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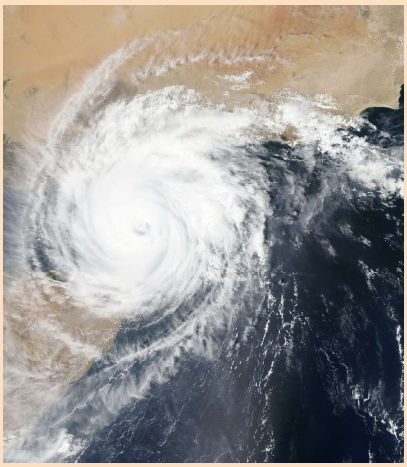
Natech 2024

8th International Symposium on Natural Hazard-Triggered Technological Accidents

Enhancing the Resilience of Critical Energy Infrastructure against Natural Hazards

July 1st-2nd, 2024



Symposium Proceedings

Norwegian University of Science and Technology (NTNU), Trondheim, Norway

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Conference Proceedings

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Norwegian University of Science and Technology (NTNU), Trondheim, Norway

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Supporting Organisations

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UNGRD Unidad Nacional para la Gestión del Riesgo de Desastres Sistema Nacional de Gestión del Riesgo de Desastres	National Unit for Disaster Risk Management (UNGRD), Colombia
IDRiM	International Society for Disaster Risk Management (IDRiM), Japan
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Acknowledgements

We extend our sincere appreciation to the session chairs, speakers, and participants who played a pivotal role in the success of the Natech2024 Symposium. Their valuable contributions, insightful comments, and engaging discussions enriched the conference experience and contributed significantly to the advancement of knowledge in the field.

Preface

Ensuring the resilience of critical energy infrastructure in the face of natural hazards is a paramount concern for industrial risk management. The availability of vital process safety barriers relies on off-site power, making it crucial for preventing or mitigating the release of hazardous materials. In emergency situations, power accessibility is also pivotal for the swift deployment of first responders. This becomes particularly significant when addressing technological accidents caused by natural hazards, known as Natech incidents, involving the release of hazardous substances.

Despite significant research advancements and implementation efforts over the past three decades, challenges in improving the management and risk reduction of Natech accidents persist. Climate change, leading to more frequent and severe hydrometeorological phenomena, amplifies the urgency of this issue. As societies become increasingly dependent on critical infrastructure systems encompassing energy, transport, water, wastewater, waste, and digital communications, the role of such infrastructure in safeguarding the delivery of essential services cannot be overstated.

Moreover, critical energy infrastructure resilience is integral to national and local priorities worldwide, serving as the backbone of our modern economies. The Sustainable Development Goals (SDGs), the Sendai Framework for Disaster Risk Reduction 2015-2030, and the Paris Agreement underscore the imperative of sustainable and resilient infrastructure. The increase in the breadth, number, frequency, and intensity of hazards necessitates a collaborative effort among scientists, public authorities, industries, and communities to enhance risk awareness and societal resilience.

In light of these considerations, the 8th Natech Symposium will convene in Trondheim, Norway, on July 1-2, 2024. This symposium serves as a platform for the exchange of scientific knowledge in Natech risk management, fostering collaboration by sharing experiences, good practices, innovative risk assessment methods, sustainable risk management strategies, and comprehensive risk reduction measures. The symposium aims to contribute to international cooperation in Natech risk management, aligning with global initiatives for resilient and sustainable infrastructure to address the challenges posed by climate change and other emerging trends.

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Material Degradation and NaTech Risk: A Bidirectional Relationship

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Abstract

An important aspect concerns the link between the degradation of materials and NaTech risk. During natural disasters, material degradation can make infrastructure more vulnerable and amplify their consequences. Therefore, the research focuses on identifying significant correlations between these two aspects. Initially, a detailed study of a specific case selected from a repository of incidents attributed to material deterioration, which also involved a natural event in energy infrastructure, was performed. Subsequently, a root cause analysis of the accident was conducted, supported by a historical review. Finally, an investigation into the potential interactions between these factors, supported by a visual analysis, to clarify and deepen these interconnected dynamics was carried out. It has been shown that natural events can accelerate the ageing process of the structures involved, while the degradation of materials can amplify the consequences. Furthermore, the deterioration of materials can affect the surrounding environment, increasing the frequency of such events in the current context of climate change. Therefore, it is essential to consider this factor when assessing NaTech risk, as ignoring it could lead to an underestimation of the true level of risk. The evaluation of the deterioration of materials implies an in-depth understanding of the relationships between the materials used and the surrounding context, considering both internal and external elements of the structure. The internal aspects are linked to the process and the materials of the plant themselves, while the external ones concern the geographical position and the surrounding environmental conditions, including natural events. This approach seeks to further explore and comprehend how the degradation of materials and NaTech events impact each other. The goal is to strengthen the ability of industrial structures to withstand these events, thereby lowering the likelihood of failures and significantly bolstering overall operational safety. By understanding these interactions better, industries can implement more effective measures to prevent and mitigate risks associated with NaTech events, ultimately ensuring safer operational environments.

Keywords: Vulnerability, Damage mechanism, NaTech risk, Accident analysis, Fault identification