



POSITION PAPER ON **ENERGY EFFICIENT HOUSES**

**Strengthening Rural
Communities Through Safe,
Sustainable, and Resilient
Infrastructure**



Research and Development Foundation (RDF)
With the Support of: **Kindernothilfe (KNH)**
Funded by: **German Federal Ministry for
Economic Cooperation and Development (BMZ)**



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By: Professor Jawed Shah

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TABLE OF CONTENTS

List of Abbreviations	3
Executive Summary	4
1. Introduction	5
2. Purpose and Scope of the Paper	6
3. Context & Problem Statement.....	6
3.1 Background of the Issue	6
3.2 Key Data and Trends	7
3.3 Geographic and National Context.....	8
3.4 Why Current Systems Are Failing.....	8
4. Position Statement.....	9
5. Evidence & Rationale.....	10
5.1 Data and Statistical Basis	10
5.2 Case Studies and Programme Experience	10
5.3 Existing Policies and Gaps	11
6. Proposed Solution / Policy Framework.....	12
6.1 Core Approach: Typology-Based Framework.....	12
6.2 Key Components of the Framework	12
6.3 How It Works in Practice.....	13
7. Priority Actions / Recommendations.....	13
8. Implementation Pathway	16
8.1 Short-Term Phase: Foundation and Standardization (0–12 Months).....	16
8.2 Medium-Term Phase: Scaling and Integration (1–3 Years).....	16
8.3 Long-Term Phase: Institutionalisation and Sustainability (3–5+ Years).....	16
8.4 Institutional Roles	17
8.5 Delivery Mechanisms.....	17
9. Role of Donors / Development Partners.....	17
9.1 Financing	17
9.2 Technical Assistance	17
9.3 Capacity Building	17
9.4 Why Their Involvement Is Critical	18
10. Expected Outcomes / Impact	18
10.1 What Will Change	18
10.2 Social Benefits	18
10.3 Economic Benefits	18
10.4 Climate Benefits.....	18

10.5 Scalability and Replication Potential	19
11. Conclusion / Call to Action.....	19
References.....	21

LIST OF ABBREVIATIONS

ABBREVIATION	FULL FORM
ACIAR	Australian Centre for International Agricultural Research
ARE	Alternative and Renewable Energy
BMZ	Federal Ministry for Economic Cooperation and Development (Germany)
DDMA	District Disaster Management Authority
DRR	Disaster Risk Reduction
ECBC	Energy Conservation Building Code
EU	European Union
FCBTK	Fixed Chimney Bull's Trench Kiln
GHAR	Green, Affordable, Resilient Housing (UNOPS Initiative)
HBFC	House Building Finance Company Limited
IEA	International Energy Agency
INGO	International Non-Governmental Organization
LGD	Local Government Department
MFI	Microfinance Institution
MHVRA	Multi-Hazard Vulnerability and Risk Assessment
NAP	National Adaptation Plan
NCCP	National Climate Change Policy
NEECA	National Energy Efficiency and Conservation Authority
NGO	Non-Governmental Organization
PDMA	Provincial Disaster Management Authority
PDNA	Post-Disaster Needs Assessment
PIU	Project Implementation Unit
PPP	Public-Private Partnership
RDF	Research and Development Foundation
SDGS	Sustainable Development Goals
SME	Small and Medium Enterprise
SPHF	Sindh People's Housing for Flood Affectees
TVET	Technical and Vocational Education and Training
UN	United Nations
UNICEF	United Nations Children's Fund
UNOPS	United Nations Office for Project Services
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

EXECUTIVE SUMMARY

Rural housing in Sindh has become one of the most urgent frontiers of climate adaptation, social protection, and inclusive development in Pakistan. The province's housing challenge is no longer defined only by a quantitative deficit of units; it is increasingly defined by the quality, resilience, and service integration of the housing stock that already exists and the systems through which new housing is planned and delivered. The catastrophic 2022 floods made this reality unmistakable. Nationally, around 780,000 houses were destroyed, and more than 1.27 million were partially damaged, with Sindh bearing approximately 83 percent of total housing damage (Government of Pakistan, 2022). These losses were not only the result of an extreme weather event; they were also the outcome of long-standing structural weaknesses in how rural housing is built, serviced, financed, and governed.

Pakistan's overall housing deficit is widely cited in the range of 10–12 million units, with an annual shortfall of around 400,000 units, and a large share of this burden falls on rural and peri-urban populations that remain outside formal housing finance and planning systems (House Building Finance Company Limited, 2024; Planning Commission, Government of Pakistan). In Sindh, the challenge is amplified by a multi-hazard environment that includes riverine and flash flooding, chronic waterlogging, salinity, drought, and increasingly severe heatwaves (PDMA Sindh, 2022a; 2022b; 2022c; 2025). Rural housing is also closely linked to sanitation, water management, energy access, livestock, and home-based livelihoods, meaning that weak housing conditions generate far-reaching consequences for health, education, productivity, and social stability.

This paper argues that incremental, fragmented, and reconstruction-led approaches are no longer adequate. Sindh requires a system-wide, typology-based climate-resilient rural housing framework that links housing design to hazard conditions and integrates WASH, passive cooling, decentralized energy, settlement-level infrastructure, inclusive financing, and local capacity development. The paper takes the position that resilient rural housing should be treated not as a narrow post-disaster shelter issue, but as a strategic pillar of climate adaptation and rural transformation.

Evidence from large-scale programmes in Sindh shows that owner-driven reconstruction, when combined with technical assistance, grant support, and basic service integration, can achieve meaningful scale and inclusion (World Bank, 2022; World Bank, 2024). However, these gains remain vulnerable unless they are institutionalized through provincial standards, typology-based guidance, delivery systems, quality assurance, and investment in local construction markets. The paper therefore proposes a framework anchored in minimum climate-resilient housing standards, typology-based planning, flood-safe sanitation, passive cooling, renewable energy readiness, settlement drainage, mason certification, resilient materials strategies, and coordinated delivery across government and development partners.

If adopted, this framework would improve safety, dignity, and health outcomes; reduce recurrent disaster losses; strengthen local economies through construction and service markets; and create a scalable model for resilience-oriented rural development. The strategic choice for Sindh is therefore clear: continue rebuilding

vulnerability after each shock, or invest in a durable rural housing system that reduces risk and supports long-term adaptation. This paper advocates strongly for the latter.

1. INTRODUCTION

Housing in rural Sindh is often discussed as a question of shelter need, but such a framing is no longer sufficient. In practice, the rural house is a multi-functional social, economic, and ecological unit. It is where families live, store food and seed, protect assets, shelter livestock, cook, rest, study, and often undertake home-based work. In many cases, it is also the first line of protection against floodwater, heat, wind, unsafe sanitation, and service disruption. When rural housing fails, the damage radiates far beyond the physical structure. It affects household health, children's ability to study, women's time burdens, social safety, livelihood continuity, and communities' capacity to recover from shocks.

This interdependence has become increasingly visible in Sindh, where climate-related hazards are intensifying and where the housing stock remains materially fragile and unevenly served. Recurrent floods, waterlogging, salinity, and extreme heat have exposed the limitations of conventional housing responses that focus narrowly on rebuilding structures without fully addressing drainage, sanitation, cooling, energy, or settlement context (Government of Pakistan, 2022; PDMA Sindh, 2025). As a result, many households remain trapped in a cycle of repeated damage and repair, while public and donor investments continue to be absorbed by reactive reconstruction rather than long-term resilience.

The policy challenge is therefore not only how to rebuild faster, but how to redefine rural housing as a climate-resilient development system. This paper seeks to contribute to that shift. It is written as a position paper, meaning that it does not merely summarize conditions; it advances an explicit policy argument. It contends that Sindh should move toward a typology-based climate-resilient rural housing framework that matches housing design and support packages to local hazard profiles and integrates housing with WASH, energy, settlement infrastructure, and local market systems.

The paper is especially relevant in the current policy moment. Pakistan's climate and adaptation frameworks already recognize the need for resilient infrastructure and community adaptation (Government of Pakistan, 2021; Government of Pakistan, 2023). Sindh has also accumulated significant practical experience through major post-flood recovery programmes and related technical initiatives (World Bank, 2022; World Bank, 2024; UNOPS, 2023). What remains missing is a coherent provincial framework that connects these strands into a durable, scalable, and inclusive rural housing agenda.

2. PURPOSE AND SCOPE OF THE PAPER

The purpose of this paper is to set out a clear and evidence-based policy position on the future of rural housing in Sindh. Specifically, it aims to:

1. establish why rural housing in Sindh should be treated as a strategic issue of climate adaptation, social protection, and rural development rather than as a narrow shelter concern;
2. document the scale and nature of the housing challenge through data, policy analysis, and programme evidence;
3. explain why current approaches remain insufficient despite important progress in reconstruction and recovery;
4. propose a practical policy framework capable of moving from fragmented interventions to a system-wide resilience model;
5. identify priority actions, institutional roles, and implementation pathways; and
6. clarify the critical role of government, technical institutions, private actors, and development partners in enabling this transition.

The paper focuses on rural Sindh, including flood-prone, waterlogged, coastal, arid, and peri-urban rural contexts. It places these within the broader national policy landscape, but its primary concern is the provincial housing system and the distinct ecological and institutional realities of Sindh. The intended audience includes provincial and federal policymakers, reconstruction and housing agencies, disaster management authorities, local government actors, development partners, technical institutions, civil society organizations, and practitioners working in climate resilience, WASH, energy, and local development.

The paper does not attempt to produce a full engineering code, a bill of quantities, or a district-by-district implementation plan. Instead, it provides a policy architecture and strategic rationale for the kind of framework that should now be adopted and operationalized.

3. CONTEXT & PROBLEM STATEMENT

3.1 Background of the Issue

Housing in Pakistan has long reflected uneven development patterns, institutional bias, and deep affordability constraints. Formal housing policy, finance, and planning have historically focused more strongly on urban areas, mortgage-based solutions, and formal construction systems, while rural housing has remained largely self-built, under-regulated, and weakly supported by public systems (Planning Commission, Government of Pakistan; House Building Finance Company Limited, 2024). For lower-income rural households, housing decisions are typically shaped not by access to formal finance or engineered designs, but by immediate affordability, available materials, inherited building practices, and local labour.

In Sindh, these structural characteristics interact with a particularly difficult climate and environmental setting. Large areas of the province are exposed to recurrent flooding, high water tables, salinity, and extreme heat, while other areas face chronic drought

and water scarcity (PDMA Sindh, 2022a; 2022b; 2022c; 2025). These risks are not abstract. They directly affect wall stability, roofing performance, sanitation safety, indoor thermal comfort, and the longevity of building materials. The result is that many rural houses in Sindh remain highly vulnerable not only to major disasters, but also to routine seasonal stresses.

At the same time, the rural house in Sindh is rarely just a shelter unit. It is embedded within a broader livelihood and settlement system. Space for livestock, grain storage, household enterprises, cooking, and water use is often integrated into the homestead. Weak housing conditions therefore expose not only residents but also productive assets and household coping systems. This is one reason why rural housing loss can be so economically and socially destabilizing even when unit costs appear modest.

3.2 Key Data and Trends

The national housing challenge provides the macro context for Sindh's rural housing crisis. Pakistan's overall housing deficit is widely estimated at around 10–12 million units, with annual new demand far outstripping formal supply (House Building Finance Company Limited, 2024; Planning Commission, Government of Pakistan, n.d.). Although the exact basis of backlog estimates has been questioned in policy debate, especially regarding methodology and repeated use of headline figures, the broad conclusion remains consistent: housing need is substantial, and poorer households are the least well served by existing systems (Nayab, 2022).

Sindh's housing profile sharpens this challenge further. According to the Provincial Census Report 2023, the province has a population exceeding 55.6 million, and housing conditions show strong rural–urban disparities in materials and service access (Pakistan Bureau of Statistics, 2023). In rural areas, 40.24 percent of outer walls are made of unbaked brick or mud, while 61.35 percent of roofs are made of wood or bamboo. These materials can be locally affordable and climatically appropriate in some settings if well detailed, but in the absence of moisture control, anchoring, structural reinforcement, and regular maintenance, they are highly vulnerable to floodwater, dampness, and wind damage (Pakistan Bureau of Statistics, 2023).

Service indicators deepen the concern. Rural households in Sindh continue to face lower access to electricity, higher dependence on firewood, and weaker sanitation coverage than urban households (Pakistan Bureau of Statistics, 2023). This means that housing vulnerability is not simply a matter of walls and roofs; it is structurally linked to energy poverty, unsafe sanitation, and higher environmental health risks.

The 2022 floods are perhaps the most compelling statistical demonstration of the problem. Nationally, approximately 780,000 houses were destroyed and more than 1.27 million were damaged, with Sindh accounting for the large majority of housing losses (Government of Pakistan, 2022). World Bank documentation on Sindh's post-flood housing response indicates that nearly 1.7 million houses in the province were either partially damaged or fully destroyed (World Bank, 2022). These figures illustrate both the scale of exposure and the inadequacy of housing systems that are repeatedly unable to absorb or withstand shocks.

3.3 Geographic and National Context

Sindh's climate and environmental profile makes uniform housing approaches inappropriate. Floodplain and irrigation-command areas experience inundation, waterlogging, and rising damp. Coastal districts face saline intrusion, storm risk, and corrosive conditions. Arid areas face drought, water scarcity, and heat stress. Peri-urban rural settlements increasingly face heat accumulation, drainage blockage, and informal expansion without corresponding infrastructure (PDMA Sindh, 2022a; 2022b; 2022c; 2025).

Waterlogging is a major example of why context matters. Around 38.5 percent of Sindh's irrigated area has groundwater within 1.5 metres of the surface, creating persistent dampness and undermining foundations, walls, and sanitation systems (van Steenberg, 2020). In high-water-table environments, conventional pit sanitation can contaminate groundwater and fail during flood periods, while rising damp accelerates deterioration in earthen or low-fired materials. Similarly, in coastal and saline areas, salt attack can degrade masonry, mortar, metal fasteners, and finishes over time (Australian Centre for International Agricultural Research, 2021; Ashraf et al., 2022). Heat is another defining constraint. PDMA Sindh's heatwave management guidance documents very high temperatures across parts of the province, including extreme summer peaks that make poor indoor environments dangerous to health and daily functioning (PDMA Sindh, 2025). Under these conditions, passive cooling, ventilation, shade, and reflective surfaces are not optional "green" features; they are core resilience and health measures.

National policy has begun to acknowledge these realities. The Updated National Climate Change Policy (2021) emphasizes climate-resilient development, risk-informed planning, and resilience-building for vulnerable populations (Government of Pakistan, 2021). The National Adaptation Plan (2023) similarly frames adaptation around vulnerable communities and the need for integrated approaches (Government of Pakistan, 2023). Yet these policy commitments have not yet been translated into a robust rural housing framework for Sindh.

3.4 Why Current Systems Are Failing

Current approaches are failing not because there has been no action, but because action has remained partial, fragmented, and insufficiently institutionalized. Several structural weaknesses stand out.

First, there is a continued urban bias in housing policy and finance. Formal housing instruments rarely meet the realities of low-income rural households, who build incrementally, often on informal tenure arrangements, and cannot access conventional mortgage products (House Building Finance Company Limited, 2024; Planning Commission, Government of Pakistan).

Second, disaster recovery approaches tend to prioritize reconstruction outputs rather than wider settlement resilience. This can result in houses being repaired or rebuilt without full attention to drainage, sanitation, cooling, or local service systems. Even strong post-flood programmes do not automatically solve the deeper challenge of how

to make resilience standard practice rather than exceptional project design (World Bank, 2022; World Bank, 2024).

Third, policy-to-practice translation remains weak. Climate adaptation policies, energy efficiency codes, and hazard planning documents exist, but these are not yet consistently translated into field-level guidance, simplified standards, or coordinated delivery mechanisms for rural housing (Government of Pakistan, 2021; National Energy Efficiency and Conservation Authority, 2023; PDMA Sindh, 2022a; 2022b; 2022c).

Fourth, the local construction ecosystem is underdeveloped. There are too few trained masons and technicians familiar with resilient detailing, insufficient quality assurance, and weak supply chains for materials and services appropriate to different hazard zones (UNOPS, 2023).

Finally, vulnerable households still face barriers related to documentation, tenure, affordability, and access to services. These barriers make it possible for those most at risk to remain excluded even when large public programmes are underway (World Bank, 2024).

4. POSITION STATEMENT

This paper takes a clear and explicit position: Sindh must move from fragmented reconstruction to a system-wide, typology-based climate-resilient rural housing framework. Current approaches, while important in immediate recovery contexts, remain too narrow to address the structural and recurring nature of rural housing vulnerability in the province. Housing in Sindh cannot be treated simply as a matter of replacing damaged units after disaster events. It must instead be approached as a strategic system linking shelter, climate adaptation, infrastructure, health, energy, and livelihoods.

The core problem with the prevailing model is that it is still largely reactive and sectorally fragmented. Housing interventions are often designed around unit completion or damage repair rather than resilience performance and settlement integration. Yet in rural Sindh, a house is only as resilient as the environment around it. A structurally improved dwelling that still sits in standing water, lacks safe sanitation, overheats in summer, or remains disconnected from energy and service systems is not truly resilient. Nor is a programme resilient if it depends entirely on exceptional post-disaster funding cycles rather than embedded public standards and institutional practice.

This paper therefore argues that Sindh should adopt a policy-driven resilience model based on three principles. First, housing must be risk-informed, meaning that design and support packages should match local hazard and environmental conditions rather than rely on generic designs. Second, housing must be integrated, meaning that structure, WASH, passive cooling, decentralized energy, and settlement infrastructure are treated as one functional system. Third, housing must be inclusive and scalable, meaning that standards, finance, delivery systems, and local markets must work not only for formal beneficiaries of emergency programmes, but for broader rural populations over time.

This is not a theoretical or aspirational proposition. It is supported by the scale of documented losses in Sindh, the realities of provincial hazard exposure, the demonstrated performance of integrated recovery programmes, and the growing body of national climate policy that already supports resilient development (Government of Pakistan, 2022; Government of Pakistan, 2021; Government of Pakistan, 2023; World Bank, 2024). What is now required is the institutional and policy shift to turn these lessons into a coherent rural housing system.

5. EVIDENCE & RATIONALE

The case for a new rural housing framework in Sindh rests on a strong combination of empirical evidence, implementation experience, and policy analysis. Together, these demonstrate not only the seriousness of the challenge but also the practicality of moving toward a more resilient housing model.

5.1 Data and Statistical Basis

The first layer of evidence is quantitative. Pakistan's large and persistent housing deficit provides the macro-development backdrop, while Sindh's hazard profile and service indicators reveal why rural housing in the province should be treated as a special policy concern (House Building Finance Company Limited, 2024; Planning Commission, Government of Pakistan, n.d.; Pakistan Bureau of Statistics, 2023). The 2022 flood damage figures show what happens when structurally and environmentally weak housing systems encounter extreme climate stress at scale (Government of Pakistan, 2022).

Census data reveal the fragility of much rural housing stock in Sindh. High dependence on mud and unbaked walls, bamboo or timber roofs, poor sanitation coverage, and lower electricity access indicate that many households live in structures that are both materially weak and weakly serviced (Pakistan Bureau of Statistics, 2023). This matters because resilience is not determined by the shell alone; it is shaped by the interaction of housing and services. A poorly ventilated mud house without drainage or safe sanitation is vulnerable in more ways than one.

Environmental evidence adds further weight. Waterlogging and shallow groundwater constrain foundations and sanitation in large parts of the province (van Steenberg, 2020). Salinity creates special durability challenges in southern and coastal zones (Australian Centre for International Agricultural Research, 2021; Ashraf et al., 2022). Heatwave exposure increases the importance of passive cooling and thermal design (PDMA Sindh, 2025). These conditions mean that resilient rural housing in Sindh must be designed for multiple stressors simultaneously.

5.2 Case Studies and Programme Experience

The second layer of evidence comes from practice. The Sindh Flood Emergency Housing Reconstruction Project is especially important because it demonstrates that large-scale, owner-driven, grant-supported reconstruction with technical assistance can be implemented in Sindh (World Bank, 2022). Subsequent expansion of support

under additional financing indicates both the magnitude of need and the viability of scaling delivery systems (World Bank, 2024).

This experience is valuable for several reasons. First, it shows that large numbers of households can be reached through an owner-driven approach, which helps preserve household agency and can reduce delivery bottlenecks. Second, it demonstrates the feasibility of integrating WASH into housing support rather than treating it as a separate sectoral add-on. Third, it shows the importance of targeted measures for women-headed households and vulnerable groups, including support related to financial inclusion and accessibility (World Bank, 2024).

Technical capacity-building initiatives provide complementary evidence. The GHAR initiative supported by UNOPS emphasizes green, resilient, and affordable housing and has included capacity-building for masons and institutions in Pakistan. Its relevance lies in showing that resilient housing cannot scale without strengthening the knowledge and practice of the people who actually build it (UNOPS, 2023).

There is also growing practice-based evidence from climate-resilient sanitation in Pakistan's flood-prone areas, where raised sanitation systems and adaptive design measures have shown the possibility of sustaining WASH functionality during and after flood events (Sanitation Learning Hub & UNICEF Pakistan, 2022). This supports the argument that resilient housing and resilient sanitation should be jointly designed and funded.

5.3 Existing Policies and Gaps

The third layer of evidence concerns policy. Pakistan's climate policy framework is increasingly supportive of resilience-oriented development. The National Climate Change Policy (2021) promotes climate-resilient planning, risk-informed development, and adaptation measures for vulnerable communities (Government of Pakistan, 2021). The National Adaptation Plan (2023) further emphasizes community resilience, sectoral adaptation, and integrated approaches (Government of Pakistan, 2023). The Energy Conservation Building Code (ECBC-2023) gives a nationally endorsed reference point for passive design, energy efficiency, and building performance (National Energy Efficiency and Conservation Authority, 2023).

At the provincial level, PDMA Sindh's planning documents already provide multi-hazard information that could support a typology-based housing system (PDMA Sindh, 2022a; 2022b; 2022c; 2025). Yet important gaps remain. There is still no standardized rural climate-resilient housing package for Sindh, no province-wide typology-based design framework, no mature coordination system integrating housing with WASH, drainage, and energy, and no sufficiently developed financing and skills ecosystem for long-term resilience.

Taken together, these data, case studies, and policy gaps create a compelling rationale for moving beyond project-by-project housing interventions toward a coherent provincial policy framework.

6. PROPOSED SOLUTION / POLICY FRAMEWORK

The proposed solution is a typology-based climate-resilient rural housing framework that treats housing as part of a wider resilience system rather than as a stand-alone construction activity. The rationale for this approach is straightforward: the housing risks faced by rural households in Sindh vary substantially by geography, environment, and settlement form, and these risks cannot be addressed through a single design model or a single delivery logic.

6.1 Core Approach: Typology-Based Framework

Under this framework, housing interventions would be organized around a set of practical settlement and hazard typologies, each linked to design standards, service packages, and implementation guidance. At minimum, the framework should cover:

- **Floodplain and waterlogged typologies**, where elevated plinths, moisture control, drainage, and raised sanitation are critical (Government of Pakistan, 2022; van Steenberg, 2020);
- **Coastal saline typologies**, where salt-resistant detailing, corrosion management, and elevated structures are especially important (Australian Centre for International Agricultural Research, 2021; Ashraf et al., 2022);
- **Arid and drought-prone typologies**, where thermal comfort, water storage, and low-water service options matter more strongly (PDMA Sindh, 2022c);
- **Peri-urban heat and informality typologies**, where drainage, passive cooling, and layout planning are central (PDMA Sindh, 2025; National Energy Efficiency and Conservation Authority, 2023).

The purpose of typology is not to overcomplicate rural housing policy; it is to make it more realistic and effective. A house in a floodplain village cannot be expected to perform under the same logic as one in an arid district or a saline coastal setting.

6.2 Key Components of the Framework

The framework should consist of five mutually reinforcing components.

1. Minimum Climate-Resilient Housing Package: This package should define the minimum performance and service requirements expected in supported rural housing. It should include plinth and moisture control measures, safe structural detailing, flood-resilient sanitation, passive cooling, basic safe wiring and solar readiness, and accessibility measures where needed (World Health Organization, n.d.; Sanitation Learning Hub & UNICEF Pakistan, 2022; National Energy Efficiency and Conservation Authority, 2023; World Bank, 2024).

2. Settlement-Level Resilience Integration: Housing cannot be resilient if the settlement remains unsafe. Programmes should therefore include micro-drainage, safe water access, pathway improvement, and hazard-aware siting, particularly in waterlogged or flood-prone zones (Government of Pakistan, 2022; van Steenberg, 2020).

3. Market Systems and Local Capacity Development: A resilient housing framework must be supported by trained masons, technical supervision, resilient materials guidance, and local supply chains for construction and energy services. This is essential for both scale and sustainability (UNOPS, 2023).

4. Inclusive and Blended Financing: The framework should include grants for highly vulnerable households, microfinance for incremental improvement, and financing for shared infrastructure. It should also build in support for women-headed households and others who face barriers to formal access (House Building Finance Company Limited, 2024; World Bank, 2024).

5. Institutional Coordination: Implementation must be coordinated across housing agencies, PDMA/DDMAs, local government, WASH agencies, energy providers, and finance actors. Without coordination, resilience investments will continue to be fragmented.

6.3 How It Works in Practice

In operational terms, the framework would begin with district and settlement risk screening using PDMA data and local vulnerability information. Once settlements are classified by typology, households and communities would receive design packages and support mechanisms suited to their context. Delivery would proceed primarily through an owner-driven model backed by technical supervision, staged payments, and compliance checks. Settlement-level infrastructure would be introduced where required to reduce environmental risk. Local builders would be trained and certified, and financial institutions would be engaged to support non-beneficiary households in making incremental upgrades over time.

The framework is therefore not just a design concept. It is a delivery model, a standards model, and a governance model combined.

7. PRIORITY ACTIONS / RECOMMENDATIONS

To translate the framework into policy and practice, Sindh should adopt a sequence of actionable measures. The most important are set out below.

1. Issue a Provincial Rural Climate-Resilient Housing Standard.

This should define the minimum design and service requirements for supported rural housing.

Lead: Provincial housing/reconstruction authority.

Timeline: 0–12 months.

A standard is necessary to move beyond inconsistent project designs and align implementation with climate policy and building performance principles (Government of Pakistan, 2021; National Energy Efficiency and Conservation Authority, 2023).

2. Establish a Typology-Based Planning and Design Protocol.

This should formally classify settlements into major hazard and environmental typologies and link each typology to design menus and service packages.

Lead: PDMA Sindh and housing authority.

Timeline: 0–12 months for design, 12–24 months for mainstreaming.

This would ensure design decisions are based on actual hazard conditions rather than uniform assumptions (PDMA Sindh, 2022a; 2022b; 2022c).

3. Make Flood-Safe Sanitation a Mandatory Housing Component.

All supported housing should include context-appropriate sanitation solutions.

Lead: Housing authority, WASH agencies, local government.

Timeline: Immediate.

This is necessary because sanitation failure is one of the key hidden vulnerabilities in flood-prone and high-water-table settings (World Health Organization, n.d.; Sanitation Learning Hub & UNICEF Pakistan, 2022).

4. Mainstream Passive Cooling and Thermal Resilience.

Simplified ECBC-based guidance should be adapted for rural housing.

Lead: NEECA, technical institutions, housing authority.

Timeline: 0–12 months.

Heat resilience is now essential in Sindh's housing system (PDMA Sindh, 2025).

5. Integrate Solar Readiness and Safe Wiring.

Housing designs should be compatible with decentralized energy systems.

Lead: Energy Department, housing agencies, private providers.

Timeline: Immediate design integration; 1–3 years for wider market strengthening.

This supports lighting, cooling, and household productivity (Pakistan Bureau of Statistics, 2023).

6. Launch a Mason Certification and Quality Assurance Programme.

Training and certification should be institutionalized through TVET and technical partners.

Lead: TVET authorities, technical institutions, housing authority.

Timeline: 0–12 months for pilots; 1–3 years for expansion.

This would address one of the most immediate bottlenecks to quality delivery (UNOPS, 2023).

7. Develop a Resilient and Lower-Emission Materials Strategy.

This should promote suitable materials, improved kiln technologies, and context-sensitive application of stabilised earth systems.

Lead: Industry and housing departments, universities, private sector.

Timeline: 1–2 years for pilots and guidance.

This is important both for resilience and for environmental performance (Bashir et al., 2023; Sheikh et al., 2024; Hasnain et al., 2026; Shiferaw, 2025; International Energy Agency, 2023).

8. Create Inclusive Financing Pathways.

A mix of grants, microfinance, and blended financing should be established.

Lead: Finance Department, banks/MFIs, development partners.

Timeline: 0–18 months for product development.

This is essential because conventional housing finance does not meet rural affordability realities (House Building Finance Company Limited, 2024; Nayab, 2022).

9. Address Documentation and Eligibility Constraints.

Mechanisms should be introduced to reduce exclusion related to documentation or informal tenure.

Lead: Board of Revenue, housing authority, social welfare systems.

Timeline: Immediate incorporation in programme design; 1–3 years for system reform.

This is crucial for reaching those most at risk (World Bank, 2024).

10. Integrate Settlement Drainage and Safe Access into Housing Support.

Housing programmes should include drainage and pathway investment in high-risk areas.

Lead: Local Government Department, district administrations.

Timeline: pilot within 12 months; scale over 1–5 years.

This responds directly to the environmental context of waterlogging and flood exposure (van Steenberg, 2020; Government of Pakistan, 2022).

11. Align Housing with PDMA Risk Governance.

Risk mapping, early warning, and disaster planning should be embedded in housing delivery.

Lead: PDMA/DDMAs with housing agencies.

Timeline: 0–12 months.

This ensures resilience is tied to existing disaster governance rather than parallel systems (PDMA Sindh, 2022a; 2022b; 2022c).

12. Establish a Monitoring, Learning, and Grievance Mechanism.

The system should track not only outputs but resilience and inclusion outcomes.

Lead: Housing authority and programme management units.

Timeline: 0–12 months.

This is essential for accountability and adaptation of the framework over time (World Bank, 2022; World Bank, 2024).

8. IMPLEMENTATION PATHWAY

A transition of this kind requires a staged approach that builds institutional foundations first, then expands implementation, and finally embeds resilience into the permanent provincial system.

8.1 Short-Term Phase: Foundation and Standardization (0–12 Months)

The short-term phase should focus on creating the policy and technical infrastructure for the framework. This includes issuing standards, defining typologies, developing simplified design manuals, integrating PDMA data into planning, launching pilot training and QA systems, and establishing monitoring and grievance arrangements. This phase is about moving from broad policy recognition to practical operational tools (Government of Pakistan, 2021; Government of Pakistan, 2023).

8.2 Medium-Term Phase: Scaling and Integration (1–3 Years)

The medium-term phase should expand implementation into priority districts and systematically integrate WASH, energy, and settlement infrastructure with housing delivery. It should also expand mason certification, support resilient material supply chains, and roll out inclusive finance products. This is the phase in which the framework begins to function as a real delivery system rather than a pilot concept (World Bank, 2022; UNOPS, 2023).

8.3 Long-Term Phase: Institutionalisation and Sustainability (3–5+ Years)

The long-term phase should embed the framework within provincial planning, financing, and regulatory systems. Standards should become part of routine public investment and programme appraisal. Training should be integrated into TVET structures. Financial products for incremental upgrading should become more widely

available. Data systems should support learning and refinement. At this stage, resilient rural housing should become standard provincial practice rather than a special project.

8.4 Institutional Roles

The housing or reconstruction authority should lead on standards, coordination, and quality assurance. PDMA Sindh and DDMAAs should lead on risk screening, hazard integration, and preparedness linkages. Local government should lead on settlement infrastructure and WASH integration. Technical institutions should support standards development, training, and materials testing. Financial institutions should support financing access. Communities should remain central through owner-driven construction and maintenance. Development partners should support financing, technical assistance, and institutional strengthening (World Bank, 2022; PDMA Sindh, 2022a; 2022b; 2022c).

8.5 Delivery Mechanisms

The most suitable delivery mechanism is a strengthened owner-driven approach, where households are supported through grants or finance, technical guidance, staged inspections, and integrated service packages. This should be paired with settlement-level investment and market strengthening, including trained masons and local materials/service providers. Such an approach balances scale, household ownership, and contextual flexibility.

9. ROLE OF DONORS / DEVELOPMENT PARTNERS

Development partners have a central role in enabling this transition. Their relevance lies not only in financing construction, but in helping build the systems that make resilience durable and scalable.

9.1 Financing

Donors can provide capital for resilient housing, settlement drainage, WASH integration, passive cooling adaptation, and inclusion-focused financial mechanisms. They can also help mobilize climate finance by positioning rural housing as a major adaptation investment. This matters because the scale of need is too large to be met through domestic fiscal means alone, especially in a post-disaster environment (Government of Pakistan, 2022; World Bank, 2024).

9.2 Technical Assistance

Donors can support typology development, standards design, monitoring systems, and translation of climate policy and ECBC guidance into field-appropriate tools. This is especially important in bridging the gap between policy and implementation and in ensuring international good practice is adapted to local conditions (Government of Pakistan, 2021; National Energy Efficiency and Conservation Authority, 2023).

9.3 Capacity Building

Development partners can support mason certification, institutional strengthening, market development, and community awareness. Initiatives like GHAR show the value of combining technical housing knowledge with institution-building and field-level skills development (UNOPS, 2023).

9.4 Why Their Involvement Is Critical

Donor engagement is critical because it helps de-risk innovation, accelerate system reform, promote inclusion, and link emergency recovery to long-term adaptation. Without donor support, interventions are more likely to remain reactive and fragmented. With donor support, the province has a real opportunity to move from isolated reconstruction to a durable resilience system (World Bank, 2022; World Bank, 2024).

10. EXPECTED OUTCOMES / IMPACT

If adopted, the proposed framework would change both what is built and how the rural housing system functions.

10.1 What Will Change

Housing will shift from being delivered as a stand-alone structure to being delivered as part of a resilience package that includes sanitation, drainage, passive cooling, and energy readiness. Design will become risk-informed rather than generic. Inclusion barriers will be reduced. And investment will increasingly be oriented toward preventing future losses rather than repeatedly repairing them.

10.2 Social Benefits

Socially, the framework would improve safety, privacy, dignity, and health for rural households. Better sanitation and water management would reduce exposure to disease. Better thermal performance would improve well-being, especially during extreme heat. More inclusive programme design would improve access for women-headed households, people with disabilities, and those facing documentation barriers (World Health Organization, n.d.; World Bank, 2024).

10.3 Economic Benefits

Economically, resilient housing reduces repeated loss and repair costs, supports local employment in construction and energy services, and strengthens household productivity through better living and working environments (Government of Pakistan, 2022; UNOPS, 2023). Improved financing pathways would also allow more households to invest incrementally in resilience rather than waiting for future disasters or donor assistance.

10.4 Climate Benefits

From a climate perspective, the framework directly supports adaptation by improving the performance of housing in floods, waterlogging, salinity, drought, and heat stress (Government of Pakistan, 2021; Government of Pakistan, 2023). Passive cooling and improved materials choices can also reduce environmental burden and improve long-term resource efficiency (National Energy Efficiency and Conservation Authority, 2023; Shiferaw, 2025; International Energy Agency, 2023).

10.5 Scalability and Replication Potential

Because the framework builds on owner-driven models, existing recovery platforms, and official hazard data, it has strong scaling potential within Sindh (World Bank, 2022; World Bank, 2024). Its typology-based logic also gives it replication value in other multi-hazard provinces and comparable settings beyond Pakistan.

11. CONCLUSION / CALL TO ACTION

Sindh's rural housing challenge is not a narrow shelter issue to be revisited only after each disaster. It is a structural issue of climate adaptation, rural inequality, public health, and development planning. The evidence in this paper makes clear that vulnerability is produced not only by hazard exposure, but by the persistent interaction of weak construction, unsafe sanitation, shallow groundwater, salinity, inadequate cooling, uneven energy access, and fragmented institutions (Government of Pakistan, 2022; Pakistan Bureau of Statistics, 2023; van Steenberg, 2020).

For this reason, the province can no longer afford to rely on a model that simply repairs or reconstructs houses without transforming the conditions that make them fragile in the first place. What is needed is a shift from rebuilding units to building a system: a system of standards, typologies, finance, technical capacity, settlement planning, and coordinated implementation.

This paper has argued that such a transition is both necessary and feasible. Necessary, because the climate, environmental, and service realities of rural Sindh are becoming more severe. Feasible, because the province already possesses many of the ingredients needed for transformation: post-flood delivery experience, official hazard data, policy anchors in national climate frameworks, early technical initiatives, and growing recognition among development partners that resilience must be built across sectors (Government of Pakistan, 2021; Government of Pakistan, 2023; World Bank, 2024; UNOPS, 2023).

The Government of Sindh should therefore move decisively to adopt a typology-based climate-resilient rural housing framework and integrate it into public planning and recovery systems. Development partners should support this not as an isolated housing project, but as a strategic resilience investment. Technical institutions should help refine designs, materials, and training. Financial institutions should expand access to incremental upgrading finance. And communities should remain central through owner-driven implementation and local accountability.

The alternative is well known: repeated losses, repeated expenditures, and repeated vulnerability. The opportunity is equally clear: safer homes, healthier settlements,

stronger local economies, and a provincial housing system better aligned with the realities of climate change.

The time to act is now! Sindh has both the evidence and the institutional opening to move from rebuilding vulnerability to building resilience. Climate-resilient rural housing should become a cornerstone of the province's adaptation, recovery, and inclusive development agenda.

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