricing of Museum Admission." *Journal of Cultural Economics* 21, no. 4 (1997): 307-333. <https://www.jstor.org/stable/41810643>.

Straughn, Celka, and Howard Gardner. 2011. "GoodWork in Museums Today... and Tomorrow." Essay. In *The Routledge Companion to Museum Ethics: Redefining Ethics for the Twenty-First Century Museum*, edited by Janet Marstine, 41–53. Abington, Oxon: Routledge.

- “Support Us.” 2021. Penn Museum Workers United.  
<https://phillysphinx.wixsite.com/pmwu/support-us>.
- “Sustainable Materials Management: Non-Hazardous Materials and Waste” 2023. EPA. Environmental Protection Agency. June 19, 2023. <https://www.epa.gov/smm/sustainable-materials-management-non-hazardous-materials-and-waste-management-hierarchy>.
- “Sustainability.” United Nations, 2023. <https://www.un.org/en/academic-impact/sustainability>.
- Tang, Aliris. “Penn Museum will reopen to the public on July 28.” *The Daily Pennsylvanian*, July 27, 2020. <https://www.thedp.com/article/2020/07/penn-museum-reopening-coronavirus-precautions-july>.
- Thomas Jefferson et al. July 4, 1776. *Copy of the Declaration of Independence*. Manuscript/Mixed Material. <https://www.loc.gov/item/mtjbib000159/>.
- Thumann, Albert, William J. Younger, and Terry Niehus. 2012. *Handbook of Energy Audits*. 9th ed. Lilburn, GA: Fairmont Press, Inc.
- Township of Esquimalt. “Green Building Checklist.” 2019, [https://www.esquimalt.ca/sites/default/files/docs/Green\\_Building\\_Checklist\\_2019.pdf](https://www.esquimalt.ca/sites/default/files/docs/Green_Building_Checklist_2019.pdf).
- Trautmann, Charlie. 2020. “Thriving (in a Downturn).” *Hand to Hand*, issue Tightening Up: Streamlining Museum Operations (June 2020). <https://doi.org/https://childrensmuseums.org/2020/06/26/thriving-in-a-downturn/#:~:text=Interactive%20museums%20in%20the%20U.S.,history%20museums%20slightly%20below%20average>.
- United Nations General Assembly. *The Universal Declaration of Human Rights*. December 10, 1948. <https://www.un.org/sites/un2.un.org/files/2021/03/udhr.pdf>.
- UPenn ISC. “Salary Management Data Collection.” The University of Pennsylvania, 2024. <https://www.isc.upenn.edu/salary-management-data-collection#:~:text=Releasing%20Data%20Outside%20the%20University,Resources%20and%20Institutional%20Research%20%26%20Analysis>.
- Valletta, Rachel. “What Does Sustainability Mean to You?” The Franklin Institute, August 20, 2019. <https://www.fi.edu/en/blog/what-does-sustainability-mean-you>.
- “Volume vs. Weight Based Programs .” 2016. EPA. Environmental Protection Agency. February 1, 2016. <https://archive.epa.gov/wastes/conservation/tools/payt/web/html/top20.html>.

- “Waste Tracking and Management in Commercial Buildings.” 2023. Energy Star. 2023.  
[https://www.energystar.gov/buildings/benchmark/understand\\_metrics/waste\\_tracking](https://www.energystar.gov/buildings/benchmark/understand_metrics/waste_tracking).
- “What is LEED certification?” US Green Building Council, 2022. <https://support.usgbc.org/hc/en-us/articles/4404406912403-What-is-LEED-certification>.
- “What to Recycle: Programs and Initiatives.” City of Philadelphia, 2023.  
<https://www.phila.gov/programs/recycling-program/what-to-recycle/>.
- Woodhouse, Anna, Davis, Jennifer, Pénicau, Caroline, and Ostergren, Karin. “Sustainability checklist in support of the design of food processing.” *Sustainable Production and Consumption* 16 (2018): 110-120.
- Yassaghi, Hamed, and Simi Hoque. 2019. “Climate Change Impacts on Office Buildings Performance: A Case Study of Philadelphia, USA Authors.” *Buildings, Cities, and Performance I* 3: 68–75.  
<https://doi.org/https://prometheus.library.iit.edu/index.php/journal/article/view/82>.