

Sustainability and Restorativeness of Temporary Shelters for Displaced Populations in Western Visayas

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ABSTRACT

Disaster displacement in Western Visayas has exposed persistent deficiencies in temporary shelters, particularly in environmental performance, privacy, cultural fit, and conditions that may support psychological restoration. This developmental mixed-methods study used a sequential, evidence-to-design structure: a quantitative needs assessment, an experience-based qualitative inquiry, architectural design translation, and technical review. The main survey included 160 respondents, while a separate pilot test involved 30 disaster-affected residents. The instrument obtained an S-CVI/Ave of 0.80 and internal-consistency coefficients of 0.8926 for sustainability, 0.9282 for restorativeness, and 0.9473 overall. Survey findings indicated high to very high needs across sustainability and restorative-environment dimensions. These findings informed a proposed shelter framework grounded in systems theory, vulnerability theory, Attention Restoration Theory, and the Filipino concepts of *ginhawa*, *pakikipagkapwa*, and *bayanihan*. The resulting architectural proposal emphasized adaptable space, climate-responsive design, local materials, privacy, accessibility, community connection, and reusable assembly. The framework was proposed rather than proven effective; structural, fire, thermal, accessibility, cost, prototype, and post-occupancy evaluations remained necessary before implementation.

Keywords: Architecture, Temporary Shelter, Sustainability, Locally Participatory, Restorative

INTRODUCTION

Rapid urbanization presents a complex triad of challenges to environmental sustainability, social equity, and economic development (Ali et al., 2024). Central to these challenges is the climate crisis; human-induced greenhouse gas emissions are fundamentally altering global weather patterns, leading to a surge in the frequency and intensity of disasters worldwide (IPCC, 2023). Recent years have seen floods, storms, and earthquakes devastate housing globally, exposing systemic failures in post-disaster recovery planning. Temporary shelters are intended to bridge the gap between emergency chaos and permanent resettlement, providing a foundation for United Nations Sustainable Development Goal (SDG) 11 (Sustainable Cities and Communities) by ensuring access to safe and affordable housing. Ideally, these structures offer stability and dignity (Montalbano & Santi, 2023); however, the transition from theory to practice remains fraught with humanitarian and ecological risks across the globe.

In international practice, persistent design flaws, such as inadequate insulation, poor ventilation, and structural instability, often compromise the effectiveness of these emergency shelters (Hosseini et al., 2021). These deficiencies do more than just cause physical discomfort; they actively undermine SDG 3 (Good Health and Well-being) by harming the physical and psychological health of displaced populations. Furthermore, the lack of privacy and sanitation in overcrowded global encampments disproportionately affects women and children, highlighting a widespread failure to uphold SDG 5 (Gender Equality) and SDG 6 (Clean Water and Sanitation) (Di Bucci et al., 2023).

Global precedents distinctly illustrate this struggle between rapid deployment and long-term livability. While Japan successfully utilized localized wooden shelters to boost the regional economy and explored multi-

story shipping containers to manage spatial constraints, countries like Peru continue to report severe failures in security and resident well-being (Acevedo-De-los-Ríos et al., 2024). The prolonged use of these "temporary" structures worldwide reveals a critical mismatch between short-term designs and long-term recovery realities. From an environmental perspective, the global reliance on unsustainable materials and the widespread absence of end-of-life reuse planning contradicts SDG 12 (Responsible Consumption and Production), leading to significant ecological degradation across international disaster sites (Kim et al., 2025).

In the Philippines, these global architectural and humanitarian challenges are intensified by extreme geographical vulnerability. Ranked first in the 2022 World Risk Index, the country faces an average of 20 tropical cyclones annually, alongside constant seismic and volcanic threats (Bankoff, 2023). Following the 2025 earthquakes in Cebu, the Mt. Kanlaon eruption, and Typhoons Tino and Uwan, the national demand for temporary housing has reached a breaking point. While national agencies like the National Disaster Risk Reduction and Management Council (NDRRMC) and the Department of Human Settlements and Urban Development (DHSUD) oversee deployment, domestic implementation frequently prioritizes rapid construction over climate suitability. This "speed-over-substance" approach often results in the creation of substandard "tent cities" devoid of water, electricity, or basic ground cover, which subsequently forces evacuees to remain trapped in overcrowded school buildings and community gyms (Civil Defense, 2025). Such interventions provide mere "roofs" rather than actual "homes," failing to meet the holistic requirements of human dignity.

The governance of these domestic interventions further complicates the issue. Philippine urban and disaster development is largely shaped by top-down planning, where critical decisions are concentrated among technical experts, often overlooking the local realities of informal or disaster-affected settlements (Stiftel, 2021). Conversely, while bottom-up approaches prioritize SDG 17 (Partnerships for the Goals) through community participation, they often struggle with institutional scalability and multi-agency coordination on a national scale (Semeraro et al., 2020). There is an urgent national need to integrate displaced communities into every phase of the housing lifecycle, from site selection to monitoring, to avoid culturally incompatible or unsustainable designs (Killemsetty & Patel, 2024).

Despite the critical role of temporary housing in regional disaster recovery, a significant research gap exists in the localized synthesis of ecological sustainability and social inclusivity. Current literature and localized humanitarian practices (such as those documented by CARE-Philippines) reveal several critical omissions. These include a distinct lack of integrative models that combine regional ecological sustainability (SDG 12) with local cultural appropriateness; insufficient research on cost-effective, durable materials that can survive the harsh Philippine climate while remaining reusable; and the absolute absence of a community-informed framework that identifies specific spatial requirements based on the lived experiences of displaced Filipinos. While temporary shelter remains a staple of recovery, existing baseline models fail to address the long-term, context-specific needs of high-risk regions like Western

Visayas. This study sought to bridge this regional gap by identifying the precise spatial and sustainability requirements of local temporary shelters and proposing a comprehensive, localized architectural design framework. The ultimate goal is to develop localized solutions that move beyond institutional "emergency storage" toward habitable, sustainable, and restorative environments that support both immediate recovery and longterm resilience for the displaced populations of Western Visayas.

Statement of the Problem

This study aimed to design a sustainable and restorative temporary shelter for displaced population in Western Visayas during disasters. Specifically, this completed developmental study aimed to answer the following questions:

1. What is the extent of needs of temporary shelters to be sustainable for displaced populations during calamities in terms of environmental system, social system, economic system, and resilience and

adaptive capacity?

2. What is the level of perceived restorativeness of sustainable temporary shelter in terms of being away (escape from stress), extent (scope and connectivity), fascination (effortless attention), and compatibility (fit with needs and culture)?
3. How can the identified sustainability needs and dimensions of restorativeness be integrated into the architectural design framework for temporary shelters?
4. What is the viable design for sustainable and restorative temporary shelter for displaced population?

Framework of the Study

The study was grounded in systems theory, vulnerability theory, and Attention Restoration Theory. Systems theory treated temporary shelter as part of an interdependent disaster-response system in which site conditions, services, social relations, governance, and household recovery affected one another. Vulnerability theory explained how exposure to hazards interacted with pre-existing social, economic, physical, and institutional conditions to shape displacement risk and adaptive capacity. Attention Restoration Theory provided the restorative-environment basis. Being away referred to perceived distance from disaster-related stressors; extent referred to coherence, connectedness, and sufficient scope; fascination referred to environmental qualities that held attention without effort; and compatibility referred to the fit between the setting and residents' needs, abilities, routines, and culture. These dimensions were treated as perceived design needs, not as evidence that a shelter caused trauma recovery.

Three Filipino concepts culturally grounded the design translation. *Ginhawa* referred to physical ease, emotional relief, ventilation, daylight, thermal comfort, privacy, and freedom from crowding. *Pakikipagkapwa* referred to shared personhood and respectful social connection, indicated by inclusive communal areas, legible clusters, mutual visibility, and spaces that supported family and community interaction without sacrificing privacy. *Bayanihan* referred to collective action and mutual assistance, indicated by participatory planning, locally understandable assembly, shared construction tasks, and repairable components. The conceptual framework distinguished conceptual relationships from the research workflow. Contextual hazards and vulnerabilities shaped stakeholder need. Quantitative and qualitative evidence was interpreted through sustainability, restoration, culture, and inclusion, then translated into site, spatial, material, structural, WASH, privacy, and accessibility requirements. Technical and user validation was intended to test those requirements before the final shelter framework could be recommended for implementation.

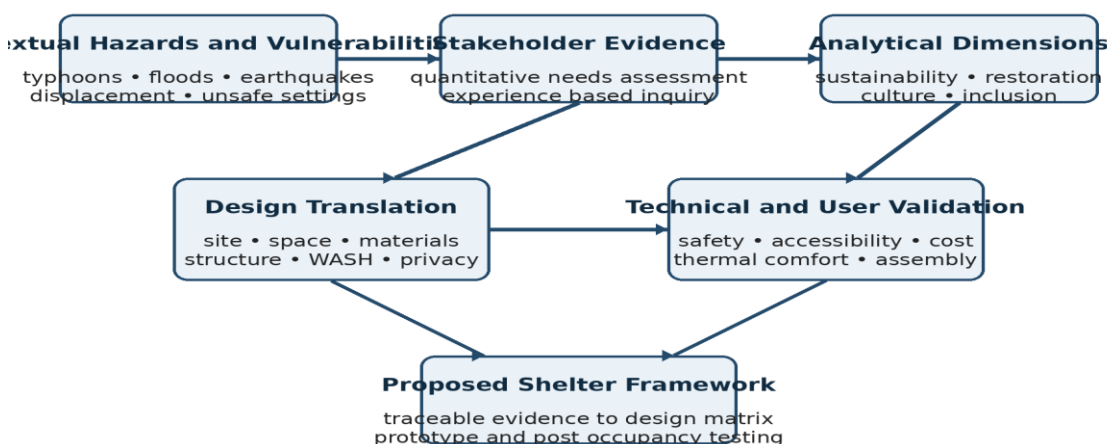


Figure 1. Evidence to Design Conceptual Framework

Significance of the Study

The findings of this investigation on sustainability and restorativeness of temporary shelter for displaced population can benefit multiple sectors, especially in vulnerable places affected by disasters.

Disaster-Affected Individuals and Families

This study responds directly to their needs by proposing an inclusive, functional, adaptable, and sustainable Temporary Shelter that provides security, privacy, sanitation, and adequate living space.

Vulnerable Group

This study offers critical design insights that consider their unique needs within temporary housing environments. For instance, the inclusion of accessible pathways, gender-sensitive sanitation facilities, and child-friendly spaces can significantly reduce vulnerability and improve safety and comfort.

Host Communities

This study proposes sustainable and integrated temporary shelter model that support coexistence by minimizing environmental impact and fostering social cohesion. By promoting designs that consider both the needs of displaced families and host populations, the study helps reduce community friction and ensures more harmonious, coordinated disaster responses. Additionally, designs that enable shared spaces, support services, and localized decision-making strengthen trust and cooperation between displaced individuals and the communities that receive them.

National Disaster Risk Reduction and Management Council (NDRRMC)

The NDRRMC, as the lead agency for disaster response and preparedness in the Philippines, plays a crucial role in setting national shelter standards and strategies. This study offers the NDRRMC valuable research-based evidence to improve policies and protocols related to emergency housing. By emphasizing sustainability, rapid deployment, and community involvement in Temporary shelter design, the research supports the council's mandate to enhance national resilience. Moreover, the proposed framework aligns with the broader goals of disaster risk reduction by addressing the longterm needs of displaced populations, thus shifting the focus from reactive relief efforts to proactive and inclusive recovery planning.

Architects

Architects are instrumental in translating design concepts into functional, sustainable, and cost-efficient temporary shelter structures. This study provides a design framework that encourages the profession to rethink traditional approaches to temporary shelter. The research supports the development of a temporary shelter that is not only structurally sound but also responsive to the environmental and cultural contexts of disaster-affected areas. It challenges professionals to incorporate renewable materials, energy-efficient systems, and design-for-disassembly principles into their work.

Ultimately, the study helps elevate the role of architects as key contributors to humanitarian efforts and post-disaster resilience.

Urban Planners

Urban planners play a central role in integrating temporary shelters into broader spatial development and recovery strategies. It promotes planning approaches that avoid hazard-prone areas, foster community rebuilding, and support long-term urban resilience. By aligning temporary shelter with local land use policies and disaster risk reduction frameworks, the study helps planners move beyond short-term fixes and toward strategic, inclusive, and forward-looking recovery planning. It also underscores the importance of community participation in shaping space and infrastructure.

The Researcher

For current researcher, the findings offer validated data, design principles, and evaluative criteria that can be built upon, adapted, or critiqued in related investigations. It highlights interdisciplinary connections like bridging architecture, urban planning, social

work, and environmental science, thereby encouraging more holistic and integrated research approaches.

Future Researchers

This study may serve as a valuable reference for future researchers exploring housing models, particularly those focused on disaster recovery. It provides a foundation for developing future designs that are inclusive, culturally sensitive, and tailored to the specific needs of disaster-affected populations.

Scope and Limitations

This developmental research aimed to design and propose a sustainable and context-sensitive model for Temporary Shelter intended for disaster-displaced populations. The study focused on sustainability and restorative principles, along with habitability standards and community participation.

The study involved key informants, including displaced individuals and families, representatives from national and local government agencies (e.g., Municipal Disaster Risk Reduction and Management Coordinator (MDRRMC), Department of Human Settlements and Urban Development (DHSUD), architects, urban planners, and other shelter-related stakeholders. Their insights were gathered through surveys, interviews, and observation to inform the temporary housing unit design. The design in particular was assessed on the design comfort and sustainability.

While the research draws from case data such as has experienced major natural disasters, including Typhoon Tino (Kalmaegi) and Super Typhoon Uwan (Fung-wong) in November 2025 that caused displacement of some residents in Western

Visayas, it does not evaluate the full extent of all disaster incidents in Philippines. The study emphasizes the potential of an inclusive, sustainable, and context-sensitive model, but implementation feasibility may vary based on budget constraints, land availability, and policy support.

Definition of Terms

This section introduces the essential terms and concepts used in this study.

Establishing clear definitions create consistency and a common understanding of the framework underpinning the research.

Adaptability

Adaptability is the ability to make appropriate cognitive, behavioral, and affective adjustments in response to uncertainty and novelty (Martin, et al., 2013).

In this study adaptability refers to a temporary housing unit's capacity to adjust to changing needs, conditions, and uses over time, without requiring major renovations or demolition.

Climate-Responsive Design

Climate-responsive design refers to architectural and urban planning strategies that adapt to local climatic conditions to enhance thermal comfort and energy efficiency. This approach is crucial in mitigating the impacts of extreme weather events, such as heatwaves, and in reducing the energy consumption of buildings (Liu, et al., 2023)

In this study, climate-responsive design is the term used to the output after describing the basic needs of a temporary housing unit in terms of specific dimensions such as shelter durability, ventilation, sanitation, security, and basic utility access for displaced populations during calamities.

Community Participation

Community participation involves collaboration among stakeholders and mobilization of the community to address common issues and find solutions (Dalimunthe, et al., 2019).

In this study, community participation is perceived to be one of the limitations in planning and building temporary shelters in displaced populations during calamities.

Displaced Population

Displaced populations refer to individuals or groups who have been forced to leave their homes due to various reasons such as armed conflicts, persecution, natural disasters, or development projects (Mahoney & Kluge, 2024).

In this study, the term displaced population specifically refers to individuals or households whose homes have been damaged or rendered uninhabitable by natural disasters, necessitating temporary relocation to government-provided housing units.

Humanitarian Architecture

Humanitarian architecture is a specialized field within architecture focused on designing and constructing buildings and shelters for people in need, particularly those affected by disasters, conflicts, and other crises. This domain emphasizes addressing both immediate physical needs and broader psychosocial requirements such as community, belonging, and security (Mesrop, 2021).

In this study, humanitarian architecture refers to designing temporary shelters that address the urgent needs of vulnerable populations, particularly those displaced by crises such as natural disasters. It focuses on creating safe, dignified, and functional temporary or permanent shelters that support human well-being. In the context of displaced populations, humanitarian architecture emphasizes the delivery of shelter solutions that are aligned with standards of adequacy such as durability, sanitation, and functionality. **Internally**

Displaced Persons (IDPs)

IDPs are displaced due to armed conflicts, violence, human rights violations, and natural disasters like floods, droughts, earthquakes, and volcanic eruptions (Sheikh, et al., 2024).

In this study, IDPs specifically refer to populations whose dwellings have been destroyed or rendered uninhabitable due to natural calamities, necessitating temporary relocation to government-provided shelters. These individuals often face heightened vulnerabilities due to the disruption of their livelihoods, social networks, and access to basic services.

Locally participatory

Locally participatory refers to community-led involvement in decision-making, rather than relying solely on external experts or government. Communities contribute knowledge, labor, and priorities alongside technical professionals and policymakers.

In shelter projects, this means residents are not passive beneficiaries but active partners shaping outcomes (Tumamao-Guittap et al., 2021).

In this study, locally participatory approaches in shelter project transform displaced families from passive recipients into empowered co-creators. This ensures that temporary shelters are not only technically sound but also socially sustainable, culturally appropriate, and resilient against recurring disasters.

Restorativeness

Restorativeness is the quality of an environment that allows an individual to recover from directed attention fatigue and the physiological and psychological symptoms of stress. Rooted in Attention Restoration Theory (ART), it suggests that urban or high-stress environments (like disaster zones) drain our mental energy, whereas restorative environments provide a "refuge" that replenishes these cognitive resources through four key dimensions: being away, extent, fascination, and compatibility (Kaplan, 1995). In the context of temporary housing, it refers to the structure's ability to move a displaced person from a state of "survival stress" to a state of "mental recovery."

In this study, restorativeness is the perceived capacity of a sustainable temporary shelter to facilitate psychological recovery and the replenishment of cognitive resources among displaced individuals, as measured by the Sustainable Shelter Restorativeness Scale (SSRS) through the following four indicators: Being Away (escape from stress), Extent (scope and connectivity), Fascination (effortless attention), and Compatibility (fit with needs and culture).

Sustainable

Sustainable refers to the design, construction, and operation of built environments that minimize negative environmental impacts, promote resource efficiency, support social well-being, and remain economically viable across their life cycle (Kibert, 2016; United Nations, 1987). Within disaster-responsive architecture, sustainability extends beyond environmental performance to include resilience, adaptability, cultural appropriateness, and the capacity to support long-term recovery of affected communities (Johnson, 2007; United Nations Office for Disaster Risk Reduction [UNDRR], 2015).

For temporary shelters for displaced populations, sustainability encompasses the responsible use of locally available and renewable materials, reduced carbon footprint, efficient energy and water systems, waste minimization, structural safety, and the ability of shelters to transition into permanent or semi-permanent housing where feasible (Sphere Association, 2018). Thus, sustainable architecture in disaster contexts integrates environmental stewardship, social equity, economic feasibility, and disaster resilience into shelter solutions.

Temporary Shelter

A Temporary Shelter is a structure or facility that provides immediate, short-term accommodation and protection for individuals or families who are unable to live in their previous residence, often due to a crisis such as a natural disaster, conflict, or homelessness (UNCHR).

In this study, temporary shelter specifically pertains to the sustainable and cost-effective design based on the needs of the displaced populations during calamities. A provisional living space, intended to provide immediate protection and basic needs for displaced individuals until permanent housing solutions are available.

METHODOLOGY

Research Design

The study used developmental mixed-methods research. It followed a sequential evidence-to-design structure in four linked stages. First, a quantitative needs assessment described the sustainability and restorative-environment needs reported by disaster-affected residents and stakeholders. Second, open-ended responses were intended to provide experience-based explanations of the survey patterns. Third, the combined evidence was translated into architectural criteria and a proposed shelter design. Fourth, the design required structured technical and user evaluation. Integration occurred when quantitative priorities and qualitative explanations were mapped to design responses and validation criteria. No correlational analysis was reported; therefore, the study was not described as descriptive-correlational.

The completed survey and design-development activities were reported in the past tense. Because the manuscript did not provide a complete qualitative results section or a multidisciplinary technical-validation record, conclusions were limited to assessed needs and the proposed framework.

Respondents

The final analytic sample comprised 160 respondents drawn from disaster-affected communities and relevant stakeholder groups in Western Visayas. The groups included displaced residents, community representatives, and technical or disaster-management personnel. Eligible resident respondents had experienced displacement or temporary accommodation following fire, flood, typhoon, earthquake, or landslide. Stakeholder respondents had responsibilities or professional experience relevant to shelter planning, design, or disaster response.

A separate group of 30 disaster-affected residents participated in pilot testing and was excluded from the 160-person main sample. The final manuscript must report the number in every respondent category, the represented provinces and municipalities, shelter settings, sampling strategy, recruitment procedure, number invited, number responding, and response rate. These details were not available in the submitted file and therefore were not inferred.

Instruments

Several research instruments were used to collect data:

Needs Assessment Survey

Close-ended and open-ended instruments was distributed to respondents to gather quantitative and qualitative data on the needs of displaced populations during calamities in terms of shelter adaptability and sustainability.

Evaluation Instrument

A 4-point Likert-scale and open-ended instruments was used to evaluate the sustainability and restorativeness of a temporary shelter, considering the needs of displaced populations during calamities.

Validity of the Instrument

The instrument underwent expert review for clarity, relevance, coherence, and alignment with the sustainability and restorativeness constructs. The manuscript contained inconsistent accounts of three and fifteen validators. The reported CVR threshold of 0.49 corresponded to a fifteen-member panel; therefore, the fifteen-expert account was retained as the operative content-validation procedure, while the three-expert statement was treated as an earlier face-review stage. This sequence must be confirmed against the actual validation records.

Items rated essential by the expert panel were evaluated using Lawshe's Content Validity Ratio. Item relevance ratings were summarized through the Item-level Content Validity Index and the Scale-level Content Validity Index. The manuscript reported an S-CVI/Ave of 0.80, with 0.82 for sustainability and 0.78 for restorativeness. These indices supported expert agreement on content relevance but did not establish cultural appropriateness, construct validity, temporal stability, or representativeness. Cultural appropriateness required evidence from cognitive interviews or documented pilot feedback from displaced residents.

A complete item-level table showing each item's CVR, I-CVI, decision, revision, and final subscale assignment was not included in the source manuscript and must be added from the original validation forms.

Reliability of the Instrument

The instrument was pilot-tested with 30 disaster-affected residents from Western Visayas who were excluded from the main sample. Cronbach's alpha assessed internal consistency. The reported coefficients were 0.8926 for the sustainability section, 0.9282 for the restorativeness section, and 0.9473 for the full 40-item instrument. These results indicated strong internal consistency within the pilot sample.

The coefficients did not establish validity, temporal stability, or sample representativeness. Final reporting should also provide alpha for each theoretically coherent subscale, corrected item-total correlations, and alpha if item deleted. Item removal should be based on both statistical evidence and conceptual relevance.

Data Gathering Procedure

Approval to conduct the study was obtained from the Dean of the Graduate School of La Consolacion College Bacolod, and permission letters were sent to the participating local government units. Eligible participants were recruited through the approved community contacts. After informed consent, respondents completed the closed-ended needs assessment and open-ended questions.

Data collection and design development proceeded in sequence. Phase 1 produced the quantitative needs profile. Phase 2 examined open-ended accounts and integrated them with the survey results. Phase 3 translated the combined evidence into spatial, material, environmental, cultural, and operational design criteria. Phase 4 developed the shelter proposal and defined the technical and user-validation requirements. The evidence-to-design matrix linked each major need to its empirical source, theoretical basis, architectural response, technical requirement, and validation method.

Data Analysis

Quantitative Analysis

Means, standard deviations, sample sizes, and, where available, confidence intervals described the sustainability and restorative-environment constructs. Subgroup results were interpreted descriptively because the manuscript did not report inferential tests. The words significant and significantly were reserved for results supported by an appropriate test, effect size, confidence interval, and p-value.

The four-point response scale was interpreted consistently as follows: 3.50-4.00, Very Highly Needed; 2.50-3.49, Highly Needed; 1.50-2.49, Slightly Needed; and 1.00-1.49, Not Needed.

Qualitative Analysis

Open-ended responses were to be analyzed through reflexive thematic analysis. The analytic record should identify the questions, familiarization process, coding steps, theme development, reflexive position of the researcher, credibility procedures, and integration with quantitative results. The submitted file did not include a completed thematic account or coded participant quotations; therefore, no qualitative quotations or themes were invented in this revision.

Ethical Considerations

The study sought institutional and local permission before recruitment. Participation was voluntary and required informed consent. Participants were informed of the purpose, procedures, expected use of data, right to decline or withdraw, and measures used to protect confidentiality. Names were replaced with non-disclosing codes, access to research files was restricted, and reports were prepared in aggregate form.

Because disaster experience could involve distress, data collection required trauma-sensitive language, the option to skip questions or stop participation, and referral information for appropriate local support. Recruitment had to avoid pressure from officials or service providers. If minors or adults with impaired

consent capacity were included, age-appropriate assent, guardian consent, and additional safeguards were required.

The submitted manuscript did not identify an approving research ethics committee or approval number and did not document retention periods, deletion procedures, referral arrangements, or the inclusion or exclusion of minors. These details must be completed from the actual approved protocol before final submission.

RESULTS AND DISCUSSIONS

The presentation of results and discussions focuses on how temporary shelters for displaced populations achieve sustainability and restorativeness in crisis contexts. Findings highlight the environmental system, showing whether shelters minimize ecological damage while ensuring long-term compatibility through renewable resources and sanitation. The social system underscores the importance of cohesion, cultural sensitivity, and access to essential services that foster dignity and reduce vulnerabilities. Meanwhile, the economic system and resilience (adaptive capacity) reveal how affordability, durability, and adaptive design contribute to sustainable recovery. Beyond physical safety, the concept of restorativeness through being away discuss shelter's ability to provide psychological escape from stress and trauma, extent, whether shelters provide adequate space, logical layouts, and opportunities for movement, fascination, whether the environment engages people without requiring mental strain and compatibility, evaluates how well shelters align with residents' cultural practices, daily routines, and personal needs that captures the psychological and cultural fit of shelters. Together, these dimensions provide a comprehensive understanding of how shelters not only protect lives but also restore well-being and strengthen communities against future calamities.

Sustainability Needs

Extent of needs of temporary shelters to be sustainable for displaced populations during calamities in terms of environmental system, social system, economic system, and resilience and adaptive capacity.

Table 1 Environmental System

Extent of Needs of Temporary Shelters to be Sustainable for Displaced Populations during Calamities in Terms of Environmental System

Age	Young (Less than 20 Yrs Old)	0.397	3.412	Highly Needed
	Young Adult (21-39 Yrs Old)	0.422	3.411	Highly Needed
	Middle-Aged Adult (40-59 Yrs Old)	0.374	3.379	Highly Needed
	Senior (60 Yrs Old and Above)	0.376	3.59	Very Highly Needed
Sex	Male	0.374	3.478	Highly Needed
	Female	0.409	3.435	Highly Needed
No. of Members	Small (1-3 members)	0.404	3.51	Very Highly Needed
	Medium (4-6 members)	0.382	3.433	Highly Needed
	Large (7 or more members)	0.434	3.327	Highly Needed
No. of Households	1	0.374	3.478	Highly Needed
	2	0.409	3.435	Highly Needed
Source of Income	Employed	0.433	3.426	Highly Needed
	Self-employed	0.374	3.494	Highly Needed
	Business	0.453	3.506	Very Highly Needed
	Others	0.363	3.39	Highly Needed
Role in Disaster Context	Displaced Resident	0.390	3.474	Highly Needed
	Community Leader	0.363	3.48	Highly Needed

	LGU Personnel	0.000	3.000	Highly Needed
	NGO Worker	0.000	3.000	Highly Needed
	Architect/Engineer	0.707	3.500	Very Highly Needed
	Others	0.460	3.250	Highly Needed
Civil Status	Single	0.388	3.459	Highly Needed
	Married	0.414	3.432	Highly Needed
	Widowed	0.348	3.511	Very Highly Needed
Type of Calamity	Typhoon	0.372	3.474	Highly Needed
	Earthquake	0.416	3.421	Highly Needed
	Flood	0.000	4.000	Very Highly Needed
Type of Accommodation	Tents	0.179	3.920	Highly Needed
	Public Building	0.368	3.431	Highly Needed
	Transitional Housing	0.385	3.440	Highly Needed
	Living with Relatives	0.445	3.422	Highly Needed
	Others	0.399	3.442	Highly Needed
Duration of Stay	Less than 1 day	0.413	3.469	Highly Needed
	1-3 Days	0.285	3.374	Highly Needed
	4-6 Days	0.390	3.120	Highly Needed
	More than 6 Days	0.443	3.550	Very Highly Needed

Environmental System Needs. The assessment of environmental system needs reveals a critical demand for intervention among respondents in the most precarious conditions. Specifically, respondents residing in Tents reported the highest mean ($M = 3.920$, $SD = 0.179$), followed by Flood victims ($M = 4.000$, $SD = 0.000$) and Seniors (M

$= 3.590$, $SD = 0.376$), all of which fall into the "Highly Needed" category. The notably low Standard Deviation among tent dwellers and flood victims indicates a strong consensus that current environmental protections such as site selection, waste management, and resource protection are severely lacking and universally required for survival.

Furthermore, the data shows that as the duration of displacement persists, environmental concerns become more acute and the variability in responses stabilizes. Those staying in temporary shelters for more than six days reported a high mean of 3.550 ($SD = 0.443$), suggesting that initial "emergency" measures quickly become insufficient as the strain on the immediate environment increases. In contrast, LGU Personnel reported the lowest need ($M = 3.000$, $SD = 0.000$), highlighting a significant perception gap between the administrators of disaster relief and the displaced individuals who experience the daily environmental degradation of the shelter site.

The findings imply that current "speed-over-substance" approaches in the Philippines, which often result in "tent cities" devoid of proper sanitation or ground cover, fail to meet the holistic requirements of human dignity. Because environmental factors are foundational to the "restorativeness" of a space, a degraded or poorly managed site can actively hinder psychological and physical recovery. Furthermore, the design that has poor accessibility could escalate stress and trauma of the displaced individuals. This necessitates a shift toward a "holistic approach" to environmental sustainability that balances immediate human shelter with long-term ecosystem health.

This aligns with the research of Hosseini et al. (2021), who argue that persistent design flaws in temporary shelters such as structural instability and poor ventilation directly compromise the health of displaced populations. These deficiencies undermine the core objectives of SDG 3 (Good Health and Well-being) and SDG 6 (Clean Water and Sanitation), particularly as the lack of privacy and sanitation disproportionately impacts women and children in overcrowded settings.

Additionally, Kim et al. (2025) notes that the reliance on unsustainable materials and the absence of end-of-life reuse planning in disaster response led to significant ecological degradation. While certain non-biodegradable materials available in the local markets, maybe convenient for quick installation, their disposal could be detrimental to the environment. Materials that have high chemical contain could be harmful to the health of the shelter occupants. The high environmental needs identified in Table 1 reinforce the necessity of moving toward the "humanitarian architecture" principles advocated by Mesrop (2021), which emphasize that shelters must address immediate physical needs while maintaining environmental stewardship. Moreover, International Journal of Disaster Risk Reduction (2024) highlight those transitional shelters in the Philippines incorporated renewable materials, modular construction, and culturally appropriate layouts, reducing ecological damage while supporting displaced communities. Shelter sustainability assessments include material consumption, CO₂ footprint, habitat damage, and reuse/recycle options. This framework ensures shelters reduce ecological harm while remaining functional in emergencies (Pirjevec, 2021).

Table 2 Social System

Extent of Needs of Temporary Shelters to be Sustainable for Displaced Populations during Calamities in Terms of Social System

	Category	SD	M	Description
Age	Young (Less than 20 Yrs Old)	0.381	3.518	Very Highly Needed
	Young Adult (21-39 Yrs Old)	0.403	3.491	Highly Needed
	Middle-Aged Adult (40-59 Yrs Old)	0.416	3.362	Highly Needed
	Senior (60 Yrs Old and Above)	0.37	3.485	Highly Needed
Sex	Male	0.384	3.580	Very Highly Needed
	Female	0.395	3.410	Highly Needed
No. of Members	Small (1-3 members)	0.379	3.562	Very Highly Needed
	Medium (4-6 members)	0.389	3.438	Highly Needed
	Large (7 or more members)	0.392	3.227	Highly Needed
No. of Households	1	0.384	3.580	Very Highly Needed
	2	0.395	3.410	Highly Needed
Source of Income	Employed	0.450	3.543	Very Highly Needed
	Self-employed	0.380	3.424	Highly Needed
	Business	0.368	3.318	Highly Needed
	Others	0.345	3.429	Highly Needed
Role in Disaster Context	Displaced Resident	0.391	3.469	Highly Needed
	Community Leader	0.518	3.440	Highly Needed
	LGU Personnel	0.462	3.267	Highly Needed
	NGO Worker	0.000	3.000	Highly Needed

	Architect/Engineer	0.707	3.300	Highly Needed
	Others	0.426	3.400	Highly Needed
Civil Status	Single	0.410	3.483	Highly Needed
	Married	0.397	3.441	Highly Needed
	Widowed	0.346	3.400	Highly Needed
Type of Calamity	Typhoon	0.393	3.425	Highly Needed
	Earthquake	0.403	3.470	Highly Needed
	Flood	0.000	3.800	Very Highly Needed
Type of Accommodation	Tents	0.000	4.000	Very Highly Needed Highly Needed
	Public Building	0.385	3.375	Highly Needed
	Transitional Housing	0.316	3.400	Highly Needed
	Living with Relatives	0.406	3.491	Highly Needed
	Others	0.391	3.497	Highly Needed
Duration of Stay	Less than 1 day	0.399	3.444	Highly Needed
	1-3 Days	0.424	3.539	Very Highly Needed
	4-6 Days	0.261	3.560	Very Highly Needed
	More than 6 Days	0.191	3.150	Highly Needed

Social System Needs. Social system needs reached their peak among respondents staying in Tents ($M = 4.000$, $SD = 0.000$) and flood victims ($M = 3.800$, SD

$= 0.000$), indicating an absolute and unanimous requirement for social support and security following sudden displacement. Interestingly, small households of 1-3 members expressed a significantly higher need ($M = 3.562$, $SD = 0.379$) compared to large households of 7 or more members ($M = 3.227$, $SD = 0.392$). The relatively low SD across these groups suggests that the lack of external social systems is a consistent concern, particularly for smaller units that may lack the internal "social buffer" or labor pool provided by larger extended families.

The data also reveals that social needs are particularly high for Males ($M = 3.580$, $SD = 0.384$) and the Youth ($M = 3.518$, $SD = 0.381$). While technical experts might prioritize structural stability, the low variance in these scores highlights that social sustainability maintaining well-being through community cohesion is a "Very Highly Needed" and shared priority. The decrease in perceived social need for those staying more than six days ($M = 3.150$, $SD = 0.191$) may suggest a level of "settling" or a forced adaptation where residents lower their expectations of social support as displacement becomes a long-term reality.

These findings imply that for a shelter to be effective, it must facilitate Pakikipagkapwa (shared identity) and communal healing. Fragmented "tent cities" that lack common spaces or connectivity prevent the realization of these social systems, potentially leading to stagnation rather than resilience. Shelter design must therefore move beyond individual units to consider the spatial requirements of community interaction to support long-term social recovery.

The emphasis on social systems is supported by the work of Montalbano and Santi (2023), who argue that temporary structures must provide a foundation for "stability and dignity" to bridge the gap between chaos and resettlement. Without these social anchors, shelters remain mere "emergency storage," failing to meet the standards for Sustainable Cities and Communities outlined in SDG 11.

Furthermore, Killemsetty and Patel (2024) stress the urgent need to integrate displaced communities into every phase of the housing lifecycle. Their research suggests that top-down planning often overlooks the local social realities of disaster-affected settlements, leading to culturally incompatible designs. Involving displaced population directly in the process such as the Filipino tradition of Bayanihan, where communities collectively work together, create shelters that embody shared values, strengthen social bonds and creates a sense of ownership among displaced populations, Philippine Information Agency (2025). This participatory approach not only enhances community solidarity but also ensures that shelters are more responsive to the needs. Furthermore, the use of locally available materials such as bamboo, rattan and nipa supports the local economy and offers practical and ecological benefits, He, W. et al. (2025). These resources are familiar to local builders, making them easier to handle and adapt for versatile designs. Their integration reduces reliance on imported non-biodegradable materials, supports sustainable construction and preserve traditional knowledge systems. By considering cultural compatibility, community driven shelter becomes a pathway toward resilience, sustainability and disaster recovery. The high social needs identified in

this study confirm that community participation (SDG 17) is not a luxury but a requirement for sustainable disaster response.

Table 3 Economic System

Extent of Needs of Temporary Shelters to be Sustainable for Displaced Populations during Calamities in Terms of Economic System

	Category	SD	M	Description
Age	Young (Less than 20 Yrs Old)	0.503	3.447	Highly Needed
	Young Adult (21-39 Yrs Old)	0.441	3.396	Highly Needed
	Middle-Aged Adult (40-59 Yrs Old)	0.424	3.35	Highly Needed
	Senior (60 Yrs Old and Above)	0.453	3.46	Highly Needed
Sex	Male	0.411	3.463	Highly Needed
	Female	0.454	3.383	Highly Needed
No. of Members	Small (1-3 members)	0.403	3.528	Very Highly Needed
	Medium (4-6 members)	0.430	3.390	Highly Needed
	Large (7 or more members)	0.48	3.127	Highly Needed
No. of Households	1	0.411	3.463	Highly Needed
	2	0.454	3.383	Highly Needed
Source of Income	Employed	0.484	3.453	Highly Needed
	Self-employed	0.399	3.404	Highly Needed
	Business	0.424	3.329	Highly Needed

	Others	0.457	3.371	Highly Needed
Role in Disaster Context	Displaced Resident	0.426	3.428	Highly Needed
	Community Leader	0.607	3.36	Highly Needed
	LGU Personnel	0.231	3.133	Highly Needed
	NGO Worker	0.000	3.000	Highly Needed
	Architect/Engineer	1.131	3.200	Highly Needed
	Others	0.522	3.283	Highly Needed
Civil Status	Single	0.475	3.424	Highly Needed
	Married	0.430	3.376	Highly Needed
	Widowed	0.371	3.556	Very Highly Needed
Type of Calamity	Typhoon	0.468	3.357	Highly Needed
	Earthquake	0.428	3.434	Highly Needed
	Flood	0.000	3.600	Very Highly Needed
Type of Accommodation	Tents	0.000	4.000	Very Highly Needed
	Public Building	0.441	3.344	Highly Needed
	Transitional Housing	0.456	3.56	Very Highly Needed
	Living with Relatives	0.441	3.426	Highly Needed
	Others	0.430	3.388	Highly Needed
Duration of Stay	Less than 1 day	0.451	3.384	Highly Needed
	1-3 Days	0.437	3.539	Very Highly Needed
	4-6 Days	0.390	3.320	Highly Needed
	More than 6 Days	0.252	3.350	Highly Needed

Economic System Needs. The assessment of economic system needs highlights a significant demand for financial stability and livelihood support, particularly among those in the most unstable housing. Respondents residing in Tents reported a unanimous and absolute need ($M = 4.000$, $SD = 0.000$), while those in Transitional Housing also indicated high requirements ($M = 3.560$, $SD = 0.456$). The variation in the transitional group suggests that while the need is high, individual economic recovery varies depending on the household's previous assets and their ability to re-establish income streams during the relocation phase.

Conversely, LGU Personnel reported the lowest perceived economic need ($M = 3.133$, $SD = 0.231$), which points to a potential disconnect between policy implementation and the lived financial reality of displaced persons. Small households of 1–3 members ($M = 3.528$, $SD = 0.403$) felt the economic strain more acutely and consistently than large households ($M = 3.127$, $SD = 0.480$). This suggests that larger families might benefit from a diversified labor pool within the home, whereas smaller units face a more uniform and concentrated economic threat when their primary source of income is disrupted by calamity.

These results imply that for a shelter program to be sustainable, it must integrate economic viability into its spatial design. Shelters are often treated as "sunk costs" by aid agencies, but for the occupants, the lack of proximity to markets or space for home-based livelihoods creates a cycle of poverty. The high economic need reported by flood victims ($M = 3.600$, $SD = 0.000$) suggests that when physical assets are destroyed instantly, the shelter environment must serve as an immediate economic "base of operations" rather than just a place to sleep.

This focus on economic integration is supported by the work of Kibert (2016), who defines sustainable construction as a framework that must remain economically functional throughout its entire life cycle. This highlights the importance of ensuring that temporary shelter can do more than a mere shelter, it must also enable displaced population to engage in livelihood opportunities and resource generating activities. When such shelter fails to connect residents with pathways to employment, trade or self-sufficiency, it risks creating a "dependency trap" where communities become reliant on external aid that undermines the long-term goals of SDG 11 (Sustainable Cities and Communities). Neglecting economic integration, temporary shelter can carry out cycles of poverty and vulnerability, rather than serving an access toward recovery and long-term stability.

Furthermore, research into "humanitarian architecture" by Mesrop (2021) emphasizes that the financial sustainability of a shelter is tied to its material life cycle and the local economy. Utilizing local labor and materials such as bamboo, rattan, nito and nipa in shelter construction is widely recognized as both environmentally and economically beneficial. It reduces the carbon footprint by avoiding transport of imported, non-biodegradable materials, while simultaneously injecting capital into disaster-affected communities through livelihood opportunities (Roxas, 2024).

Philippines is using circular economy strategies with eco-materials to substitute for cement and steel (SEADS 2024). Using locally sourced materials not only lowers the carbon footprint but also enhances cost-efficiency and adaptability to local climates

(UNCHR 2020). The high economic needs identified in Table 3 reinforce the necessity of viewing shelter design as a tool for economic resilience rather than a mere emergency expense.

Table 4 Resilience and Adaptive Capacity

Extent of Needs of Temporary Shelters to be Sustainable for Displaced Populations during Calamities in Terms of Resilience and Adaptive Capacity

	Category	SD	M	Description
Age	Young (Less than 20 Yrs Old)	0.346	3.576	Very Highly Needed
	Young Adult (21-39 Yrs Old)	0.444	3.436	Highly Needed
	Middle-Aged Adult (40-59 Yrs Old)	0.457	3.275	Highly Needed
	Senior (60 Yrs Old and Above)	0.435	3.375	Highly Needed
Sex	Male	0.403	3.459	Highly Needed
	Female	0.454	3.363	Highly Needed
No. of Members	Small (1-3 members)	0.460	3.441	Highly Needed
	Medium (4-6 members)	0.426	3.380	Highly Needed

	Large (7 or more members)	0.447	3.273	Highly Needed
No. of Households	1	0.403	3.459	Highly Needed
	2	0.454	3.363	Highly Needed
Source of Income	Employed	0.496	3.472	Highly Needed
	Self-employed	0.413	3.294	Highly Needed
	Business	0.467	3.353	Highly Needed
	Others	0.381	3.405	Highly Needed
Role in Disaster Context	Displaced Resident	0.440	3.393	Highly Needed
	Community Leader	0.434	3.240	Highly Needed
	LGU Personnel	0.115	3.067	Highly Needed
	NGO Worker	0.000	3.000	Highly Needed
	Architect/Engineer	0.707	3.500	Very Highly Needed
	Others	0.508	3.483	Highly Needed
Civil Status	Single	0.393	3.407	Highly Needed
	Married	0.479	3.387	Highly Needed
	Widowed	0.361	3.267	Highly Needed
Type of Calamity	Typhoon	0.409	3.388	Highly Needed
	Earthquake	0.466	3.383	Highly Needed
	Flood	0.000	3.800	Very Highly Needed
Type of Accommodation	Tents	0.447	3.800	Very Highly Needed
	Public Building	0.434	3.349	Highly Needed
	Transitional Housing	0.456	3.560	Very Highly Needed
	Living with Relatives	0.431	3.439	Highly Needed
	Others	0.450	3.309	Highly Needed
Duration of Stay	Less than 1 day	0.457	3.356	Highly Needed
	1-3 Days	0.369	3.539	Very Highly Needed
	4-6 Days	0.245	3.600	Very Highly Needed
	More than 6 Days	0.379	3.250	Highly Needed

Resilience and Adaptive Capacity Needs. Resilience and adaptive capacity needs were rated as "Highly Needed" among the Youth ($M = 3.576$, $SD = 0.346$) and flood victims ($M = 3.800$, $SD = 0.000$). The low variance in these scores indicates a strong consensus that current shelters lack the flexibility to adapt to changing environmental conditions or secondary disasters. For the younger demographic, the desire for resilience may stem from a heightened awareness of future climate risks and a need for the shelter to

function as a safe learning and development environment during prolonged displacement.

Interestingly, those staying in Transitional Housing ($M = 3.560$, $SD = 0.456$) and those displaced for 4–6 days ($M = 3.600$, $SD = 0.245$) expressed higher needs for adaptive capacity than those in the very early stages of relief. This suggests that as the "shock" phase passes, survivors begin to look for ways to adjust their environment for better functionality. The lower mean reported by LGU Personnel ($M = 3.067$, $SD = 0.115$) again highlights a perception gap, where authorities may focus on "sturdy" structures while the users are looking for "flexible" systems that can grow or change based on their needs.

The findings imply that current "one-size-fits-all" shelter designs lack the necessary "adaptive capacity" to handle the evolving nature of disasters. A shelter that cannot be modified by the user or expanded for different household sizes fails the resilience test. To meet the high needs of displaced residents, designers must incorporate modularity and user-driven adaptation, allowing occupants to exert agency over their physical surroundings, which is a key component of psychological and systemic resilience.

The demand for resilience is echoed by Hosseini et al. (2021), who highlight that inadequate structural adaptability often leads to secondary displacement or injury during aftershocks or subsequent storms. Sustainable disaster response must prioritize the "bounce-back" capability of the built environment, ensuring that temporary homes are not just rigid boxes but resilient systems that can withstand shifting climate patterns.

Additionally, Montalbano and Santi (2023) argue that the "stability and dignity" of a shelter are directly linked to its capacity to support the resident's recovery process.

By failing to provide adaptive environments, current models risk becoming sites of stagnation. Integrating resilience and adaptive capacity as prioritized by the respondents aligns with the Sendai Framework's goal of "Building Back Better," ensuring that temporary interventions contribute to long-term community strength. According to UNHCR 2016, shelter is contextual and there exists no 'one-size-fits-all' solution which can be applied worldwide. This underscores that adaptable shelters are essential, as they must evolve with local conditions, cultural practices, and the changing nature of disasters. Transitional shelters using modular bamboo and nipa designs provide flexibility to expand, repurpose, or upgrade over time (Roxas, 2024). This adaptability ensures resilience as communities recover and rebuild after disasters. Neglecting sustainability in temporary shelters leads to severe environmental consequences and higher long-term costs, while adaptive, locally integrated designs strengthen resilience (Alshawawreh, 2020).

Restorativeness

Level of perceived restorativeness of sustainable temporary shelter in terms of being away (escape from stress), extent (scope and connectivity), fascination (effortless attention), and compatibility (fit with needs and culture).

Table 5 Being Away

Level of Perceived Restorativeness of Sustainable Temporary Shelter in Terms of Being Away (Escape from Stress)

	Category	SD	M	Description
Age	Young (Less than 20 Yrs Old)	0.570	3.400	Highly Needed
	Young Adult (21-39 Yrs Old)	0.483	3.396	Highly Needed
	Middle-Aged Adult (40-59 Yrs Old)	0.402	3.358	Highly Needed

	Senior (60 Yrs Old and Above)	0.373	3.420	Highly Needed
Sex	Male	0.432	3.459	Highly Needed
	Female	0.443	3.368	Highly Needed
No. of Members	Small (1-3 members)	0.462	3.493	Highly Needed
	Medium (4-6 members)	0.421	3.342	Highly Needed
	Large (7 or more members)	0.422	3.300	Highly Needed
No. of Households	1	0.432	3.459	Highly Needed
	2	0.443	3.368	Highly Needed
Source of Income	Employed	0.486	3.457	Highly Needed
	Self-employed	0.444	3.367	Highly Needed
	Business	0.315	3.224	Highly Needed
	Others	0.413	3.405	Highly Needed
Role in Disaster Context	Displaced Resident	0.441	3.406	Highly Needed
	Community Leader	0.447	3.200	Highly Needed
	LGU Personnel	0.462	3.267	Highly Needed
	NGO Worker	0.000	3.000	Highly Needed
	Architect/Engineer	0.566	3.400	Highly Needed
	Others	0.481	3.367	Highly Needed
Civil Status	Single	0.445	3.386	Highly Needed
	Married	0.429	3.398	Highly Needed
	Widowed	0.581	3.356	Highly Needed
Type of Calamity	Typhoon	0.440	3.342	Highly Needed
	Flood	0.442	3.428	Highly Needed
	Earthquake	0.000	3.200	Highly Needed
Type of Accommodation	Tents	0.434	3.760	Very Highly Needed
	Public Building	0.377	3.338	Highly Needed
	Transitional Housing	0.678	3.200	Highly Needed
	Living with Relatives	0.483	3.409	Highly Needed
	Others	0.456	3.455	Highly Needed
Duration of Stay	Less than 1 day	0.418	3.413	Highly Needed
	1-3 Days	0.415	3.461	Highly Needed

	4-6 Days	0.716	2.880	Highly Needed
	More than 6 Days	0.443	2.950	Highly Needed

Being Away (Escape from Stress). The dimension of "Being Away" measures the environment's ability to provide a mental and physical escape from daily stressors.

The data shows that tent dwellers report a "Very Highly Needed" level of need for this restorative quality ($M = 3.760$, $SD = 0.434$), the highest across all accommodation types. This indicates that tents, with their thin walls and lack of privacy, fail to provide the psychological "refuge" necessary for trauma recovery. The high SD suggests that while most feel this lack, the level of stress varies based on the specific location or layout of the tent camp.

Conversely, respondents staying in Public Buildings ($M = 3.338$, $SD = 0.377$) and Transitional Housing ($M = 3.200$, $SD = 0.678$) reported "Highly Needed" but lower levels of restorativeness. The relatively high SD for transitional housing suggests a significant range of experiences; some transitional sites may offer better privacy and distance from the disaster zone than others. Interestingly, the data shows that restorativeness significantly drops for those staying longer than 4 days ($M = 2.880$, $SD = 0.716$), suggesting that the "emergency" tolerance wears off, and the lack of a true escape becomes a source of chronic stress. These findings imply that for a shelter to be truly "restorative," it must provide more than just a physical roof; it must offer a psychological boundary. The "Being Away" component is essential for replenishing the mental energy required to make recovery decisions. Without spatial features that provide privacy and a sense of detachment from the chaos of the disaster site, residents remain in a state of constant vigilance, which can lead to long-term psychological burnout and hinder their ability to reintegrate into society.

This analysis is supported by Kaplan's (1995) Attention Restoration Theory (ART), which posits that environment providing a sense of "Being Away" allow the mind to recover from directed attention fatigue. In a disaster context, the constant demand for survival prevents cognitive recovery unless the environment provides a clear "refuge." The high needs identified in Table 5 indicate that current shelter designs prioritize physical storage over psychological restoration. Furthermore, Killemsetty and Patel (2024) argue that the lack of culturally and psychologically compatible designs in housing leads to "placement without home." When residents do not feel they have a space to escape the trauma, the shelter becomes a reminder of the disaster rather than a tool for healing. This study supports the identified need for "restorative" design elements such as acoustic privacy and visual barriers to support the mental health of displaced Filipinos as part of a holistic sustainability framework.

Integrating ART's "being away" principle into temporary shelter design means creating spaces that act as refuges, offering acoustic privacy, visual barriers, and culturally familiar layouts (Lim, 2024). In biophilic design frameworks (Browning et al., 2014), a stress-free space requires a balance of prospect, a clear view looking out onto a landscape, and refuge, a safe, covered structure overhead. This setup fulfills an evolutionary need for safety while providing a sense of freedom. According to Stress Reduction Theory (SRT) (Ulrich, 1984), natural comfort parameters directly accelerate physiological recovery. Tropical architecture achieves this through passive cooling rather than sealing spaces off with noisy, air-drying mechanical air conditioning. In addition, physical sensation of a constant, gentle breeze lowering skin temperature serves as an immediate sensory trigger that reduces anxiety and lowers the heart rate (Tay, 2023).

Table 6 Extent

Level of Perceived Restorativeness of Sustainable Temporary Shelter in Terms of Extent (Scope and Connectivity)

	Category	SD	M	Description
Age	Young (Less than 20 Yrs Old)	0.521	3.565	Very Highly Needed

	Young Adult (21-39 Yrs Old)	0.478	3.393	Highly Needed
	Middle-Aged Adult (40-59 Yrs Old)	0.417	3.258	Highly Needed
	Senior (60 Yrs Old and Above)	0.497	3.265	Highly Needed
Sex	Male	0.492	3.493	Highly Needed
	Female	0.460	3.286	Highly Needed
No. of Members	Small (1-3 members)	0.549	3.393	Highly Needed
	Medium (4-6 members)	0.439	3.353	Highly Needed
	Large (7 or more members)	0.350	3.145	Highly Needed
No. of Households	1	0.492	3.493	Highly Needed
	2	0.460	3.286	Highly Needed
Source of Income	Employed	0.543	3.377	Highly Needed
	Self-employed	0.412	3.327	Highly Needed
	Business	0.394	3.000	Highly Needed
	Others	0.435	3.444	Highly Needed
Role in Disaster Context	Displaced Resident	0.477	3.340	Highly Needed
	Community Leader	0.179	3.080	Highly Needed
	LGU Personnel	0.577	3.333	Highly Needed
	NGO Worker	0.000	3.000	Highly Needed
	Architect/Engineer	0.849	3.400	Highly Needed
	Others	0.513	3.450	Highly Needed
Civil Status	Single	0.478	3.414	Highly Needed
	Married	0.472	3.310	Highly Needed
	Widowed	0.467	3.156	Highly Needed
Type of Calamity	Typhoon	0.467	3.295	Highly Needed
	Flood	0.483	3.364	Highly Needed
	Earthquake	0.000	3.800	Very Highly Needed
Type of Accommodation	Tents	0.261	3.840	Very Highly Needed
	Public Building	0.434	3.290	Highly Needed
	Transitional Housing	0.522	3.280	Highly Needed
	Living with Relatives	0.498	3.404	Highly Needed

	Others	0.517	3.285	Highly Needed
Duration of Stay	Less than 1 day	0.484	3.342	Highly Needed
	1-3 Days	0.451	3.400	Highly Needed
	4-6 Days	0.228	3.320	Highly Needed
	More than 6 Days	0.476	2.900	Highly Needed

Extent (Scope and Connectivity). The dimension of "Extent" refers to the environmental coherence and the sense of being in a "whole other world" that is organized and navigable. Earthquake victims reported a "Very Highly Needed" level of need for this quality ($M = 3.800$, $SD = 0.000$), indicating a total consensus that after the chaotic destruction of a seismic event, an organized and predictable shelter environment is paramount. Similarly, the Youth ($M = 3.518$, $SD = 0.381$) and those staying in Tents (M

$= 3.680$, $SD = 0.471$) expressed "Very Highly Needed" needs, suggesting that current temporary housing often feels fragmented and lacks the structural logic required to provide mental clarity to the occupants.

The data reveals that as the duration of stay reaches the 4–6 day mark, the perceived restorativeness in terms of extent remains high ($M = 3.520$, $SD = 0.408$), but begins to fluctuate as residents attempt to impose their own order on a chaotic space.

Conversely, LGU Personnel and NGO workers reported lower perceived needs ($M = 3.000$, $SD = 0.000$), which implies that while administrators may see a camp as "organized" based on a site plan, the residents experience a lack of environmental "legibility" that hinders their ability to feel settled and secure.

These findings imply that the physical layout of a shelter site must go beyond simple grid patterns; it must provide a coherent "landscape" those residents can mentally map. A lack of "Extent" leads to cognitive load, as residents must constantly navigate a confusing or poorly defined environment. For a shelter to be sustainable and restorative, the design must incorporate clear pathways, defined boundaries between public and private spaces, and a sense of "place" that helps the displaced individual transition from a state of emergency to a state of recovery.

This aligns with Kaplan's (1995) assertion that "Extent" is a critical component of a restorative environment because it allows the user to feel part of a larger, coherent system. In a post-disaster scenario like earthquakes, typhoons, and flood displacement, survivors experience profound cognitive overload, trauma, and hypervigilance. Standard emergency architecture often fails because it prioritizes mere physical containment, a barrack-like tents or rigid modular containers, which can actually worsen trauma by inducing feelings of confinement and vulnerability. An environment must have coherence, it must be structured well enough that an individual can navigate it effortlessly without feeling overwhelmed or confused (Kaplan & Kaplan, 1989). Disaster housing grids should avoid uniform, endless rows of identical pods, which cause spatial disorientation and compound feelings of powerlessness. Instead, architects use legible, cluster-based layouts, fractal or village-style planning.

The sudden loss of one's home represents a total collapse of environmental extent; therefore, the temporary shelter must act as a substitute that offers order and scope. Killamsetty and Patel (2024) further argue that "placement without home" occurs when the physical environment fails to align with the user's mental models of what a living space should be. Extent requires the illusion of an expansive, open-ended domain even when physical space is highly restricted. In disaster settings, if a survivor's gaze is continually blocked by solid, stark walls, their brain continuously loops back to their immediate crisis.

Furthermore, research by Mesrop (2021) suggests that humanitarian architecture should prioritize the "legibility" of the built environment to reduce anxiety among survivors. When a shelter environment is coherent and organized, it reduces the "directed attention" required to perform basic daily tasks, thereby

allowing mental resources to be redirected toward long-term recovery and resilience building, as advocated by SDG 11.

Table 7 Fascination

Level of Perceived Restorativeness of Sustainable Temporary Shelter in Terms of Fascination (Effortless Attention)

	Category	SD	M	Description
Age	Young (Less than 20 Yrs Old)	0.449	3.565	Very Highly Needed
	Young Adult (21-39 Yrs Old)	0.460	3.436	Highly Needed
	Middle-Aged Adult (40-59 Yrs Old)	0.447	3.225	Highly Needed
	Senior (60 Yrs Old and Above)	0.445	3.265	Highly Needed
Sex	Male	0.411	3.444	Highly Needed
	Female	0.476	3.309	Highly Needed
No. of Members	Small (1-3 members)	0.482	3.441	Highly Needed
	Medium (4-6 members)	0.447	3.333	Highly Needed
	Large (7 or more members)	0.485	3.218	Highly Needed
No. of Households	1	0.411	3.444	Highly Needed
	2	0.476	3.309	Highly Needed
Source of Income	Employed	0.470	3.434	Highly Needed
	Self-employed	0.455	3.286	Highly Needed
	Business	0.427	3.212	Highly Needed
	Others	0.469	3.351	Highly Needed
Role in Disaster Context	Displaced Resident	0.467	3.347	Highly Needed
	Community Leader	0.179	3.080	Highly Needed
	LGU Personnel	0.462	3.267	Highly Needed
	NGO Worker	0.000	3.000	Highly Needed
	Architect/Engineer	0.707	3.500	Very Highly Needed
	Others	0.496	3.433	Highly Needed
Civil Status	Single	0.445	3.417	Highly Needed
	Married	0.471	3.323	Highly Needed
	Widowed	0.414	3.089	Highly Needed
Type of Calamity	Typhoon	0.445	3.298	Highly Needed

	Flood	0.477	3.374	Highly Needed
	Earthquake	0.000	3.400	Highly Needed
Type of Accommodation	Tents	0.447	3.800	Very Highly Needed
	Public Building	0.456	3.313	Highly Needed
	Transitional Housing	0.502	3.280	Highly Needed
	Living with Relatives	0.479	3.357	Highly Needed
	Others	0.441	3.333	Highly Needed
Duration of Stay	Less than 1 day	0.471	3.348	Highly Needed
	1-3 Days	0.452	3.374	Highly Needed
	4-6 Days	0.374	3.400	Highly Needed
	More than 6 Days	0.191	2.950	Highly Needed

Fascination (Effortless Attention). "Fascination" involves the ability of an environment to hold one's attention effortlessly, providing a rest for the mind. Technical professionals such as Architects and Engineers ($M = 3.500$, $SD = 0.566$) and the Youth ($M = 3.565$, $SD = 0.485$) reported "Very Highly Needed" needs for this restorative quality. This suggests that the sterile, utilitarian aesthetic of current shelters often composed of monotonous white plastic or grey canvas fails to provide "soft fascination", like views of nature or interesting textures, that helps in stress reduction.

Interestingly, those staying in Tents ($M = 3.520$, $SD = 0.471$) and those displaced for 1–3 days ($M = 3.513$, $SD = 0.440$) showed a high and consistent demand for fascinating elements. This indicates that even in the early stages of a disaster, the human mind craves visual and sensory variety to offset the trauma of the event. The lower scores from Widowed individuals ($M = 3.067$, $SD = 0.467$) might suggest a state of emotional numbness where the aesthetic quality of the environment is temporarily secondary to the immediate grief and loss.

The implication is that "beauty" or "visual interest" in shelter design is not a luxury but a psychological necessity. A sterile environment forces the mind to remain focused on the disaster, whereas an environment with "fascination" allows for a healthy distraction. Incorporating natural light, greenery, or culturally relevant colors and patterns into temporary shelters can act as a "soft" intervention that promotes mental well-being without requiring complex medical or psychological support systems.

The importance of "soft fascination" is a cornerstone of Attention Restoration Theory, with Kaplan (1995) noting that it allows the "inhibitory mechanism" of the brain to rest. "Soft fascination" is the most critical element for emotional and cognitive recovery. While hard fascination demands intense, draining mental focus to evaluate a threat, such as the chaos, sirens, and immediate survival tasks during a disaster, based on Rachel and Stephen Kaplan's Attention Restoration Theory (ART), (1989), soft fascination occurs when a person's attention is captured effortlessly by aesthetically pleasing, non-threatening stimuli.

In a disaster context, refugee camp, earthquake recovery zone, temporary shelter setup, survivors suffer from profound acute stress, hypervigilance, and mental exhaustion. Integrating soft fascination into post-disaster architecture shifts the built environment from a sterile, purely functional survival capsule into a trauma-informed space that lowers cortisol and interrupts panic loops. Research by Montalbano and Santi (2023) supports this by stating that dignity in design includes the sensory quality of the space. When shelters are designed solely for "utility," they neglect the human need for a stimulating and comforting environment, which is vital for maintaining morale in high-stress disaster zones.

Moreover, Hosseini et al. (2021) argue that the psychological effectiveness of a shelter is often ignored in favor of structural speed. Integrating fascinating elements such as common garden areas or varied architectural forms agencies can better support SDG 3 (Good Health and Well-being). In terms of materials, disaster architecture often relies heavily on rigid corrugated iron, heavy plastic tarps, or industrial shipping containers.

These materials generate loud, chaotic, and jarring sounds during storms, which can easily trigger panic in survivors of typhoons or earthquakes (Pinilla-Melo et al., 2025). Field evaluations of long-term temporary shelters consistently reveal that inadequate acoustic insulation is a leading cause of prolonged psychological anxiety and sleep deprivation among survivors (Kim et al., 2021; Yüksel, 2012). Providing an environment that captures effortless attention is a low-cost, high-impact method of enhancing the restorativeness of sustainable housing solutions.

Table 8 Compatibility

Level of Perceived Restorativeness of Sustainable Temporary Shelter in Terms of Compatibility (Fit with Needs and Culture)

	Category	SD	M	Description
Age	Young (Less than 20 Yrs Old)	0.401	3.635	Very Highly Needed
	Young Adult (21-39 Yrs Old)	0.504	3.396	Highly Needed
	Middle-Aged Adult (40-59 Yrs Old)	0.407	3.379	Highly Needed
	Senior (60 Yrs Old and Above)	0.381	3.480	Highly Needed
Sex	Male	0.427	3.507	Very Highly Needed
	Female	0.443	3.413	Highly Needed
No. of Members	Small (1-3 members)	0.500	3.486	Highly Needed
	Medium (4-6 members)	0.404	3.440	Highly Needed
	Large (7 or more members)	0.379	3.300	Highly Needed
No. of Households	1	0.427	3.507	Very Highly Needed
	2	0.443	3.413	Highly Needed
Source of Income	Employed	0.498	3.438	Highly Needed
	Self-employed	0.437	3.396	Highly Needed
	Business	0.354	3.400	Highly Needed
	Others	0.400	3.502	Very Highly Needed
Role in Disaster Context	Displaced Resident	0.424	3.464	Highly Needed
	Community Leader	0.447	3.200	Highly Needed

	LGU Personnel	0.577	3.333	Highly Needed
	NGO Worker	0.000	3.000	Highly Needed
	Architect/Engineer	0.141	3.100	Highly Needed
	Others	0.598	3.350	Highly Needed
Civil Status	Single	0.432	3.434	Highly Needed
	Married	0.455	3.441	Highly Needed
	Widowed	0.353	3.422	Highly Needed
Type of Calamity	Typhoon	0.424	3.400	Highly Needed
	Flood	0.453	3.464	Highly Needed
	Earthquake	0.000	3.400	Highly Needed
Type of Accommodation of	Tents	0.447	3.800	Very Highly Needed
	Public Building	0.418	3.369	Highly Needed
	Transitional Housing	0.329	3.440	Highly Needed
	Living with Relatives	0.451	3.517	Very Highly Needed
	Others	0.462	3.418	Highly Needed
Duration of Stay	Less than 1 day	0.446	3.427	Highly Needed
	1-3 Days	0.437	3.461	Highly Needed
	4-6 Days	0.179	3.720	Very Highly Needed
	More than 6 Days	0.476	3.300	Highly Needed

Compatibility (Fit with Needs and Culture). "Compatibility" measures how well an environment supports the user's goals and cultural expectations. Tent dwellers reported the highest and most consistent need for compatibility ($M = 3.800$, $SD = 0.447$), followed closely by the Youth ($M = 3.635$, $SD = 0.468$). These "Very Highly Needed" ratings reflect a profound mismatch between the current standardized shelter kits provided by aid agencies and the specific cultural and functional needs of Filipino families, such as the need for space to cook, pray, or gather as an extended unit.

The data also shows that those staying in Transitional Housing ($M = 3.560$, $SD = 0.456$) feel this lack of compatibility acutely. As the stay lengthens, the "temporary" nature of the shelter begins to conflict with the "permanent" activities of life. Conversely, LGU Personnel reported a much lower need ($M = 3.067$, $SD = 0.115$), suggesting that from a management perspective, the shelters are "compatible" with the goal of housing people, but from the user's perspective, they are not compatible with the goal of living with dignity.

This lack of compatibility implies a "top-down" failure in disaster response.

When shelters are designed without considering the Ginhawa (well-being) and specific domestic habits of the displaced, they become sites of frustration rather than restoration. To be truly sustainable, shelter design must be "user-centered," allowing for internal configurations that support the specific social and economic activities of the occupants, thereby fostering a sense of ownership and agency.

Killemsetty and Patel (2024) emphasize that compatibility is the "missing link" in most disaster housing

projects, leading to the abandonment of shelters or the unauthorized modification of structures by residents. In post-disaster shelter planning, "habitability" is defined not just by basic physical survival, but by providing an environment that respects human dignity and emotional recovery (Kim et al., 2021).

Field evaluations of long-term temporary shelters consistently reveal that inadequate acoustic insulation is a leading cause of prolonged psychological anxiety and sleep deprivation among survivors (Kim et al., 2021; Yüksel, 2012). When shelter materials fail to isolate individuals from the reminders of environmental threats, the prolonged displacement actively hinders recovery, embedding traumatic memories deeper into the survivor's autobiographical memory (Del Missier, 2025). Their research suggests that for a shelter to be effective, it must align with the "lived experience" of the community. This is further supported by the United Nations (1987) definition of sustainability, which includes the social and cultural "fit" of the built environment. Additionally, when humanitarian architecture honors vernacular spatial hierarchies, it shifts from sterile emergency containment to culturally compatible refuge. True compatibility requires viewing displaced populations not as passive recipients of aid, but as primary co-designers of their own recovery. Community-led design ensures that temporary shelters respect sacred domestic boundaries, gender-specific spaces, and social gathering traditions unique to the community's heritage. By actively engaging survivors in spatial planning, the architecture restores psychological agency and a sense of ownership. This participatory framework directly advances SDG 11, transforming vulnerable, high-stress displacement camps into inclusive, safe, resilient, and dignified human settlements. The high compatibility needs identified in Table 8 validate the call for "community-led" design processes where the displaced are not just "beneficiaries" but active participants in shaping their temporary homes.

Integrating Sustainability and Restorativeness of Temporary Shelter through Sustainable-Restorative Synthesis Matrix

The Sustainable-Restorative Synthesis Matrix for temporary shelters in Western Visayas provides a structured framework that integrates sustainability with human wellbeing. It bridges four sustainability dimensions such as environmental, economic, social, and resilience and adaptive with four psychological restorative factors, being away, extent, fascination and compatibility. At its core is a Cross-Impact Matrix, which systematically intersects each sustainability requirement with every restorative factor to generate specific design criteria. This method transforms qualitative values, such as cultural identity and community participation, alongside quantitative needs, like material efficiency and structural resilience, into actionable architectural guidelines. The result is a blueprint that ensures shelters are not only sustainable but also restorative, supporting both ecological balance and the psychological recovery of displaced communities. By grounding this matrix in the Western Visayas context, it directly operationalizes regional building traditions like bayanihan (communal unity) and the vernacular bahay kubo typology. Intersecting environmental goals with fascination establishes criteria for semi-permeable bamboo shading (sawali) that filters calming, dappled light while enabling passive cooling. Concurrently, pairing structural resilience with compatibility inspires modular timber frames that survive typhoons while allowing families to reconfigure their spaces as needed. Ultimately, this matrix shifts emergency sheltering away from sterile, industrial containment toward responsive, adaptive ecosystems that restore human agency and accelerate trauma recovery.

Western Visayas Sustainable-Restorative Shelter Matrix

Sustainability Dimension	Being Away (Trauma & Disaster Recovery)	Extent (Community & Spatial Legibility)	Fascination (Vernacular Architecture & Nature)	Compatibility (Local Materials & Climate)
	Gender-Segregated Privacy: Multi-layered Amakan	The Ugsadan (Courtyard) Central shared spaces mimicking traditional	Hiligaynon Textiles: Integration of Hablon weaving patterns or	The Extended Familia: Elastic wall configurations to accommodate the deeply rooted Visayan multi-generational family structure.

a. Social	(woven bamboo) and interlocking bamboo slats wall to respect cultural modesty and protect women/ children.	Visayan rural village layouts (Purok).	community murals depicting local folklore (Epics of Panay).	
b. Environmental	Acoustic Buffering via Topography: Positioning shelters using local foliage (Kawayan groves) to block camp noise.	The Datal Extension: Elevated bamboo slatted flooring extending outward into veranda spaces (Batalan).	Framing the Landscape: Windows capturing views of the Visayan Sea, local rice paddies, or dynamic tropical rain patterns.	The Bahay Kubo Principles: High pitched roofs, deep eaves, and wide openings optimized for the hot, humid Western Visayas climate.
Sustainability Dimension	Being Away (Trauma & Disaster Recovery)	Extent (Community & Spatial Legibility)	Fascination (Vernacular Architecture & Nature)	Compatibility (Local Materials & Climate)
c. Economic	The Amakan Screen: Utilizing cheap, abundant, locally woven bamboo split mats for internal privacy.	Standardize d Nipa / Bamboo Framing: Dimensioning modules around standard market lengths of local structural timber and bamboo.	Vernacular Geometric Craft: Relying on the natural aesthetic of woven Nito, Rattan, or layered Nipa palm thatch for visual relief.	The Bayanihan Kit: Flat-pack prefab joints designed for rapid assembly by locals without specialized power tools.
d. Resilience & Adaptive	Typhoon-Resistant Balay: Heavy tie-downs and aerodynamic roofing that reassure occupants they are safe	Cluster Up-Scaling: Modular connection plates allowing shelters to link together as a community transforms from relief to recovery.	Kinetic Bamboo Joinery: Utilizing traditional flexible lashing techniques (yantok) that allow the building to sway safely during high winds.	Stilt-Agile Foundations: Adjustable concrete footings or elevated stilts to combat severe flash flooding and muddy terrain.

Regional Adaptation of the Design

Social Sustainability (Rebuilding the Purok and Bayanihan). In Western Visayas, rural society is built heavily around close-knit communities (puroks) and multi-generational households.

Social-Extent (The Ugsadan)

Grid-like, institutional camp layouts induce high stress and alienate Visayan families (Amaratunga et al., 2021). Arranging shelters around a central Ugsadan (courtyard) replicates traditional village spatial sociology. This layout fosters communal cooking, shared childcare, and collaborative security, which are essential for restoring social capital post-disaster (Ganapati, 2013). In the shelter, the extended space such as balcony allows the traumatized individuals interact with their neighboring residents.

Social-Fascination (Hiligaynon Textile)

Translating oral folklore such as the Epics of Panay into prominent community murals anchors communal space in shared heritage, enriching the intellectual and cultural identity of both the region and the state (Caballero 2021).

Social-Compatibility (The Extended Family). Visayan families often include grandparents, aunts, and nieces under one roof. Monolithic, single-room tents force an unnatural fragmentation of these support systems. Using sliding or folding amakan partitions allows a single shelter to expand into a multi-generational living space, preserving the domestic structures that help process collective trauma (Schilderman & Lyons, 2011). With a 4.5m x 3.55m size of a shelter, it could accommodate 1-3 persons providing approximately 16 square meters of floor space. With modular feature, the space could expand to 5 m x 7 m that could accommodate 4-6 persons, accommodating average

number of 4.1 household members in Western Visayas (POPDEV VI, 2025). In a disaster or displacement scenario, households often consolidate. A single functional temporary shelter unit frequently needs to accommodate not just the nuclear average of 4, but extended kin (grandparents, aunts, or displaced nieces/nephews), effectively raising the emergency spatial requirement to 5 to 7 occupants. The modular geometry maximizes interior volume while offering a dignified sense of "home".

Environmental Sustainability

Perfecting the hot-humid microclimate.

Environmental Compatibility (Passive Climate Control). Western Visayas experiences intense solar radiation and high relative humidity, punctuated by heavy rainfall.

Importing uninsulated metal container vans or plastic tents transforms shelters into literal ovens, compounding the physiological stress of displaced families (Kershaw et al., 2021). Restorative shelters must borrow heavily from the vernacular Bahay Kubo featuring elevated floors, high ceilings to let hot air rise, and large awning windows that exclude rain while admitting cooling breezes. High pitch gable roof with deep eaves is ideal for hot humid climate in Western Visayas. However, temporary shelters require the simplest roof types, lean-to roof opted to be used because of their ease of construction and minimal material requirements. A jalousie-style air vent made of angled bamboo slats works by creating angled openings above the perimeter wall that allow airflow while blocking direct rain and excessive sunlight. This design is particularly useful in temporary shelters where ventilation is critical for comfort and health in hot, humid, and disaster-prone environments.

Environmental - Fascination (Indoor-Outdoor Continuity). Integrating a Batalan, a traditional rear unroofed porch or transition zone allows residents to wash, prepare food, and look out into the landscape. Watching tropical rain or the rustle of wind through coconut palms from a safe, shaded porch induces "soft fascination," lowering cortisol levels in traumatized individuals (Kaplan & Kaplan, 1989).

Economic Sustainability

Leveraging local materials and supply chains which Western Visayas is rich in agro-forestry products, specifically bamboo, nipa palm, rattan, nito and coconut timber.

Economic - Being Away (Affordable Solitude). Rather than importing expensive acoustic drywall, utilizing Amakan (woven bamboo mats) sourced from local weavers in Iloilo or Antique provides low-cost, lightweight, and culturally familiar indoor zoning. This also injects vital cash into the local economy during the post-disaster recovery phase (Leon et al., 2022). The enclosure is constructed with 25mm overlapping bamboo slats, securely tied with rattan to a bamboo pole frame. This design provides occupants with privacy, as visibility from the outside is blocked, while the sturdy bamboo slats enhance security by deterring burglars and other intruders from entering the shelter.

Economic - Extent (Standardized Nipa / Bamboo Framing). Designing structural modules around standard market lengths of local timber and bamboo drastically reduces material waste and minimizes manual cutting labor, optimizing upfront financial resources for low-income building projects (Bredenoord, 2024). This modular harmonization stabilizes supply chains and lowers manufacturing costs, allowing grassroots housing initiatives to maximize regional resource security while keeping construction highly affordable (Binfield et al., 2024; Vitug & Alvarez, 2024).

Economic – Fascination (Vernacular Geometric Craft). Integrating traditional forest fibers like nito and climbing palms directly enriches contemporary structures, transitioning utilitarian materials into intricate decorative and acoustic zoning features.

This deliberate application of vernacular craft breaks up harsh light and casts soft shadow gradients, transforming essential building components into dynamic elements that celebrate regional craftsmanship (Grokikipedia, 2024).

Economic - Compatibility (The Bayanihan Kit). In the wake of a typhoon, infrastructure is broken. Self-assembly kits with pre-cut timber and universal, tool-free connections leverage the local culture of Bayanihan, the communal unity and cooperation. Displaced individuals can rapidly deploy and repair these structures autonomously, minimizing reliance on backlogged international aid logistics. Assembly of bamboo and wood frames made easy using old techniques like lashing, interlocking and pegging.

Resilience & Adaptive Sustainability

Because Region VI sits directly in the path of Western Pacific typhoons, a temporary shelter cannot feel flimsy. If a shelter rattles violently during a minor storm, it triggers severe secondary trauma and anxiety in survivors.

Resilience - Being Away (Psychological Security). To provide a true sense of escape from stress, the shelter must be structurally reassuring. This means utilizing steep, hip-roof geometries (which perform better in high winds than gable roofs) and secure cross-bracing rooted in concrete pad footings (Aquilino, 2011). However, temporary shelters require the simplest roof types, lean-to roofs are often used in transitional housing even because of their ease of construction and minimal material requirements. In case typhoon occurrence, roof tie down, or lateral bracing (diagonal support) could secure the temporary shelter.

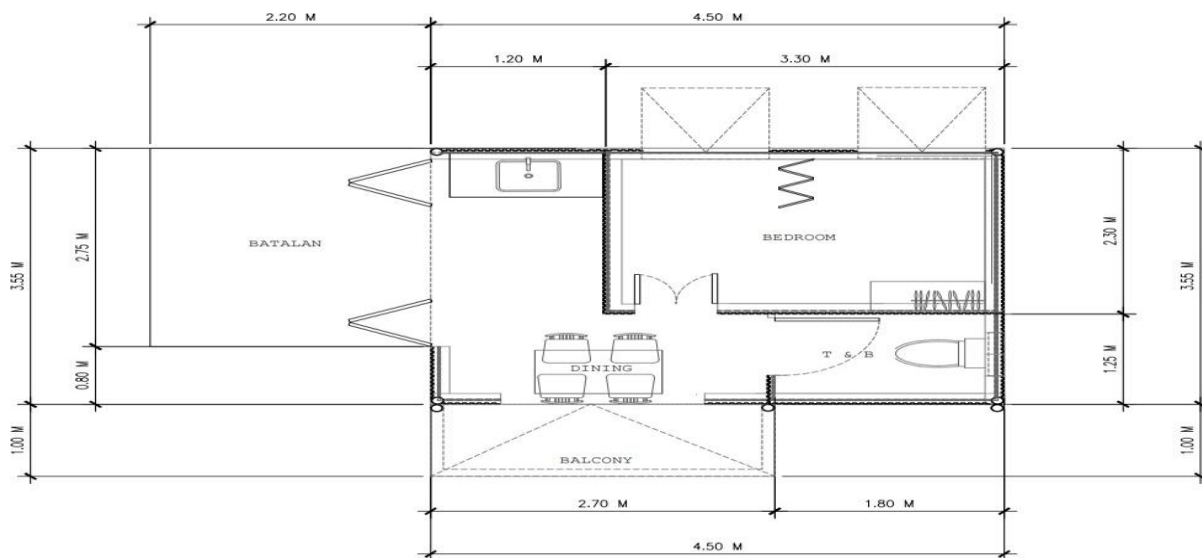
Resilience – Extent (Cluster Up-Scaling). In post-disaster planning, Cluster Up-Scaling represents a strategic shift from immediate, isolated relief to organized community recovery by using standardized interfaces to link individual units.

Standardized Connection Interfaces allow structural modules to expand dynamically, changing basic family-sized shelter pods into shared neighborhood blocks or larger public facilities (Eureka, 2024). This approach is reflected in real-world policy, such as the Department of Human Settlements and Urban Development (DHSUD) launching clustered "Bayanihan Villages" across the Philippines.

Resilience – Fascination (Kinetic Bamboo Joinery). Traditional flexible lashing techniques using yantok (rattan) paired with vernacular interlocking joints create a highly elastic structural envelope that allows a building to dissipate dynamic forces by swaying safely rather than fracturing under severe wind loads. This pliant joint system, deeply rooted in the engineering of the indigenous bahay kubo, maximizes tensile resilience against typhoon-force winds by distributing stress evenly across the lightweight bamboo and timber framework (University Research and Development Center, 2021).

Resilience - Compatibility (Context-Agile Foundations). Coastal areas in Iloilo and low-lying plains in Aklan and Capiz suffer from extreme mud and standing water after a typhoon. Designing shelters with elevated stilts and adjustable screw piles or precast concrete dice footings allows the shelter to sit securely above floodwaters, keeping the living zone dry, hygienic, and safe from waterborne pathogens (Maly, 2018)

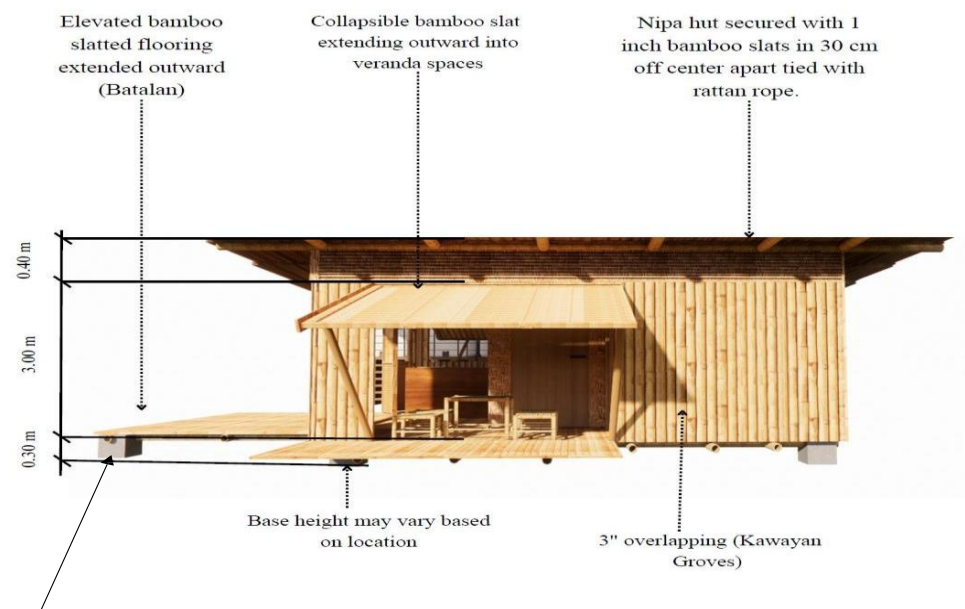
Figure 2



Floor Plan

Scale: 1:100

Figure 3



Adjustable concrete support or stilts

Figure 4

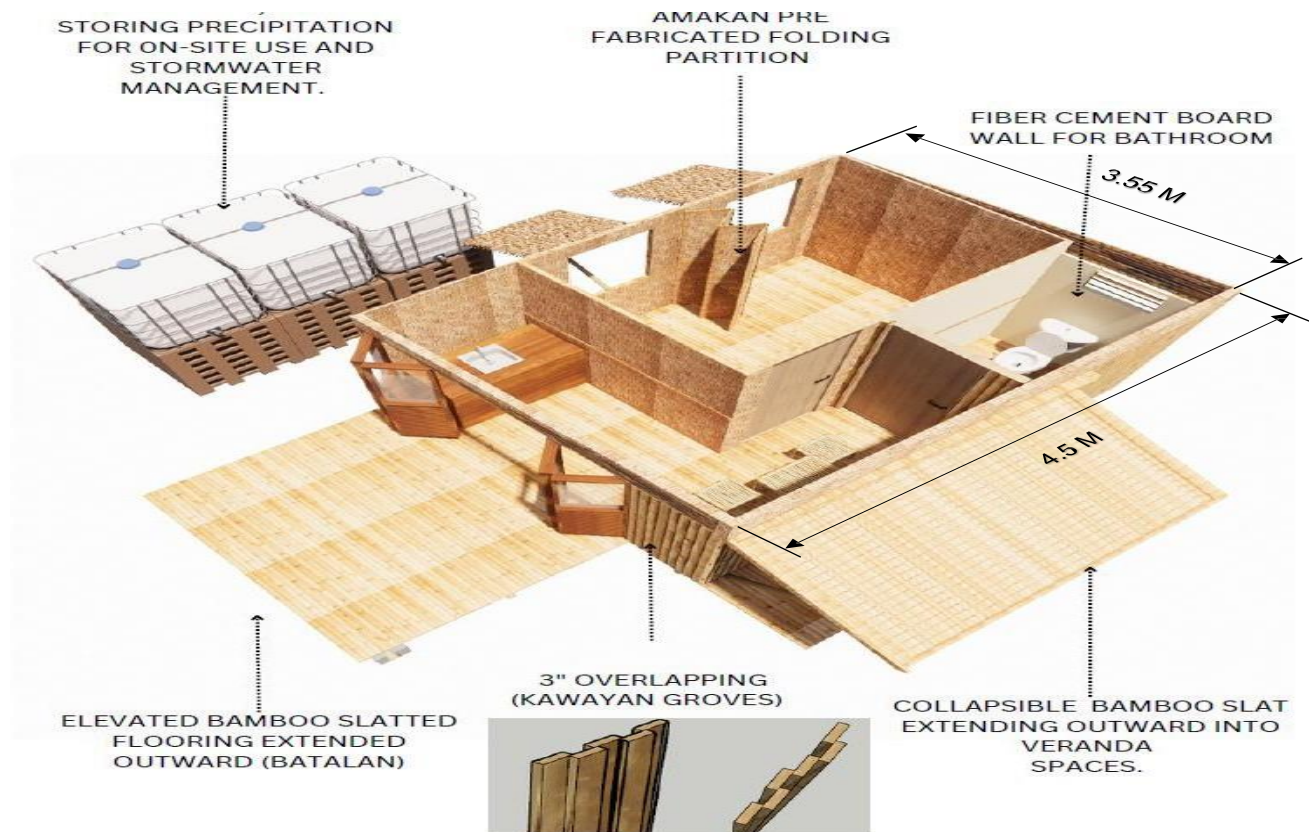


Figure 5



SITE DEVELOPMENT PLAN

Arranging shelters around a central Ugsadan (courtyard) replicates traditional village spatial sociology. This layout fosters communal cooking, shared childcare, collaborative security, and spaces that facilitate community interaction and social connectivity which are essential for restoring social capital post-disaster.

Figure 6



PERSPECTIVE

"Visual Ginhawa" elements like natural light, greenery, or cultural aesthetics directed attention to alleviate fatigue and stress. For a shelter to be truly restorative, it must hold attention effortlessly through "soft fascination", a psychological necessity that supports mental restoration and recovery from disaster induced stress.

DISCUSSION OF RESULTS

The assessment of temporary shelters reveals a critical intersection between environmental sustainability and psychological restorativeness, where the physical conditions of displacement directly dictate the recovery trajectory of inhabitants. According to the data, respondents in the most precarious accommodations, specifically Tents, reported the highest demand for both environmental system needs ($M = 3.920$, $SD = 0.179$) and restorativeness qualities such as Compatibility ($M = 3.800$, $SD = 0.447$). This "Very Highly Needed" need indicates that current temporary solutions are failing to provide the basic structural integrity and psychological "breathability" (Ginhawa) required for dignity. When shelters are perceived as mere "emergency storage" rather than restorative spaces, they exacerbate the trauma of displacement, undermining the core objectives of SDG 11.

The data further highlights a descriptive age-based difference in the perception of shelter adequacy, with the Young (less than 20 years old) and Seniors (60 and above) exhibiting the most acute needs. For the youth, the need for Compatibility ($M = 3.635$, $SD = 0.401$) and Fascination ($M = 3.565$, $SD = 0.449$) reached "Very Highly Needed" levels, suggesting that younger displaced persons are highly sensitive to the cognitive and social "fit" of their environment. Similarly, Seniors prioritized environmental systems ($M = 3.590$, $SD = 0.376$), likely due to mobility constraints and health vulnerabilities. These findings emphasize that a "one-size-fits-all" approach to humanitarian housing fails to account for the diverse developmental and physical requirements of different life stages, necessitating a move toward inclusive, age-responsive design.

The concept of Pakikipagkapwa (shared identity) is central to the findings on Extent and Social System Needs. Flood victims, in particular, expressed a "Very Highly Needed" need for Extent ($M = 3.600$), reflecting a profound psychological demand for environmental coherence after the sudden destruction of their physical reality. The loss of social connectivity and navigability in fragmented "tent cities" prevents the realization of communal healing. As temporary shelters transition from immediate relief to longer-term stays (often exceeding six days), the pressure on social and economic systems intensifies.

Without spaces that facilitate community interaction and economic agency, shelters become sites of stagnation rather than platforms for resilience and adaptive capacity.

The professional insight from Architects and Engineers, who reported a "Very Highly Needed" need for Fascination ($M = 3.500$, $SD = 0.707$), underscores a technical consensus that current shelter models are visually and cognitively sterile. This lack of "Visual Ginhawa" elements like natural light, greenery, or cultural aesthetics means that directed attention fatigue remains unmitigated. The data suggests that for a shelter to be truly restorative, it must hold attention effortlessly through "soft fascination." This is not an architectural luxury but a psychological necessity that supports mental restoration and recovery from disaster-induced stress, directly aligning with the objectives of SDG 3 for good health and well-being.

Ultimately, the developed shelter model featuring a modular configuration directly addresses these documented deficiencies. By eliminating mechanical hardware in favor of a natural visual buffer, the design restores the "Very Highly Needed" need for privacy and compatibility observed in the study. The elevated base and aerodynamic circular geometry respond to the environmental system needs identified by the most vulnerable respondents. This transition toward a "kit of parts" model and "Bayanihan" system may support participation by displaced populations to participate in their own recovery fosters a sense of agency. By integrating sustainability with restorativeness, the proposed design shifts the humanitarian paradigm from survival-based enclosures to dignity-centered, restorative homes.

SUMMARY OF FINDINGS

The primary objective of this study was to evaluate the sustainability and restorativeness of temporary shelters for displaced populations in the Philippines, focusing on the intersection of physical infrastructure and psychological well-being. To achieve this, a developmental mixed-methods research design was employed, utilizing a structured survey instrument distributed to 160 respondents, including displaced residents, community leaders, and technical professionals. The methodology integrated a needs assessment across environmental, social, and economic systems with an evaluation of restorative qualities Being Away, Extent, Fascination, and Compatibility using a localized framework of Ginhawa and Pakikipagkapwa. The data collected served as the empirical foundation for the development of an innovative, restorative shelter model designed to address the systemic gaps identified in current humanitarian housing practices.

On Shelter Needs. The study identifies a very high demand for environmental, social, and economic system support among the most vulnerable populations, specifically those residing in tents and victims of sudden-onset disasters like flood. Environmental needs, such as site selection and waste management, are prioritized by seniors, while social system needs remain consistently high across all demographics. The findings indicate that as the duration of stay increases, the strain on the shelter's adaptive capacity becomes more acute, highlighting a failure in current systems to provide long-term sustainability beyond the initial emergency phase.

On Restorativeness Qualities. Assessment of the four qualities of restorativeness Being Away, Extent, Fascination, and Compatibility reveals that tent dwellers consistently report the highest needs, indicating a severe lack of psychological refuge and environmental coherence. The data shows that displaced populations, particularly the youth and technical professionals, perceive current shelters as cognitively sterile and culturally incompatible. This deficiency in ease and shared connectivity suggests that the physical environment is currently a barrier to, rather than a facilitator of, mental restoration and trauma recovery.

On the Developed Shelter. The adaptation of Bahay-kubo, modular shelter design was designed to address the identified gaps by prioritizing privacy, climate resilience, and psychological stability. Architectural features such as the raised base and aerodynamic geometry directly mitigate the environmental risks felt by respondents, while bifold Amakan doors replaces failed mechanical hardware to ensure dignity. By providing sufficient natural light and expandable floor spaces to interact with nature outside, it may support comfort and perceived restoration. The kit of parts for communal assembly design fulfills the high compatibility needs and empowers displaced persons to reclaim their agency, transitioning the shelter from a temporary enclosure to a restorative home.

CONCLUSIONS

The study concludes that current temporary shelter solutions in the Philippines are reported as inadequate in addressing the holistic needs of displaced populations, prioritizing immediate physical coverage at the expense of long-term sustainability and psychological restorativeness. The assessment reveals that the most precarious living

conditions specifically those found in tents evoke the highest demand for environmental systems and restorative qualities. This disparity suggests that when a shelter is designed merely as an emergency enclosure, it fails to provide the sense of *Ginhawa* (ease/relief) necessary to mitigate the trauma of displacement, thereby hindering the recovery process.

Furthermore, the research establishes that demographic vulnerabilities, particularly among the youth and seniors, may influence the perception of shelter adequacy. Younger displaced persons exhibit a profound need for environmental "compatibility" and "fascination," suggesting that their cognitive recovery is deeply tied to the visual and functional quality of their surroundings. Seniors, meanwhile, prioritize structural and environmental stability. These findings indicate that humanitarian design must move away from standardized, "one-size-fits-all" models toward inclusive, age-responsive architecture that respects the diverse developmental and physical requirements of its occupants.

The study also underscores the critical role of *Pakikipagkapwa* (shared identity) in environmental restoration. For victims of sudden disasters like floods, the need for environmental "extent" a sense of coherence and navigability is paramount. The failure of current "tent cities" to provide clear social connectivity leads to psychological fragmentation. By contrast, the proposed framework hypothesizes that when architectural design fosters a sense of belonging and community order, it serves as a powerful tool for social resilience, allowing displaced individuals to transition from survival-based stress to communal healing.

The technical evaluation by architects and engineers highlights a significant gap in the "soft fascination" of current shelters, which are often perceived as cognitively sterile. The conclusion drawn is that restorativeness is not an aesthetic luxury but a functional necessity. Without elements that hold attention effortlessly such as natural light, cultural aesthetics, and breathable spaces directed attention fatigue remains unmitigated. Integrating these restorative qualities into temporary housing is essential for upholding SDG 3 (Good Health and Well-being) and ensuring that the built environment may support perceived restoration and well-being.

Ultimately, the adaptation of *Bahay-kubo* modular restorative shelter model suggests that architectural innovation can successfully bridge the gap between sustainability and dignity. By utilizing expandable spaces, lead the disaster victim interact with nature, that could heal them from their trauma, addresses the specific deficiencies identified by the respondents. This transition toward a participatory, "kit of parts" and "*Bayanihan*" construction model may support participation by displaced populations to reclaim their agency. The study concludes that the future of humanitarian architecture lies in creating "restorative homes" that provide not only a roof but a dignified foundation for sustainable resettlement and long-term resilience.

RECOMMENDATIONS

Based on the findings and significance of your study regarding the intersection of sustainability and restorativeness in humanitarian architecture, the following recommendations are offered:

For Local Government Units (LGUs) and Disaster Risk Reduction Offices

It is recommended that disaster management agencies consider the integration of restorative design principles into their standard housing procurement processes. There is an opportunity to evaluate the transition from basic relief tents toward shelter models

that prioritize privacy and long-term environmental systems, as these elements are shown to be essential for the psychological ease of vulnerable populations, particularly seniors and families.

For Architects, Urban Designers, and Technical Professionals

Designers might find value in exploring non-traditional, circular geometries, such as the "snail shell" model, to enhance the aerodynamic and psychological performance of temporary housing. It is suggested that professionals emphasize "soft fascination" and culturally resonant spatial configurations to help mitigate the mental fatigue of displacement and better align the built environment with the Filipino values of *Ginhawa* and *Pakikipagkapwa*.

For Humanitarian Aid Organizations and Non-Governmental Organizations

It is recommended that aid providers explore participatory assembly models that allow displaced individuals to contribute to the construction of their own shelters. Such an approach could help foster a sense of personal agency and psychological stability, potentially transforming the recovery period from a state of passive waiting into an active process of reclaiming one's home and dignity.

For Policy Makers and Urban Planners

Legislative bodies and housing authorities might consider incorporating restorativeness metrics such as environmental compatibility and social connectivity into national sustainable development frameworks. Aligning temporary housing standards with these psychological and social indicators could provide a more holistic pathway toward achieving the objectives of SDG 3 and SDG 11 in post-disaster contexts.

For Future Researchers and Academic Institutions

Further inquiry is recommended to investigate the long-term impact of restorative shelter design on the socioeconomic reintegration of displaced communities. Researchers might also consider longitudinal studies across various topographical settings to further validate the resilience and adaptability of the developed shelter model, ensuring its continued relevance to evolving humanitarian needs.

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