

REVIEWER'S REPORT

Manuscript No.: IJAR- 59010

Title: Enhancing Fire and Life Safety Resilience of Critical Infrastructure in Saudi Arabia: A Risk-Based Engineering Framework for Vision 2030

Recommendation:

Accept

Rating	Excel.	Good	Fair	Poor
Originality	Yes			
Techn. Quality		Yes		
Clarity	Yes			
Significance		Yes		

Reviewer Name: Dr. Ashish Yadav

Detailed Reviewer's Report

Reviewer's Comment for Publication.

Acceptance Comment are mentioned below suitable for the paper titled "*Enhancing Fire and Life Safety Resilience of Critical Infrastructure in Saudi Arabia: A Risk-Based Engineering Framework for Vision 2030*"

Reviewer Comments: Accept

Reviewer Comments –

1. Introduction

The manuscript addresses a highly relevant and timely issue concerning fire and life safety resilience in Saudi Arabia's rapidly developing critical infrastructure under Vision 2030. The topic is significant because the expansion of transport, energy, healthcare, utilities, digital infrastructure, and high-occupancy facilities increases the need for resilient and integrated safety strategies. The study appropriately recognises that conventional code compliance alone may not adequately address complex hazards, cascading disruptions, and continuity requirements. Overall, the introduction establishes a strong rationale for developing a risk-based engineering framework tailored to the Saudi context.

2. Literature Review

The literature review is comprehensive, structured, and appropriately focused on recent peer-reviewed evidence published between 2020 and 2025. The use of the PRISMA methodology provides a systematic and transparent basis for identifying and critically examining relevant research. The organisation of the evidence into hazard scenarios, protection systems, evacuation, emergency response, continuity and recovery, and digital intelligence provides a coherent foundation for the proposed framework. The review also effectively connects international resilience research with Saudi-specific regulatory developments and demonstrates the limitations of relying exclusively on prescriptive approaches.

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3. Solution Approach

The proposed risk-based engineering framework is a strong contribution of the manuscript and effectively integrates regulatory compliance with asset criticality, probabilistic scenario analysis, performance objectives, verification, resilience indicators, and lifecycle assurance. The approach appropriately considers fire safety as an interconnected system rather than as a collection of independent protective measures. The inclusion of human reliability, emergency command, recovery objectives, operational learning, and digital intelligence further strengthens the practical value of the framework. The proposed approach is relevant to owners, regulators, designers, and operators and has clear potential for application across Saudi Arabia's critical infrastructure sectors.

4. Results and Discussion

The results and discussion provide a convincing synthesis of the reviewed evidence and clearly demonstrate that resilience requires a broader perspective than conventional fire-code compliance. The findings appropriately highlight the importance of credible fire scenarios, coordinated passive and active protection, effective evacuation and emergency response, functional continuity, and rapid recovery. The discussion of Saudi Arabia's 2024 codes is particularly relevant, as it demonstrates how a strong prescriptive regulatory foundation can be complemented by performance-based and risk-informed engineering practices. The proposed integration of incident data, full-scale testing, digital twins, and recovery-time information also provides a valuable pathway for future validation and operational improvement.

5. Conclusion

The manuscript presents a coherent, timely, and practically relevant framework for enhancing fire and life safety resilience in Saudi Arabia's critical infrastructure in support of Vision 2030. Its principal strength lies in combining established regulatory requirements with risk-based analysis, resilience objectives, lifecycle assurance, and digital intelligence. The study offers meaningful value to both academic researchers and practitioners responsible for the design, regulation, operation, and continuity of critical facilities.

Based on the relevance of the topic, methodological structure, quality of the synthesis, and practical contribution, the manuscript is suitable for publication and is recommended for Acceptance.