Invited Perspective:
Four reasons DRR does not work as intended – lessons from the 2025 California wildfires and beyond

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Abstract. The 2025 California wildfires revealed persistent gaps in translating well-established knowledge of wildfire risk reduction into effective land-use planning, building practices, and community preparedness. Drawing on the widely discussed case of a wildfire-surviving residential building in Pacific Palisades, this Invited Perspective examines four interrelated constraints on community resilience that are consistently observed across diverse hazards: limited stakeholder awareness and risk perception; inadequate capacity at both household and institutional levels; weak incentives for proactive adaptation; and governance barriers, including regulatory fragmentation, unclear accountabilities, and insufficient integration of risk into policy frameworks. Prompted by the 2025 California wildfires, this perspective examines these gaps in disaster risk reduction (DRR) and highlights how social, economic, and political dynamics interact with these constraints to perpetuate exposure in hazard-prone areas. Examples from other recent disastrous events, such as the 2023 Turkey-Syria earthquakes, the 2024 Valencia floods, and the 2025 Texas floods, illustrate that these challenges are common across diverse hazards and contexts, underscoring the need for more integrated, participatory, and context-sensitive approaches. Strengthening institutional capacity, aligning incentives with risk, and fostering awareness and engagement are essential to support adaptive, equitable, and sustainable resilience strategies capable of addressing both single and multi-hazards.

1 Introduction

The 2025 California wildfires, also referred to as Eaton and Palisades fires, had profound human and infrastructural impacts, with approximately 18,300 structures damaged or destroyed and 29 confirmed fatalities (State of California, 2025a, b). One case widely discussed in traditional (Namkung, 2025) and social (Chasen, 2025) media focused on a residential building in Pacific Palisades, Los Angeles, California, that withstood the flames during the Palisades Fire (Fig. 1). Pacific Palisades is a neighbourhood in the Westside region of Los Angeles, located about 20 miles (32 km) west of downtown. The fire began on January 7, 2025, north of Bienveneda Avenue, and spread rapidly due to extreme Santa Ana winds and critically dry brush, moving quickly through the Palisades and nearby communities before being fully contained on January 31 (State of California, 2025a). The architect of this building attributed its resilience to a design specifically adapted to withstand the effects of wildfire (Namkung, 2025). This case is notable because (1) wildfire-adapted design has been studied and applied in the US and globally for decades (Syphard et al., 2017; Editorial, 2020; Papathoma-Köhle et al., 2025), and (2) similar design adaptations have been successfully implemented in many land use regulations for other hazard types (Iglesias et al.,

2021), such as floods (Proverbs and Lamond, 2017; Mannucci et al., 2022) and earthquakes (Bankoff, 2015; Freddi et al., 2021).

Apparently, the problem is not a lack of knowledge of design principles, but rather their inconsistent and inadequate implementation in land use (Kramer et al., 2021), leaving structures and communities vulnerable to natural hazards. As White et al. (2001) already observed in their seminal article, 'Knowing Better and Losing Even More', persistent failure to apply knowledge effectively often stems from conflicting interests and a lack of political will, as well as an inconsistent or inadequate capacity of local institutions to implement effective risk governance strategies. These are issues that have long been recognised, yet remain unresolved in natural hazard risk management (Alcántara-Ayala et al., 2025). These challenges are also apparent in current wildfire management, which emphasizes suppression and, to a lesser extent, fuel management in forests. A key barrier to establishing fire-adapted communities is misaligned incentives of relevant actors. Much of the risk and cost associated with building in fire-prone areas falls on homeowners and local communities, who often face significant recovery challenges, while federal and other public agencies tend to absorb a large portion of the suppression and post-fire response costs when wildfires occur. Aligning responsibility with risk could provide meaningful incentives for proactive mitigation. For example, shifting a greater share of wildfire protection costs from federal agencies to state, local, and private actors would encourage hazard reduction and vulnerability minimization prior to fire events (Schoennagel et al., 2017).

These challenges, however, are not unique to the 2025 California wildfires, but are characteristic of disaster risk governance globally, as demonstrated by recent events including the 2023 Turkey-Syria earthquakes (D'Ayala, 2023), the 2024 Valencia flood in Spain (Charalampous et al., 2025), and the 2025 Texas floods in the US (Newitt, 2025), where well-established knowledge of risk reduction similarly failed to translate into effective land-use planning and implementation. Several interrelated factors contribute to this implementation gap and are presented below as the four reasons why DRR did not work as intended: lack of awareness, deficiencies in capacities, lack of incentives, and governance barriers.

Conceptually, this Invited Perspective addresses these challenges and advances the ongoing debate on DRR (e.g., Bourgeois et al., 2024; Alcántara-Ayala et al., 2025) by reframing them not as isolated deficits but as a coupled system of constraints. We synthesise recurring implementation deficits into a coherent, cross-hazard framework and argue that the persistence of risk is best understood through the interaction of four interdependent constraints: limited awareness, deficiencies in capacities, misaligned incentives, and governance barriers. The added value of this contribution lies in integrating these dimensions into a unified analytical lens that emphasises their systemic interplay across scales, sectors, and hazard types, illustrated through the 2025 California wildfires and other large events. Crucially, it is this interaction, rather than any single factor, that systematically drives persistent implementation gaps across hazards and contexts.

Figure 1. The sketch shows a wildfire-surviving house in Pacific Palisades, Los Angeles, constructed according to wildfire-resistant design principles. It is illustrating the concept of a non-combustible or fire-resistant exterior façade, helping to reduce ignition from radiant heat and wind-driven embers. Multi-pane windows are used to increase resistance to heat exposure and minimize breakage. The design includes adapted roof overhangs, sealed eaves, and ember-resistant detailing that limit pathways for embers to enter the structure. Gutters are designed to reduce debris accumulation, further lowering fire risk. Further details for reducing vulnerability are described in Papathoma-Köhle et al. (2025). Together, these architectural strategies contributed to the building's remarkable performance during the 2025 wildfire events. Figure conceptualized from a Google Street View scene (02/2025).

2 Lack of awareness

Limited risk awareness among property owners and tenants contributes to low risk perception, resulting in inadequate preparedness and insufficient protective measures. This can be explained by a combination of cognitive biases, short-term economic considerations that favour immediate costs over long-term safety, and a tendency to rely on governmental intervention while underestimating individual responsibility. Together, these factors constrain proactive risk management at the household level.

At the same time, although adaptation decisions are often framed as matters of personal choice (Hui et al., 2022), evidence from the 2025 California wildfires demonstrates how insufficient policy incentives and complex, and sometimes conflicting, regulatory signals can undermine individual risk awareness and preparedness. During the Eaton and Palisades Fires, limitations in risk communication, evacuation guidance, and the accessibility of hazard information constrained residents' ability to interpret fire behaviour and make timely protective decisions. In this context, Jiao et al. (2025) and Zhang et al. (2025) recommend the use of more accessible, spatially explicit, and graphic communication tools to improve public understanding of wildfire dynamics, adaptation options, and evacuation pathways, thereby reducing the reliance on individual interpretation in high-stress emergency conditions. This is intended to foster informed decision-making and

community engagement, which subsequently raises risk awareness. To overcome these barriers, effective and continuous risk communication, aligned with supportive policy instruments, is essential (Reining et al., 2025). Such communication must go beyond generic messaging and instead involve targeted, accessible and context-specific messages designed to raise awareness and motivate behavioural change (see also Meyer et al. (2012), Schneider et al. (2023) or Snel et al. (2024) for flood hazards).

Raising risk awareness requires not only the dissemination of information but also its translation into actionable knowledge (Mowery et al., 2019), a challenge that extends beyond the context of the 2025 California wildfires and is broadly applicable across hazard types and risk settings. This demands the development and implementation of communication strategies that are transparent, consistent, and tailored to the demographic and socioeconomic context (Lambrou et al., 2023). Specifically, short messages and television are the preferred channels for wildfire alerts in the US, which should be delivered in clear, accessible language and, where relevant, also in foreign languages to reach all affected populations (Jiao et al., 2025). Public education campaigns should be complemented by accessible risk assessment tools that allow individuals to understand their specific exposure and vulnerability, not only to individual hazards but increasingly to compound events. As compound events become more frequent and intense, the overall risk to assets and communities often grows unnoticed (Essen et al., 2023), especially when sequences of events surpass the thresholds of designed resilience, underscoring the need for awareness-building tools to detect and mitigate potential vulnerabilities (Dulin et al., 2025). These tools must be user-friendly and adapted to different levels of technical literacy so as to ensure their usability across diverse audiences. Authorities must ensure that information reaches diverse audiences, including vulnerable populations, through multiple channels such as digital platforms, community meetings and early warning systems. The consequences of deficiencies in such communication processes were also evident during the 2024 Valencia flood, where delayed, unclear, or insufficient warning dissemination significantly constrained the ability of residents to anticipate the severity of the event and take timely protective action. Despite the availability of meteorological information, failures in translating hazard forecasts into effective and actionable public warnings amplified exposure and losses (Fekete et al., 2025). Similar issues were reported during the 2025 Texas floods, where inconsistencies in alert timing and content, combined with fragmented communication channels, further limited the population's ability to respond effectively, highlighting that failures in risk communication represent a recurring governance barrier across diverse hazard contexts (Newitt, 2025). Strengthening this communication process will improve the ability of individuals to understand and implement necessary protective measures, ultimately reducing overall vulnerability to hazards (Wachinger et al., 2013; Mostafiz et al., 2022).

3 Deficiencies in capacities

Capacity building extends beyond individual societal capabilities (Kuhlicke et al., 2011) to encompass the broader institutional frameworks required to effectively manage and mitigate the consequences of natural hazards. With respect to wildfires in the western US, this was found to involve not only enhancing the capacities of individuals and communities but also strengthening the organizational, legal, and procedural systems that underpin risk governance (Nielsen-Pincus et al., 2019). While standards, rules, and regulations are in place, their effectiveness depends critically on how well they are translated into actionable and enforceable policies, such as land-use planning principles, disaster-resistant infrastructure guidelines, enforceable building codes, and other prescriptive measures (Rauter et al., 2020). However, this translation is often impeded by institutional fragmentation, overlapping mandates among agencies, financial constraints, and limited technical expertise, particularly at the local level (Schinko et al., 2023).

Specifically, studies have concluded that complex patterns of land ownership and management in the vicinity of a community can increase its exposure to wildfire risk by complicating coordination efforts (Nielsen-Pincus et al., 2019). Kramer et al. (2019) highlight that US wildfire policy and recommendations primarily target the wildland-urban interface,

seeking to reduce structure ignitions from adjacent vegetation and windborne firebrands. Although a recent Executive Order promotes retrofits and defensible space for federal buildings (Obama, 2016), there is no broader federal regulation of land-use planning or building practices for wildfire risk, unlike federal involvement for other hazards, leaving adaptation responsibilities to local governments and communities. In practice, cities and counties can integrate wildfire risk into planning and use land-use regulations to steer or limit development in hazardous areas, while home-level mitigation (e.g., fire-resistant materials, vegetation management) may be mandated through building codes, overlay zoning, and related ordinances. Relatedly, weak alignment with contemporary resilience frameworks and the need for regular guideline updates further suggest that current instruments fall short of motivating household-level adaptation in a systematic way (Zhang et al., 2025).

Complementing these regulatory approaches, widespread voluntary and educational initiatives, such as Firewise (National Fire Protection Association, 2016), provide homeowners with actionable guidance to reduce wildfire risk through mitigation and adaptation measures. While such initiatives are intended to help address deficiencies in capacities at the household level, they also implicitly shift responsibility for risk reduction onto individuals. In doing so, they often assume that households possess the necessary resources and capacities, such as internet access, digital literacy, available time, and financial resources, which are unevenly distributed (Ryan et al., 2023). As a result, rather than fully closing capacity gaps, these initiatives may reproduce or even exacerbate them, highlighting how deficiencies in capacities operate as a systemic barrier to effective DRR implementation.

These systemic barriers hinder the coordination and implementation of effective adaptation and resilience-building measures. Often, unclear roles and responsibilities combined with limited inter-agency communication reduce the coherence and overall effectiveness of risk reduction strategies (Zhang et al., 2025). Strengthening institutional capacity, therefore, requires ongoing investment in education and training programs, knowledge-sharing networks, and cross-sectoral, multi-scale collaboration, ensuring that risk management strategies are not only well designed but also successfully implemented across all levels of government (Hamilton et al., 2023).

Beyond technical and structural improvements, capacity building must be anchored in inclusive decision-making processes. Involving local communities, private sector actors, civil society organizations, and scientific experts helps to ground risk management strategies in local knowledge and social realities, enhancing both their legitimacy and effectiveness (Jacobson, 2023). Participatory approaches also contribute to the development of adaptive, context-specific solutions that are better aligned with the needs and capacities of diverse stakeholders (Lang et al., 2012). Ultimately, a strong institutional foundation enhances societal resilience by ensuring that risk governance is both robust and responsive in the face of increasing hazard complexity and climate uncertainty.

4 Lack of incentives

Strengthening incentives and building motivation are essential for translating adaptive capacity into concrete action (Sánchez et al., 2022; Schubert et al., 2025). Without sufficient motivation, even well-developed institutional and individual capacities may remain underutilised. A variety of intrinsic and extrinsic factors influence the willingness and ability of individuals, particularly property owners, to implement adaptation measures at the local and household levels (Attems et al., 2020). As an assessment of the NFPA Firewise Sites of Excellence Pilot 2019-2020 in the US has shown, intrinsic motivators include elements such as an access to relevant information, participation in communication networks, the presence of policy entrepreneurs who champion adaptation agendas, and active community engagement in risk reduction initiatives (Miller, 2022). Extrinsic motivators include financial, regulatory, and technological incentives that make adaptation both feasible and attractive (Anderson et al., 2023). These may include subsidies or tax incentives for building retrofits, streamlined permitting procedures, or access to innovative risk-reducing technologies (Schumann III et al., 2020).

Property market mechanisms also play an important role, as risk-informed property valuation and disclosure practices can incentivize private investment in resilience-enhancing measures (Egbelakin et al., 2017; Boomhover, 2023). However, it has been observed that such incentives can also facilitate displacement and gentrification, enabling socially advantaged former and new residents to return and rebuild in burnt areas while creating barriers for many socially vulnerable long-term residents (Lambrou et al., 2025). An analysis of Kramer et al. (2021) has shown that post-fire development in California overwhelmingly favours rebuilding in place rather than retreating from hazard: across 28 destructive wildfires, 58% of destroyed buildings were rebuilt within 3-6 years and 94% within 13-25 years, and new construction within burned perimeters was common, indicating continued investment in at-risk locations. Their study also unveiled that siting decisions did not consistently shift toward lower-risk areas; indeed, rebuilt landscapes generally resembled pre-fire patterns, and the relative risk of locations chosen for new construction either remained unchanged or increased as time since fire grew. This aligns with the findings of Radeloff et al. (2018) and Jiao et al. (2025) and highlights that the continued rebuilding in hazardous areas reflects strong social and institutional forces (relocation is costly and psychologically challenging, existing infrastructure lowers barriers to reconstruction, and local governments often promote rebuilding to support economic recovery) making changes in settlement location unlikely even following major losses.

Policy contexts further reinforce rebuilding in place: despite requirements for defensible space and fire-resistant materials in some high-risk areas, there are no statewide land-use restrictions that limit residential development based on wildfire risk, and recovery practice often emphasizes rapid rebuilding over risk reduction, with financial assistance and insurance facilitating reconstruction without altering siting (Kramer et al., 2021). Consequently, exposure within burned perimeters persists or grows, increasing future protection burdens and the potential for losses as wildfires continue to recur and intensify.

Complementary findings by Howell and Elliott (2019) and Reining et al. (2025) show that increasing local hazard damage is associated with rising wealth inequality, particularly across dimensions of race, educational attainment, and homeownership. Moreover, for a given level of damage, greater receipt of Federal Emergency Management Agency assistance is linked to further widening of these inequalities. Together, these findings indicate that two defining social challenges of our time, escalating natural hazard losses and wealth inequality, are dynamically interconnected, underscoring the need for new directions in both research and policy development.

The introduction of mandatory insurance schemes can mitigate moral hazard by ensuring that risk is properly priced and managed, thereby encouraging property owners to make more risk-aware decisions. The primary formal insurance scheme for wildfire risk in California is the Fair Access to Insurance Requirements (FAIR) Plan. This is a state-mandated insurance programme of last resort for property owners who cannot secure private home insurance due to wildfire risk. While it provides basic coverage for fire, lightning, smoke and related perils, it typically offers less comprehensive coverage and is more expensive than traditional private insurance policies. To be eligible, a homeowner must have been denied coverage in the private market, and the FAIR Plan only covers specific perils rather than providing full homeowners' insurance (Auer, 2024; Keller et al., 2025).

Furthermore, an important and often underutilized source of motivation is the desire for active involvement in decision-making processes related to climate adaptation and DRR. This necessitates the incorporation of participatory approaches that enable citizens to contribute their knowledge, values, and preferences to the design and implementation of adaptation strategies (Ford et al., 2015). Transdisciplinary knowledge co-creation – bringing together stakeholders from science, policy, practice, and civil society – can facilitate mutual learning, foster innovation, and build trust between actors (Mauser et al., 2013). Such participatory processes not only enhance motivation by increasing perceived ownership of adaptation measures, but also contribute to more context-sensitive, equitable, and effective outcomes.

5 Governance barriers

Effective management of natural hazards requires the systematic identification and removal of institutional and structural barriers that impede resilience and preparedness. These barriers often stem from a combination of administrative fragmentation, misaligned political incentives, and insufficient integration of risk considerations into broader policy frameworks (Anderson et al., 2023). Key challenges include accountability gaps, where unclear mandates and responsibilities across institutions hinder coordinated action, as well as a pervasive lack of transparency in decision-making processes. Lessons from the 2025 Palisades Fire highlight persistent governance barriers in wildfire risk reduction, as local governments have been slow to assume a more proactive role, such as mandating ignition-resistance upgrades to the existing housing stock and enforcing vegetation management in the wildland-urban interface, while regulations introduced in 2020 to establish ember-resistant zones around buildings in California remained stalled in bureaucratic processes as of January 2025 (Babrauskas, 2025).

Political constraints also play a significant role, with policy directions sometimes shaped by short-term populist agendas or illiberal leadership, such as the rollback of disaster preparedness regulations observed during the Trump administration in the US. Another example is the 2024 Valencia flood in Spain, were governance complexities and party politics driven by political rivalry and autonomy tensions hindered effective disaster management (Geier, 2025). Such political dynamics can erode established norms of precautionary planning and diminish institutional commitment to long-term risk reduction.

Weak enforcement of existing regulations, legal ambiguities, and fragmented sectoral responsibilities further exacerbate different dimensions of vulnerability. Vulnerability operates in two ways: it is shaped both by the pre-existing condition of the elements at risk and by the impact of the hazardous process, which repeatedly encounters ambiguity and challenges in DRR (Fuchs et al., 2024). The absence of coherent mainstreaming of disaster risk management across sectors results in siloed interventions that fail to address the systemic nature of vulnerability, which can also be illustrated by the 2023 Turkey-Syria earthquakes. In this case, residential construction was frequently undertaken by inadequately experienced or unqualified contractors, operating within a regulatory environment characterised by weak oversight and inconsistent enforcement of building codes. Although seismic design standards formally existed, their implementation was undermined by fragmented institutional responsibilities, limited inspection capacity and routine amnesties for illegal construction, ultimately resulting in considerable losses (D'Ayala, 2023).

Comparable governance challenges have also been observed in wildfire risk management contexts. Specifically, the alert notification systems and evacuation policies for the Eaton and Palisades Fires were found to have critical issues, including outdated policies, inconsistent practices and communications vulnerabilities (McChrystal Group, 2025). Moreover, mismatches between the spatial and temporal scales of risk and those of policy implementation hindered the effectiveness of adaptation and resilience strategies. For example, since their introduction two decades ago, Community Wildfire Protection Plans (CWPPs) have become a widely used tool to enhance community preparedness, wildfire risk mitigation, and coordination among federal and state land management agencies, local governments, and residents in fire-prone regions. Palsa et al. (2022) reported that, while CWPPs have generally succeeded in engaging diverse stakeholders, significant challenges persist, particularly as the planning context and expectations surrounding wildfire risk continue to evolve. They further state that guidance for CWPP development remains relatively vague, resulting in substantial variation in plan scope, scale, and objectives. At the same time, the large number and diversity of CWPPs, developed across highly heterogeneous socio-environmental settings, provide important opportunities to assess the factors influencing participation, inclusivity, and effectiveness in collaborative wildfire risk mitigation planning.

Financial limitations and persistent knowledge gaps further restrict the ability of institutions to engage in proactive disaster preparedness. Limited funding for prevention measures often leads to reactive, crisis-driven responses rather than long-term planning (Biesbroek et al., 2013). Meanwhile, rushed and poorly executed infrastructure and construction projects – often driven by political or economic expediency – can inadvertently increase exposure to hazards, particularly in rapidly

urbanising areas or regions undergoing post-disaster reconstruction (D'Ayala, 2025). Addressing these multifaceted governance challenges requires a multilevel, multidisciplinary approach to strengthen governance, improve enforcement and promote sustainable development practices (Biesbroek et al., 2013).

6 Conclusion

It has been shown that the institutional and regulatory landscape of wildfire risk management in California is characterised by a multi-level and fragmented governance structure. At the federal level, agencies play a dominant role in wildfire suppression and emergency response, while regulatory authority over land-use planning and building practices largely rests with state and especially local governments (counties and municipalities). Although building codes and defensible space requirements exist in high-risk areas, there is no comprehensive statewide framework that systematically restricts development based on wildfire risk. In addition, a complex mix of public and private actors, including insurance providers, utilities, and community-based initiatives such as CWPPs, shape risk reduction practices. This fragmented allocation of responsibilities, combined with uneven enforcement capacity, financial constraints, and misaligned incentives (e.g. federal cost absorption for suppression versus local responsibility for mitigation), creates systemic bottlenecks that hinder the consistent implementation of DRR measures. Persistent implementation gaps in DRR can be broadly attributed to four interrelated factors: lack of awareness, deficiencies in capacities, lack of incentives, and governance barriers (see Fig. 2). These factors do not operate in isolation but interact across scales and sectors, collectively constraining effective risk reduction. As illustrated, these constraints collectively limit institutional capacity for DRR, contributing to continued exposure, maladaptation, and socially unequal risk outcomes across multiple hazard contexts, and highlighting the need for integrated strategies that address all dimensions simultaneously.

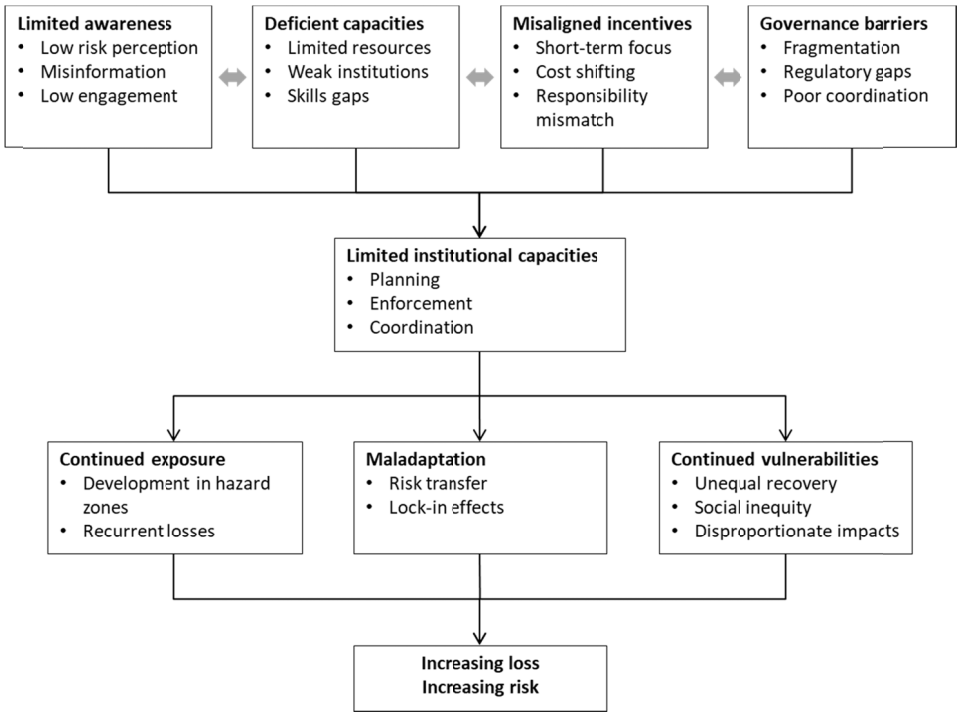

Figure 2. Cross-hazard DRR: Institutional constraints and challenges. Conceptual framework illustrating how four interrelated factors (limited awareness, deficient capacities, misaligned incentives, and governance barriers) jointly constrain institutional capacity for disaster risk reduction. These constraints, operating across multiple hazard contexts, contribute to continued exposure, maladaptation, and socially unequal risk outcomes.

Each of these factors has distinct yet interrelated roots. Limited awareness is often influenced by psychological and socio-cultural dynamics, including cognitive biases such as normalcy bias, overconfidence, and the discounting of future risks, which reduce recognition of hazard exposure and vulnerability. Deficiencies in capacities, encompassing technical, financial, and organizational resources, further restrict the ability of individuals and institutions to implement effective risk reduction measures. Misaligned incentives – arising from short-term economic thinking, competing priorities, or insufficient policy mechanisms – can discourage proactive engagement in DRR strategies. Finally, governance barriers, such as fragmented administrative structures, poor coordination across scales, and weak regulatory enforcement, undermine the development and execution of coherent risk reduction policies. Together, these intertwined behavioural and institutional dynamics constrain engagement, limit adaptive action, and perpetuate vulnerability (Gill, 2026).

These barriers are amplified further by misinformation and conspiracy theories that spread rapidly across social media. Beyond the 2025 California wildfires, other recent disasters such as the 2023 Turkey-Syria earthquakes (Canavar, 2023), the 2024 Valencia flood in Spain (Chauvet, 2024), and the 2025 Texas floods in the US (Golgowski, 2025; Makuch, 2025) serve as further examples of how insufficient awareness, limited institutional capacities, misaligned incentives, and persistent governance failures translate into severe societal impacts.

The complexity of DRR lies not only in the unpredictability and variability of natural hazards, but also in the socio-political and institutional contexts in which risk is managed. As a multifaceted challenge, DRR requires interdisciplinary and transdisciplinary collaboration that cuts across policy sectors and levels of government. This includes integrating knowledge from the natural sciences, engineering, urban planning, economics, and the social sciences, as well as actively engaging with civil society and the private sector. Institutional inertia and policy fragmentation often act as critical constraints, reflecting both governance barriers and capacity deficits, making cross-sectoral collaboration both necessary and difficult. This includes embedding risk considerations into land use planning, environmental regulation, infrastructure development, and social protection policies. Coherent land use strategies that account for hazard exposure, ecological integrity, and socio-economic vulnerabilities are vital for building systemic resilience and reducing long-term risks.

Institutional capacity plays a central role in enabling or constraining such efforts. Recent extreme events, such as the widespread wildfires in the US, have exposed the severe consequences of institutional weaknesses, including delayed responses, insufficient preparedness, and poorly coordinated interventions. These cases highlight the urgent need to enforce existing regulations more effectively, improve inter-agency coordination, and strengthen governance mechanisms at all levels. Effective DRR must also address structural and systemic vulnerabilities, including not only physical exposure to hazards but also deeper social issues such as inequality, marginalisation, and access to resources (Doorn et al., 2021). Furthermore, diversity in terms of perspectives, experiences, and knowledge systems must be recognised as a valuable asset in developing inclusive and context-sensitive resilience strategies (Papathoma-Köhle et al., 2021).

Without addressing these deeply embedded governance challenges, spanning awareness, capacity, incentives, and governance, efforts to build hazard-resilient societies will remain fragmented. What is needed is a more integrated, equitable, and inclusive approach that aligns DRR with the broader sustainability agenda and acknowledges the interdependencies between environmental and social systems (Hossain et al., 2020). This approach must support long-term resilience for all communities in the face of escalating climate-related risks. Science is therefore called upon to move beyond sectoral adaptation toward transformative approaches; only then can it meaningfully contribute to strengthening community resilience under changing conditions. As White et al. (2001) already argued 25 years ago, this requires shifting from uncoordinated, sector-specific responses to a more coherent and integrated form of risk management that addresses

underlying structural issues and political inertia, ultimately fostering resilient systems capable of anticipating, absorbing, and recovering from both single and multi-hazards.

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