fire

Editorial

Current Advances on the Assessment and Mitigation of Fire Risk in Buildings and Urban Areas—First Edition

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Fire safety within residential buildings and urban environments continues to be a pressing global concern, demanding dynamic and comprehensive strategies for effective risk assessment and mitigation [1]. This inaugural Special Issue marks the commencement of a series aiming to provide researchers with a platform to showcase cutting-edge developments in this critical area. Authored by researchers from diverse continents, including Europe, Asia, and Australia, the contributions in this first edition collectively aim to deepen our understanding and refine practices in this pivotal field.

In the paper entitled "*A Cold Climate Wooden Home and Conflagration Danger Index: Justification and Practicability for Norwegian Conditions*", Dobler Strand and Log [2] investigate the conflagration danger index in Norwegian cold-climate wooden homes. Their study predicted a dynamic fire danger indicator for homes with indoor wooden panelling, particularly in regions with cold climates. The authors introduce a cold-climate wooden home fire danger index by analysing dry wood fire dynamics and weather data, aligning risk levels with existing national forest fire indexes. Key conclusions of this paper highlight the viability of using the fuel moisture content (FMC) in wooden panelling as a predictive indicator for fire risks and emphasise regional susceptibility to conflagrations based on weather and building materials.

In "*Research and Application of Improved Multiple Imputation Based on R Language in Fire Prediction*", Wang et al. [3] propose an enhanced multiple imputation technique using R language for fire prediction models, focusing on addressing missing data that affect prediction accuracy. Their objective was to utilise Hazard and Operability (HAZOP) analysis to accurately identify and exclude data with substantial missing rates. The study showcases high prediction efficacy in handling missing data, specifically in Hubei Province, underlining the significant influence of government supervision on fire trends.

In "Modelling and Mapping Urban Vulnerability Index against Potential Structural Fire-Related Risks: An Integrated GIS-MCDM Approach", Noori et al. [4] identify urban areas at risk of fire hazards by integrating Geographic Information System (GIS) and multi-criteria decision-making methods (MCDMs). Their study focuses on creating an urban vulnerability index map of Ardabil city in Iran. Conclusions reveal specific vulnerable areas and neighbourhoods within the city, offering valuable insights for decision-makers to implement targeted fire risk mitigation strategies.

In the study entitled "*Effect of Interlayer Materials on Fire Performance of Laminated Glass Used in High-Rise Building: Cone Calorimeter Testing*", Hassan et al. [5] investigate the fire performance of laminated glass in high-rise buildings, emphasising the impact of interlayer materials on fire behaviour. Among other objectives, the authors aimed to understand how parameters such as glass thickness, interlayer materials, and heat flux influence reaction-to-fire properties. Key conclusions highlight the significant influence of these parameters on the heat release rate, smoke production, and overall fire behaviour of laminated glass, providing crucial insights for building design and safety regulations.

In "*A Scientometric Research on Applications and Advances of Fire Safety Evacuation in Buildings*", Yang et al. [6] conduct a comprehensive scientometric review focusing on fire

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safety evacuation applications in various building types. In this study, the authors aimed to elucidate evolving trends in fire evacuation research, refining evacuation models, and improving practical considerations. Conclusions highlight the evolving focus on refining crowd behaviour models, aligning theoretical methods with real-world evacuation scenarios, and emphasising the study of evacuation drills and external environmental factors.

In "*Critical Factors Affecting Fire Safety in High-Rise Buildings in the Emirate of Sharjah, UAE*", Omar et al. [7] identify critical factors influencing fire accidents in high-rise buildings in the Emirate of Sharjah. This study involves a comprehensive literature review and consultations with subject matter experts to pinpoint factors applicable to the Emirate. Using Failure Mode, Effect, and Criticality Analysis (FMECA), the authors categorise critical factors into management, human, and technical aspects. Key conclusions identify crucial elements affecting fire safety, such as fire regulations, human behaviour, maintenance practices, and urbanisation. Among other aspects, this study emphasises the importance of these factors in shaping fire incidents and suggests strategic interventions for enhanced fire safety measures.

In "*Development of a Novel Quantitative Risk Assessment Tool for UK Road Tunnels*", Haddad and Harun [8] propose a novel Quantitative Risk Assessment (QRA) model, named LBAQRAMo, specifically designed for UK road tunnels. This study aims to provide a comprehensive risk analysis for tunnels, encompassing the frequency and consequences of fire incidents. Through quantitative frequency analysis and consequences analysis, the authors evaluate the societal risk of tunnels and estimate the number of fatalities for various scenarios. Key conclusions emphasise the efficacy of LBAQRAMo in assessing tunnel safety and ensuring compliance with UK safety limits. Furthermore, the model demonstrates the safety of investigated tunnels and offers insights into risk evaluation and management.

In "*The Ignition Frequency of Structural Fires in Australia from 2012 to 2019*", Tan et al. [9] analyse Australian fire statistical data to assess the ignition frequency of structural fires from 2012 to 2019. Their main objective was to refine the generalised Barrois model to better fit Australian building characteristics. The study includes new categories of buildings, such as hotels and hospitals, absent from previous studies. Key conclusions highlight significant variations in ignition frequencies across different building types in Australia compared with Finland. The enhanced Barrois model based on Australian fire data offers critical insights into ignition frequencies, aiding accurate fire risk quantification in the Australian context.

In "*Understanding Building Resistance to Wildfires: A Multi-Factor Approach*", Samora-Arvela et al. [10] investigate factors influencing building resistance to wildfires, focusing on a case study in the Central Region of Portugal. This research aimed to determine the key factors impacting structure survival during wildfires, guiding municipal mitigation strategies. The conclusions reveal the influence of factors such as overhanging vegetation, locations in forest areas, and structural isolation from major roads on building destruction or survival. Among other aspects, the study emphasises zoning regulations and defensible space as crucial components of strategies to enhance resilience against wildfires.

In "*Reduced Scale Experiments on Fire Spread Involving Multiple Informal Settlement Dwellings*", Narayanan et al. [11] conducted reduced-scale experiments to understand fire spread in informal settlements. The central objective of this investigation was to develop a methodology to study fire spread phenomena in these settlements, which are challenging to investigate through large-scale experiments. Conclusions highlight the significant influence of factors such as dwelling spacing, cladding materials, wind effects, and fuel loads on fire spread rates. Moreover, the study underscores the correlation between reduced- and full-scale experiments in understanding fire dynamics while emphasising the complexity of scaling flame impingement and the need for further investigation.

In "Fire Risk Assessment on Wildland–Urban Interface and Adjoined Urban Areas: Estimation Vegetation Ignitability by Artificial Neural Network", Polinova et al. [12] focus on fire risk assessment in wildland–urban interface (WUI) areas using pattern recognition neural networks (PRNNs). The authors aimed to identify areas with a high probability of ignition by analysing time series multispectral images. The conclusions highlight the effectiveness of the PRNN in identifying areas prone to ignitability, especially utilising vegetation indices reflecting changes in biomass and canopy cover. In addition, the study offers a valuable methodology for risk assessment and fuel treatment planning in fire-prone ecosystems.

In "*Assessment and Mitigation of the Fire Vulnerability and Risk in the Historic City Centre of Aveiro, Portugal*", Silva et al. [13] conduct a fire risk assessment in the historic city centre of Aveiro, Portugal, aiming to identify fire vulnerability and propose mitigation strategies. Through fieldwork building inspections and GIS mapping, they evaluate fire risk levels in historic buildings. Key conclusions reveal a substantial percentage of assessed buildings with higher-than-acceptable fire risk levels, necessitating tailored mitigation strategies. The study emphasises the need for adapted evaluation methods for historic areas to ensure safety without compromising heritage values.

Finally, in "Estimating the Suppression Performance of an Electronically Controlled Residential Water Mist System from BS 8458:2015 Fire Test Data", Hopkin et al. [14] detail fire tests for an electronically controlled water mist system, aiming to estimate its suppression performance. Their study involves B-RISK zone modelling and comparisons with thermocouple test data to understand the system's capabilities. Conclusions support the application of traditional suppression assumptions, derived from sprinkler systems, to the tested water mist system. Furthermore, the study highlights the system's potential in controlling fire heat release, albeit within the constraints of the test methods representing limited fire scenarios.

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References

1. Ferreira, T.M. Fire Risk Assessment and Safety Management in Buildings and Urban Spaces—A New Section of Fire Journal. *Fire* **2022**, *5*, 74. [CrossRef]
2. Strand, R.D.; Log, T. A Cold Climate Wooden Home and Conflagration Danger Index: Justification and Practicability for Norwegian Conditions. *Fire* **2023**, *6*, 377. [CrossRef]
3. Wang, J.; Yang, M.; Li, T.; Jiang, X.; Lu, K. Research and Application of Improved Multiple Imputation Based on R Language in Fire Prediction. *Fire* **2023**, *6*, 235. [CrossRef]
4. Noori, S.; Mohammadi, A.; Ferreira, T.M.; Ghaffari Gilandeh, A.; Mirahmadzadeh Ardabili, S.J. Modelling and Mapping Urban Vulnerability Index against Potential Structural Fire-Related Risks: An Integrated GIS-MCDM Approach. *Fire* **2023**, *6*, 107. [CrossRef]
5. Hassan, M.K.; Hasnat, M.R.; Loh, K.P.; Hossain, M.D.; Rahnamayiezekavat, P.; Douglas, G.; Saha, S. Effect of Interlayer Materials on Fire Performance of Laminated Glass Used in High-Rise Building: Cone Calorimeter Testing. *Fire* **2023**, *6*, 84. [CrossRef]
6. Yang, Y.; Du, H.; Yao, G. A Scientometric Research on Applications and Advances of Fire Safety Evacuation in Buildings. *Fire* **2023**, *6*, 83. [CrossRef]
7. Omar, M.; Mahmoud, A.; Abdul Aziz, S.B. Critical Factors Affecting Fire Safety in High-Rise Buildings in the Emirate of Sharjah, UAE. *Fire* **2023**, *6*, 68. [CrossRef]
8. Haddad, R.K.; Harun, Z. Development of a Novel Quantitative Risk Assessment Tool for UK Road Tunnels. *Fire* **2023**, *6*, 65. [CrossRef]
9. Tan, S.; Moinuddin, K.; Joseph, P. The Ignition Frequency of Structural Fires in Australia from 2012 to 2019. *Fire* **2023**, *6*, 35. [CrossRef]
10. Samora-Arvela, A.; Aranha, J.; Correia, F.; Pinto, D.M.; Magalhães, C.; Tedim, F. Understanding Building Resistance to Wildfires: A Multi-Factor Approach. *Fire* **2023**, *6*, 32. [CrossRef]
11. Narayanan, V.; Oguaka, A.; Walls, R.S. Reduced Scale Experiments on Fire Spread Involving Multiple Informal Settlement Dwellings. *Fire* **2022**, *5*, 199. [CrossRef]
12. Mahamed, M.; Wittenberg, L.; Kutiel, H.; Brook, A. Fire Risk Assessment on Wildland–Urban Interface and Adjoined Urban Areas: Estimation Vegetation Ignitability by Artificial Neural Network. *Fire* **2022**, *5*, 184. [CrossRef]

13. Silva, D.; Rodrigues, H.; Ferreira, T.M. Assessment and Mitigation of the Fire Vulnerability and Risk in the Historic City Centre of Aveiro, Portugal. *Fire* **2022**, *5*, 173. [CrossRef]
14. Hopkin, C.; Spearpoint, M.; Muhammad, Y.; Makant, W. Estimating the Suppression Performance of an Electronically Controlled Residential Water Mist System from BS 8458:2015 Fire Test Data. *Fire* **2022**, *5*, 144. [CrossRef]