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Disaster Impacts on Private Construction: A Review

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Abstract-

Disasters, both natural and anthropogenic, increasingly disrupt private construction, presenting multifaceted challenges that threaten structural integrity, delay timelines, and inflate costs. The interplay of urbanization, climate change, and weak regulatory frameworks exacerbates these impacts, necessitating comprehensive analysis and proactive measures. This review synthesizes global research, case studies, and frameworks to elucidate the broad spectrum of disaster effects on private construction, including immediate damages, supply chain disruptions, long-term economic implications, and community resilience. Key findings highlight critical vulnerabilities—such as inadequate building codes, insufficient preparedness, and reliance on non-resilient materials—while emphasising the need for durable construction, risk-sensitive urban planning, and integration of disaster risk reduction (DRR) into every stage of project development. Case studies from flood-prone regions, seismic zones, and areas affected by extreme weather events underscore the importance of adaptive planning, innovative materials, and community engagement. This paper argues for a paradigm shift from reactive to proactive strategies, recommending the adoption of multi-hazard frameworks, real-time risk monitoring, and participatory planning processes to enhance resilience. Future research should prioritise under-represented regions, explore the socio-economic drivers of vulnerability, and innovate sustainable construction technologies. By fostering a culture of preparedness and sustainability, the private construction sector can mitigate disaster impacts, ensuring both economic stability and community well-being.

Key Words: Private Construction, Disaster Impacts, Risk Management, Vulnerabilities, Sustainable Development.

1. Introduction to Disaster Impacts on Private Construction

Natural disasters increasingly challenge private construction, with urbanisation and climate change worsening their impacts. Disasters like hurricanes, floods, earthquakes, and wildfires threaten structural integrity, disrupt supply chains, inflate costs, and delay timelines. Research in Malaysia highlights social and environmental vulnerabilities as critical pre-event factors influencing disaster severity. Post-event impacts span four key areas: people, reputation, communication, and finance. Interestingly, only 37% of organisations have business continuity plans, indicating that there is a preparedness gap. The study, with literature reviews and semi-structured interviews with seven affected organisations, suggests that the current sample size is too low and more data should be collected.(Iffah Farhana et al., 2016).

The impacts are not limited to immediate damage but affect long-term economic stability and community resilience. This introduction seeks to explore the multifaceted impacts of disasters on private construction, highlighting the need for proactive risk management strategies and adaptive planning to mitigate these challenges effectively. Through the discussion of case studies and current research, it will provide an overview of how disasters reshape the private construction landscape and underscore the importance of disaster preparedness in integration into construction practices.(Arumala, 2012).Research on disaster risk reduction (DRR) in Barbados reveals significant vulnerability to natural hazards, such as hurricanes, floods, and earthquakes, exacerbated by high population density (664 people/km^2) and weak building code enforcement. Inadequate regulations leave housing, particularly wooden structures and squatter settlements, highly vulnerable. Despite awareness of hazards, complacency and economic factors deter proactive risk management. Deficiencies in public awareness, national coordination, and multi-stakeholder engagement further hinder effective risk assessment and resource allocation.(Chmutina & Bosher, 2015).

Flooding as a natural disaster causes damage to construction sites and infrastructure directly and indirectly causes long-term supply chain interruptions in materials and labor. Thus, construction companies need to develop strong contingency plans in anticipation of the delays and loss of revenue from such unexpected events. (Shaari et al., 2019). The COVID-19 pandemic has posed challenges like workforce shortages, higher material costs, and delayed timelines, emphasizing the need for flexible planning and resilience in construction. Incorporating health protocols and remote work practices helps maintain productivity and protect the workforce. Prioritizing disaster preparedness safeguards investments, minimizes losses, and fosters a culture of safety and adaptability, enabling projects to withstand disruptions and meet community needs.(Nimish Deshpande , 2022).

2. Overview of Types of Disasters Affecting Construction

Construction projects face significant risks from disasters, including natural events like earthquakes, floods, and hurricanes, as well as human-induced incidents like fires and industrial accidents. These disasters cause structural damage, disrupt activities, delay timelines, and result in financial losses. Climate-related events also weaken foundations and materials, affecting durability. A thorough understanding of these risks is crucial for effective mitigation, resilience, and ensuring construction continuity.

Economically, the earthquake had a big impact on the housing sector by exposing lack of financial resilience in affected residents and businesses. The paper identifies areas of improvement in building databases, renovation programs, and better emergency preparedness focusing on seismic performance assessments and strengthening vulnerable structures, such as cultural heritage buildings and essential facilities like hospitals and schools.(Atalić et al., 2021). The research in Bangladesh focuses on the complex socio-natural factors that determine landslide vulnerability in the Chittagong Hill Districts (CHD), with special reference to the disparities between the urbanized Bengali and Rohingya refugee communities and indigenous tribal communities. Urbanized hill communities are under risk, characterized by poverty, social injustice, precarious livelihoods, and hazardous living conditions on unstable slopes, which are exacerbated by environmental degradation, deforestation, and extreme precipitation events linked to climate change.(Ahmed, 2021). Flood risk assessments are still exposing critical gaps, according to a Vietnamese researcher, with 65% of the studies lacking a clear definition of flood risk, which would allow them to synthesize the results. While most of these studies confined themselves to the physical and environmental drivers, little attention has been given to social, economic, and governance dimensions. Given that GIS and hydrological modeling are methods that are 83% quantitative, several qualitative and mixed methods are underemployed (9% and 8%, respectively). There are also few studies that engage local stakeholder participation and that address small cities or peri-urban areas, thus hurting their relevance. Inadequate focus on social vulnerabilities, economic resilience, and environmental risks stands out as a main concern. Improvements could be made with the participation of key stakeholders, a wider inclusion of economic and social factors, and offering expansion on research covering underrepresented areas. (Nguyen et al., 2021).

Historical Context: Major Disasters and Their Effects on Construction

Major disasters through the age have been extremely impactful in construction history by changing the way in which infrastructure is designed, constructed, and managed for most of the time. The 2011 Tōhoku earthquake in Japan and the 1994 Northridge earthquake in California taught the world about the fragility of conventional structural designs and the necessity for seismic-resistant and advanced engineering designs. (Asian Disaster Reduction Center (ADRC) & (Irp), 2011). Similarly, the 2001 Bhuj earthquake in India caused widespread destruction, leading to a paradigm shift in seismic safety measures and stricter building codes in the region(Gupta, 2003).

While researching EWEs and their impact on construction SMEs, the study found that 75% of the SMEs surveyed reported having experienced some sort of an EWE since 2005, with heavy snow being the most common one. Key effects included employee absenteeism (53%) and access issues to construction sites (33%). Most SMEs were found to lack resilient risk management systems, which are independent of social, economic, physical, and environmental measures. Displaced workers, in the social realm, are being desperately needed for recovery, while economically, only 20% of them have disruption mitigation plans. Poor site conditions amplify the impact of EWEs. With climate change making the construction industry more vulnerable, proactive risk assessments, combined with predictive EWE data, should form an important part of effective planning and resilience.(Karuhanga, 2010).

Floods, from the catastrophic flooding in Pakistan in 2010 to the Kerala floods in India in 2018, accentuated resilient urban planning, appropriate drainage systems, and flood-resistant construction technologies(CWC 2018). Hurricanes such as Hurricane Katrina in 2005 wrought untold havoc across the southern United States, thus underscoring the imperative of the design of buildings to withstand atypical wind and storm surge conditions. Cyclone Amphan in 2020 had revealed the structural incapacity of buildings in coastal areas of both India and Bangladesh, thus prompting renewed thrust towards cyclone-resilient designs. (Balasubramanian & Chalamalla, 2020).

Other significant disasters include the 2004 Indian Ocean tsunami, which destroyed vast coastal infrastructure in South and Southeast Asia, prompting innovations in coastal construction and disaster preparedness(Lavigne F, 2013). Industrial accidents, such as the 1984 Bhopal gas tragedy in India, brought attention to the need for stringent safety measures in industrial construction(Amina Sharif, 2013). The 2019 Jakarta floods and recurring landslides in the Himalayan regions of India, such as the 2013 Uttarakhand floods, underscored the importance of geotechnical studies and resilient hill construction practices.

The extent of damage caused by the events has led to the introduction of related advances in construction practices to include disaster-resistant materials and systems of early warning to mitigate the risk through stringent construction codes. The antiquity of disasters has taught valuable lessons to the construction industry on safety, sustainability, and resilience in undermining difficulties emerging from both natural and man-made disasters.

Economic Impacts of Disasters on Private Construction Projects

In summary, these studies have shown the effects of natural hazards on the coastal regions of China and emphasised a need to develop sustainable development strategies that strike a balance between economic growth and environmental protection. An emphasis is put on including environmental aspects in the economic policies to enhance resilience, improve responses to disasters, and also enhance the infrastructure. This paper identifies gaps in regard to the analysis of disaster impacts on coastal ecosystems and socio-economic implications of resource exploitation, advocating for empirical studies on economic losses, environmental degradation, and disaster management effectiveness. It recommends integrating disaster risk reduction into development planning, establishing early warning systems, and creating mechanisms for community involvement to promote stability and sustainability.(Shi Peijun, 1995).

The study examines the impact of flood disasters on Malaysia's construction sector GDP, revealing short- and long-term effects. In the short run, flood size boosts GDP growth through immediate economic activities, while long-term growth stems from reconstruction efforts. A cointegration relationship shows larger areas and higher damage costs drive recovery and growth. Using rigorous econometric methods, including unit root tests, ARDL bounds testing, and an error correction model (ECM), the study confirms robust results through stability tests like CUSUM and CUSUMsq.(Shaari et al., 2019).

Social Implications: Community and Stakeholder Perspectives

A paper synthesising business modelling and disaster research is provided to propose an initiative-based system of measuring the business vulnerability to natural disasters. The impact factors, such as capital, labour, supplier, and customer vulnerability, are identified and operate parallelly with encumbrances on recovery and attenuation measures. Public policy, local governments, and proactive hazard management are identified as salient in reducing vulnerabilities under the social, economic, physical, and environmental dimensions by the study. The study stresses the importance of collaborative emergency planning, context-based hazard adjustments, and small business assistance; it proposes pre-disaster recovery and further research on effective preparedness strategies and policy tools. (Zhang et al., 2009).

Research on the disaster governance of Ladakh shows a hazard-centred, military-dominated approach bred from colonial history and national security concerns. Hence, it marginalises local ownership and civil society agendas regarding disaster risk reduction. The study identifies various vulnerabilities that will have to be addressed; these include dependency on military governance, bureaucratic inertia, weak infrastructure, and climatic risks, as derived from extensive research. It reviews the reactive nature of current approaches in the realm of entry and calls for shifting remedial strategies to planning and implementation with the active roles for civic organisations and local communities. Through the Social Domains framework, it stressed integrating local knowledge and community-led practices to effectively respond to the peculiar needs and challenges in Ladakh. (Field & Kelman, 2018).

Research reveals how important the incorporation of psychological indicators into flood vulnerability assessments is. Using flood survey data from 456 Austrian households at flood risk, it further deduces that psychological factors like flood preparedness intentions, fear of flooding, self-efficacy, and perceived risk significantly contributed to the explanation of vulnerability outcomes. Hierarchical regression analysis showed that these psychological factors often have stronger explanatory power than traditional physical and social indicators and should thus be taken into account in risk research as they shape motivation toward flood preparedness and mitigation behaviour. (Babcicky & Seebauer, 2021).

Despite the significant benefits of community engagement in disaster management planning, the role of construction contractors in this area has received little attention. The current literature shows that there is a lack of contractor participation, as revealed by some of the respondents; most have commented that they had very little or no engagement with government agencies in the disaster planning process. This study then shows that contractors will participate in disaster management but prefer making participation a voluntary matter instead of legislating It emphasises the need for improved communication, resource management strategies, and a framework for establishing a process for such consultations. (Stringfellow, 2014).

Case Studies: Lessons Learned from Recent Disasters

The study presents an integrated framework for assessing natural disasters' impacts. A more comprehensive evaluation of the impacts can enhance crisis management. The framework classifies impacts into tangible and intangible, as well as direct and indirect, categories, helping to provide an understanding of the disaster effects with more perfective approaches. We analyse existing methodologies such as the ECLAC and HAZUS frameworks, but neither clearly evaluates overly long-term impacts on quality of life, livelihoods, and the environment. This paper emphasised, however, the need to take into account the cause-and-effect relationships among impacts, whereby direct impacts can give rise to indirect consequences over time. Though this dynamic coupling is still to be worked out, it will be instrumentally important for estimating disaster impacts and improving mitigation strategies. The research also emphasises the importance of critical infrastructure's role in generating impacts and notes the contradictory nature of current methodologies, which prohibit sound impact estimates. Research in the future should be urged to conduct far more thorough studies on these cause-and-effect relationships and approach the dynamism of impacts for the sake of more accurate and persistent evaluations. The proposed framework accounts for 23 families and 152 impact indicators that give managers added power to estimate and deal with the multifaceted consequences of natural hazards. (Laugé et al., 2013).

Research into the urban flood damage in Changwon, Korea, revealed that central commercial areas are at the highest risk of flooding owing to high population density and land values. A fuzzy logic model is used to classify flood risk on the basis of land use, land appreciation, building features, and site conditions. Therefore, it emphasises nonstructural measures of mitigation in urban planning that start by adjusting land use and allocating green spaces in order to reduce flood risks. It identifies social, economic, physical, and environmental vulnerabilities and outlines long-term strategies by fixing the weather and topographical data to improve flood risk classification and resilience development. (Park & Lee, 2018).

The research investigates the vulnerability of five building materials—brick, concrete block, steel wall panels, wooden walls, and precast concrete framing—against river floodwaters in Malaysia. It finds wooden walls most vulnerable to flood damage, while concrete block walls and precast concrete framing show higher resilience. Vulnerability curves were developed to guide homeowners in selecting materials that minimise flood repair costs. Despite a thorough study, gaps remain in understanding material performance in floods, emphasizing the need for further research. The study recommends using concrete block walls and precast concrete framing in flood-prone areas and calls for exploring long-term impacts and socio-economic factors for better flood resilience.(Balasbaneh et al., 2020).

The study brings attention to gaps in enacted legislation, which falls shorts for post-disaster reconstruction, hence is inefficient for recovery. It calls upon a new structure of legislation to provide a foundation for practical reconstruction practices, especially through pre-disaster planning. Using the case studies from the 2004 Manawatu floods and Matata debris flow in New Zealand, the paper points out the need for better coordination among the stakeholders. The Ministry of Civil Defence and Emergency Management proposes a holistic recovery process. In conclusion, through its recommendations, recovery policies must focus ahead of time on coordination, hazard risk assessment, and resource management if recovery is to be carried out effectively. (Le Masurier et al., 2006).

Comprehensive Analysis of Vulnerability, Mitigation Measures, Frameworks, and Future Research from Literature Review

Title of Paper	Vulnerability Analysis	Mitigation Measures	Frameworks	Future Research
(Nimish Deshpande, 2022)	SMEs particularly vulnerable; supply chain issues; physical risks in hurricane-prone areas.	Safety guidance, process improvements, technology adoption, compliance with OSHA.	Mitigation framework based on systematic review.	Focused sampling; subgroup analysis; better theories on disaster risk impacts.
(Wu et al., 2022)	Vulnerability Analysis Not provided in this paper	Stopping excavation, backfilling, shotcrete sealing, use of risk assessment tools.	Cloud model, Membership function, Bayesian network	Enhancing objectivity of weight determination; real-time risk factor monitoring.
(Atalić et al., 2021)	Older masonry buildings highly vulnerable; significant	Seismic performance assessment; stabilization and	Public safety framework in	Long-term recovery evaluation; strategies for older buildings;

	economic and social impacts.	anchoring of structural elements.	Croatia (not detailed).	community involvement.
(Ahmed, 2021)	Socio-economic disparities, precarious living on hill slopes, climate risks.	Stop hill cutting, awareness, sustainable resource management.	SWOT analysis, participatory rural appraisal.	Cultural knowledge integration; socio-economic urban impacts; climate change analysis.
(Nguyen et al., 2021)	Physical drivers prioritized; economic resilience underexplored.	Land-use planning, ecosystem restoration, early warning systems.	Integrated flood management approach.	Governance-related flood risks; peri-urban vulnerabilities.
(Balasbaneh et al., 2020)	Physical vulnerability of building materials, wood most vulnerable.	Use durable materials; concrete blocks suggested over wood.	No specific framework mentioned.	Long-term material performance; innovative materials for flood resilience.
(Docherty et al., 2020)	Integration of physical and social vulnerability; focus on multi-hazards.	Community engagement, predictive models, co-designing strategies.	Proposed multi-hazard framework integrating qualitative and quantitative methods.	Adaptation of framework to different hazards; focus on data-scarce regions.
(Iffah Farhana et al., 2016)	Social, economic, and physical vulnerabilities in construction sector.	Business continuity plans, disaster preparedness, facilities management.	Business Continuity and Disaster Recovery Management framework.	Empirical studies on reputation and environmental impacts.
(Gautam et al., 2016)	Lack of numerical data; focus on traditional housing resilience.	Strengthening vernacular constructions; retrofitting with local adaptations.	No detailed framework; focus on vernacular housing analysis.	Numerical modeling of housing; integration of traditional resilience features in codes.
(Chmutina & Bosher, 2015)	Inadequate building codes; high urban population density risks.	Stricter enforcement of building codes, DRR integration in policies.	Building regulations framework with a focus on DRR.	Integration of DRR in housing policies; enhancing public awareness.
(Zea Escamilla & Habert, 2015)	Local vs. global material sustainability; trade-offs in environmental and technical performance.	Use of bamboo, concrete, and wood for low-cost, low-impact shelters.	Benchmark system for transitional shelters' sustainability.	Long-term sustainability of materials; integration in diverse hazard contexts.
(Shaari et al., 2019)	Flood size and damage linked to GDP growth;	Durable construction materials;	ARDL model for disaster-economic growth relationship.	Sector-specific flood impact; comparative

	recovery-dependent resilience.	maintaining stock of essential items.		studies with other disasters.
(Celentano et al., 2019)	Material procurement affects construction time; design complexity impacts speed.	Use of locally available materials; multiscale analysis for efficiency.	People-centered housing recovery framework.	Social impact of material choice; design simplifications in shelters.
(Park & Lee, 2018)	Central commercial areas most flood-vulnerable; land value correlation.	Nonstructural planning; green area allocation; risk-based urban planning.	Fuzzy model for flood risk classification.	Integration of weather data into models; evaluation of current prevention facilities.
(Field & Kelman, 2018)	Military-centric disaster governance limits local participation.	Locally contextualized DRR strategies; reduced reliance on military relief.	Social Domains framework for disaster governance.	Exploring bureaucratic inertia in disaster responses; enhancing local engagement.

Interdisciplinary Perspectives on Disaster Risk and Resilience: A Comprehensive Flowchart Analysis

The flowchart displays visual relationships among ten research papers which show their involvement in disaster risk assessments alongside vulnerability studies and post-disaster reconstruction efforts. The research arranges studies under primary themes including flood risk evaluation and landslide and earthquake vulnerability analysis as well as multi-hazard approaches and construction industry resilience and infrastructure risk assessments. The flowchart presents a clear graphical view that demonstrates how research investigations link together for complete disaster governance understanding by showing how varied studies enhance readiness before and after disasters.

The purpose of the flow chart analysis displays visual connections between research papers and their roles in various aspects within disaster vulnerability studies and construction impact assessments and risk evaluation.

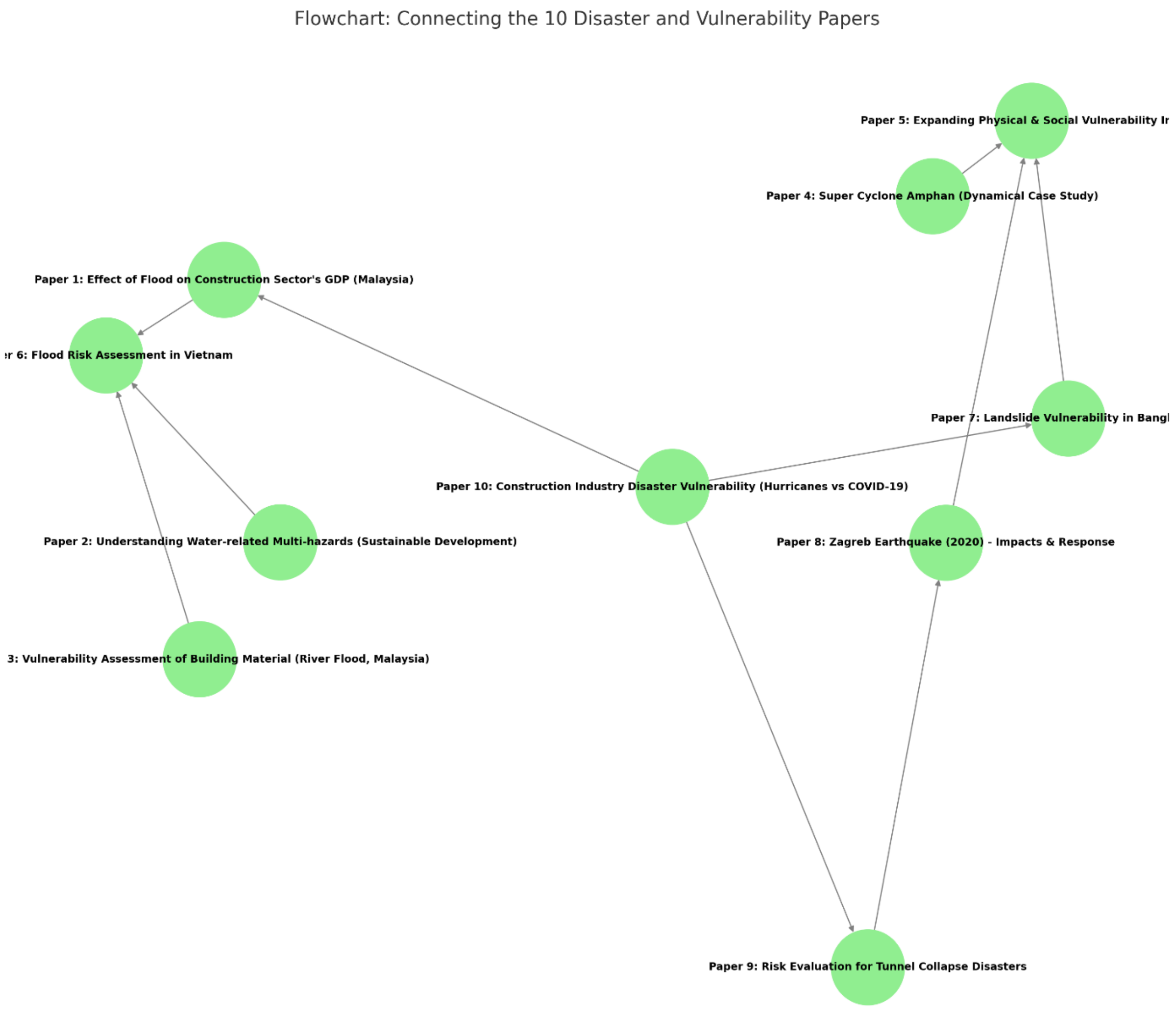

Fig No.1 Flow Chart (Source- Author)

- **Flowchart Structure Example:**

Flood-related papers → Connected to Flood Risk Assessment, Material Selection, and Testing. (Paper 1,3,6)

Landslide/Earthquake papers → Connected to Structural Analysis, Failure Pattern Testing, and Design. (Paper 7,8,9)

Construction Impact papers → Connected to Economic Feasibility, Cost Analysis, and Disaster Response. (Paper 2,4,5,10)

3. Output of Flow Chart

The flowchart evaluation integrates 10 research documents that deliver individual perspectives about disaster risk assessments as well as vulnerability assessments and post-emergency recovery procedures.

The assessment of flood impacts on Malaysia's GDP features in Paper 1 and Paper 6 provides crucial flood risk evaluations which benefit Vietnamese urban development. Building materials face substantial risks during river floods thus Paper 3 investigates their sensitivity to make construction more resilient. Paper 5 goes past infrastructure research by establishing psychological vulnerability indices to demonstrate human disaster effects. The research by Paper 4 provides analysis of disaster governance through the study of Super Cyclone Amphan. The analysis of landslide vulnerability in Bangladesh through Paper 7 investigates socio-economic risk factors alongside Paper 8 studying the structural weaknesses from the Zagreb earthquake of 2020. The publication of Paper 9 brings forth an evaluation model to assess risks from tunnel collapse incidents that enhances infrastructure safety evaluations. Paper 10 evaluates the construction industry's resilience through its examination of Florida's construction sector's response to hurricanes versus COVID-19 impacts. These research papers have built a thorough framework for disaster governance yet they pinpoint essential gaps that need further study especially regarding climate resilience approaches and policy execution and neighborhood adaptation methods.

Innovative Solutions and Technologies for Disaster Resilience in Construction

Research on vernacular houses in Nepal suggests the resilience of traditional houses against earthquakes and floods in the Terai and hilly regions, namely Rajbanshi, Gurung, and Magar houses. Constructed with local materials and techniques, these houses have withstood the test of time through past disasters. Based on field explorations in Jhapa and Kaski districts, the study asserts that future research needs to quantify their resilience and incorporate cultural, social, and environmental sustainability into the same. It talks about strengthening and retrofitting such households to be resilient, merging the traditional practices with modern engineering for both safety and heritage conservation. (Gautam et al., 2016).

Particular emphasis on multi-hazard approaches for disaster risk reduction and sustainable development emerged, noting an impressive increase in multi-hazard studies in the last two decades. Future research aims to apply the framework for investigating hydrologically induced landslides and flooding at a case-study level with emphasis on their natural and anthropogenic drivers, rainfall signatures, and landscape responses. These will contribute predictive regional models for disaster risk reduction strategies, in particular in areas that are currently data scarce. The framework also holds promise for the development of locally undemanding mitigation strategies in order to include stakeholders, work with methods of co-design, and make use of new technologies for data-gathering and multi-hazard forecasting. It will link socio-economic data to hydrometeorological drivers to enhance community awareness, resilience, and response to multi-hazards across diverse geographies and scales. (Docherty et al., 2020).

This study offers a dynamic risk assessment methodology of tunnel collapse, does C1oud-model Membership function, and Bayesian network together to assess construction risks. It works on a structure of Analytic Network Process to calculate the weight of each risk factor and transform them into conditional probability tables for decision-making very close to real time. It uses a hundred marks system basically to transform qualitative indices into risk grades, with a case study on Yutangxi Tunnel validating its applicability. The model guides construction on-site, with suggestions for mitigation measures to reduce risks of collapse. Further research will enhance objectiveness and integrate real-time monitoring into the model for improved accuracy and greater application potential. (Wu et al., 2022).

The research explores the relationship of material procurement, construction speed, and design in post-disaster reconstruction and advocates a multiscale approach. When at the Constructive Technology scale, local materials give a boost to construction speed, while at the Shelter Unit scale, roof design complexity is a more influential factor in construction time. The study shows that poor choices in design can impede emergency responsiveness, even though material diversity has its benefits. It also identifies an absence of relevant research on the socio-cultural acceptance of materials and calls for further exploration in community preferences about choosing specific materials.(Celentano et al., 2019).

Future Trends in Disaster Preparedness for Private Construction

The study reveals the importance of the construction industry in DRR. It has to be seen both before and after disaster, hence its involvement in the DRR strategy at all project stages in construction, starting from planning, design, construction, and maintenance. The study finds a gap between theoretical knowledge and practical DRR application in disaster areas, indicating that construction professionals need more involvement in disaster management. It calls for strengthening professional institutions and trade associations to improve DRR skills. The paper reviews literature on the construction industry and DRR, emphasizing the need for effective planning. It emphasizes the necessity for systematic efforts to enhance disaster planning and mitigation knowledge in the industry, especially during disasters. Future research should focus on connecting theory to the actual real-world contributions of the construction sector, evaluating current DRR measures, and finding new materials and technologies that could increase resilience.(Malalgoda et al., 2011).

The research critiques disaster risk management (DRM) and argues that disaster loss is not proportionally matching the level of disaster rise, implying that perhaps it is not the kind of approach needed at present. Thus, it advocates seeing the disasters as results of lousy development practices instead of just seeing them as natural events. The paper critiques the Hyogo Framework for Action, criticised as ineffective in reducing disaster risks, and calls for a holistic approach to risk management in development. A two-day workshop held in 2013 with 21 specialists defined DRM and emphasised that integration of risk management into development was of paramount importance. The research identifies gaps in understanding how international financial institutions enable debt-driven risk accumulation, how economic processes affect disaster risk, and how governance structures hinder effective risk management. The paper calls for research on how the development processes connect to disaster risk, particularly in relation to climate change and socio-economic drivers, and how neoliberal consumerism affects the reduction of disaster risk. It promotes forward DRM, which includes the integration of risk management into regular planning, promotes accountability and transparency, and fosters innovation in partnership between civil society, business, and government. The research is focused on sustainability, equity, and ecosystem understanding in disaster risk reduction in order to develop a more integrated and effective DRM system.(Lavell & Maskrey, 2014)

Post-disaster reconstruction shows the benefits of local and global materials. Local materials minimize damage to the environment and cut costs while global materials provide better technical performance. A benchmark system assessed the sustainability of twenty transitional shelters and indicated high technical performance possible at low costs and environmental impacts with materials such as bamboo, concrete, and wood. Life Cycle Assessment (LCA) has been used for evaluating environmental impacts; however, the entire sustainability of types of material fails to comprehend. It calls for a multi-faceted approach to sustainability and further research in the areas of material availability, availability of skilled labor, and performance of long-term shelters.(Zea Escamilla & Habert, 2015).

4. Conclusion

This review highlights the profound impacts of disasters on private construction, encompassing immediate physical damage and long-term economic, social, and environmental consequences. Vulnerabilities such as inadequate building codes, lack of disaster preparedness, and limited stakeholder collaboration are prevalent. Disasters like earthquakes, floods, and hurricanes emphasize the critical need for integrating resilience into construction practices. Research shows how structural damages, disrupted timelines, inflated costs, and governance issues exacerbate disaster impacts, with studies indicating that materials like concrete block walls are more resilient than wooden walls. Socio-economic factors, community engagement, and public policy significantly influence disaster management effectiveness, underlining the importance of holistic risk assessment and recovery planning. Moreover, local knowledge and adaptive technologies are key to enhancing resilience and minimizing losses. Despite these insights, the review reveals limitations, including a reliance on geographically specific case studies, under-representation of qualitative data, and a lack of standardised frameworks for evaluating long-term disaster impacts. The absence of empirical research on governance structures further narrows the scope of existing analyses. To address these gaps, future research must focus on expanding geographic representation to include small cities and peri-urban areas, integrating qualitative and quantitative data for comprehensive models, and exploring innovative materials and sustainable practices to improve construction resilience. Additionally, the role of governance and socio-economic policies in disaster risk reduction must be critically analyzed. Developing participatory frameworks for local stakeholder involvement in disaster preparedness and recovery is essential. This collaborative, multidisciplinary approach is imperative for creating sustainable, resilient infrastructure that can withstand future disasters. By addressing current shortcomings and leveraging diverse methodologies, the construction sector can evolve to meet the challenges posed by disasters, fostering stability, safety, and sustainability.

References-

1. Ahmed, B. (2021). The root causes of landslide vulnerability in Bangladesh. Landslides, 18(5), 1707–1720. https://doi.org/10.1007/s10346-020-01606-0
2. Al, L. Fp. Rl. F. et. (2013). Indian ocean tsunami, 2004. https://doi.org/10.1007/978-1-4020-4399-4_192
3. Arumala, J. O. (2012). Impact of large-scale disasters on the built environment. Leadership and Management in Engineering, 12(3), 147–150. https://doi.org/10.1061/(ASCE)LM.1943-5630.0000175
4. Asian Disaster Reduction Center (ADRC), & (Irp), I. R. P. (2011). Great East Japan Earthquake: Preliminary Observations. Office, May, 1–18.
5. Atalić, J., Uroš, M., Šavor Novak, M., Demšić, M., & Nastev, M. (2021). The Mw5.4 Zagreb (Croatia) earthquake of March 22, 2020: impacts and response. Bulletin of Earthquake Engineering,

19(9), 3461–3489. https://doi.org/10.1007/s10518-021-01117-w
6. Babcicky, P., & Seebauer, S. (2021). People, not just places: Expanding physical and social vulnerability indices by psychological indicators. Journal of Flood Risk Management, 14(4). https://doi.org/10.1111/jfr3.12752
7. Balasbaneh, A. T., Abidin, A. R. Z., Ramli, M. Z., Khaleghi, S. J., & Marsono, A. K. (2020). Vulnerability assessment of building material against river flood water: Case study in Malaysia. IOP Conference Series: Earth and Environmental Science, 476(1). https://doi.org/10.1088/1755-1315/476/1/012004
8. Balasubramanian, S., & Chalamalla, V. K. (2020). Super Cyclone Amphan: A Dynamical Case Study. 1–13. http://arxiv.org/abs/2007.02982
9. Nimish Deshpande (2022). Assessing The Impacts Of Covid-19 And Hurricanes On Construction Companies In Florida
10. Celentano, G., Escamilla, E. Z., Göswein, V., & Habert, G. (2019). A matter of speed: The impact of material choice in post-disaster reconstruction. International Journal of Disaster Risk Reduction, 34, 34–44. https://doi.org/10.1016/j.ijdrr.2018.10.026
11. Chmutina, K., & Bosher, L. (2015). Disaster risk reduction or disaster risk production: The role of building regulations in mainstreaming DRR. International Journal of Disaster Risk Reduction, 13(October 2010), 10–19. https://doi.org/10.1016/j.ijdrr.2015.03.002
12. Docherty, J. M., Mao, F., Buytaert, W., Clark, J. R. A., & Hannah, D. M. (2020). A framework for understanding water-related multi-hazards in a sustainable development context. Progress in Physical Geography, 44(2), 267–284. https://doi.org/10.1177/0309133319900926
13. Field, J., & Kelman, I. (2018). The impact on disaster governance of the intersection of environmental hazards, border conflict and disaster responses in Ladakh, India. International Journal of Disaster Risk Reduction, 31, 650–658. https://doi.org/10.1016/j.ijdrr.2018.07.001
14. Gautam, D., Prajapati, J., Paterno, K. V., Bhetwal, K. K., & Neupane, P. (2016). Disaster resilient vernacular housing technology in Nepal. Geoenvironmental Disasters, 3(1), 1–14. https://doi.org/10.1186/s40677-016-0036-y
15. Gupta, M. K. (2003). An eyewitness account of the Bhuj earthquake. Proceedings of the Indian Academy of Sciences, Earth and Planetary Sciences, 112(3), 347–352. https://doi.org/10.1007/BF02709261
16. Karuhanga, B. N. (2010). 기사 (Article) 와 안내문 (Information) [. The Eletronic Library, 34(1), 1–5.
17. Laugé, A., Hernantes, J., & Sarriegi, J. M. (2013). Disaster impact assessment:A holistic framework. ISCRAM 2013 Conference Proceedings - 10th International Conference on Information Systems for Crisis Response and Management, May, 730–734.
18. Lavell, A., & Maskrey, A. (2014). The future of disaster risk management. Environmental Hazards, 13(4), 267–280. https://doi.org/10.1080/17477891.2014.935282
19. Le Masurier, J., Rotimi, J. O. B., & Wilkinson, S. (2006). A comparison between routine construction and post-disaster reconstruction with case studies from New Zealand. Association of Researchers in Construction Management, ARCOM 2006 - Procs 22nd Annual ARCOM Conference, 1(Angus 2005), 523–530.
20. Malalgoda, C., Amaratunga, D., & Pathirage, C. (2011). Exploring disaster risk reduction in the built

environment. The Building Economist, 25–30, 32–34. https://search.informit.org/doi/abs/10.3316/INFORMIT.761258282493110

21. Nguyen, M. T., Sebesvari, Z., Souvignet, M., Bachofer, F., Braun, A., Garschagen, M., Schinkel, U., Yang, L. E., Nguyen, L. H. K., Hochschild, V., Assmann, A., & Hagenlocher, M. (2021). Understanding and assessing flood risk in Vietnam: Current status, persisting gaps, and future directions. Journal of Flood Risk Management, 14(2), 1–24. https://doi.org/10.1111/jfr3.12689
22. Paper, F., Farhana, I., Talib, A., Takim, R., & Nawawi, A. H. (2016). Jurnal Teknologi IMPACT OF CONSTRUCTION DISASTER TO PRIVATE Full Paper. 2, 91–97.
23. Park, K. Y., & Lee, M. H. (2018). Vulnerability analysis of urban district on the urban flood damage: case study—Changwon. Desalination and Water Treatment, 119, 27–35. https://doi.org/10.5004/dwt.2018.22154
24. Shaari, M. S. M., Abd. Karim, M. Z., & Hasan Basri, B. (2019). The Effect of Flood Disaster on Construction Sector's GDP Growth in Malaysia. Proceedings of the Second International Conference on the Future of ASEAN (ICoFA) 2017 - Volume 1, 1, 111–122. https://doi.org/10.1007/978-981-10-8730-1_12
25. Shi Peijun. (1995). THE NATURAL DISASTERS,CONSTRUCTIONS WORKS FOR DISASTER REDUCTION AND SUSTAINABLE DEVELOPMENT OF CHINA. 03, 267–278. http://kns.cnki.net/kcms/detail/detail.aspx?dbname=CJFD1995&filename=ZRZX503.009&dbcode=CJFD
26. Stringfellow, P. (2014). Construction contractors involvement in disaster management planning. Australasian Journal of Construction Economics and Building, 14(2), 120–132. https://doi.org/10.5130/ajceb.v14i2.3912
27. Wu, B., Qiu, W., Huang, W., Meng, G., Huang, J., & Xu, S. (2022). Dynamic risk evaluation method for collapse disasters of drill-and-blast tunnels: A case study. Mathematical Biosciences and Engineering, 19(1), 309–330. https://doi.org/10.3934/mbe.2022016
28. Zea Escamilla, E., & Habert, G. (2015). Global or local construction materials for post-disaster reconstruction? Sustainability assessment of twenty post-disaster shelter designs. Building and Environment, 92, 692–702. https://doi.org/10.1016/j.buildenv.2015.05.036
29. Zhang, Y., Lindell, M. K., & Prater, C. S. (2009). Vulnerability of community businesses to environmental disasters. Disasters, 33(1), 38–57. https://doi.org/10.1111/j.1467-7717.2008.01061.x