

Construction Research Congress 2024

**Sustainability, Resilience, Infrastructure
Systems, and Materials Design in
Construction**

Selected Papers from the Construction
Research Congress 2024

Des Moines, Iowa, USA
20 – 23 March 2024

Editors:

**Jennifer S. Shane
Katherine M. Madson
Yunjeong (Leah) Mo**

**Cristina Poleacovschi
Roy E. Sturgill Jr.**

ISBN: 978-1-7138-9338-7

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2024) by American Society of Civil Engineers
All rights reserved.

Printed with permission by Curran Associates, Inc. (2024)

For permission requests, please contact American Society of Civil Engineers
at the address below.

American Society of Civil Engineers
1801 Alexander Bell Drive
Reston, VA 20191
USA

Phone: (800) 548-2723

Fax: (703) 295-6333

www.asce.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

Contents

Sustainability and Resilience

Quantifying the Thermal Comfort Improvement in a Redevelopment Project in Comparison to Semi-Permanent Homes in a Densely Populated Slum1
 Vandana C. Padmanabhan and Ann Francis

Circular Economy Strategies for Decarbonization of the Built Environment Value Chain Scope 3 Emissions: A Network Analysis10
 Radwa Eissa and Islam H. El-adaway

Distributed Solar Generation: Data Analytics of the Existing Literature for Guiding Future Prospects21
 Gasser Ali and Islam H. El-adaway

Citizens’ Socioeconomic Background and Energy Accessibility during Extreme Events31
 Niousha Talebpour and Mohammad Ilbeigi

Improving Flood Resilience of Bridge Infrastructure through Fluid, Structural, and Risk Modeling38
 Junyi Duan and Chengcheng Tao

Machine Learning-Based Risk Analysis for Infrastructure Vulnerable to Flood Hazards48
 Junyi Duan, Joy Gao, and Chengcheng Tao

A Transition Management Framework for Implementing Circular Economy in the Construction Industry.....56
 Aida Mollaei, Guilherme Eliote, Beatriz Guerra, Sheida Shahi, Fernanda Leite, Carl Haas, and Olaf Weber

A Methodology to Develop Master Plans for Construction and Demolition Waste Management66
 Antoinette Abou Jaoude and Issam Srouf

Characteristics of Early Adopters and Their Followers of Rooftop Solar, Electric Vehicles, and Heat Pumps.....76
 Yohan Min, Hyun Woo Lee, Novi Bramono, and Erin Mayfield

Exploring the Landscape: Environmental, Social, and Governance (ESG) in the Construction Industry86
 Ze (Keats) Hua and Elif Deniz Oguz Erkal

Deconstruction Information Model-Based Material Passports for Promoting Circular Economy in the AEC Industry through the Use of Building Information Modeling: A Literature Review	96
Paula Lopez Alvarez de Neyra and Amelia Celozza	
Characteristics and Influencing Factors of HVAC Energy Consumption in US Residential Buildings	106
Biao Kuang, Ziming Liu, Yangming Shi, and Jianli Chen	
Disproportionate Impacts of Stormwater Infrastructure Failure on Unhoused Communities: A Literature Review	117
Abigail F. Murray and Bethany Gordon	
Network Structures and Project Complexity in Environmental Impact Assessment Outcomes	127
John Salazar, Jose Guevara, and Gabriel Castelblanco	
History and Evolution of Ventilation in Cleanroom Environments: A Network Analysis Approach	138
Mohammad Saleh Nikoopayan Tak and Ehsan Mousavi	
Development of an Assessment Tool to Measure the Preparedness of Construction Firms for Upcoming Disasters	149
Sai Akhila Boddi Reddy and Ingrid Arocho	
An Exploratory Investigation of Social Vulnerability from the Building Resilience Perspective	156
Suman Paneru, Yanxiao Feng, Chen Xia, Yuqing Hu, and Julian Wang	
Concurrent Modeling of Embodied Carbon and Construction Costs for Mass Timber Construction	165
Matthew Wiggins, Hyun Woo Lee, and Tomás Méndez Echenagucia	
An Analysis of the Axiological Antecedents of Inter-Organizational Collaboration in Resilience Planning Using Exponential Random Graph Models	175
Hang Ren, Travis A. Whetsell, Lu Zhang, and N. Emel Ganapati	
Integrating Stakeholder Value Dynamics with Resilience Evaluation for Housing	186
Parasar Gosain and Lu Zhang	
Resilient Materials and Technologies for a Single-Family Home: A Review	197
Sandeep Langar and Shreya Kaduskar	

River Flood Prediction Based on Physics-Informed Long Short-Term Memory Model	208
Xiyu Pan, Neda Mohammadi, and John E. Taylor	
Developing a Conceptual Life-Cycle Framework for Advancing Equity in Local Capital Improvement Planning	217
Chau Le, Muhammad Ali Moriyani, and Tuyen Le	
A Novel Approach for Classifying the Management Priorities of Flooding Events Using Clustering Algorithms and Geospatial Analysis	226
Ghiwa Assaf and Rayan H. Assaad	
Assessing the Vulnerability of Communities to Heat Waves: Developing a Heat Vulnerability Index	237
Ghiwa Assaf and Rayan H. Assaad	
Integrating Benefit-Cost Analysis and Monte Carlo Simulation to Prioritize Flood Mitigation Projects and Model Flood-Related Uncertainties	247
Mohsen Mohammadi and Rayan H. Assaad	
Modeling the Ripple Effects of Flooding Events: Determining Critical Dependencies Using Association Rule Analysis	257
Mohsen Mohammadi, Ghiwa Assaf, and Rayan H. Assaad	
Automatic Detection of Natural Hazard-Induced Power Grid Infrastructure Faults Using Computational Intelligence	267
Xi Hu and Rayan H. Assaad	
Modeling Flood Vulnerabilities and Estimating Potential Economic and Social Losses: Assessing the Level of Community Flood Readiness and Preparedness in Newark, NJ	277
Yasser Jezzini and Rayan H. Assaad	
A Subject Review on the Use of Mass Timber in the US Construction Industry	287
Shafayet Ahmed, Vineeth Dharmapalan, and Ziyu Jin	
A Literature Review of Carbon Emissions Monitoring Practices in Construction Projects	296
In Bae Chung and Carlos H. Caldas	
Creating a Large-Scale National Residential Building Energy Dataset Using a Two-Stage Machine Learning Approach	305
Sorena Vosoughkhosravi and Amirhosein Jafari	
Assessing Energy Performance and Thermal Satisfaction of Flexible Space Usage in Office Buildings	316
Shiqi Ding, Chengyu Tang, Snowil Lopes, and Da Li	

An Experimental Framework to Measure Dynamic Thermal Resilience of Wall Panels under Extreme Weather Conditions.....	327
Hamed Khaleghi and Aslihan Karatas	
Describing Types of AEC Firms with Climate Pledges	336
Nathalie Thelemaque and Jessica Kaminsky	
Origami Housing: A Post-Disaster Temporary Emergency Housing Solution.....	346
Claudia Calle Müller and Mohamed Elzomor	
Pattern Analysis of LEED v4 Rating System	356
Aman Tripathi, Shubhang Gaur, Mina Mahdavi Parsa, Deep Doshi, Srujan Kothakapu, and Soowon Chang	
Real-Time Building and Comfort Data Collection Using Mobile Robots	365
Yijin Zhao, Bharadwaj R. K. Mantha, and Da Li	
Investigating Trends and Influential Factors for Sustainability Ratings in Envision-Certified Infrastructure Projects	376
Rubaya Rahat and Mohamed ElZomor	
Equity-Integrated Infrastructure Resilience Analysis: Case Studies of Florida Communities.....	385
Sunil Dhakal and Lu Zhang	
Exploring Socio-Demographic Inequalities in Post-Disaster Community Well-Being: Case Study of Hurricane Harvey	395
Mohamadali Morshedi, Arkaprabha Bhattacharyya, and Makarand Hastak	
Prioritizing Capacity Building Strategies to Ensure Robustness and Faster Recovery of Cellular Networks from Hurricanes	406
Arkaprabha Bhattacharyya, Mohamadali Morshedi, and Makarand Hastak	
Spatiotemporal Insights into Online Public Responses to Disasters in Developed and Underdeveloped Countries	416
Md. Ashiqur Rahman, Lufan Wang, and Runhe Zhu	
A Life-Cycle Analysis-Based Framework to Analyze Various Circular Economy Strategies in Buildings	427
J. S. Smitha and Albert Thomas	
Household Water Insecurity and Depression Symptoms among Individuals Exposed to Hurricanes Maria and Fiona.....	437
Toby N. T. Nelson, Cristina Poleacovschi, Ivis García, Kaoru Ikuma, Carl F. Weems, and Chris R. Rehmman	

Lightweight Cellular Concrete (LCC) for Stormwater Management in Parking Lots: A Design Optimization Approach.....	448
Sundeep Inti, Niharika Dayyala, and Luke Tempestini	
Adoption of Circular Economy Practices in the Built Environment—A Survey of US Construction Industry Stakeholders.....	459
Christopher N. Bennett, Zia Ud Din, Ahmed Senouci, and Rosalind Wyatt	
An Assessment of the Social Determinants of Participation in Energy Efficiency Programs in Alaskan Native Homes	468
Amanda Quarshie, Cristina Poleacovschi, Kristen Cetin, Marcus Nartey, and Farah Mneimneh	
The Use of Advanced Solutions towards COVID-19 Recovery at Airports in the Eastern USA	484
Michael Ammourey and Baris Salman	
Evaluating the Impacts of Hurricane Maria on Residential Construction Practices in Puerto Rico	495
M. Bradley Wells, Clifton B. Farnsworth, Andrew South, Evan D. Bingham, and James P. Smith	
Does LEED BD+C for New Construction Provide a Realistic and Practical Sustainability Evaluation System?.....	505
Mohsen Goodarzi and Alireza Shayesteh	
Potential Factors Influencing Student Rental Housing Participation in Demand-Side Management Strategies.....	515
Patricia Guillante, Natalie Fylak, and Kristen Cetin	
Potential Leading Sustainability Performance Indicators for Sustainable Low-Income Housing.....	526
Asma A. Sharafeddin and Ingrid Arocho	
COVID-19 Impacts on Construction Project Execution: Case Studies of Data Center Projects.....	538
Don Miller and Yewande S. Abraham	
A Bibliometrics-Based Visualization Analysis of Sustainable Transportation Infrastructure Research	548
Anupa Silwal, Aayush Khadka, and Elnaz Safapour	
Systematic Review of Material Selection for Building Envelopes Based on Multi-Criterion Decision-Making.....	558
Enric Barkokebas, Valeria Vecchio, Regina Dias Barkokebas, and Mohamed Al-Hussein	

A Systematic and Bibliometric Review of Greenhouse Gas Emissions in the Construction Phase of Residential Buildings	568
Valeria Vecchio, Enric Barkokebas Martins, Regina Dias Barkokebas, Beda Barkokebas, and Mohamed Al-Hussein	
Reuse and Recycling Feasibility Assessment for Bridge Components: A Case Study of a Bridge Investigation in Florida	578
Maral Nazemi, Juyeong Choi, and Qian Zhang	
Comparing Differences of Community Resilience and Rurality in the USA for Counties Prone to Riverine Flooding	589
S. Yasaman Ahmadi, Jennifer I. Lather, and Christine E. Wittich	
Artificial Intelligence Enabling Sustainable Construction: A Systematic Review	600
Vaishnavi Jagalur Ramachandra, Naila Mahaveen, Siddharth Banerjee, and Pedram Ghannad	
A GIS-Based Social Vulnerability Assessment of Communities in Coastal Areas Exposed to Extreme Flood Events: A Case Study of the New Orleans Urban Area	610
Behzad Rouhanizadeh, Elnaz Safapour, and Anupa Silwal	
A Framework of the Assessment of the Financial Feasibility of Utilizing Piezoelectric Harvesters in Roadways.....	620
Heba M. Gaber and Mohamed Abdel-Raheem	
Factors Leading to Tap Water Mistrust in Served Alaskan Native Communities—A Case Study of a Village in the Norton Sound Region	630
Marcus Nartey, Cristina Poleacovschi, Kaoru Ikuma, Christina Gish Hill, Carl F. Weems, Scott Feinstein, and Lina Sela	
<i>Infrastructure Systems and Engineering and Materials Design</i>	
Spatial and Demographic Trends in Lead Levels: The Case of Chicago’s Water System	641
Haniye Safarpour, Deborah A. Carroll, and Lauryn A. Spearing	
State Departments of Transportation Efforts toward Optimizing the Management of Ancillary Asset Data: State of Practice and Future Recommendations.....	651
Ashtarout Ammar, Gabriel B. Dadi, and Hala Nassereddine	
Introducing CHAMFiT: A Decision-Making Tool for Optimizing the Use of Wireless and Sensing Technologies in Highway Projects.....	661
Ashtarout Ammar, Makram Bou Hatoum, Gabriel Dadi, and Hala Nassereddine	

Finite Element Analysis of Structural Lining Materials for Pipeline Rehabilitation	671
Junyi Duan, Chengcheng Tao, and Ying Huang	
Creation of Truck Weight Road Groups for Pavement Design	679
Jieyi Bao, Xiaoqiang Hu, Yi Jiang, and Shuo Li	
Identifying Socio-Technical Challenges to Decentralized Wastewater Infrastructure Management in the Rural Alabama Black Belt.....	690
Amal Bakchan and Kevin D. White	
Enhancing Winter Maintenance Decision Making through Deep Learning-Based Road Surface Temperature Estimation.....	701
Pooya Darghiasi, Mina Zamanian, and Mohsen Shahandashti	
Third-Party Damages to Underground Utilities: The Critical Need for Root Cause Analysis	712
Ahmed Jalil Al-Bayati, Louis Panzer, Ricardo Eiris, and Mohammadsoroush Tafazzoli	
Case Study: Effect of the Condition Data of Automated Pavement Surveys on Pavement Performance Indicators	720
Faisal Quibria Chowdhury and Yoojung Yoon	
Empirical Study of the Correlation between Geoelectrical and Soil-Index Properties of Clayey Soils	731
Mina Zamanian, Pooya Darghiasi, and Mohsen Shahandashti	
Automated Underground Water Leakage Detection with Machine Learning Analysis of Satellite Imagery	741
Shiva Arabi and David Grau	
Empirical Analysis of Pavement Condition Transition Probabilities.....	751
Frederick Chung, Minsoo Baek, Yejee Paik, and Baabak Ashuri	
Exploration of Healthcare Infrastructure Interdependencies due to Natural Disasters.....	759
Nivaldo Calabran, Catalina Ferrara, and Felipe Araya	
Modeling and Predicting Deterioration of Concrete Bridge Elements Using Machine Learning	769
Mahdi Ghafoori, Moatasseem Abdallah, and Mehmet Egemen Ozbek	
Evaluating Utility Data Reliability: A Comparison of One Call and Subsurface Utility Engineering (SUE) Records	778
Jeremiah A. Adebisi, James H. Anspach, Roy E. Sturgill, and Philip J. Meis	

Systematic Review of Social Equity for Installing Public Electric Vehicle Charging Stations (EVCS)787
Soowon Chang and Heung Jin Oh

Deciding Infrastructure Reconstruction Priorities after Disasters: A Literature Review795
Lila Madariaga, Clifton B. Farnsworth, Andrew South, and Keona Wu

Trends in Equitable Electric Vehicle Adoption and Impacts on Pavement Condition and Electric Power Infrastructure805
Simone Curtis, John Montagu, Constance Crozier, Cristina Torres-Machi, and Kyri Baker

Development of an Integrated Web-Based Application for Pavement Design and Life-Cycle Cost Analysis.....816
Anh D. Chau and Long D. Nguyen