Global Environmental Hazards: An Empirical Assessment of Systemic Risk, Regional Vulnerabilities, and Socio-Economic Adaptive Capacities (2025–2026)

Dr. Rajesh Timane
Head of the Management Department, PDIMTR, Dhanwate National College, Nagpur

Abstract—**This paper presents an empirical, multi-hazard assessment of natural disasters occurring within the 2025–2026 window, evaluating how accelerating climate anomalies intersect with regional socio-economic vulnerability. Drawing on the Copernicus Climate Change Service (C3S/ERA5), the EM-DAT-aligned reporting of the National Interagency Fire Center (NIFC) and NOAA's National Hurricane Center, and rapid-attribution studies from World Weather Attribution, four regional case studies are analyzed: the 2025 European heatwaves, the 2025 Western United States wildfire season, the 2025 South and Southeast Asian monsoon floods, and the 2025 Atlantic hurricane season. The findings reveal a consistent dual-vulnerability paradox: high-income economies suffer acute demographic and structural vulnerability, where unacclimatized populations and heat-retaining or fire-adjacent infrastructure yield concentrated mortality and loss spikes during severe anomalies, while developing regions face broader environmental and socio-economic exposure, where comparatively higher physiological and cultural resilience is outpaced by thin institutional safety nets, high informal-labor exposure, and fragile infrastructure.**

The paper documents the emergence of cascading and compound hazards — drought-to-wildfire transitions, heatwave-intensified monsoon rainfall, and rapidly intensifying cyclones outrunning evacuation timelines — and situates all four cases within the common finding that multi-hazard early warning systems reduce disaster mortality roughly sixfold, yet remain unevenly distributed globally. We conclude that 2025–2026's disasters are, overwhelmingly, systemic failures of risk-informed development rather than purely unpredictable atmospheric events, and propose a framework prioritizing multi-hazard early warning expansion, structural retrofitting, and pre-arranged risk-financing instruments such as catastrophe bonds and the Loss and Damage Fund.

Index Terms—**Multi-hazard risk; climate attribution; heat wave mortality; wildland-urban interface fires; South Asian monsoon flooding; Atlantic hurricane rapid intensification; compound disasters; Early Warnings for All; catastrophe bonds; loss and damage; socio-economic vulnerability; disaster risk reduction**

I. INTRODUCTION

Statistical Baseline of Global Escalation: The 2025–2026 disaster record confirms an accelerating, not plateauing, trend. Global surface temperatures in 2025 ran tied with 2023 as the second-warmest year on record according to Copernicus C3S/ERA5 data, with the June–August period ranking as the third-warmest boreal summer globally. That same year saw a wildfire season in the United States that burned over 5.1 million acres and destroyed more than 18,000 structures; a South Asian monsoon season that displaced millions across India, Pakistan, and Bangladesh; and an Atlantic hurricane season that, despite near-average storm counts, produced three Category 5 hurricanes — the most since the record-breaking 2005 season. The UN Office for Disaster Risk Reduction's 2025 Annual Report notes that while average global disaster-related mortality has fallen by two-thirds over the past two decades due to better early warning, 2025 itself was still marked by severe, simultaneous disasters across multiple continents, including Hurricane Melissa in the Caribbean and unprecedented wildfires in California.

The Transition to Systemic Risk: This paper adopts the standard formulation of modern disaster science:

Disaster Risk = Hazard × Exposure × Vulnerability

The empirical premise is that natural hazards — a heatwave, a fire ignition, a monsoon depression, a tropical wave — are physical events that will occur regardless of policy. Disasters, by contrast, are what happens when those hazards meet exposed populations and inadequate social or infrastructural buffers. This distinction is not semantic; it is the basis for the entire policy section of this paper.

Thesis Statement: The 2025–2026 disaster record is characterized by a dual-vulnerability paradox: historically cooler, wealthier nations experience acute mortality and infrastructure failure driven by demographic aging and rigid, hazard-retaining urban design, while developing nations face broader existential risk because escalating environmental thresholds are outpacing even their comparatively higher physiological and cultural resilience, owing to thin socio-economic adaptive capacity.

This paper is written, as its companion heat-wave analysis was, through a lens that treats vulnerability not merely as a technical gap but as a question of collective stewardship — consistent with the Vedic principle of Vasudhaiva Kutumbakam, "the world is one family," and with Indian Knowledge Systems' framing of Nature (Prakriti) as a generative, feminine, cyclical force whose thresholds are not optional constraints but relationships to be honored. Four case studies, each governed by a different physical mechanism, are used to test whether this paradox holds consistently across hazard types.

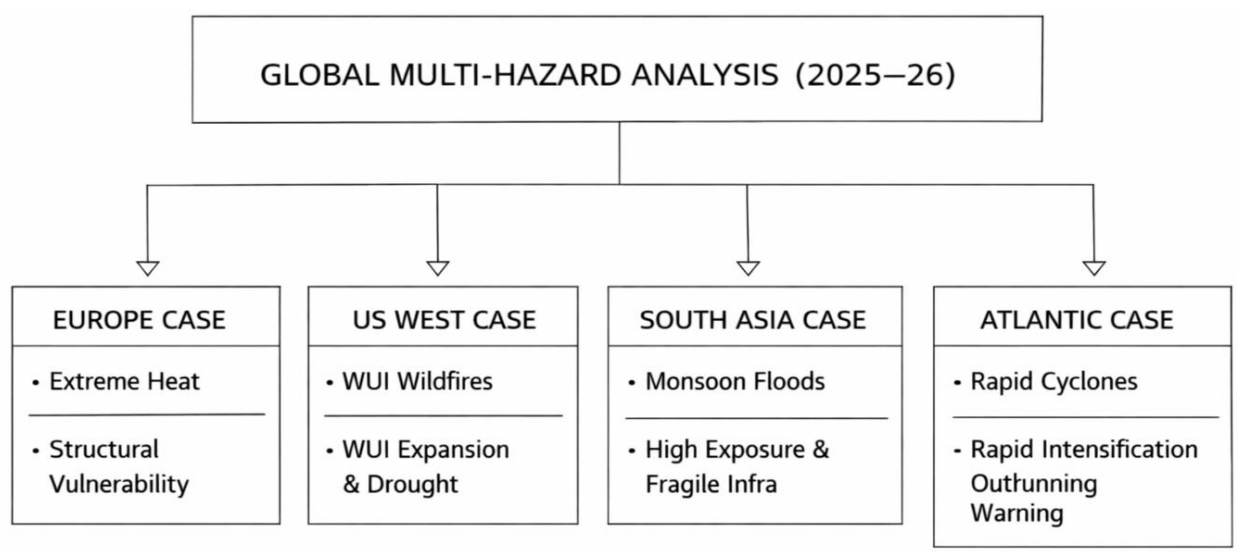
II. LITERATURE REVIEW AND THEORETICAL FOUNDATIONS

The Thermodynamics of Climate-Driven Hazards: Each hazard type in this study is driven by a distinct but related thermodynamic mechanism. Heatwaves stem from atmospheric blocking patterns that trap high-pressure systems in place for days; the 2025 European heatwaves were intensified by an exceptional marine heatwave in the western Mediterranean, where sea surface temperatures reached the highest daily anomaly ever recorded for the region (3.7°C above average) (Copernicus, 2025). Wildfires are driven by compounding drought and fuel-moisture deficits — by mid-2025, nearly 45% of the western United States was under severe to exceptional drought, with live fuel moisture below 70% and dead fuel moisture below 5% in many fire-prone ecosystems (Wikipedia, 2026a; The Global Statistics, 2026).
Monsoon flooding is intensified by a well-documented thermodynamic relationship: each degree of temperature anomaly above average adds roughly 7% more moisture-holding capacity to the atmosphere, meaning that a hotter subcontinent produces heavier rain when the monsoon breaks (CNN, 2025). Rapid cyclonic intensification is driven by anomalously warm sea surface temperatures providing more energy for storm development; Hurricane Melissa's rapid intensification in October 2025 coincided with Central Caribbean Sea surface temperatures 1.4°C above the late-October average — conditions a Climate Central analysis found to be up to 800 times more likely because of human-induced climate change (Allianz Commercial, 2025).
The Mechanics of Human and Structural Vulnerability: Physiological limits are best documented for heat: the Wet-Bulb Globe Temperature (WBGT) framework shows severe heat strain even in acclimatized workers at 32°C, with evaporative cooling failing near 35°C (Environment Energy Leader, 2026). A parallel structural vulnerability exists across all four hazards. In Europe, housing stock engineered for heat retention becomes a liability during anomalies. In the American West, the expansion of the wildland-urban interface (WUI) — now home to over 44 million U.S. residences — has placed growing numbers of structures directly in fire-prone terrain (Nature Scientific Data, 2025). In South Asia, informal settlements in floodplains and steep Himalayan valleys sit directly in the path of cloudburst-driven flash floods. In the Caribbean and Gulf Coast, older building stock and undercapitalized insurance markets strain against storms that intensify faster than evacuation and construction timelines can absorb.

Extreme Event Attribution Methodology: World Weather Attribution's rapid-assessment methodology — combining observed weather data, climate models, and mortality or damage statistics — has now been applied across all four hazard types studied here, from European heat mortality to Hurricane Melissa's amplified wind speed and economic damage (Allianz Commercial, 2025). This cross-hazard application of a single attribution methodology is itself evidence that these events share a common climatic driver, even as their physical manifestations differ.

III. DATA AND METHODOLOGY

Primary Data Repositories: Hazard data: ERA5-based temperature and precipitation anomalies (Copernicus C3S); wildfire perimeter and burned-area data (NIFC, NCEI); tropical cyclone track and intensity data (NOAA National Hurricane Center). Impact data: Fatality, displacement, and structural-loss statistics drawn from national disaster management authorities, UNDRR's Sendai Framework Monitor, and insurance-industry loss estimates (Aon, Swiss Re, Moody's RMS).
Vulnerability and Adaptive Capacity Indicators: Demographic metrics (age-dependency ratios), economic metrics (Gini coefficients, informal-labor share, insurance penetration), and infrastructural metrics (WUI housing density, flood-defense coverage, early-warning-system coverage) are applied across all four cases for comparability.
Comparative Case Selection Matrix: The wireframe illustrates a global overview of interconnected climate hazards projected for 2025–26. At its apex lies the Global Multi-Hazard Analysis, branching into four regional cases—Europe, US West, South Asia, and the Atlantic. Each region highlights a dominant threat, from extreme heat and wildfires to floods and cyclones, revealing how diverse vulnerabilities converge under planetary stress. Together, the diagram captures a structured vision of systemic risk and resilience across continents.



IV. EMPIRICAL RESULTS: REGIONAL CASE STUDIES

Case Study 1: Extreme Summer Heat Waves in Western and Central Europe (2025)
Empirical observation: Europe's summer 2025 land temperature ran 0.90°C above the 1991–2020 average, its fourth-warmest on record, with the Iberian Peninsula and southwest France recording anomalies of 4–6°C above average during a mid-August heatwave (Copernicus, 2025). A late-June heatwave alone was linked to roughly 2,300 excess deaths across twelve European cities, 65% attributable to climate change (Grantham Institute, 2025).

Vulnerability analysis: A broader summer-wide rapid analysis across 854 European cities estimated 24,400 heat-related deaths, of which about 16,500 (68%) were attributable to climate change; people aged 65 and over accounted for roughly 88% of excess deaths in the June event (LSHTM, 2025; Earth.org, 2025). This is the clearest illustration in the dataset of demographic and structural vulnerability meeting a comparatively moderate physical hazard.

Case Study 2: Wildland-Urban Interface Fires in the Western United States (2025)
Empirical observation: The 2025 U.S. wildfire season recorded 77,850 fires burning 5,131,474 acres and destroying 18,385 structures, including 12,773 residential properties (NIFC, 2025). The January 2025 Southern California firestorm alone — ignited during hurricane-force Santa Ana winds amid the driest nine-month stretch on record for Los Angeles — burned over 57,000 acres, destroyed more than 18,000 structures, killed 31 people, and produced economic damage estimated between $76 billion and $131 billion (The Global Statistics, 2026).

Vulnerability analysis: The expansion of housing into the WUI is the central exposure driver: one study found that had development not expanded beyond 1990 levels, roughly 27% fewer homes would have fallen within wildfire perimeters over the following decades (RFF, 2025). Insured losses tied to natural catastrophes in 2025 reached $107 billion globally, with 83% of U.S. insured losses driven by the LA wildfires alone — underscoring that even a wealthy, well-resourced state faces severe economic exposure once housing growth outpaces defensible-space and zoning safeguards (WEF, 2025).

Case Study 3: Severe Monsoon Deluges and Flash Flooding in South and Southeast Asia (2025)
Empirical observation: August–September 2025 brought some of the worst flooding in nearly four decades to Indian and Pakistani Punjab, displacing at least 3,500 people in Jammu alone and affecting over 1,400 villages in each country's Punjab (Wikipedia, 2026b). Cloudburst-driven flash floods in Pakistan's Buner district killed at least 321 people within 48 hours in August 2025, while flooding in India-administered Kashmir killed at least 60 more (CNN, 2025). Later in the year, an erratic northeast monsoon combined with successive cyclones and typhoons to devastate Indonesia (approximately 700 deaths, 570,000 displaced), Sri Lanka (roughly 500 deaths, 15,000 homes destroyed via Cyclonic Storm Ditwah), and Vietnam (over 90 deaths in November alone) (Britannica, 2026).

Vulnerability analysis: The CNN reporting on the 2025 floods draws an explicit causal chain: prolonged regional heatwaves preceding the monsoon increased atmospheric moisture-holding capacity, intensifying the subsequent rainfall — a direct case of one hazard type (heat) compounding another (flood) within the same season and geography (CNN, 2025). With 60% of South Asia's land area under agriculture, the socio-economic transmission channel runs directly through livelihoods: 2024's monsoon flooding alone destroyed an estimated $380 million in

Bangladeshi crops, including 1.1 million metric tons of rice, and reduced regional cotton output by 7% (WTW, 2025).

Case Study 4: Rapid Cyclone Intensification in the Atlantic Basin (2025)
Empirical observation: The 2025 Atlantic hurricane season produced 13 named storms, five hurricanes, and four major hurricanes — the highest percentage of named storms reaching major-hurricane status ever observed in a single season — including three Category 5 storms, the most since 2005 (NOAA, 2025; EarthSky, 2025). Hurricane Erin intensified from 75 mph to 160 mph winds in 24 hours, tied for the fifth-fastest such increase on record. Hurricane Melissa, the season's final storm, underwent a 115-mph wind increase and 90-millibar pressure drop within 72 hours before striking Jamaica as a Category 5 storm with 185 mph sustained winds, causing at least 126 fatalities season-wide and over $12.7 billion in losses (Wikipedia, 2026c).

Vulnerability analysis: Despite the storm's severity, NOAA's National Hurricane Center provided nearly three days' advance notice that Melissa would make Category 5 landfall in Jamaica — the earliest such lead time on record for a storm reaching that intensity from a low initial baseline — demonstrating that forecasting improvements, aided for the first time by AI model guidance, can partially offset physical hazard escalation (NOAA, 2025). Jamaica's pre-arranged financial protections then absorbed part of the shock: the country received a $150 million payout from a World Bank catastrophe bond and further coverage through the Caribbean Catastrophe Risk Insurance Facility — a case where financial pre-positioning functioned as a socio-economic adaptive capacity multiplier even against a hazard forecasting alone could not fully neutralize (WEF, 2025).

V. DISCUSSION: COMPOUND HAZARDS AND THE VULNERABILITY PARADOX

The Mechanics of Cascading Disruptions: The 2025–2026 record provides a clean example of cascading hazard transition within the U.S. wildfire case: severe to exceptional drought across 45% of the western United States by mid-2025 depleted soil moisture and reduced fuel moisture to critical levels, directly enabling the scale of fire activity that followed (The Global Statistics, 2026). A parallel cascade appears in South Asia, where antecedent heatwaves measurably intensified subsequent monsoon rainfall through increased atmospheric moisture capacity (CNN, 2025) — meaning the same warming trend that drives Case 1's heat mortality also amplifies Case 3's flood risk in a different geography.

Evaluating the Resilience Hypothesis: The four cases substantially validate the paper's central hypothesis, though with hazard-specific texture. Europe's heat case is the clearest demographic-and-structural failure: comparatively moderate temperatures (high 30s Celsius) produced tens of thousands of deaths concentrated overwhelmingly among the unacclimatized elderly. The Atlantic cyclone case shows a different pattern — Jamaica's outcome was shaped less by physiological resilience than by the interaction between forecasting lead time and pre-arranged financial capacity, suggesting that for kinetic hazards, institutional preparedness substitutes for the physiological buffer that matters more in thermal hazards. South Asia's flood case shows the clearest tipping-point dynamic: a population with substantial cultural adaptation to monsoon rainfall was overwhelmed once cloudburst intensities crossed a threshold (100mm/hour, per the India Meteorological Department's definition) that existing drainage, dam-release protocols, and settlement patterns could not safely absorb (CNN, 2025).

Simultaneous Regional Stress: 2025 also illustrated concurrent multi-hazard stress on global systems: UNDRR's own annual report frames Hurricane Melissa, a catastrophic Myanmar earthquake, and the unprecedented California wildfires as simultaneous 2025 shocks landing disproportionately in fragile or under-resourced contexts (UNDRR, 2025). This concurrency is itself a vulnerability multiplier, straining the same pool of international humanitarian, reinsurance, and disaster-response capacity across multiple fronts at once.

VI. INSTITUTIONAL ADAPTATION FRAMEWORKS AND POLICY INTERVENTIONS

Proactive Early Warning Infrastructures: The UN's Early Warnings for All initiative reported in 2025 that 119 countries now have Multi-Hazard Early Warning System coverage — a 113% increase since 2015 — with UN Secretary-General António Guterres noting that just 24 hours' notice before a hazardous event can reduce resulting damage by up to 30% (UN, 2025). UNDRR's 2025 Annual Report similarly finds that countries with comprehensive early warning systems experience roughly six times lower disaster mortality than those without (UNDRR, 2025). Coverage gaps remain concentrated exactly where Case 3's vulnerability was highest: 48% of least-developed countries and 57% of small island developing states still lack adequate multi-hazard systems (UN, 2025).

Engineering and Structural Retrofitting: For high-income nations, the priority is converting heat-retaining and fire-adjacent building stock into heat-shedding, defensible designs — reflective roofing, urban green corridors, and WUI zoning reform of the kind analyzed in Resources for the Future's assessment of counterfactual 1990-level development limits (RFF, 2025). For developing nations, sub-national Heat Action Plans on the Ahmedabad model, cool-roofing programs, and climate-resilient flood infrastructure remain the most cost-effective interventions documented in the literature.

Financial Risk Architecture: The 2025–2026 record offers the clearest evidence yet that pre-arranged risk financing works at scale. Catastrophe bond markets absorbed a substantial share of 2025's shocks: global insured natural-catastrophe losses reached $107 billion in 2025, the sixth consecutive year above $100 billion, with catastrophe bonds increasingly used by both insurers and governments — Jamaica's $150 million Melissa payout and the Los Angeles Department of Water and Power's $100 million wildfire-linked cat bond being the clearest 2025 examples (WEF, 2025). More broadly, UNDRR documented that Jamaica's combined risk-transfer instruments triggered more than $240 million in payouts in 2025 alone, its largest ever (UNDRR, 2025). The COP27-established Loss and Damage Fund remains the mechanism intended to extend this kind of protection to countries lacking the capital-market access Jamaica used, though funding levels continue to fall well short of need (UNEP, 2022; UNDRR, 2025).

VII. CONCLUSION

Restatement of Main Findings: Across four structurally distinct hazards observed within the same 2025–2026 window, the dual-vulnerability paradox holds with remarkable consistency: wealthy, historically cooler or drier regions suffer concentrated, demographically skewed mortality and loss when hazards exceed the tolerances their infrastructure and populations were built for, while developing regions absorb broader socio-economic devastation once environmental thresholds outpace thin institutional buffers — even where underlying physiological and cultural resilience runs comparatively high.

Contribution to Disaster Science Literature: The evidence argues for retiring single-hazard risk models in favor of dynamic, multi-hazard, vulnerability-weighted frameworks — particularly given the documented cascading relationships this paper traces between drought and fire, and between heat and monsoon intensity, within the very same 2025 season.

Recommendations for Future Empirical Research: The clearest empirical gap remaining is high-resolution, localized tracking of night-time cooling deficits and their cumulative effect on human physiological recovery across all four hazard geographies — a frontier where satellite-based monitoring (of the kind NASA and Copernicus are already deploying for wet-bulb hotspot detection) could be extended into a genuinely global, multi-hazard early-warning layer.
As with the companion heat-wave analysis, it seems right to close by returning to the wider frame: these four hazards, different as their physics are, all resolve into the same underlying question — how justly and consciously the single human family, Vasudhaiva Kutumbakam, chooses to share both the burden of a warming Nature and the tools available to meet her cyclical extremes with dignity.

REFERENCES

[1] Allianz Commercial. (2025). 2025 North Atlantic hurricane season review. https://commercial.allianz.com/news-and-insights/expert-risk-articles/hurricane-season-review-2025.html

[2] Britannica. (2026). Asia floods of 2025. https://www.britannica.com/event/Asia-Floods-of-2025
[3] CNN. (2025). What are cloudbursts and why might a warming world make them even more dangerous? https://www.cnn.com/2025/08/19/asia/pakistan-india-cloudburst-floods-climate-explainer-intl-hnk
[4] Copernicus Climate Change Service. (2025). Southwestern Europe faces extreme heat during the third-warmest August globally. https://climate.copernicus.eu/copernicus-southwestern-europe-faces-extreme-heat-during-third-warmest-august-globally
[5] Earth.org. (2025). Europe heatwave death toll 3 times higher due to climate change. https://earth.org/death-toll-of-european-heatwave-3-times-higher-because-of-climate-change-analysis-shows/
[6] EarthSky. (2025). Looking back on the 2025 Atlantic hurricane season. https://earthsky.org/earth/looking-back-on-the-2025-atlantic-hurricane-season/
[7] Environment+Energy Leader. (2026). Gulf and South Asia wet bulb limits: The EHS gap in 2026. https://www.environmentenergyleader.com/stories/gulf-and-south-asia-wet-bulb-limits-the-ehs-gap-in-2026,126634
[8] Grantham Institute / Imperial College London. (2025). Fossil fuel emissions have rapidly worsened European heatwaves in just a few decades. World Weather Attribution. https://www.worldweatherattribution.org/fossil-fuel-emissions-have-rapidly-worsened-european-heatwaves-in-just-a-few-decades/
[9] London School of Hygiene & Tropical Medicine. (2025). Climate change-driven summer heat caused 16,500 additional deaths across Europe. https://www.lshtm.ac.uk/newsevents/news/2025/climate-change-driven-summer-heat-caused-16500-additional-deaths-across-europe
[10] National Interagency Fire Center. (2025). Wildland fire summary and statistics annual report 2025. https://www.nifc.gov/sites/default/files/NICC/2-Predictive%20Services/Intelligence/Annual%20Reports/2025/annual_report_2025_0.pdf
[11] Nature Scientific Data. (2025). Two and a half decades of United States wildfire burn zone disaster data, 2000–2025. https://www.nature.com/articles/s41597-025-06226-8
[12] NOAA. (2025). 2025 Atlantic hurricane season marked by striking contrasts. https://www.noaa.gov/news-release/2025-atlantic-hurricane-season-marked-by-striking-contrasts
[13] Resources for the Future (RFF). (2025). Wildfires in the United States 101: Context and consequences. https://www.rff.org/publications/explainers/wildfires-in-the-united-states-101-context-and-consequences/
[14] The Global Statistics. (2026). Wildfire statistics in US 2026: Acres burned, costs & key stats. https://www.theglobalstatistics.com/wildfire-statistics-in-the-us/
[15] UN. (2025). Early Warnings for All. https://www.un.org/en/climatechange/early-warnings-for-all

[16] UNDRR. (2025). UNDRR 2025 Annual Report. https://www.undrr.org/annual-report/2025
[17] UNEP. (2022). What you need to know about the COP27 Loss and Damage Fund. https://www.unep.org/news-and-stories/story/what-you-need-know-about-cop27-loss-and-damage-fund
[18] Wikipedia. (2026a). 2025 United States wildfires. https://en.wikipedia.org/wiki/2025_United_States_wildfires
[19] Wikipedia. (2026b). 2025 India–Pakistan floods. https://en.wikipedia.org/wiki/2025_India%E2%80%93Pakistan_floods
[20] Wikipedia. (2026c). 2025 Atlantic hurricane season. https://en.wikipedia.org/wiki/2025_Atlantic_hurricane_season
[21] World Economic Forum (WEF). (2025). Catastrophe bonds are helping insurers manage climate risks. https://www.weforum.org/stories/2025/12/catastrophe-bond-insurance-climate-crisis/
[22] WTW. (2025). South Asian flooding highlights risks of an increasingly intense and erratic monsoon. https://www.wtwco.com/en-sa/insights/2025/04/south-asian-flooding-highlights-risks-of-an-increasingly-intense-and-erratic-monsoon

Annexure

Annexure A: Baseline Global Comparative Matrix (2025–2026)

Metric	Europe Heat Wave Case	US Wildfire Case	South Asia Flood Case	Atlantic Cyclone Case
Primary hazard window	June–August 2025	Jan 2025 (LA firestorm); May–Nov 2025 season	Aug–Sep 2025 (Punjab/J&K); Nov–Dec 2025 (SE Asia)	Jun–Nov 2025
Primary data source	Copernicus C3S/ERA5; WWA; LSHTM/Imperial College	NIFC; NCEI; Nature Scientific Data (2025)	Wikipedia/local disaster authorities; CNN/IMD; Britannica	NOAA National Hurricane Center; Allianz Commercial
Dominant vulnerability factor	Demographic aging; heat-retentive architecture	Wildland-urban interface (WUI) housing expansion	High population density in floodplains; steep-valley cloudburst exposure	Rapid intensification outrunning evacuation/build timelines

Peak hazard intensity indicator	+4–6°C anomaly (Iberia/SW France, mid-Aug)	45% of western US under severe–exceptional drought	>100 mm/hr cloudburst rate (IMD threshold)	Melissa: 115 mph wind gain / 90 mb pressure drop in 72 hrs
Primary economic impact	Energy grid strain; labor productivity loss	Real estate destruction; insured-loss concentration	Crop failure; infrastructure destruction; livelihood loss	Insurance market payouts; coastal/agricultural loss
Core mitigation strategy in use	Urban cooling retrofits; heat-health early warning	Defensible-space zoning; drought-linked fire restrictions	Sub-national flood/cloudburst early warning; dam-release protocols	AI-assisted rapid-intensification forecasting; catastrophe bonds

Annexure B: Quantitative Impact Tabulation (2025–2026)

Case	Fatalities	Displaced / Affected	Economic / Insured Loss	Key Attribution Finding	Source
Europe heatwaves (summer 2025)	~24,400 heat-related deaths (854 cities); ~2,300 in late-June event alone (12 cities)	Elderly (65+) ≈ 88% of June excess deaths	Not separately quantified in this dataset	68% of summer deaths attributable to climate change; June event 65% attributable	LSHTM (2025); Grantham Institute (2025)
US wildfires (2025)	31 (Jan. LA firestorm)	18,385 structures destroyed (12,773 residential)	LA firestorm: \$76–131 bn; national insured losses \$107 bn (2025, all perils)	83% of 2025 US insured losses tied to LA wildfires	The Global Statistics (2026); WEF (2025)
South/SE Asia monsoon floods (2025)	321 (Pakistan, Buner, 48 hrs); 60+ (J&K); ~700 (Indonesia, Nov.); ~500	3,500+ displaced (Jammu); 570,000 displaced (Indonesia);	2024 comparator: \$380 mn Bangladeshi crop loss; 7%	Antecedent heatwaves raised atmospheric moisture ~7%/°C,	CNN (2025); Wikipedia (2026b); Britannica (2026); WTW (2025)

	(Sri Lanka, Cyclone Ditwah)	1.5 million affected (Indonesia)	cotton output decline	intensifying rainfall	
Atlantic hurricanes (2025)	126 (season total, mostly Melissa)	Jamaica: direct landfall, Category 5	$12.7 bn (season); Jamaica cat bond payout $150 mn	Melissa's peak winds +7%, economic damage +25% vs. pre-industrial climate	Wikipedia (2026c); Allianz Commercial (2025); WEF (2025)

Annexure C: Early Warning and Risk-Financing Coverage (2025 Baseline)

Indicator	Value	Source
Countries with Multi-Hazard Early Warning System coverage	119 (↑113% since 2015)	UN, Early Warnings for All (2025)
Mortality reduction associated with comprehensive early warning coverage	~6x lower disaster mortality	UNDRR 2025 Annual Report
Damage reduction from 24-hour advance warning	Up to 30%	UN Secretary-General António Guterres (Oct. 2025)
Least-developed countries lacking adequate MHEWS	48%	UN, Early Warnings for All (2025)
Small island developing states lacking adequate MHEWS	57%	UN, Early Warnings for All (2025)
Global insured natural-catastrophe losses (2025)	$107 bn (6th consecutive year >$100 bn)	World Economic Forum (2025)
Jamaica combined risk-transfer payouts (2025, post-Melissa)	>$240 mn (largest ever received)	UNDRR 2025 Annual Report

Note: figures above are drawn from the same primary sources cited in the References section of the main paper; where a range or estimate is reported by the original source (e.g., LA firestorm economic loss), the full range is retained here rather than a single point estimate, to avoid false precision.