PROTECCT-GLAM: Providing Risk of The Environment's Changing Climate Threats for Galleries, Libraries, Archives & Museums.

The PROTECCT-GLAM project is a three-year research project conducted by Dr. Edward Benoit, III, Dr. Jill Trepanier, & Dr. Jennifer Vanos.[1] This applied research project proposal requests $498,803 from the National Leadership Grants for Libraries under Program Goal 4 & Objective 4.1. The research will develop a national categorical climate change risk assessment scale for galleries, libraries, archives, & museums (GLAMs) & a prioritized research agenda to address the associated challenges.

Project Justification For decades, climate scientists have attempted to warn society about potential significant threats related to a changing climate as an attempt to call for action. Unfortunately, many did not take the danger's immediacy seriously, & the risks have now moved from potential to present. More than ever before, cultural heritage institutions must assess their unique climate change-related threats to their collections & missions as part of their overall disaster & emergency management plans.[2] This proposed project would help repositories identify their associated risks from a changing climate & direct a future research agenda toward meeting GLAM's specific challenges.

Although existing projects & scholarship discuss climate change risks for cultural heritage institutions, the majority of studies focus primarily on a single institutional type or risk factor.[3] The proposed project takes a more holistic approach through exploring climate change manifestations & compounding risks factors across all repository types. It also brings together researchers from diverse scientific backgrounds providing unique insights to understanding climate change threats to institutions tasked at protecting the nation's most vital historical resources.

The proposed project builds off previous GLAM climate change research.[4] Likewise, it is grounded in prior climate change research including, but is not limited to, work focused on extreme tropical cyclone wind speeds & storm surges around the coastal U.S., understanding extreme rainfall variability in flood-prone places, the changing intensity & duration of extreme heat events, & those addressing dry versus humid heat.[5]

Project Work Plan Occurring over three years, the project will incorporate two main phases with three years of graduate student support. The research will address the following questions: What are the climate change-related risks most likely to provide threats to GLAMs? How can climate change risk for GLAMs be understood as a categorical scale when

[1]Dr. Benoit, Associate Director, School of Library & Information Science (LSU); Dr. Trepanier, Associate Professor, Department of Geography & Anthropology (LSU); Dr. Jennifer Vanos, Associate Professor, School of Sustainability, Arizona State University.

[2] According to the 2019 Heritage Health Information Survey, 58% of institutions do not have a disaster plan with 75% lacking both a plan & staff training to implement a plan. Institute of Museum & Library Services, "Protecting America's Collections," 2019.

[3] For example, T. Mazurczyk, N.B. Piekielek, E. Tansey, & B.M. Goldman, "American Archives & Climate Change: Risks & Adaptation, *Climate Risk Management 20*, no. 1, 2018: 111-125.

[4] Chiara Bertolin, "Preservation of Cultural Heritage & Resources Threatened by Climate Change," *Geosciences 9*, no. 1, 2019; Eira Tansey, "Archival Adaptation to Climate Change," *Sustainability: Science, Practice & Policy 11*, no. 2, 2015: 45-56; Matthew Gordon-Clark, "Paradise Lost? Pacific Island Archives Threatened by Climate Change," *Archival Science 12*, no. 1, 2012: 51-67; Matthew Gordon-Clark & Simon Shurville, "'To Take up Arms against a Sea of Troubles': Finding Safe Havens for the National Archives of Low-Elevation Pacific Islands & Nations Threatened by Climate Change," *Archives & Manuscripts 38*, no. 1, 2010: 78-93; Madeleine Charney & Petra Hauke, "Global Action on the Urgency of Climate Change: Academic & Research Libraries' Contributions," *College & Research Libraries News 81,* no. 3, 2020: 114–17; Jennifer Meyer, "Global Warming's Library Challenge," *Library Journal 133*, no. 18, 2008: 26–29; Sarah Sutton, "The Evolving Responsibility of Museum Work in the Time of Climate Change," *Museum Management & Curatorship 35*, no. 6, 2020: 618–35; & P. Hamilton & E. C. Ronning, "Why Museums? Museums as Conveners on Climate Change," *Journal of Museum Education 45*, no. 1, 2020: 16–27.

[5] Jill C. Trepanier, J. Yuan, & T. H. Jagger, "The Combined Risk of Extreme Tropical Cyclone Winds & Storm Surges along the U.S. Gulf of Mexico Coast," *Journal of Geophysical Research-Atmospheres 122*, no. 6, 2017: 3299-3316; Jill C. Trepanier, H. F. Needham, & K. N. Ellis, "Understanding the Relationship between Hurricane Storm Surge & Rainfall Near New Orleans, Louisiana," *Journal of Coastal Research*, 34, no. 1, 2018: 559-572; Jill C. Trepanier & Clay S. Tucker, "Event-Based Climatology of Tropical Cyclone Rainfall in Houston, Texas & Miami, Florida," *Atmosphere 9*, no 5, 2018; & Jennifer K Vanos**,** L.S. Kalkstein, & T.S. Sanford,"Detecting Synoptic Warming Trends across the US Midwest & Implications to Human Health & Heat-Related Mortality*," International Journal of Climatology 35*, no. 1, 2015: 85-96.

combining those threats most likely to need significant consideration? What are the GLAM-specific climate change challenges? How can a collaborative research agenda best address these challenges with input from practitioners & academics?

Years One & Two will address the first two research questions through leveraging advanced geographic information system (GIS) analysis of existing climate change threats & models. The PIs will interpret existing research to identify GLAM-specific risks including, but not limited to, tropical cyclone wind and/or flooding damage, inland precipitation, & extreme heat signatures. The analysis will utilize a comprehensive GLAM dataset previously developed by the PIs, including all U.S. GLAMs by physical location & type. The PIs will use the ArcGIS Pro software available through LSU & ASU to first showcase the current known risks to GLAMS throughout the U.S. focused on those most likely to cause damage to infrastructure or resources (i.e., wind & flooding related events) or cause issues in storage & maintenance (i.e., extreme heat). Tasks in year one include reviewing the current research to understand what the major threats are to GLAMS & gather data associated with threats. Examples of main data hubs likely to be used include the National Centers for Environmental Information & the National Climatic Data Center. Tasks in year 2 include estimating the risk using statistical approaches utilized by PI Trepanier with spatiotemporal visualization techniques in ArcGIS.[6] The final year two task will be to categorize the overall GLAM risks (i.e., one minimal threat is level 1. all at maximum threat for a repository is level 5). *Year Three* will address the final two questions through hosting a working institute gathering key practitioners & academics from the GLAM communities to discuss challenges & the research needed to address them. The results from the project's first phase will serve as the foundation for the 4-day institute. Participants will collaborate & develop a research agenda, prioritized timeline, & communication plan to best address the identified GLAM climate change-related risks. Institute attendance costs will be covered by the project for 50 in-person attendees, while sessions will also be available online for those who cannot attend in person. Time will also be spent in year 3 focused on building a web interface using ArcGIS for public use, including story maps after the project ends. Throughout the project, the PIs will meet regularly with a practitioner advisory panel to receive feedback on the project's progress & development. The panel members will be compensated for their time with a small stipend.

Diversity Plan The project's focus on climate change impacts will inherently incorporate geographical diversity. Unfortunately, marginalized communities are more at risk due to their geographic locations near coasts, low-lying and/or low-income areas, & in hotter areas within cities. The proposed institute in year 3 will prioritize participants from marginalized & underrepresented communities affected by these extremes. Finally, students from underrepresented groups will be given hiring preference for the project's positions. This particular project is unique due to the blend of information science & climate science, perfectly positioning it to provide opportunities for students to learn more about their environment while also learning about how to utilize resources available to them.

Project Results The anticipated findings from the project's first phase will be publicly disseminated through an online portal. GLAM practitioners will be able to interact with the project's ArcGIS map to identify their institution's potential risk. The project website will also include best practices & preparation suggestions for individual repositories utilization as taken from the communication at the 4-day institute. Additionally, the website will provide access to all the institute's presentations, findings, & action items. The institute's research agenda & project results will be used to secure additional funding from governmental or private sources. Finally, the project results will be communicated to non-GLAM communities through enacting the institute's communication plan to governmental agencies at the federal, state, & local levels, print & electronic media outlets, & other interested community groups.

Budget Summary The proposed project costs will be $498,803 with no cost-sharing. This includes $54,936 in PI summer salary, $75,000 in student support, fringe benefits of $24,174, & tuition remission of $20,520. The budget includes $25,000 for conference travel, $7,000 for supplies and promotional items, $8,500 for operating expenses, $6,000 in advisory board stipends, $39,555 for consultants, & total institute costs of $83,000. The institute costs include a $1,000 travel allowance, $210 lodging at LSU, $400 Food & Beverage, & additional costs of $50 for a total of $1,910 per participant. Finally, indirect costs of $155,118 are included, using LSU's federally negotiated on-campus rate of 48% MTDC.

---

[6] Jill C. Trepanier, "North Atlantic Hurricane Winds in Warmer than Normal Seas," *Atmosphere 11*, no. 1, 2020: 293.