

Systematic Review

Decision-Making for Post-Disaster Housing Reconstruction in Critical Zones: A Systematic Review of Criteria, Strategies, and Research Gap

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Abstract

Post-disaster housing reconstruction (PDHR) is increasingly needed in critical zones—areas where persistent uncertainty, institutional instability, and structural operational constraints define the reconstruction environment—yet the knowledge base guiding such efforts has been built almost entirely on evidence from stable natural disaster settings. This study addresses this limitation through a systematic literature review conducted in accordance with PRISMA 2020 guidelines, synthesising peer-reviewed evidence from Web of Science and Scopus to map existing PDHR strategies, construction technologies, decision criteria, and evaluation approaches. The synthesis exposes three interlocking gaps: PDHR based on human-made disasters is markedly underrepresented in the literature (Gap 1); PDHR in critical zones—particularly active human-made critical zones—rarely feature as the primary object of analysis (Gap 2); and no holistic multi-criteria structured decision framework treats contextual factors such as supply chain feasibility, security conditions, and financial continuity as the primary evaluation criteria (Gap 3). Existing frameworks prioritise intrinsic performance measures suited to stable contexts and remain structurally misaligned with critical-zone realities, establishing the need for context-driven decision frameworks in which operational constraints become central to reconstruction choices.

Keywords: post-disaster housing reconstruction; constraints; critical zones; systematic review; decision-making frameworks; contextual criteria; uncertainty; instability

1. Introduction

Disasters—natural and human-made—continue to cause widespread residential destruction, triggering complex and resource-intensive reconstruction processes. Post-disaster housing reconstruction (PDHR)—the restoration, repair, or rebuilding of residential structures to provide safe and sustainable living conditions—is one of the most consequential phases of disaster recovery [1–3]. In 2024 alone, 393 recorded disasters caused 16,753 deaths, affected over 167 million people, and resulted in nearly USD 242 billion in economic damages [4]. Residential structures account for an estimated 80–90% of total building losses during disasters, representing approximately 50% of total monetary losses [5]. A comprehensive review of 83 World Bank-supported PDHR programmes from 1980 to 2024, which financed the recovery of 2.3 million homes, found that results frameworks did not systematically measure cost, quality, or time of delivery—underscoring a persistent gap between output and effectiveness in PDHR at the global level [5]. Decisions made during



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the reconstruction phase about strategies, technologies, and evaluation criteria determine not only the speed and cost of recovery but the long-term resilience and livelihoods of affected communities [1,6,7].

This research is framed around two independent but interacting problems (Figure 1). The first concerns the disaster source: the overwhelming majority of PDHR research addresses natural disasters—earthquakes, floods, and cyclones—while human-made disasters, including armed conflict, post-war destruction, and conflict-driven displacement, remain severely underrepresented [2,6]. The second concerns the reconstruction environment: a growing proportion of reconstruction worldwide takes place not in stable, well-governed settings but in critical zones—areas characterised by persistent, prolonged, and high-level uncertainty, instability, and dynamic operational constraints on construction activity [3,6]. These two problems are analytically distinct, yet their intersection—human-made disasters in critical zones—represents the most operationally challenging and least studied combination in the PDHR literature.

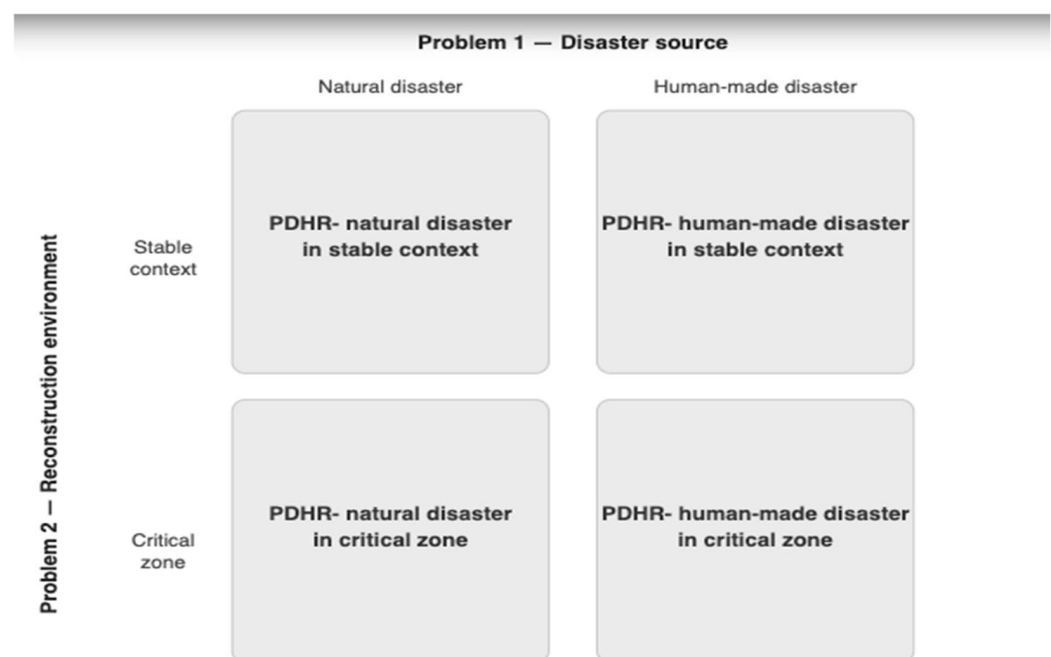


Figure 1. Two-problem analytical framing for post-disaster housing reconstruction (PDHR) research: disaster source × reconstruction environment.

Critical zones are not defined by the disaster event but by the conditions that persist throughout the reconstruction timeline. This research identifies six distinct types: (i) natural-hazard-prone zones with recurrent destructive events; (ii) active war zones where construction occurs under ongoing armed conflict; (iii) politically unstable or fragile state contexts characterised by governance collapse and institutional fragility; (iv) economically constrained environments with hyperinflation, currency collapse, or severe resource scarcity; (v) unstabilised social zones characterised by mass displacement, social fragmentation, and contested authority; and (vi) confined zones—areas subject to externally imposed restrictions, including international sanctions, embargoes, blockades, or internal lockdowns making geographic isolation such as pandemics—that sever construction supply chains and restrict the flow of materials, equipment, and skilled labour required for reconstruction. In fragile, conflict, and violence-affected countries, PDHR faces key operational challenges, including institutional fragility, limited access to skilled labour and materials, collapsed supply chains, and social fragmentation—conditions under which approaches designed for stable environments are structurally inapplicable [8,9]. The World Bank’s analysis of

83 housing recovery projects explicitly distinguishes post-conflict reconstruction from natural disaster recovery, recognising sufficient structural differences to merit entirely separate analytical frameworks [5].

The contemporary relevance is acute. The Syrian conflict has displaced more than half of Syria's population, with internally displaced persons reaching approximately 6.8 million and refugees exceeding 5.5 million by the end of 2024—the vast majority lacking access to adequate housing [10]. In Gaza, 92% of all housing units—approximately 436,000 homes—were destroyed or damaged as of January 2025, displacing over 90% of the civilian population from their residences [9,11,12]. And in Ukraine, 13% of the total housing stock has been damaged or destroyed, affecting more than 2.5 million households, with housing reconstruction needs estimated at nearly USD 84 billion—the single largest sector in the total recovery cost of USD 524 billion [8,13,14]. These cases exemplify the critical-zone conditions the PDHR literature systematically fails to address.

The PDHR decision-making literature has evolved from performance-based frameworks prioritising cost, time, and structural quality [2,15] toward sustainability-oriented approaches that incorporate environmental impact, social cohesion, and community agency [1,2,6,7]. The literature has identified four broad approaches to PDHR—government-led, donor-driven, community-driven, and owner-driven reconstruction—each with distinct strengths, weaknesses, and contextual appropriateness [15,16]. Owner-driven housing reconstruction has been found more effective than procurement-based or turnkey approaches in developing country contexts [17], while community-driven approaches demonstrate advantages in social capital building and cultural appropriateness [1,18]. A systematic review of the factors affecting reconstruction project resilience identified 24 resilience factors across five criteria groups—governance, innovation, reconstruction approaches, resource management, and stakeholder expectations—confirming the inherently multi-criteria nature of PDHR decision-making [2,3,7,15,19]. PDHR decisions require the simultaneous weighing of structural performance, cost, time, governance capacity, community agency, land tenure, supply chain availability, cultural appropriateness, and environmental sustainability—often under severe time pressure and institutional uncertainty [1–3,6,15]. Yet a critical gap persists: contextual criteria—supply chain feasibility under blockade, security conditions on active conflict sites, governance continuity under political instability, and financial continuity amid hyperinflation—remain underrepresented in the PDHR evaluation and decision-making literature [2,6]. In critical zones, where these factors determine whether reconstruction is feasible at all, frameworks calibrated to stable environments are structurally misaligned with operational reality.

Multi-criteria decision-making (MCDM) frameworks have been introduced as structured responses to PDHR complexity, enabling a systematic evaluation of competing reconstruction options against weighted criteria sets [20–22]. Similarly, construction solutions proven effective in natural disaster contexts—prefabricated systems, local material approaches, and engineered transitional housing—have been advanced as technically and economically viable responses to post-disaster housing needs [23–26]. However, both evaluation frameworks and construction solutions remain calibrated to the conditions of stable environments. Construction materials and technologies should be selected based on resistance to future disasters, quality, cost efficiency, adaptability to local resources, and compliance with residents' lifestyles and architectural traditions [27]—criteria that become substantially more complex in critical zones, where supply chains are disrupted, skilled labour is scarce, and governance oversight has collapsed [8,9]. The operational gap between what is technically optimal and what is contextually feasible in critical zones has not been systematically examined in the PDHR literature.

This paper addresses these gaps through a systematic literature review following PRISMA 2020 guidelines [28–30] (Supplementary Materials). Searching Web of Science and Scopus, 84 peer-reviewed studies were identified, screened, and synthesised. Three interconnected research gaps are identified: the scarcity of PDHR evidence in human-made disaster contexts (Gap 1); the virtual absence of critical zone PDHR research, particularly for human-made critical zones (Gap 2); and the absence of a contextually calibrated decision framework for PDHR in critical zones, encompassing both evaluation criteria and construction solution validation (Gap 3). The review makes four contributions: (1) a validated seven-type critical-zone typology with verifiable operational indicators; (2) a two-problem framing distinguishing disaster source from reconstruction environment; (3) a differentiated mapping of primary and secondary decision criteria, construction solutions, and evaluation tools across 84 studies; and (4) an evidence-based agenda for future framework development in critical zone contexts.

The paper is structured as follows. Section 2 establishes the conceptual background. Section 3 describes the methodology. Section 4 presents results across five analytical dimensions. Section 5 discusses the three gaps and proposes future research directions. Section 6 draws conclusions.

2. Conceptual Background

This section establishes the conceptual framework underpinning the review. It begins by defining and typologising critical zones as structurally distinct reconstruction environments, anchoring the concept in existing literature on fragile states, disaster risk, and conflict-affected reconstruction [31–35]. It then examines how these conditions alter the nature and feasibility of PDHR. Finally, it analyses the evolution of decision-making frameworks for PDHR and demonstrates why existing frameworks are insufficient for critical zone contexts. Each subsection culminates in one of the three research gaps this review addresses.

2.1. Definition of Critical Zones

Although there is no universally accepted definition of critical zones in the PDHR literature, the authors conceptualise critical zones as geographical areas characterised by prolonged negative environmental risks, namely (1) uncertainty, (2) instability, and (3) constraints, to a level that disrupts housing reconstruction activity in these areas.

The degree of criticality varies across contexts depending on the origin and intensity of these conditions. It is typically exacerbated where multiple interrelated factors coexist, including institutional fragility, weak governance structures, chronic insecurity, and restrictions on resource flows [36]. In such settings, infrastructure systems are often severely degraded or only partially functional due to prolonged destruction, underinvestment, and/or ineffective management—significantly hindering the ability to sustain continuous and well-coordinated reconstruction activities [37].

What fundamentally defines a critical zone is that, independently of the origin of the crisis factor, the response must be operated under prolonged uncertainty, instability, and persistent constraints—conditions that conventional reconstruction frameworks fail to address, making the planning and respective decision-making for sustainable development in such zones a complex task that needs special decision-making consideration and approach.

Critical Zone Typology

This conceptualisation of critical zones is derived from and extends existing typologies of fragile and conflict-affected environments. The World Bank's classification of Fragile, Conflict, and Violence (FCV) contexts [17] and the Fragile States Index [38] identify governance collapse and institutional fragility as primary determinants of reconstruction diffi-

culty. The UNDRR Sendai Framework for Disaster Risk Reduction 2015–2030 [39] identifies persistent hazard exposure as a core driver of reconstruction vulnerability. Chang et al. [40] demonstrate that supply chain and resource constraints constitute independent barriers to reconstruction effectiveness. The UNHCR Global Trends report [10] and the IDMC Global Internal Displacement Database [41] document mass forced displacement and social fragmentation as persistent structural conditions that undermine community-based reconstruction. The present typology synthesises and extends these frameworks to produce a unified, operationally grounded classification applicable to the full spectrum of contexts in which post-disaster housing reconstruction operates. Critically, while the CZ concept draws on and intersects with the fragile-state literature—particularly where fragility has progressed to active operational disruption during reconstruction—these concepts are not coextensive. A state may be classified as fragile yet maintain sufficient institutional presence to permit reconstruction under manageable conditions. The CZ framework extends beyond this to near-collapsed and fully collapsed state capacity, where governance, security, supply chains, and institutional coordination have deteriorated to the point where standard PDHR decision frameworks cannot function. The defining criterion is not a country’s fragility classification but the nature and severity of the operational conditions prevailing during reconstruction itself.

Based on their primary driving mechanism, seven critical-zone types are established. These types represent the principal configurations documented across the disaster risk reduction, humanitarian, and fragile states literature [10,17,38,39,41–44]. Compound or co-occurring conditions are captured by Type 7, which allows for the simultaneous presence of multiple types in a single reconstruction context. Each type is defined by observable, verifiable indicators drawn from established international frameworks, and each indicator is accompanied by its authoritative institutional source. Table 1 presents the seven types with their definitions and operational indicators.

Table 1. Types of critical zones with operational indicators.

CZ Type	Definition	Operational Indicators
Type 1 Natural Hazard Zone	Areas subject to recurrent natural hazard events (e.g., earthquake, flood, cyclone, tsunami, landslide, and volcano) creating prolonged uncertainty about future destruction and/or where the scale of destruction imposes prolonged constraints on (re)construction capacity.	ONE sufficient: (1) Hazard event of the same or similar type documented in EM-DAT as occurring during the reconstruction timeline, with the hazard threat persisting during active reconstruction works—verified using EM-DAT event records [42]. (2) Scale of destruction documented in EM-DAT as overwhelming the institutional, financial, or supply chain reconstruction capacity of the affected area—verified using EM-DAT severity indicators: deaths, affected population, or economic damage as a percentage of GDP [42].
Type 2 Active War Zone	(Re)construction in an area where destructive armed war is currently ongoing, OR an area known for repeated cycles of destructive violence creating persistent uncertainty about renewed conflict, OR where a destructive war is highly expected or imminent. Post-war contexts where conflict has fully ceased do NOT qualify as Type 2.	ONE sufficient: (1) Active or recently violated ceasefire documented during the reconstruction period—verified via UN OCHA Situation Reports [45] or ACLED event records for the specific reconstruction area [46]. (2) UN Security Level System (SLS) Level 4 (Substantial) or higher assigned to the reconstruction area by the UN Department of Safety and Security—the threshold at which the UN formally intensifies mandatory security risk management and imposes operational movement constraints on humanitarian and reconstruction personnel [43].
Type 3 Politically Unstable Zone	Areas where prolonged governance collapse, institutional fragility, political crisis, or state failure creates operational instability for (re)construction. Includes post-war contexts where political fragility persists after conflict has formally ceased.	ONE sufficient: (1) Fragile States Index (FSI) total score ≥ 90.0 out of 120—places the country in the Alert band as officially defined by the Fund for Peace [38,47]. (2) World Bank harmonised Country Policy and Institutional Assessment (CPIA) score ≤ 3.2 on a scale of 1–6—the officially documented threshold for inclusion on the World Bank Fragile and Conflict-affected Situations (FCS) list [48] *.
Type 4 Economic Hardship Zone	Areas where prolonged internal economic collapse, chronic poverty, or structural economic failure imposes severe constraints on the procurement and delivery of construction materials, financing, and skilled labour.	ONE sufficient: (1) Annual inflation rate $\geq 50\%$ during the reconstruction period—lower bound of the extraordinary acceleration phase preceding hyperinflation as documented in IMF Working Paper WP/18/266 [44]—verified via World Bank Development Indicators [49] or IMF World Economic Outlook [50]; (2) Country classified as Low Income by the current World Bank income classification, combined with documented evidence of structural procurement or financing constraints in the reconstruction sector—verified via World Bank country income classifications; updated each July [51] and project-level assessment. (3) Official aid flows to the reconstruction sector declined by more than 30% over 3 consecutive years **—verified via The Organisation for Economic Co-operation and Development (OECD) Development Assistance Committee (DAC) Creditor Reporting System (CRS) [52] or UN OCHA Financial Tracking Service [45].

Table 1. Cont.

CZ Type	Definition	Operational Indicators
Type 5 Unsterilised Social Zone	Areas where the social fabric of the reconstruction community has been severely and persistently disrupted—through mass outward displacement, inter-communal violence, ethnic or sectarian fragmentation, or forced population rupture—creating prolonged uncertainty and instability that systematically undermines the community participation, collective decision-making, and social coordination required for effective housing reconstruction. Mass forced displacement from the area is a primary but not exclusive indicator of this condition.	ONE sufficient: (1) Active outward displacement documented from the reconstruction area during the reconstruction timeline—verified using the IDMC Global Internal Displacement Database recording the area as a displacement origin zone [53]. (2) Active refugee outflow from the reconstruction area documented during the reconstruction timeline, indicating population flight from the reconstruction context—verified using the UNHCR Refugee Data Finder recording the country/area as a country of origin [54]. (3) FSI Group Grievance sub-indicator documented in the highest quintile globally for the country during the reconstruction period, indicating severe inter-communal tension or ethnic/sectarian fragmentation—verified via Fund for Peace FSI country data [38].
Type 6 Confined Zone	Areas where movement, access, trade, or construction activity is severely confined or restricted by external forces beyond the local population’s control. Confinement may result from international sanctions or trade embargoes, physical blockades, or pandemic or epidemic lockdowns.	ONE sufficient: (1) International sanctions or trade embargo documented as actively in force during the reconstruction period, directly restricting construction material imports, equipment procurement, or project financing—verified against UN Security Council sanctions lists [55], US Office of Foreign Assets Control [56], or EU restrictive measures registers [57]. (2) Physical blockade documented as actively in force during reconstruction, restricting movement of materials or personnel—verified using UN OCHA access monitoring reports [45]. (3) WHO Public Health Emergency of International Concern (PHEIC) declaration documented as causing confirmed construction site shutdown or workforce immobilisation during the reconstruction period—verified via WHO PHEIC declarations [58].
Type 7 Compound/Multidimensional Zone	Areas where two or more CZ types are simultaneously present, creating compounded operational constraints that exceed the challenges of any single CZ type. These represent the most severe and least studied PDHR environments globally.	Any two or more of Types 1–6 confirmed simultaneously in the same reconstruction context. Each individual type must satisfy its own operational indicators as defined above.

* Both FSI and CPIA are country-level screening triggers; classification must be confirmed at sub-national or project scale before application to a specific reconstruction context. ** The 30% threshold for aid flow decline represents the authors’ own operationalisation of aid discontinuity.

2.2. Post-Disaster Housing Reconstruction (PDHR)

Post-disaster housing reconstruction (PDHR) refers to the process of restoring, repairing, or rebuilding residential structures following disruptive events such as natural hazards or human-induced disasters—encompassing both temporary shelter provision and permanent housing reconstruction while explicitly focused on the medium-to-long-term reconstruction phase rather than immediate emergency relief. As argued by Yakın and Güncü, recovery extends beyond the physical replacement of damaged dwellings to include the re-establishment of safe, functional, and sustainable living environments [59]. The United Nations Office for Disaster Risk Reduction identifies effective reconstruction as requiring the principle of Build Back Better (BBB), integrating risk reduction, resilience, and long-term development considerations into recovery efforts. The World Bank characterises housing reconstruction as a multidimensional process involving technical, social, economic, and institutional components rather than a purely engineering task [60], with social vulnerabilities—prolonged displacement, livelihood disruption, and reduced coping capacity—compounding the urgency of sustained permanent housing delivery.

Successful PDHR requires the simultaneous consideration of multiple interrelated factors, including the availability and cost of construction materials, labour capacity and skills, funding mechanisms, governance structures, land tenure, and community participation. Reconstruction outcomes are highly sensitive to decision-making processes—particularly in balancing speed, cost efficiency, and quality—and to stakeholder coordination, institutional capacity, and policy frameworks, the absence of which frequently results in delays, cost overruns, or culturally inappropriate solutions.

Unlike conventional post-disaster contexts, critical zones are not shaped solely by the immediate impact of a hazardous event but by persistent, prolonged, and high-level constraints that put reconstruction efforts at fundamental risk [61,62]. In ‘normal’ disaster-affected areas, reconstruction typically occurs within relatively stable governance systems, functioning markets, and accessible supply chains, allowing recovery to follow a sequential transition from relief to reconstruction and development [1]. By contrast, PDHR in critical zones unfolds under prolonged and high-level uncertainty, recurrent disruptions, and chronic constraints, where reconstruction activities may be interrupted, delayed, or cancelled—and where the very conditions required to execute a reconstruction strategy cannot be assumed to persist.

Critical zones impose severe limitations on material availability, machinery access, skilled labour supply, and contractor capacity, while financial flows are often unpredictable due to donor fatigue, political conditionality, or economic instability [40]. Security concerns restrict on-site operations and the supply of certain materials, causing critical shortages, increasing costs, and limiting the range of feasible construction technologies. In confined zones (Type 6), internationally imposed sanctions and embargoes close or restrict the ports and border crossings through which construction materials, machinery, and technical expertise must flow—a constraint with no equivalent in natural disaster reconstruction contexts and for which no existing PDHR framework provides operational guidance.

2.3. Resilient PDHR Decision-Making in Critical Zones

The analysis of housing reconstruction strategies and the decision-making processes that govern them has evolved considerably in the literature, although with a trajectory consistently anchored in stable reconstruction contexts. The first studies employed a technical performance-based approach, focusing on time, cost, and construction quality [63–65]. More recently, following broader trends in the construction industry, a growing number of studies have integrated sustainability and environmental performance—including life cycle analysis—into the evaluation of housing solutions [66–69].

A clearer taxonomy of decision criteria is essential to understand what the literature measures and what it systematically omits. Drawing on the included corpus, criteria used in PDHR decision-making can be classified into two broad categories:

- Performance-based criteria (intrinsic)—assess the inherent qualities of a reconstruction solution independent of context: cost-effectiveness, time efficiency, structural performance, material durability, sustainability, and environmental impact. These dominate the existing literature.
- Context-based criteria (extrinsic)—assess the operational feasibility of implementing a solution within a specific reconstruction environment: supply chain reliability and access, security conditions and site access, financial flow continuity and donor stability, labour availability under conflict or displacement, technology access under sanctions or import restrictions, land tenure security under instability, and governance and institutional capacity. These appear systematically as secondary mentions in the literature—acknowledged but not operationalised as primary evaluation dimensions.

This distinction is essential for critical-zone PDHR. In stable reconstruction contexts, performance-based criteria are appropriate primary evaluation dimensions because contextual conditions can be assumed to be stable. In critical zones characterised by prolonged and high-level uncertainty, instability, and/or constraints, the reverse is true: contextual criteria are the primary determinants of whether a reconstruction strategy is feasible at all, while performance optimisation is secondary to operational viability [70]. PDHR in critical zones inherently constitutes a multi-criteria problem requiring the simultaneous balance of multiple, often conflicting objectives, including cost efficiency, construction speed, structural safety, social acceptance, and environmental performance [59,71], further amplified by contextual constraints that conventional frameworks do not accommodate.

Before evaluating reconstruction decision outcomes, it is essential to consider the resilience of the decision-making process itself. Resilience in decision-making refers to the capacity of the process to maintain functionality, coherence, and adaptability under conditions of prolonged and high-level risk, uncertainty, instability, and disruption [72]. In disaster risk reduction and recovery, resilience has emerged as a central concept—the capacity of systems, communities, and infrastructure to absorb disturbances, adapt to changing conditions, and recover while maintaining essential functions [36]. Despite its relevance, resilience is frequently underrepresented or implicitly treated in PDHR decision frameworks, particularly in highly constrained and unstable contexts [73].

In critical zones, resilience-oriented decision-making extends beyond structural robustness to encompass the dynamic and uncertain operational conditions under which construction must proceed. Reconstruction solutions must adapt to evolving conditions—security threats, changing supply chain access, fluctuating funding, shifting governance—rather than optimise against a fixed baseline of stable assumptions. This necessitates prioritising locally available materials, flexible construction systems, modularity, and workforce strategies that reduce dependence on external inputs in zones where material imports are restricted [74]. Contextual criteria must therefore be treated as primary evaluation dimensions—not as secondary qualifications appended to performance-based frameworks.

It therefore becomes necessary to develop comprehensive, structured decision frameworks that support the transparent comparison of reconstruction alternatives under complex and constrained conditions [75]. Such frameworks must be specifically designed for and validated in critical zone contexts, particularly those shaped by human-made disaster sources where operational constraints are the most severe and least studied in the relative decision-making framework process. The specific methodological form of such a framework—including whether and how multi-criteria decision-making tools, optimisation methods, or simulation-based approaches are incorporated—is appropriately a matter for

future research and beyond the scope of this review to prescribe. This review establishes the substantive content that any such framework must address: the contextual dimensions identified across the 84-study corpus and the critical-zone conditions mapped in Section 2.1.

3. Methodology

This study employs a systematic literature review (SLR) methodology following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines [28]. The review maps the current state of knowledge on post-disaster housing reconstruction (PDHR), identifying the strategies, materials, construction technologies, and decision criteria employed across diverse contexts and delineating the research gaps that constrain the development of effective and resilient PDHR approaches in critical zones.

3.1. Database Search and Strategy

Two major peer-reviewed databases were searched: Web of Science (WoS) and Scopus. These databases were selected for their comprehensive and complementary coverage of construction management, disaster risk reduction, sustainability, housing studies, and humanitarian engineering—the primary disciplinary domains of this review [76,77]. Both apply rigorous quality thresholds for journal indexing, ensuring that only peer-reviewed outputs are captured [77,78]. The last search was conducted on 30 June 2026, with no publication date restriction.

Grey literature—including agency reports, institutional evaluations, and policy documents—was deliberately excluded from the database search. This decision was taken for two reasons: first, grey literature in the PDHR domain varies considerably in methodological rigour and peer scrutiny [79]; second, the primary aim of this review is to map the scholarly evidence base and identify the gaps therein. The implications of this exclusion are acknowledged as a limitation in Section 3.4.

The search string was developed using six Boolean keyword clusters, refined iteratively through a scoping pilot search and author review [80]. The research terms were expanded to trigger relevant records of decision-making in PDHR across both natural and human-made disaster contexts in critical zones (Table 2).

Table 2. Research keyword clusters.

Cluster	Extended Terms
1. Disaster source	Disaster OR earthquake OR seismic OR tsunami OR hurricane OR flood OR catastrophe OR war OR “armed-conflict”
2. Disaster consequences	Post-disaster OR post-conflict OR post-war OR destruction OR mega-construction OR IDP OR “war-damaged housing”
3. Housing	“Humanitarian shelter” OR “transitional shelter” OR “permanent housing” OR “temporary housing” OR “housing reconstruction” OR “residential housing” OR housing OR shelter OR “refugee housing”
4. Reconstruction tech.	“Construction methods” OR “housing typology” OR modular OR prefabricated OR traditional OR “reinforced concrete” OR “cast in-situ” OR precast OR timber OR container OR “steel structure” OR “housing recovery” OR “building back better”
5. Critical zones	Constraint OR restriction OR uncertainty OR disruption OR instability OR “disaster-prone regions” OR chaos OR crisis OR “armed-conflict” OR “fragile states” OR logistics OR governance OR “land tenure” OR pandemic OR “conflict-affected” OR blockade OR sanction OR occupation OR siege
6. Decision-making	Evaluation OR “decision-making” OR criteria OR strategy OR “decision framework” OR “owner-driven” OR “donor-driven” OR cost OR time OR quality OR “supply chain” OR social OR cultural OR labor OR resources OR stakeholder OR political OR financial OR safety OR security OR sustainability OR resilience

3.2. Eligibility Criteria

Eligibility criteria were operationalised in writing prior to screening and applied consistently throughout all five screening rounds [28,81]. Studies were included if they: (a) addressed PDHR strategies, construction methods, materials, technologies, or decision criteria/frameworks in a post-disaster or post-conflict housing context; (b) were set in a natural disaster, human-made disaster (including conflict, displacement, and pandemic disruption), or compound critical zone context; and (c) were published as peer-reviewed journal articles, conference papers, book chapters, or systematic reviews in English. Studies were excluded if they: (a) focused solely on non-housing infrastructure (e.g., roads, bridges, and utilities) without a housing reconstruction component; (b) addressed disaster risk reduction or climate adaptation without a post-disaster reconstruction component; (c) addressed logistics, operations research, or supply chain optimisation without direct connection to housing construction or reconstruction decision-making; (d) were purely social science, public health, or psychosocial studies without construction or decision-making content; (e) were historical or archival studies without applicability to contemporary PDHR practice; or (f) were duplicates of records already retrieved from the other database.

3.3. Screening, Data Extraction, and Coding

The initial search retrieved 123 records from WoS and 395 from Scopus, yielding a combined total of 518 records. These records proceeded through five sequential screening rounds as follows (Figure 2):

Round 1—Document type filter: 176 records were excluded on the basis of document type (WoS = 1, Scopus = 175), retaining 342 records. Non-peer-reviewed document types—including editorials, letters, and news items—were removed at this stage.

Round 2—Language filter: 2 records were excluded as non-English publications (WoS = 2), retaining 340 records.

Round 3—Duplicate removal: 8 cross-database duplicate records were identified and removed (Scopus = 8) [78], retaining 332 unique records.

Round 4—Title and abstract screening: 245 records were excluded on the basis of title and abstract review against the eligibility criteria (WoS = 74, Scopus = 171), retaining 87 records for full-text assessment.

Round 5—Full-text eligibility: 3 records were excluded after full-text review (WoS = 1, Scopus = 2), yielding a final corpus of 84 studies (WoS = 45, Scopus = 39) for qualitative synthesis.

The full PRISMA 2020 screening flow is presented in Figure 2. A structured data extraction sheet was developed in Microsoft Excel and piloted on five randomly selected included studies prior to full application [29,80]. For each of the 84 included studies, the following variables were extracted: (a) bibliographic information (authors, year, title, source, and DOI); (b) disaster type (natural, human-made, compound, or general); (c) critical zone classification per the six-type typology defined in Section 2.1; (d) geographic context; (e) PDHR solutions, construction methods, materials, and technologies; (f) decision criteria, coded as main focus or secondary mention; and (g) evaluation method. Data were extracted by the first author and independently verified by the second author across a random sample of 20 records, as described in Section 3.4.

The results, categorised by sub-thematic, disaster types and critical zone classification, are presented in Tables 3–5. Each study was assigned a primary disaster type—natural, human-made, or compound—based on the explicit description in the study context. Where no specific disaster event was identified, the study was coded as general/unspecified. Critical-zone type was assigned independently of disaster type, based on the operational conditions described in or inferred from the study setting. A study set in a seismic zone with

recurrent hazard exposure was coded as Type 1 (natural-hazard-prone); a study conducted in an active conflict environment was coded as Type 2 (active war zone); a post-conflict context with institutional fragility was coded as Type 3 (politically unstable/fragile state); an economically constrained setting with hyperinflation or resource scarcity was coded as Type 4; a context characterised by mass displacement and social fragmentation was coded as Type 5; and an externally confined setting subject to sanctions, blockades, or imposed isolation was coded as Type 6. Studies were coded as Non-CZ where the reconstruction environment was stable, or none of the six critical-zone conditions was present as a primary analytical feature. Where a study acknowledged CZ conditions as contextual background but did not treat them as a primary analytical object, CZ conditions were recorded as partially considered.

The results of the search, categorised by construction solutions, are presented in Table 6a,b. Construction solutions were extracted where a study explicitly proposed, tested, or evaluated a specific housing construction approach [82,83]. Studies addressing only management, logistics, or financial frameworks without a construction technology component were not coded for this variable. Each identified solution was categorised into one of three typologies: (i) prefabricated or modular systems; (ii) local or natural material approaches; or (iii) hybrid systems combining elements of both. The time horizon was assigned based on the study's stated or inferable scope—short-term or emergency if the solution was designed for immediate post-disaster deployment, and medium- to long-term if the solution addressed transitional or permanent reconstruction. Studies that did not specify a time horizon were uncoded.

The results, categorised by decision criteria, are presented in Table 7a. Decision criteria were extracted from the stated aims, research questions, analytical frameworks, and findings of each included study. Each identified criterion was coded as either main focus—where the criterion constituted a primary evaluation dimension formally measured, weighted, or systematically assessed in the study—or a secondary mention—where the criterion was referenced in the literature review, discussion, or recommendations but not operationally integrated into the study's evaluation framework. This distinction was introduced to reveal the gap between what the PDHR literature acknowledges as contextually important and what is actually operationalised in decision frameworks, directly informing Gap 3, as identified in Section 5. Further quantitative analysis of criteria occurrence in the reviewed literature is presented in Table 7b, and a comparison between contextual criteria in natural vs human-made PDHR reviewed studies is presented in Table 7c.

The results of the search, categorised by evaluation frameworks, are presented in Table 8a. Evaluation tools were extracted where a study applied a formal quantitative or structured qualitative assessment method to evaluate PDHR solutions, sites, or decisions. Tool categories were developed inductively from the corpus and included: recovery modelling, engineering performance assessment, multi-criteria decision-making (MCDM) frameworks, cost estimation, spatial and logistics optimisation, life cycle assessment (LCA), and statistical or other methods. For the three studies applying MCDM frameworks, a separate cross-comparison was constructed (Table 8b), extracting the full criteria set used in each framework, the MCDM method applied, and the study objective. The main focus vs. secondary mention distinction applied in Table 7a is applied consistently in Table 8b, enabling direct identification of contextual CZ criteria that are systematically absent from all published MCDM frameworks in the PDHR literature—the empirical foundation of Gap 3.

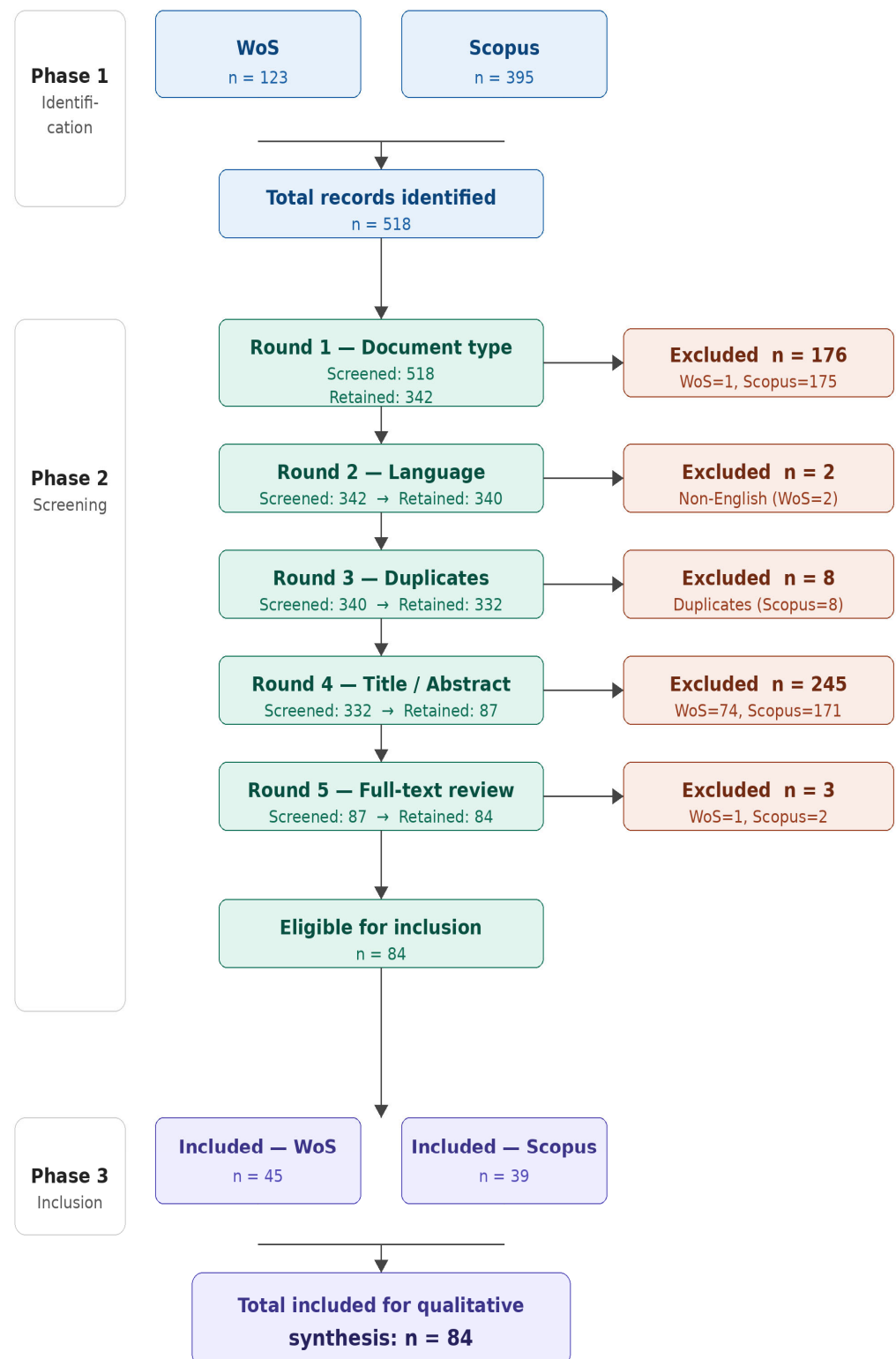


Figure 2. PRISMA 2020 screening flow diagram.

3.4. Inter-Rater Reliability and Limitations

To ensure the reliability of the review process, the second author independently verified a random sample of 20 records (approximately 24% of the full-text assessed corpus) across the entire data extraction and coding process, encompassing full-text eligibility decisions, disaster type and critical zone classification (Tables 4 and 5), construction solution categorisation and time horizon assignment (Table 6a,b), decision criteria identification and

coding as main focus or secondary mention (Table 7a,b), and evaluation tool and MCDM framework coding (Table 8a,b). Agreement was assessed using Cohen's Kappa (κ) [84], yielding $\kappa = 0.82$, indicating almost perfect agreement per the classification scale of Landis and Koch [85]. All discrepancies were resolved via discussion between the two authors prior to finalisation.

The following limitations are explicitly acknowledged in accordance with PRISMA 2020 Item 27 [28]: (a) Database coverage: only WoS and Scopus were searched; domain-specific databases and repositories were not included [72]. (b) Grey literature exclusion: reports from UNHCR, UN-Habitat, the World Bank, IFRC, and the Shelter Cluster were excluded as a deliberate methodological choice to maintain consistency of quality standards within a peer-reviewed corpus; this exclusion has particular implications for the human-made disaster evidence base (Gap 1) and is acknowledged as a structural limitation [79]. (c) Language restriction: only English-language publications were included [81]. (d) Single primary extractor: data extraction and coding were conducted by the first author; the inter-rater verification exercise described above was applied to mitigate potential coder bias across all analytical outputs [84,85].

4. Results

This section presents the findings of the systematic literature review across 84 included studies drawn from Web of Science ($n = 45$) and Scopus ($n = 39$). The results are organised into five analytical dimensions: (4.1) disaster types; (4.2) critical zone classification; (4.3) decision criteria; (4.4) PDHR solutions and construction technologies; and (4.5) evaluation approaches and decision-making frameworks.

The included corpus spans 2013 to 2026. The two earliest studies—Taheri and Tomlinson [86] examining the role of post-disaster public policy responses in housing recovery of tenants, and Doberstein and Stager [87] addressing post-disaster vulnerability reduction in informal settlements—reflect the foundational concern with equity and governance in PDHR that recurs throughout the corpus. The main body of literature is concentrated from 2015 onward, with notable acceleration after 2018, coinciding with increased scholarly attention to conflict-affected and fragile-state reconstruction contexts [28,36]. Figure 3 presents the annual publication trend by database.

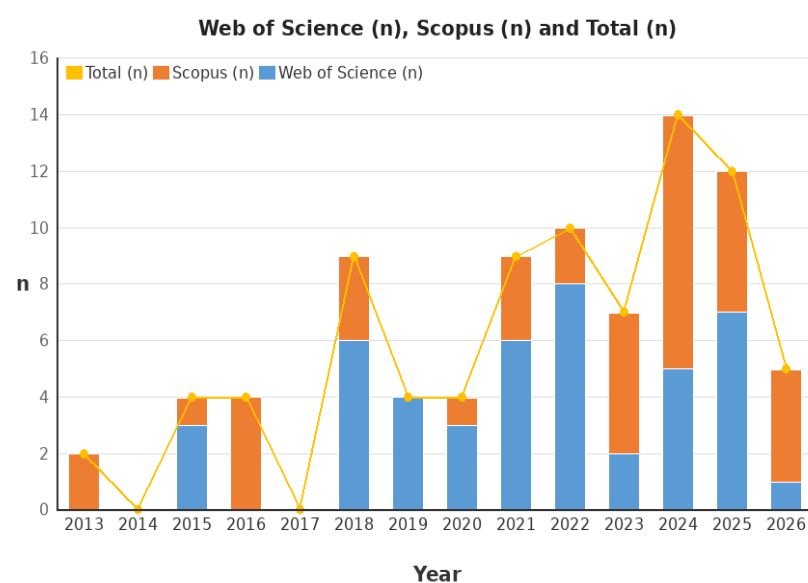


Figure 3. Annual publication trend of included studies by database.

Furthermore, Table 3 presents a thematic classification of the 84 included studies according to the PDHR sub-topics they address, highlighting that most studies are multidimensional in focus—simultaneously engaging policy and governance dimensions alongside community, financial, or technical aspects—while supply chain, labour, and decision-making dimensions remain the least represented research areas in the current evidence base.

Table 3. PDHR thematic classification of 84 included studies. Legend: A1—Structural & Technical Performance. A2—Sustainability & Environmental Impact. A3—Cost, Finance & Funding Access. A4—Time & Speed of Delivery. A5—Supply Chain & Material Availability. A6—Labour & Workforce Capacity. A7—Policy & Institutional Governance. A8—Community Participation & Social Dimensions. A9—Decision-Making & Prioritisation. A10—Recovery Modelling & Simulation.

#	Citation (Author, Year)	Ref.	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
1	(Mucedero et al., 2026)	[88]	✓		✓	✓						
2	(Taheri & Tomlinson, 2013)	[86]							✓	✓		
3	(Doberstein & Stager, 2013)	[87]							✓	✓		
4	(Diaz et al., 2015)	[89]					✓					✓
5	(Kumar et al., 2015)	[90]				✓		✓				✓
6	(Mukherji, 2015)	[91]			✓				✓	✓		
7	(Tafti, 2015)	[92]			✓				✓			
8	(Arlikatti & Andrew, 2016)	[93]			✓				✓	✓		
9	(Duyne, 2016)	[94]							✓	✓		
10	(Sapat, 2016)	[95]							✓			
11	(Nejat & Ghosh, 2016)	[96]				✓						✓
12	(Sutley & Hamideh, 2018)	[97]			✓	✓	✓	✓		✓		✓
13	(Zhu et al., 2018)	[20]	✓		✓	✓					✓	
14	(Curato, 2018)	[98]							✓	✓		
15	(Dabaieh & Alwall, 2018)	[99]		✓	✓					✓		
16	(Hamideh et al., 2018)	[100]			✓	✓				✓		✓
17	(Nakashima & Okada, 2018)	[101]			✓				✓			
18	(Bondinuba et al., 2018)	[102]			✓					✓		
19	(Afolabi et al., 2018)	[103]							✓	✓		
20	(Mukherji, 2018)	[104]			✓				✓	✓		
21	(Burton et al., 2019)	[105]			✓					✓		✓
22	(Fayazi et al., 2019)	[16]							✓	✓		
23	(Arroyo & Åstrand, 2019)	[106]			✓				✓			
24	(Koshiyama, 2019)	[107]							✓	✓		
25	(Biswas et al., 2020)	[108]							✓	✓		
26	(Faure et al., 2020)	[109]							✓	✓		
27	(Awaludin et al., 2020)	[24]	✓		✓	✓						
28	(Burlotos et al., 2020)	[110]	✓		✓							
29	(Pezzica et al., 2021)	[6]									✓	
30	(Kondo & Lizarralde, 2021)	[111]							✓	✓		
31	(Ramos & Pereira, 2021)	[112]			✓	✓	✓					
32	(Costa et al., 2021)	[113]			✓	✓	✓	✓				✓
33	(Alisjahbana & Kiremidjian, 2021)	[114]				✓			✓			✓
34	(Shrestha et al., 2021)	[115]			✓				✓			
35	(Greer & Trainor, 2021)	[116]							✓	✓		
36	(Safapour et al., 2021)	[117]			✓		✓		✓	✓		
37	(Sospeter et al., 2021)	[118]			✓				✓			
38	(Zavareh & Winder, 2022)	[119]			✓	✓						✓

Table 3. *Cont.*

#	Citation (Author, Year)	Ref.	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
39	(Shahzad et al., 2022)	[120]	✓			✓		✓				
40	(Diaz et al., 2022)	[121]			✓	✓	✓	✓				✓
41	(Balachandran et al., 2022)	[122]							✓	✓		
42	(Barreca et al., 2022)	[123]	✓	✓		✓						
43	(Talbot et al., 2022)	[124]	✓		✓				✓	✓		
44	(Goldwyn et al., 2022)	[125]	✓					✓		✓		
45	(Costa et al., 2022)	[126]			✓	✓				✓		✓
46	(Lines et al., 2022)	[127]			✓	✓						✓
47	(KamacI-Karahan & Kemec, 2022)	[128]								✓		
48	(Sen-Bayram et al., 2023)	[129]			✓	✓					✓	
49	(Ginigaddara et al., 2023)	[23]	✓									
50	(Ahmed, 2023)	[130]	✓						✓	✓		
51	(Iskandarani et al., 2023)	[131]							✓	✓		
52	(Calandra, 2023)	[18]			✓				✓	✓		
53	(Healey et al., 2023)	[132]	✓							✓		
54	(Sechi et al., 2023)	[133]	✓					✓		✓		
55	(Mongold et al., 2024)	[134]			✓	✓	✓	✓		✓		✓
56	(Wu & Lu, 2024)	[135]							✓	✓		
57	(Harrison et al., 2024)	[136]	✓			✓	✓	✓				
58	(Kahandawa et al., 2024)	[137]			✓							
59	(Blagojevic et al., 2024)	[138]				✓						✓
60	(Khajehei & Hamideh, 2024)	[139]			✓				✓	✓		
61	(Serter & Gumusburun, 2024)	[140]									✓	
62	(Wang et al., 2024)	[141]	✓						✓	✓		✓
63	(Skwarko et al., 2024)	[142]							✓	✓		
64	(Shamloo et al., 2024)	[143]	✓	✓	✓	✓					✓	
65	(Paul et al., 2024)	[144]								✓		
66	(Ahmed & Guyton, 2024)	[145]							✓	✓		
67	(Hendricks & Meyer, 2024)	[146]				✓						✓
68	(Opabola & Galasso, 2024)	[147]			✓	✓			✓			✓
69	(Singh & Singh, 2025)	[26]	✓	✓	✓	✓	✓					
70	(Turhan et al., 2025)	[148]	✓	✓	✓							
71	(Yore et al., 2025)	[149]								✓		
72	(Farnsworth et al., 2025)	[150]	✓						✓	✓		
73	(Mazumder & Sutley, 2025)	[151]			✓	✓				✓		✓
74	(Mashal & Jiménez Rios, 2026)	[25]	✓		✓		✓					
75	(Li et al., 2025)	[152]				✓						✓
76	(Kroen et al., 2025)	[153]							✓	✓		
77	(Anjomshoa & Heravi, 2025)	[21]	✓								✓	
78	(De & Opdyke, 2025)	[154]							✓	✓		
79	(Wang et al., 2025)	[155]	✓	✓	✓	✓			✓	✓		
80	(Elliott et al., 2025)	[156]			✓				✓	✓		
81	(Opdyke et al., 2026)	[157]							✓	✓		
82	(Ahmed et al., 2026)	[158]			✓	✓			✓	✓		
83	(Kijewski-Correa et al., 2026)	[159]			✓				✓	✓		
84	(Serter & Gumusburun, 2026)	[22]	✓							✓	✓	
Total studies per area (n):		-	22	6	40	28	10	9	41	48	7	19

4.1. Disaster Types

Table 4 presents the disaster types identified across the 84 included studies. The analysis reveals a marked imbalance in the selected PDHR literature per the origin of the disaster. Natural disasters dominate the corpus—68 of 84 studies (81.0%)—addressing seismic events, hydrometeorological disasters, and multi-hazard contexts concentrated in East Asia, South Asia, the Pacific, and North America. Studies not tied to a specific disaster type account for a further five studies (6.0%).

Table 4. Included PDHR studies per disaster type.

Disaster Category	Specific Disaster Type	n	%	Reference Numbers
Natural	Earthquake	24	28.6%	[16,21,24,25,86,88,91,92,101,104,105,110,111,113–115,126–128,134,137,138,142,152]
Natural	Flood and Hurricane	8	9.5%	[96,100,116,119,121,124,139,159]
Natural	Typhoon and Cyclone	6	7.1%	[18,98,106,132,135,145]
Natural	Tornado	1	1.2%	[141]
Natural	Multi-hazard/General natural	29	34.5%	[6,22,23,26,87,93–95,97,108,112,117,120,122,125,129,130,133,143,144,147–151,153,155,156,158]
Human-made	Armed conflict and post-war housing	8	9.5%	[20,99,103,109,118,131,136,157]
Human-made	Nuclear/Industrial accident	1	1.2%	[107]
Human-made	Technological disaster	1	1.2%	[146]
Both	Natural hazard and armed conflict	1	1.2%	[154]
General	Not disaster-specific	5	6.0%	[89,90,102,123,140]
Total	—	84	100%	—

Notes: 1. The “Both” category indicates studies addressing reconstruction contexts involving simultaneously natural hazard and human-made disasters. 2. Studies classified as “Not disaster-specific” contribute methodological or conceptual frameworks applicable across disaster types without addressing a specific disaster event.

Human-made disaster contexts remain substantially underrepresented. Only 10 studies (11.9%) address exclusively human-made disaster contexts, comprising armed conflict and post-war housing ($n = 8$, 9.5%), nuclear or industrial accident ($n = 1$, 1.2%), and technological disaster ($n = 1$, 1.2%). A further one study (1.2%) addresses both natural and human-made dimensions simultaneously, bringing the total number of studies with any human-made component to 11 (13.1%).

This imbalance reflects the uneven distribution of PDHR research production—natural disasters have historically generated larger, more accessible datasets and more stable field conditions for research. Nevertheless, human-made disasters can produce a significant level of housing destruction that deserves equal investigative attention, and whether existing PDHR frameworks developed primarily in natural disaster contexts are equally applicable to human-made disaster contexts remains insufficiently investigated. This constitutes Gap 1 of the present review.

4.2. Critical Zone Classification

Table 5 presents the critical zone classification of the 84 included studies, applying the seven-type CZ typology established in Section 2.1. The distribution reveals a highly uneven concentration across CZ types.

Non-CZ studies—addressing reconstruction in stable, well-governed contexts without persistent critical-zone conditions—constitute the largest single group, comprising 43 of 84 studies (51.2%). Among CZ-classified studies, Type 1 (Natural-Hazard-Prone Zone) is the most represented, with 15 studies (17.9%) concentrated in Indonesia, Nepal, the

Philippines, Japan, and Türkiye. Type 4 (Economic Hardship Zone) accounts for 17 studies (20.2%), addressing reconstruction contexts characterised by internal economic constraints, chronic poverty, and structural limitations on the procurement of materials, financing, and skilled labour. Type 3 (Politically Unstable Zone) accounts for seven studies (8.3%), covering contexts of governance collapse, institutional fragility, and post-conflict political instability in Angola, Nigeria, Nepal, and India. Type 2 (Active War Zone) is represented by only one study (1.2%), and Type 5 (Unstabilized Social Zone) is represented by one study (1.2%). Types 6 (Confined Zone) and 7 (Compound/Multi-Dimensional Zone) have no representation in the corpus ($n = 0$).

Table 5. Critical zone classification of the 84 included studies (seven-type typology).

CZ Code	CZ Type Name	Primary Driving Condition	n	%	Studies
Non-CZ	Non-Critical Zone	Stable, well-governed reconstruction context—no persistent CZ conditions identified	43	51.2%	[6,20,22,88–90,95–97,99–101,105,108,109,112,113,116,119–123,126,128,129,134–138,140,141,143,144,146,149,151–153,155,156,158]
Type 1	Natural-Hazard-Prone Zone	Recurrent natural hazard events creating prolonged uncertainty or overwhelming reconstruction capacity	15	17.9%	[16,18,21,23,24,26,98,106,107,111,114,127,142,145,148]
Type 2	Active War Zone	Active armed conflict or repeated cycles of destructive violence during reconstruction	1	1.2%	[157]
Type 3	Politically Unstable Zone	Governance collapse, institutional fragility, or state failure creating operational instability	7	8.3%	[86,91,92,103,115,118,131]
Type 4	Economic Hardship Zone	Internal economic collapse, chronic poverty, or structural economic failure constraining procurement of materials, financing, and skilled labour	17	20.2%	[25,87,93,94,102,104,110,117,124,125,130,132,133,139,147,150,159]
Type 5	Unstabilised Social Zone	Mass outward displacement, inter-communal fragmentation, or forced population rupture disrupting social coordination	1	1.2%	[154]
Type 6	Confined Zone	External confinement through sanctions, blockades, or pandemic lockdowns restricting movement and construction access	0	0.0%	—
Type 7	Compound/Multi-Dimensional Zone	Two or more CZ types simultaneously present, creating compounded operational constraints	0	0.0%	—
Total	—	—	84	100%	—

This distribution confirms a significant imbalance in the PDHR evidence base. While natural-hazard-prone and economic hardship contexts have attracted sustained research attention, the most operationally severe CZ environments—active conflict, external confinement, social fragmentation, and compound conditions—are virtually absent as primary objects of analysis in the existing literature. This constitutes Gap 2 of the present review.

4.3. PDHR Construction Techniques and Solution

Table 6a presents the deliberate construction techniques, materials, and technologies proposed or tested across the included studies [160–164], cross-referenced with the CZ context. Table 6b presents their time horizon distribution.

Repetitive natural disaster events have driven PDHR construction toward prefabricated, modular, and local material solutions. Prefabricated and modular systems—exemplified by the RISBARI cold-formed steel system [24], the P2M2 modular system [26], and Industry 4.0-integrated modular construction [23]—have demonstrated clear advantages in speed and structural performance under natural hazard conditions. Local material solutions have similarly shown promise, with earthen construction proven viable in seismic contexts [25] and traditional materials successfully applied in community-led reconstruction [18].

However, as shown in Table 6a,b, these solutions are concentrated almost entirely in Non-CZ and Type 1 (Natural-Hazard-Prone Zone) contexts. This solution remains limited in any human-made CZ environment (Type 2–6), especially for medium- to long-term. Only one study [25]—proposes a deliberate construction solution in a human-made CZ context (Type 4). Whether solutions proven effective under natural disaster conditions remain viable under disrupted supply chains, scarce skilled labour, collapsed governance, or constrained site access remains insufficiently investigated in the existing PDHR literature. This constitutes Gap 3 of the present review.

Table 6. (a) PDHR construction solution categorised by C.Z. context. (b) Time horizon of PDHR construction solutions by context (17 studies).

(a)				
Construction Solution Category	Non-CZ (n; Studies)	Natural CZ (Type 1) (n; Studies)	Human-Made CZ (Types 2–6) (n; Studies)	Total
Prefabricated/Modular	4 [109,120,129,136]	4 [23,24,26,107]	—	8
Local/Natural material	2 [99,108]	1 [18]	1 [25]	4
Hybrid (Prefab + Local/Transitional)	4 [22,112,123,158]	1 [148]	—	5
Total	10	6	1	17
(b)				
Time Horizon	Non-CZ (n; Studies)	Natural CZ (Type 1) (n; Studies)	Human-Made/CZ (Types 2–6) (n; Studies)	Total
Short-term/Emergency	6 [22,108,109,112,129,158]	2 [24,107]	—	8
Medium- to Long-term	4 [99,120,123,136]	4 [18,23,26,148]	1 (Type 4) [25]	9
Total	10	6	1	17

4.4. Criteria for PDHR Decision-Making

Table 7a disaggregates the 43 criteria identified across the reviewed corpus, categorised into 11 thematic groups by their focus of study. Each criterion is classified as performance-based (intrinsic to the housing solution), contextual (imposed by the operating environment), or both, and is reported by its frequency as a primary focus versus a secondary mention, together with the critical-zone types in which it appears as a primary focus. A criterion was recorded as a primary focus only where it was formally measured, weighted, or systematically evaluated, and as a secondary mention where it was acknowledged as relevant but not analytically operationalised. Analytically, primary attention concentrates

on a small set of criteria: construction speed and time efficiency (18 studies), governance and institutional capacity (15), structural system safety (14), and cost effectiveness and financing availability (12 each) account for the majority of primary evaluations, indicating that the literature's decision-making revolves around cost, time, structural performance, and—where operational conditions are severe—institutional capacity and funding.

A second set of criteria appears almost exclusively as secondary mentions rather than as primary evaluation dimensions, most notably indoor thermal comfort (1 primary, 16 secondary), cultural appropriateness (0 primary, 9 secondary), and location of reconstructed housing (2 primary, 9 secondary), while several criteria—construction code compliance, workmanship competence, building typology, and fire safety—are essentially never treated as a primary focus. The critical zone columns further show that where criteria are evaluated as a primary focus, they cluster in Type 1 and Type 4 settings (18 and 16 criteria, respectively), followed by Non-CZ (9) and Type 3 (5), while the most acute critical-zone types are almost absent—Type 2 appears for only two criteria, and Types 5, 6, and 7 appear for none.

Table 7b aggregates the criterion-level data by type, reporting the number of performance-based, contextual, and both-type criteria in each class, the summed primary-focus and secondary-mention occurrences, and the resulting primary-to-secondary ratio. Across the 43 criteria, primary-focus and secondary-mention occurrences are close to balanced overall (148 primary focus versus 142 secondary mentions; ratio 1.04:1), with performance-based (19 criteria; 63 primary focus, 56 secondary mentions), contextual (15 criteria; 63 primary focus, 57 secondary mentions), and both-type criteria (9 criteria; 22 primary focus, 29 secondary mentions) each receiving broadly comparable attention.

The significance of this distribution lies not in the aggregate balance but in how the criteria are handled: they are evaluated in isolation, with individual studies foregrounding a narrow subset while treating the remainder as background, rather than being integrated within a single decision structure. No reviewed study combines the performance-based and contextual criteria into a holistic framework capable of selecting the most appropriate construction strategy for a given reconstruction context—and this absence is most consequential precisely where contextual criteria dominate the decision, namely in critical zones. As shown in Table 7a, the criteria evaluated as a primary focus cluster in Type 1 and Type 4 settings are almost entirely unaddressed in the acute critical-zone types (Types 2, 5, 6, and 7), leaving the contexts most dependent on contextual decision criteria without any structured, multi-criteria basis for strategy selection or (re) construction methods and techniques. This fragmentation, and the absence of an integrative framework attuned to critical-zone conditions, constitutes Gap 3.

Table 7c emphasises contextual criteria in the selected PDHR studies (natural versus human-made disaster studies). This contrast indicates that the difference between natural and human-made disaster studies is not merely one of volume but of kind: the contextual criteria that dominate reconstruction in human-made settings—security conditions, governance collapse, forced displacement, funding discontinuity, and supply chain disruption—are largely absent from the natural-disaster-dominated corpus, which instead emphasises programme delivery, financing adequacy, and community participation within relatively stable institutional environments. The contextual dimensions most decisive for human-made and compound critical zones are therefore underrepresented precisely where they matter most, reinforcing both the scarcity of human-made disaster evidence (Gap 1) and the failure to operationalise critical-zone criteria into evaluation frameworks (Gap 3).

Table 7. (a) PDHR decision criteria—primary focus vs. secondary mention, with CZ type coverage vs. CZ types. (b) Primary focus vs. secondary mention by criterion type. (c) Contextual criteria emphasis in PDHR selected studies: natural vs. human-made disaster studies.

(a)							
#	Criterion	Type	Primary Focus (n)	Primary Focus (Ref. Numbers)	Secondary Mention (n)	Secondary Mention (Ref. Numbers)	CZ Types (Primary Focus)
GROUP 1—ECONOMIC & FINANCIAL							
1	Cost effectiveness (total costs)	Performance	12	[20,24,25,88,100,101,112,119,127,137,143,148]	7	[26,97,110,113,120,121,146]	Type 1, Type 4
2	Maintenance cost	Performance	1	[20]	7	[26,88,97,112,120,121,146]	Non-CZ
3	Financing availability/budget	Contextual	12	[18,92,93,102,115,117,118,139,145,151,157,159]	5	[134,142,147,150,151]	Type 1, Type 2, Type 3, Type 4
GROUP 2—TIME							
4	Construction speed/Time efficiency	Both	18	[20,22,24,26,88,90,96,100,112,114,120,126,127,136,138,143,151,158]	5	[6,26,105,108,135]	Type 1
GROUP 3—SUSTAINABILITY & ENVIRONMENT							
5	Carbon footprint/GHG emissions	Performance	1	[123]	2	[23,155]	Non-CZ
6	Energy efficiency	Performance	1	[148]	3	[23,123,143]	Type 1
7	Waste reduction	Performance	1	[148]	3	[23,26,143]	Type 1
8	End-of-life disposal/Recycling	Performance	1	[148]	2	[23,155]	Type 1
GROUP 4—STRUCTURAL & TECHNICAL PERFORMANCE							
9	Lightweight construction materials	Both	1	[123]	3	[24,124,148]	Non-CZ
10	Material manufacturing and quality	Performance	3	[20,25,148]	0	—	Type 1, Type 4
11	Construction code compliance	Performance	0	—	4	[87,124,130,150]	—
12	Structural system safety	Performance	14	[20,23,25,26,88,110,120,123,138,141,143,148,152,155]	3	[24,124,148]	Type 1, Type 4
13	Earthquake performance	Performance	6	[23–26,88,110]	0	—	Type 1, Type 4
14	Wind & flood resistance	Performance	5	[23,26,130,132,141]	0	—	Type 1, Type 4
15	Material durability	Performance	3	[20,25,148]	0	—	Type 1, Type 4
16	Construction quality & field control	Both	0	—	3	[124,125,133]	—

Table 7. Cont.

17	Workmanship competence	Both	0	—	2	[125,133]	—
18	Connection security (prefab/modular)	Performance	7	[22–24,26,120,123,136]	0	—	Type 1
19	Maintenance & repairability	Performance	2	[22,123]	0	—	Non-CZ
20	Compliance with local building regulations	Both	0	—	4	[87,124,130,150]	—
21	Damaged structure repair & reinforcement	Performance	4	[25,137,138,152]	0	—	Type 4
22	Soil conditions	Contextual	1	[25]	0	—	Type 4
23	Fire safety	Performance	0	—	0	—	Non-CZ
24	Local material use/Standardisation	Contextual	3	[25,26,136]	1	[133]	Type 1, Type 4
GROUP 5—LABOUR							
25	On-site labour demand/Productivity	Both	2	[90,113]	1	[118]	Non-CZ
26	Skilled labour necessity	Both	0	—	1	[118]	—
GROUP 6—SOCIAL & COMMUNITY							
27	Indoor thermal performance (Comfort)	Performance	1	[22]	16	[16,20,86,87,91–93,97,99,100,108,111,122,126,135,151]	Non-CZ
28	Cultural appropriateness	Contextual	0	—	9	[18,22,87,99,108,109,135,151,157]	—
29	Local constructor participation & knowledge	Contextual	1	[125]	4	[86,87,97,133]	Type 4
30	Community engagement	Contextual	1	[98]	3	[86,87,97]	Type 1
31	(Re)occupancy rate	Both	1	[88]	1	[122]	Non-CZ
GROUP 7—DESIGN							
32	Building typology	Performance	0	—	3	[24,124,148]	—
33	Construction flexibility	Performance	1	[123]	6	[24,26,120,124,136,155]	Non-CZ
GROUP 8—SUPPLY CHAIN & LOGISTICS							
34	Material procurement & availability	Contextual	6	[25,26,89,112,113,121]	5	[18,20,110,117,134]	Type 1, Type 4
35	Logistics, transportation & resource flow	Contextual	6	[21,89,112,113,121,136]	5	[18,20,110,117,134]	Type 1
GROUP 9—LAND OWNERSHIP, SITE & LOCATION							

Table 7. Cont.

36	Location of reconstructed houses	Contextual	2	[106,134]	9	[21,97,101,107,111,122,135,151,153]	Type 1
37	Security, safety & hazard conditions	Contextual	0	—	1	[109]	—
38	Land/Tenure ownership	Contextual	6	[86,87,91,94,104,115]	5	[107,111,115,151,156]	Type 3, Type 4
GROUP 10—POLITICAL, GOVERNANCE & INSTITUTIONAL CAPACITY							
39	Governance/Institutional capacity	Contextual	15	[16,18,95,106,107,109,115–118,130,135,145,153,157]	3	[97,101,155]	Type 1, Type 2, Type 3, Type 4
40	Regulatory frameworks	Contextual	5	[86,91,122,150,156]	8	[88,94,97,101,111,116,130,153]	Type 4
41	Stakeholder coordination	Contextual	2	[6,131]	1	[92]	Type 3
42	Political stability in construction zone	Contextual	2	[103,131]	4	[97,98,101,118]	Type 3
GROUP 11—TECHNOLOGY ACCESS & DIGITAL TOOLS							
43	Technology access/Digital tools	Contextual	1	[133]	3	[24,124,148]	Type 4

(b)

Criterion Type	Criteria (n)	Σ Primary	Σ Secondary	Primary/Secondary Ratio
Performance-based	19	63	56	1.13:1
Contextual	15	63	57	1.11:1
Both	9	22	29	1.04:1

(c)

Contextual Dimension	Natural-Disaster Studies	Human-Made-Disaster Studies
Governance/institutions	Institutional capacity for recovery programme delivery within largely functioning states	Governance collapse, contested authority, and absent or only partial state capacity
Security conditions	Rarely addressed; reconstruction sites generally accessible	Central concern—active or residual conflict, restricted access, and personnel safety
Financing/funding	Budget adequacy, insurance, and aid allocation	Funding discontinuity, sanctions, and dependence on diaspora or humanitarian finance
Population/social fabric	Community participation and place attachment	Forced displacement, refugee return, and social fragmentation
Supply chain/logistics	Material availability and procurement efficiency	Blockades, import restrictions, and disrupted supply routes
Land tenure	Ownership documentation and informal-settlement regularisation	Contested tenure, occupied, or abandoned property, and restitution disputes

4.5. Evaluation Methods of PDHR Solutions and Decision Tools

Table 8a presents the evaluation tools and decision frameworks applied across the 84 included studies, cross-referenced with the CZ context. The analysis reveals a fragmented methodological landscape with a clear concentration of tools in stable contexts and a near-complete absence of structured decision frameworks in human-made and CZ environments.

Recovery modelling is the most prevalent evaluation approach ($n = 15$), encompassing system dynamics models [89,90,97], agent-based models [113,134], probabilistic and stochastic frameworks [105,114,138], and data-driven machine learning approaches [96,152]. These tools model recovery trajectories, resource flows, and household decisions predominantly in Non-CZ contexts ($n = 13$), with only one application in a Type 1 environment [114] and one in a Type 4 context [147]—the latter explicitly acknowledging that methodologies developed in stable environments may not be directly transferable to developing country contexts. Engineering performance assessment appears in three studies: Awaludin et al. [24] test the RISBARI prefabricated system under seismic conditions (Type 1); Mashal and Rios [25] benchmark earthen construction performance in rural Afghanistan (Type 4); and Burlotos et al. [110] assess the structural performance of informal construction in LMIC (Type 4). These are the only studies where an evaluation tool is directly applied in a CZ environment to assess a construction solution.

MCDM and structured multi-criteria decision frameworks—the tool category most directly relevant to PDHR decision-making—appear in only 3 of 84 studies (3.6%). Table 8b presents a cross-comparison of the criterion sets applied across these three frameworks. Zhu et al. (2018) [20] apply AHP to select optimal wall panel materials for temporary shelters, using five performance criteria: initial cost, maintenance cost, assembly time, ease of assembly, and durability. Anjomshoa and Heravi [21] apply Fuzzy VIKOR to rank critical influential factors for temporary shelter site selection in seismic urban contexts (Type 1), using 10 physical and spatial site location criteria, including distance to hospitals, police stations, fire stations, fault lines, and population density. Serter and Ayalp [22] apply DEMATEL to analyse causal relationships among 11 design risks in post-disaster temporary housing units, including thermal comfort, functional adequacy, flexibility, and contextual and cultural integration. As shown in Table 8b, the criteria that are decisive in critical-zone reconstruction environments are entirely absent across the three frameworks—each addressing a different PDHR decision problem. Specifically, none of the frameworks incorporate governance and institutional capacity, security conditions in the reconstruction zone, labour availability, funding continuity, and supply chain disruption as either primary or secondary criteria. Furthermore, all three MCDM applications are set in Non-CZ or Type 1 environments—within the reviewed corpus, no structured decision framework has been applied in any human-made or compound CZ context.

This pattern is consistent across all other tool categories. Life cycle assessment ($n = 1$), cost estimation tools ($n = 2$), and spatial/logistics optimisation ($n = 2$) are all applied exclusively in Non-CZ or Type 1 environments. The cross-analysis confirms that the most operationally challenging reconstruction environments—Types 2, 3, 5, and 6—have no calibrated evaluation tool or decision framework within the reviewed corpus. This constitutes the most direct empirical evidence for Gap 3: contextual criteria are acknowledged across the PDHR literature but, within the reviewed corpus, are not operationally integrated into any evaluation framework, and no structured decision tool has been developed or tested for the specific conditions that define critical zones.

Table 8. (a) PDHR evaluation tools and decision frameworks for 84 included studies. (b) Criterion sets compared across MCDM studies in the included corpus (n = 3).

(a)					
Evaluation Tool/Framework	Description	Non-CZ (n; Studies)	Natural CZ Type 1 (n; Studies)	Human-Made/CZ Types 2–6 (n; Studies)	Total
Recovery modelling	System dynamics, agent-based, probabilistic, ML-based recovery trajectory models	13	1	1	15
		[88–90,96,97,105,113,119,126,134,138,151,152]	[114]	[147]	
Engineering performance assessment	Structural testing, seismic performance, downtime assessment	—	1	2	3
		—	[24]	[25,110]	
MCDM/Multi-criteria framework	AHP, Fuzzy VIKOR, DEMATEL—structured weighted evaluation	2	1	—	3
		[20,22]	[21]	—	
Cost estimation	Post-disaster cost modelling and financial loss estimation	2	—	—	2
		[101,137]	—	—	
Spatial/Logistics optimisation	GIS, p-Median, location-allocation for shelter deployment	1	1	—	2
		[112]	[111]	—	
Life cycle assessment (LCA)	Environmental and sustainability performance over life cycle	1	—	—	1
		[123]	—	—	
Statistical/Other	fsQCA, regression, perception studies	—	1	3	4
		—	[142]	[125,132,154]	
Total		19	5	6	30

Table 8. Cont.

(b)				
Decision Criterion	[20] Zhu et al. (2018) AHP—Non-CZ	[21] Anjomshoa & Heravi (2025) Fuzzy VIKOR—Type 1	[22] Serter & Ayalp (2026) DEMATEL—Non-CZ	Gap Finding
<i>Study objective/dimension</i>	Optimal material and method selection for temporary shelter wall panels	Ranking critical influential factors for temporary shelter site selection in seismic urban contexts	Identifying and prioritising design challenges in post-disaster temporary housing units	—
<i>MCDM method</i>	Analytic Hierarchy Process (AHP)	Fuzzy VIKOR	Decision-Making Trial and Evaluation Laboratory (DEMATEL)	—
Initial cost	Primary	—	—	—
Maintenance cost	Primary	—	—	—
Assembly time	Primary	—	—	—
Ease of assembly	Primary	—	—	—
Durability	Primary	—	—	—
Thermal, acoustic, and ergonomic comfort	—	—	Primary	—
Functional adequacy of spatial layouts	—	—	Primary	—
Flexibility and adaptability in floor plans	—	—	Primary	—
Natural lighting and ventilation	—	—	Primary	—
Reusability and modular design	—	—	Primary	—
Aesthetic and visual quality	—	—	Primary	—

Table 8. Cont.

Contextual and cultural integration in design	—	—	Primary	—
Pre-disaster planning and prototyping	—	—	Primary	—
Green and communal open space	—	—	Primary	—
Lessons from previous housing designs	—	—	Primary	—
Essential functional requirements	—	—	Primary	—
Site location criteria (distance to hospitals, police stations, fire stations, fault lines, population density, slope, land use)	—	Primary (10 disaggregated criteria)	—	Addressed in Type 1 seismic context only
Governance/Institutional capacity	—	—	—	Gap 3
Security in reconstruction zone	—	—	—	Gap 3
Labour availability	—	—	—	Gap 3
Funding/Aid continuity	—	—	—	Gap 3
Supply chain disruption	—	—	—	Gap 3

5. Discussion

The findings of this systematic review reveal a clear and coherent set of research gaps in the existing literature on post-disaster housing reconstruction (PDHR). These gaps are interconnected and reinforce one another: the scarcity of human-made disaster evidence (Gap 1) means that the specific operational conditions of human-made critical zones remain empirically unaddressed (Gap 2), which in turn means that no decision framework has been developed that captures the contextual factors that define feasibility in those environments (Gap 3). Together, these three gaps define the research frontier of PDHR and constitute the primary contribution of this review.

5.1. Gap 1—Scarcity of PDHR Research Based on Human-Made Disaster Contexts

The first and most fundamental gap identified is the overwhelming dominance of natural disaster contexts in the PDHR literature. As shown in Table 4, of the 84 included studies, 68 (81%) address reconstruction following natural hazards—earthquakes, floods, cyclones, hurricanes, tsunamis, and volcanoes—concentrated primarily in East and South Asia, North America, and Europe. Only 10 studies, about 12%, are explicitly set in human-made disaster environments, including armed conflict, political displacement, refugee crises, and post-war reconstruction. One further study addresses both natural and human-made contexts simultaneously, and five studies (6.0%) address general or unspecified disaster contexts.

This disparity is not merely a bibliometric observation—it reflects a structural imbalance in the production of PDHR knowledge. The volume of research addressing natural disaster reconstruction vastly exceeds that addressing human-made disaster reconstruction, meaning that the frameworks, criteria, and construction solutions developed in the PDHR literature are implicitly calibrated to natural disaster contexts and cannot be assumed to transfer to human-made settings.

The urgency of addressing this gap has never been greater. The global frequency and scale of human-made disasters is rising—the number of state-based armed conflicts reached its highest level since 1946 in 2022, and conflict-driven displacement continues to generate housing reconstruction needs of unprecedented scale across Syria, Yemen, Lebanon, Ukraine, the occupied territories of Palestine, and Sub-Saharan Africa [8,10,11,13]. As human-made disasters increasingly dominate the global humanitarian landscape, the absence of a dedicated PDHR evidence base for these contexts represents a critical and growing failure of the field to meet the reconstruction challenges where need is most acute.

5.2. Gap 2—Scarcity of Critical-Zone Conditions as a Primary Analytical Object in PDHR Research

The second gap narrows from the type of disaster to the nature of the reconstruction environment. Critical zones—as defined in Section 2.1—are not simply places where disasters occur but contexts characterised by persistent uncertainty, operational disruption, compounding constraints, and structural instability that extend well beyond the acute phase of any single disaster event. As shown in Table 5, of the 84 included studies, 43 (51.2%) are set in stable, non-CZ reconstruction environments. Type 1 critical zones (natural-hazard-prone critical zones) are relatively well represented with 15 studies (17.9%). However, active war zones (Type 2, $n = 1$, 1.2%), politically fragile states (Type 3, $n = 7$, 8.3%), socially unstabilised contexts (Type 5, $n = 1$, 1.2%), and confined zones (Type 6, $n = 0$) remain severely underrepresented or absent from the corpus. Economically constrained environments (Type 4, $n = 17$, 20.2%), while better represented, are predominantly addressed in developing country natural disaster contexts rather than human-made or compound CZ

settings. No study in the corpus explicitly addresses a compound critical zone context in which multiple dimensions of criticality coexist simultaneously.

The more consequential finding, however, concerns not the number of studies set in CZ environments but the analytical treatment of CZ conditions within those studies. Of the 84 included studies, only 4 (4.8%) treat CZ conditions—such as governance collapse, supply chain disruption, security constraints, or funding discontinuity—as a primary analytical object. A further 14 studies (16.7%) acknowledge these conditions partially. The remaining 66 studies (78.6%) make no substantive analytical engagement with CZ conditions whatsoever, despite many being set in environments where such conditions are demonstrably present. What is missing from the literature is therefore not only more studies from human-made conflict-affected countries, but studies that treat their recovery under critical-zone conditions as the primary analytical object and examine how these conditions fundamentally alter the nature, feasibility, and resilience requirements of PDHR.

This gap is distinct from Gap 1. A study may address a human-made disaster without addressing the critical-zone conditions it produces; conversely, a study may be set in a critical zone without explicitly examining the compounded operational constraints that define that zone as critical. The absence of such analytical engagement means that reconstruction practitioners operating in human-made critical zones—humanitarian engineers, NGO project managers, government reconstruction agencies, and international donors—have no evidence base specific to their operational environment. They are forced to adapt frameworks designed for natural disaster recovery in stable contexts, often with significant and poorly understood costs in terms of efficiency, appropriateness, and resilience [8,9].

5.3. Gap 3—Absence of a Contextually Calibrated Decision Framework for PDHR in Critical Zones

The third gap is the methodological consequence of Gaps 1 and 2. As demonstrated in Table 7a, existing studies evaluate PDHR strategies through criteria that are distributed across the corpus but never consolidated. Construction speed and time efficiency, structural performance, cost effectiveness, governance and institutional capacity, and financing availability each appear as primary evaluation dimensions, but in different studies and in isolation rather than within a single integrated framework. While these criteria are necessary for assessing the technical quality of reconstruction solutions, they are insufficient for critical zone contexts, where the primary challenge is not optimising performance under stable conditions but determining feasibility under persistent operational constraints.

Contextual criteria—including supply chain feasibility, security and access conditions, financial uncertainty and funding continuity, labour availability under displacement or conflict, land tenure security, and technology access under import restrictions—are present across the reviewed corpus, and several (notably governance and institutional capacity and financing availability) are applied as primary evaluation dimensions in individual studies. The gap is not that these criteria are absent, but that they are handled in isolation: each study foregrounds a subset while treating the remainder as background, and none integrates the full range of contextual and performance criteria within a single decision structure. This distinction—between criteria that are evaluated individually and a framework that combines them into a coherent basis for strategy selection—is the empirical foundation of Gap 3 and is directly evidenced by the primary-focus versus secondary-mention coding presented in Table 7a and aggregated in Table 7b.

This fragmentation is confirmed at the level of methodological tooling in Table 8a, which classifies the evaluation frameworks employed across the corpus. Structured multi-criteria decision-making (MCDM) approaches—the class of tools explicitly designed to integrate heterogeneous criteria into a single decision—appear in only three of the reviewed studies, and none of these is set in a human-made or acute critical zone (Types 2–6). The

corpus is instead dominated by recovery-modelling approaches (15 studies), concentrated overwhelmingly in stable and natural disaster settings. Across all evaluation-tool categories, 19 applications occur in Non-CZ contexts and only 6 in human-made critical zones, confirming that the methodological apparatus of the field—like its criteria—has been developed for and calibrated to stable environments.

Critically, this absence is most consequential precisely where contextual criteria dominate the reconstruction decision. As shown in Table 7a, the criteria evaluated as a primary focus cluster in Type 1 and Type 4 settings are almost entirely unaddressed in the acute critical-zone types—active-conflict (Type 2), confined (Type 6), and compound (Type 7) zones. Among the 84 included studies, none develops a decision framework in which contextual feasibility, rather than technical performance, serves as the primary evaluative logic, and none provides an integrated, multi-criteria basis for selecting the most appropriate construction strategy under critical-zone conditions. This fragmentation, and the resulting absence of a decision framework calibrated to contexts in which contextual criteria are decisive, constitutes Gap 3.

5.4. Research Directions

On the basis of the three gaps identified above, this review proposes the following directions for future research:

1. Empirical investigation of PDHR in human-made disaster contexts (Gap 1) within human-made critical zones (Gap 2). Future research should prioritise field-based, case-study, and programme-evaluation evidence from human-made disasters. Such evidence is essential for building an empirical base that reflects the full spectrum of real-world PDHR challenges.

2. Development of a holistic multi-criteria decision framework prioritising contextual factors (Gap 3). Future research should develop and empirically validate a decision framework that integrates contextual operational criteria—supply chain feasibility, security conditions, financial uncertainty, labour availability, and land tenure—as the primary evaluation dimensions alongside conventional performance-based criteria. The framework should be specifically designed for critical-zone conditions and validated through application in at least one human-made or compound critical zone context.

6. Conclusions

This study conducted a systematic literature review following PRISMA 2020 guidelines [28], searching the Web of Science and Scopus databases and screening 518 records across five rounds of eligibility assessment, yielding 84 peer-reviewed studies for qualitative synthesis. The review specifically examines PDHR, encompassing reconstruction strategic solutions, evaluation criteria, and decision frameworks, with a detailed investigation into how these decisions are shaped by, and are responsive to, the conditions that define critical zones: persistent instability, governance collapse, supply chain disruption, security constraints, and compounding operational uncertainty. Based on the findings, the following conclusions can be drawn.

The PDHR literature is dominated by natural disaster contexts. The overwhelming majority of the included studies address reconstruction following natural hazards—earthquakes, floods, cyclones, hurricanes, and tsunamis—while studies explicitly addressing human-made disasters, including post-conflict reconstruction (Gap 1), and those set in acute human-made critical environments as an explicit object of analysis (Gap 2) remain a small minority. This structural imbalance in the production of PDHR knowledge is particularly consequential given the growing global scale of conflict-driven housing reconstruction need.

In relation to decision-making, evaluation criteria are distributed across the literature but never consolidated into an integrated framework. Cost, construction time, structural performance, and sustainability are among the most frequently operationalised primary evaluation criteria, and several contextual criteria—notably governance and institutional capacity and financing availability—are also applied as primary dimensions in individual studies. The gap is therefore not that contextual criteria are absent, but that they are addressed in isolation: factors such as supply chain reliability, security conditions, labour availability, technology accessibility, and funding continuity are acknowledged across the corpus, yet no study integrates the full range of contextual and performance criteria into a single decision structure. This distinction—between criteria that are evaluated individually and a framework that combines them into a coherent basis for strategy selection—is the empirical foundation of Gap 3, directly evidenced by the primary-focus versus secondary-mention coding in Table 7a, aggregated in Table 7b, and corroborated by the evaluation-tool mapping in Table 8a, in which structured multi-criteria decision-making frameworks appear in only three studies and none within a human-made or acute critical zone.

Future research should prioritise the development of a contextually calibrated decision framework for PDHR in critical zones. A more comprehensive understanding of reconstruction decision-making requires evaluation approaches that integrate both performance-based and contextual criteria, specifically designed to operate under the conditions of persistent uncertainty, instability, and operational constraints that define critical zones. The substantive content of such a framework—grounded in the contextual dimensions identified in Table 7a, the CZ typology in Table 1, and the construction-solution gaps in Table 6a,b—is established by this review as a foundation for that future work.

This review makes four contributions to the PDHR literature: (1) a validated seven-type critical-zone typology with verifiable operational indicators; (2) a two-problem analytical framing distinguishing disaster source from reconstruction environment; (3) a differentiated mapping of primary and secondary decision criteria, construction solutions, and evaluation tools across 84 studies; and (4) an evidence-based identification of three interconnected research gaps that constrain the development of contextually calibrated PDHR decision frameworks.

This study is subject to several limitations. The review was restricted to English-language publications indexed in Web of Science and Scopus, with grey literature excluded. Consequently, evidence from humanitarian organisations, development agencies, and practitioners operating in conflict-affected regions may not have been fully captured. Future reviews may address this limitation through the inclusion of additional databases, non-English publications, and carefully selected grey literature sources. The analytical framework developed in this review—including the seven-type CZ typology and the primary-focus versus secondary-mention coding protocol—is itself a contribution to methodological development in this field, and its application and refinement in future empirical work is encouraged.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/buildings16153049/s1>, Table S1: PRISMA 2020 checklist.

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