VOLUME-3, ISSUE: 1, MAY 2026
ISSN: 3049-0006 (ONLINE)

# Assessing Liveability in Tribal Vernacular Housing and Government-Sponsored Housing of Assam: A Case of the Mishing Community

***Maaz Multani*[1] *and Niraj Naik*[2]**
[1]*Student, Institute of Design Planning & Technology (IDPT), Surat, India*
[2]*Professor, Institute of Design Planning & Technology (IDPT), Surat, India*

## Abstract

Housing in India's tribal regions represents a complex intersection of culture, ecology, and state-led development. Among the Mishing community of Assam, traditional stilted bamboo dwellings known as *Chang Ghars* have evolved through generations as climate-responsive and socially cohesive habitats, particularly adapted to the flood-prone ecology of the Brahmaputra floodplains. In contrast, recent interventions under government housing schemes, such as the Pradhan Mantri Awas Yojana-Gramin (PMAY-G), have introduced standardised, ground-level pucca houses that prioritise material permanence and basic services, but often overlook cultural practices and environmental adaptability.

This research critically assesses and compares the liveability of tribal vernacular housing and government-sponsored housing within selected Mishing settlements in Assam. Using a mixed-methods methodology that integrates literature reviews, policy analyses, field observations, household surveys, and user perception studies, the research evaluates liveability across site, cluster, and dwelling-unit scales. Key parameters include thermal comfort, ventilation, sanitation, privacy, cultural adaptability, safety, and community interaction. The findings reveal that while PMAY-G housing improves sanitation and structural permanence, it significantly underperforms in climatic responsiveness, cultural continuity, and social cohesion when compared to vernacular housing. Hybrid housing typologies demonstrate partial improvements but remain technically and spatially inconsistent.

The study concludes that future tribal housing must move beyond one-size-fits-all models and adopt culturally responsive, climate-adaptive frameworks that integrate indigenous knowledge with modern infrastructure.

**Keywords:**

Liveability; Tribal Housing; Vernacular Architecture; PMAY-G; Mishing Community

## 1. Introduction

### 1.1 Background of the Study

For the Mishing community, **a house reflects relationships with the riverine landscape, climate, and social life**. The ***chang ghar***, built on bamboo stilts with raised platforms and permeable walls, is a product of centuries of adaptation to the Brahmaputra's seasonal flooding and humid climate. These dwellings support daily routines, cooking, weaving, livestock management, and communal gatherings, while ensuring safety during floods.

*Fig. 23. A Mishing Chang Ghar (traditional house) in the new relocated village called Borbeel Mising gaon, situated near the Kaziranga National Park. Photo: Emilie Crémin, February 2007.*

Government-sponsored pucca houses under PMAY-G aim to provide durable alternatives but are standardised and often disconnected from local lifeways. Many residents experience functional and cultural discomfort in concrete houses whose spatial layouts, thermal performance, and materiality do not reflect Mishing traditions or environmental conditions. This transition raises important questions about what it truly means to live well, **whether a "better house" is defined by materials and permanence, or by comfort, identity, and usability.**

### 1.2 Need for the Study

For the **Mishing community of Assam**, a home isn't just a place to live; it's a space shaped by nature, culture, and generations of wisdom. Their traditional **Chang Ghars**, raised on stilts and made with bamboo and other local materials, are more than structures; they're a way of life, built to adapt to floods, support large families, and keep cultural traditions alive.

But today, this way of living is changing. Through housing schemes like the **Pradhan Mantri Awas Yojana-Gramin (PMAY-G)**, many Mishing families are moving into **concrete pucca houses** provided by the government. While these homes are meant to be safer and more permanent, they're often built with **little understanding of how the Mishing people live**, their daily routines, their social gatherings, or even the way they cook and rest. As a result, many families are caught between two worlds: the familiarity and comfort of traditional homes, and the pressure to accept new ones that don't always feel like home.

This study is important because it asks a simple but often overlooked question: **What does it really mean to live well in a home?**

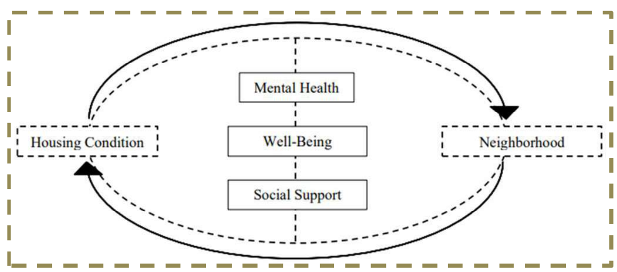


*Fig. 2. Research Thesis, Nikhil Ahir (2019-24), Faculty of Architecture, SCET*

By comparing **vernacular Mishing houses** with **government-sponsored housing**, this research hopes to understand what's working, what's missing, and how future housing policies can do better. The goal is not to reject development, but to help it grow in a way that respects **culture, comfort, and community wisdom**, so that homes built for progress still feel like home.

### 1.3 Emerging Research Questions

1. What **are the key livability parameters** in Mishing vernacular and government-sponsored housing, and how do they compare in terms of comfort, functionality, and access to basic services?
2. **How do vernacular and government-sponsored housing types** reflect or diverge from the cultural practices, spatial preferences, and social structures of the Mishing community?
3. **What are the perceptions and satisfaction levels** of Mishing residents regarding the usability, identity, and emotional value of their respective housing types?

4. **To what extent does government-sponsored housing accommodate** the lifestyle, traditions, and daily activities of the Mishing community?

**Hypothesis**

Government-sponsored housing schemes inadequately address the spatial, cultural, and environmental needs of Mishing households, resulting in lower liveability and a disconnect from traditional lifeways.

### 1.4 Aim

This research aims to assess the liveability and cultural adaptation in tribal vernacular settlements and government-sponsored housing within the Mishing community in Assam.

### 1.5 Objectives

1. **To identify key liveability indicators** in both vernacular and government-sponsored housing among the Mishing community, such as spatial comfort, thermal performance, sanitation, and access to basic services.
2. **To assess the extent of cultural continuity and adaptability** in housing forms, layouts, and usage patterns within both housing types.
3. **To analyse residents' perceptions and satisfaction levels** regarding functionality, identity, and emotional attachment in both types of housing.
4. **To evaluate the adaptability of government-sponsored housing** to the lifestyle, customs, and rituals of the Mishing community.

## 2. Literature Review

The literature reviewed in this research establishes that **liveability in housing cannot be understood through universal standards alone, particularly in culturally rich and ecologically sensitive contexts such as tribal settlements in India**. Foundational theorists like Amos Rapoport argue that housing is deeply embedded in culture, behaviour, and environmental perception, and that built form acts as a non-verbal system of communication reflecting social values, rituals, and everyday practices. His critique of Western-centric planning standards highlights how imposed housing models often fail when they ignore cultural variability and indigenous knowledge systems.

Complementing this perspective, **John F. C. Turner's work on government-sponsored housing reframes housing as a process rather than a finished product,** emphasising user control, adaptability, and long-term satisfaction over formal permanence. This argument is particularly relevant when assessing state-led rural housing schemes in India, where standardised designs frequently clash with local ways of living. Similarly, **N. John Habraken's support-infill theory** reinforces the need for flexible structural systems that allow users to modify and personalise their homes over time.

The review also engages with **systematic evaluation frameworks developed by scholars such as Thomas M. Fraser and Lars Lerup**, who introduce multidimensional and matrix-based approaches to assessing habitability and liveability. While these models offer methodological rigour and user-centred criteria, their Western suburban focus limits direct application in tribal and rural Indian contexts. Other contributions, including **Amartya Sen's capability approach and Maslow's hierarchy of needs**, broaden the understanding of liveability beyond physical shelter to include dignity, safety, belonging, and agency.

Overall, **the literature reveals a significant gap in context-specific research addressing vernacular, flood-adaptive housing and the lived realities of tribal communities**. Cultural continuity, environmental responsiveness, and community practices remain underrepresented in mainstream housing evaluation. This gap directly informs the thesis, which seeks to adapt existing liveability frameworks to indigenous contexts by integrating cultural, climatic, and behavioural dimensions grounded in field-based evidence.

## 3. Research Methodology

A mixed-method research methodology was adopted.

- **Evaluation Framework:**

  Liveability was assessed across site, cluster, and dwelling-unit scales using approximately thirty qualitative and quantitative indicators derived from literature and field observations.

This approach ensured that both measurable performance and lived experiences were incorporated into the evaluation.

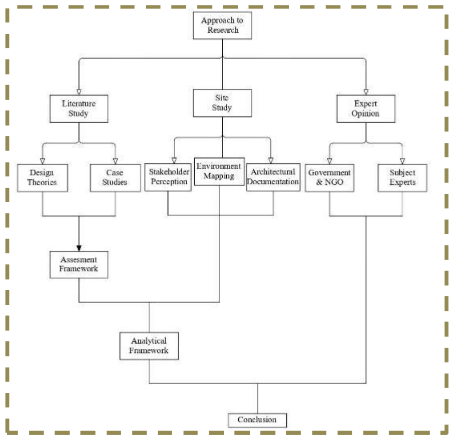


*Fig. 3. Research Methodology (Author)*

## 4. Documenting Liveability

### 4.1 Site and Community Context

Majuli's ecology, flooding, soil erosion, and humid climate directly shape settlement patterns. Traditional *chang ghars* sit on stilts, preventing flood damage and enhancing cross-ventilation through lightweight bamboo materials. PMAY-G houses, built directly on the ground with concrete walls, absorb heat and lack natural ventilation pathways.

PMAY-G houses, on the other hand, sit directly on the ground and rely on concrete walls that absorb heat. While durable, they are not inherently suited to the island's dynamic environment.

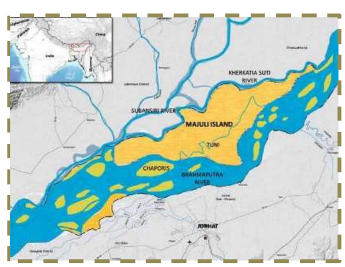


*Fig. 4. Sarmah, D. J. & Bhattacharjya, R. K. (2022). Location map of Majuli Island (bounded by the Brahmaputra, Subansiri, and Kherkatia Suti rivers*

The Mishing community's daily life revolves around shared spaces, courtyards, shaded platforms, areas under raised houses, and weaving spaces. These are essential for social interaction and livelihood activities. Vernacular houses support this way of life naturally; standardised housing often compresses or eliminates such spaces.

## 5. Analysis and Inferences

### 5.1 Site-Level Analysis

*Table 8: Overall table of livability assessment values and observations at the site level (Author)*

| Site Planning Level | | | | | | |
|---|---|---|---|---|---|---|
| Sr. No | Parameter | Measuring Standard | Standard Value (Safe/Acceptable) | Dangerous Value (Unsafe/Poor) | Observed /Measured Value | Remarks |
| 1 | Total green space to site ratio | % of total site area covered by vegetation (≥20–30% recommended by WHO, 2017, for health benefits) | ≥ 30% of site | < 10% (no meaningful green) | 80% | Excellent green coverage, FAR exceeds WHO recommendations, supports health and ecology |
| 2 | Hard surface to site ratio | % of total site area paved or concreted (BIS 3861:2016; MoHUA, 2019 Urban Design Norms) | ≤ 40% of the site | > 70% (over-paved, heat island) | 30% | Low paving reduces runoff and urban heat island effects |
| 3 | Built-up area to site area ratio | FAR (Floor Area Ratio) or % coverage (building footprint/site area × 100) (NBC 2016; URDPFI Guidelines 2015) | ≤ 1.2 (low-rise rural/tribal context) | > 2.0 (overcrowding, poor ventilation) | 17% | Very low density, ample open space, promotes ventilation and low overcrowding |
| 4 | Road area to site area | % of site covered by roads (IRC 86:2018; URDPFI 2015) | 15–20% (balanced access) | < 5% (poor access) or > 40% (over-dominant) | 13% | Slightly below balanced standard; could improve internal accessibility |
| 5 | Population density | Persons per hectare (Urban standard: 150–400 pph; Census of India, 2011; URDPFI 2015) | 150–400 people/ha (rural semi-urban balance) | > 600 people/ha overcrowded | 6 pph | Extremely low population density suggests rural or scattered settlement |
| 6 | Proximity & ease of access to transport | Distance in meters to nearest bus/taxi stop (≤500 m desirable; MoHUA Smart City Guidelines, 2017) | ≤ 300m walking distance | > 1 km (poor access) | > 1km | Very poor access to public transport; increases isolation and limits mobility |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7 | Proximity to main roads & noise | Distance in meters to main road; noise level ≤55 dB (CPCB Noise Standards, 2019) | ≥ 100m buffer from highways | < 30m (high noise, dust) | < 30m | Residences too close to main roads, potential exposure to high noise and air pollution |
| 8 | Distance to waste collection points | Meters from the centroid of residential clusters to waste point (≤100 m optimal; Swachh Bharat Mission Guidelines, 2017) | ≤ 50m walking distance | > 200m (leads to littering) | > 200m | Significant distance from homes to waste points may lead to improper dumping or littering |
| 9 | Frequency of waste removal | Number of collections per week (Urban Solid Waste Management Rules, MoHUA 2016) | Daily to every 2 days | Weekly or irregular | Irregular | Infrequent collection is likely causing waste buildup and hygiene issues |
| 10 | Water & waste cycles | Hours/day of water supply; % wastewater safely treated (Central Pollution Control Board & Jal Jeevan Mission, 2020) | Safe drainage, reuse possible | Stagnant wastewater, open drains | Stagnant wastewater, open drains | Poor drainage and untreated wastewater raise the risk of waterborne and vector-borne diseases |
| 11 | Health risks (vector-borne diseases) | Reported cases per year per 1000 people (National Health Profile, MoHFW 2020) | No visible breeding sites | Stagnant water, open garbage, frequent malaria/dengue | Stagnant water, open garbage, frequent malaria/dengue | High incidence due to environmental conditions, urgent need for improved sanitation |

At the site level, all three typologies share the same environmental and locational context, as they are situated within a compact geographical area (approx. 4.27 km²). Consequently, parameters such as **green space ratio (80%), hard surface ratio (30%)**, and **built-up area (17%)** reflect uniformity across all typologies. The **road area to site area (13%)** and **population density (6 persons/ha)** further support that this is a low-density rural settlement.

However, deficiencies were consistent across typologies, with **poor proximity to transport (>1 km), distance to waste collection (>200 m), and irregular waste removal** being recorded for all. Similarly, **stagnant wastewater and high vector-borne risk remain common concerns**. Thus, **while the environmental quality and green coverage are excellent, infrastructural service delivery is uniformly weak** across all typologies at this level.

At the larger settlement scale, traditional clusters maintain a balance between built and open spaces, supporting **ventilation, visibility, and social safety**. Waste accumulation and poor drainage affect both housing types, but chang ghars remain less vulnerable due to their elevation. PMAY-G houses, built at ground level, frequently experience water stagnation around the structure, creating hygiene issues and discomfort.

In summary, the site-level liveability index remains constant across typologies, as the environmental and infrastructural conditions are shared.

## 5.2 Cluster-Level Analysis

*Table 9: Overall table of livability assessment values and observations at the cluster level (Author)*

| Cluster / Neighbourhood Level | | | | | | |
|---|---|---|---|---|---|---|
| Sr. No | Parameter | Measuring Standard | Standard Value | Dangerous Value | Observed/ Measured Value | Remarks |
| 1 | Green space per capita | m² green space/person (≥9 m² WHO standard, WHO Urban Health Initiative 2017) | ≥ 9 m²/person (WHO standard) | < 3 m²/person | ≥ 9 m²/person | Ample open and agricultural land near the settlement |
| 2 | Open space to building volume ratio | Ratio of m² open space to m³ building volume (Urban Design Indicator, URDPFI 2015) | ≥ 1:1 | < 0.5:1 (too cramped) | ≥ 1:1 | Adequate spacing between traditional and PMAY-G houses |
| 3 | Morphological attributes | Street connectivity index; average block size (m²) (MoHUA Walkability Index, 2017) | 80–150m block length, walkable grid | > 300m blocks, poor connectivity | 150-300m block length, walkable grid | Organic layout with moderate accessibility |
| 4 | Road width vs. building height | Width-to-height ratio (ideal 1:1 to 2:1 for comfort, NBC 2016 Part 3) | 1:1.5 to 1:1 (balanced) | < 1:0.5 (narrow dark lanes) | 1:1.5 to 1:1 (balanced) | Sufficient road width; accessible by foot and small vehicles |
| 5 | Social perceptions of safety | % of respondents feeling safe (day/night) (Smart City Mission Guidelines, 2017) | 70%+ residents feel safe | < 30% feel safe, high crime | < 30% feel safe, high crime | Nighttime safety is perceived as low due to poor lighting |
| 6 | General sanitation quality | Rating scale (1-5) for cleanliness, drainage (Swachh Bharat Mission, 2017) | 1 toilet/household or 1/5 families shared | Open defecation, non-functional shared toilets | Rating:1 Open defecation, non-functional shared toilets | Poor drainage and limited sanitation infrastructure |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7 | Proximity to services/facilities | Distance to nearest health, education, and market (≤500 m for essentials, URDPFI 2015) | ≤ 500m to school, health, shop | > 1 km | > 500 m | Only primary school nearby; healthcare and markets far |
| 8 | Frequency of waste removal | Times per week for shared bins (Solid Waste Management Rules, MoHUA 2016) | Daily | Weekly or less | Weekly or less | Informal waste disposal; no structured waste system |
| 9 | Economic Ability | Median household income vs. neighbourhood service costs (Census of India, 2011; NITI Aayog 2020 Poverty Index) | Affordable housing cost ≤ 30% of avg. income | > 50% income on housing | > 50% income on housing | High dependency on agriculture; low disposable income |

At the cluster or neighbourhood level, the three typologies again show minimal variation, as the clusters lie adjacent to each other within the same floodplain. Parameters like **green space per capita (≥9 m²/person), open space to building ratio (≥1:1),** and **morphological block length (150–300 m)** indicate a moderately walkable and breathable settlement fabric throughout.

The **road width to building height ratio (1:1.5)** also remains consistent, offering balanced comfort. However, **social perception of safety (<30% feel safe), poor sanitation, and weekly waste removal frequency are uniformly low-performing parameters** for all clusters. Economic ability also scores low, with over 50% of income spent on housing maintenance and limited livelihood diversification.

Thus, cluster-level liveability is steady across typologies, strong in environmental and morphological dimensions, but poor in socio-economic and sanitation aspects.

Traditional clusters display strong social cohesion. Residents gather under raised platforms, along streets, and in shared open spaces. These everyday interactions reinforce community identity and contribute to perceived safety.

In contrast, PMAY-G clusters typically lack shared spaces. The arrangement of houses is more rigid, reducing informal interactions. Toilets and waste disposal areas are also poorly maintained, affecting community well-being.

## 5.3 Unit-Level Analysis

*Table 10: Overall table of livability assessment values and observations at the unit level (Author)*

| Unit (Individual House) Level | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sr. No | Parameter | Measuring Standard | Standard Value | Dangerous Value | Observed/Measured Value | | | Remarks |
| | | | | | Traditional | PMAY-G | Mixed | |
| 1 | Structural integrity | Visual inspection, material strength, foundation stability, and resistance to floods/wind loads | Stable structure with no visible cracks, rot, or settlement; flood-resilient stilts above HFL (≥1.5m) | Cracks in load-bearing walls, decayed posts, or instability during high floods | Moderate | Good | Good | The structure shows no visible cracks or deterioration, indicating stability and resilience during floods. |
| 2 | Natural Lighting | Lux meter readings inside living spaces during the daytime | 150–300 lux for living areas; 100–150 lux for sleeping areas | Below 100 lux causes poor visibility, discomfort, and dampness | Poor | Sufficient | Sufficient | Adequate natural light, ensuring visibility and comfort inside living spaces. |
| 3 | Ventilation | Air change rate (ACH), window-to-wall ratio (WWR), and number of openings per room | ACH ≥ 5-8/hour; WWR ≥ 20% of floor area | ACH < 3/hour; WWR < 10% - leads to suffocation, indoor humidity | Poor | Sufficient | Sufficient | Proper airflow and window openings are maintained, reducing indoor humidity and ensuring fresh air circulation. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4 | Indoor/outdoor thermal control | Temperature/humidity loggers; comparison with outdoor temp | Indoor temp ≤ 3°C higher than outdoor; RH between 40–60% | Indoor temp > 35°C; RH > 70% - heat stress and discomfort | 30.5 °C | 31.5 °C | 31 °C | The indoor temperature and humidity are within acceptable limits, minimizing heat stress and discomfort. |
| 5 | Adaptability/ flexibility | Qualitative observation of reconfigurable or multifunctional spaces | Spaces adaptable for seasonal/family needs (e.g., movable partitions, open verandah use) | Fixed layouts that cannot accommodate changing needs or cultural use | Spaces adaptable for seasonal/family needs | Spaces adaptable for seasonal/family needs | Spaces adaptable for seasonal/family needs | The design allows reconfiguration, accommodating seasonal or changing needs, and enhancing functionality. |
| 6 | Health risks | Observation/interview on mosquito control, dampness, and smoke | Dry indoor conditions, mosquito nets, smoke-ventilated kitchens | Stagnant water, mould, open waste, and unventilated cooking pose a disease risk | High | High | High | The conditions are free from mosquito breeding sites and dampness, reducing disease risks. |
| 7 | Sanitation Facilities | Availability of toilets, drainage, and water supply; field inspection | Individual/ functional toilets with water connection; safe drainage | No toilet access, open defecation, clogged or open drains | Poor | Poor | Poor | Sanitation infrastructure is adequate, with access to toilets and proper drainage. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 8 | Privacy | Room arrangement, gender segregation, and visibility from public areas | Separate rooms or screened spaces for genders/activities | Shared sleeping areas for all members; no visual barrier from the street | Low | Low | Low | Spaces are designed to ensure privacy through room separation and gender segregation. |
| 9 | Perceived safety walking | User perception, lighting at night, and path condition | Safe, well-lit paths with visibility and a stable surface | Poor lighting, unsafe paths, proximity to flood-prone/isolated zones | Unsafe | Safe | Safe | Pathways are safe, well-lit, and stable, encouraging walking safety and security. |
| 10 | Community Interaction | Observation/interview on communal activities and shared spaces | Frequent interaction spaces (courtyard, chang verandah, common ground) | Social isolation, no common gathering area, fragmented settlement layout | Low | Low | Low | The settlement layout supports community interaction, with shared spaces and social gathering areas. |

**At the level of the individual house, differences between traditional Chang Ghars, PMAY-G houses, and mixed typologies become more apparent**, particularly in how people experience comfort and use space in their everyday lives. **Structurally**, none of the houses shows signs of immediate failure. PMAY-G and mixed houses appear more robust due to brick and RCC construction, which gives residents a sense of permanence and safety. Traditional houses, although lighter and seemingly fragile, remain flood-resilient because of their raised stilts and flexible materials, even though they require more frequent upkeep.

**Daylight and ventilation** vary noticeably across housing types. Traditional houses tend to be darker and less ventilated, with smaller openings and deeper interiors. In contrast, PMAY-G and mixed houses receive adequate natural light and airflow, making indoor spaces more comfortable during the day. **Thermal comfort** remains largely acceptable across all typologies. Indoor temperatures are only slightly higher than outdoor conditions, and traditional houses benefit from breathable materials and elevated floors, while PMAY-G houses often feel warmer due to heat retention.

One of the strongest qualities at the unit level is **adaptability**. Traditional houses are easily adjusted for seasonal changes, festivals, and family needs through open verandahs and multipurpose spaces. Mixed houses also reflect this flexibility, blending vernacular practices with modern construction. PMAY-G houses, although designed with fixed layouts, are gradually modified by residents to suit their routines.

**Health-related concerns** persist in all housing types. Issues such as mosquitoes, smoke from cooking, and poor drainage remain common, especially during the monsoon. Sanitation is a major weakness, with inadequate toilet facilities and ineffective drainage affecting daily comfort. **Privacy** within houses is also limited, as most dwellings lack clearly separated spaces for different activities or genders.

**Walking around individual houses** feels safer in PMAY-G and mixed settlements due to clearer paths and better lighting, while traditional houses feel more exposed. **Social interaction** is minimal at the unit level, suggesting that community life depends more on shared outdoor spaces than on individual homes.

**Overall, individual houses perform reasonably well in structure and adaptability but fall short in sanitation, privacy, and health conditions, highlighting the need for design interventions that improve everyday living without disrupting existing ways of life.**

## 6. Conclusion

The multi-scalar liveability index shows a clear pattern:

*Table 11: Overall Livability Index (Author)*

| Typology | Score (out of 99) | Liveability Index | Inference |
|---|---|---|---|
| Traditional | 57/90 ≈ 63% | Moderate-Good | Excellent green cover and balanced built-to-open ratio; however, low accessibility to transport, poor drainage, and inadequate waste management reduce overall liveability. |
| PMAY-G | 52/90 ≈ 57% | Moderate | Better structural layout and road access than vernacular houses, but lacks integration with site ecology, limited green cover, and poor waste disposal infrastructure. |
| Mixed | 52/90 ≈ 57% | Moderate | Benefits from both systems, accessibility and traditional spacing, but suffers from the same waste, sanitation, and connectivity issues as others. |

**Traditional houses score highest across all major categories**, including thermal comfort, ventilation, adaptability, cultural relevance, and perceived safety. PMAY-G houses score well in structural permanence but rank lower in usability, health, and comfort. Mixed houses fall somewhere in between.

These findings reinforce the importance of designing housing that fits the ecological and cultural context rather than imposing a universal solution.

The comparison reveals a fundamental truth: **a house becomes livable not only when it is strong but when it supports people's ways of living**.

**Traditional Houses excel in ecological and cultural liveability, preserving sustainability and flexibility. PMAY-G Houses perform better structurally but underperform in comfort, sanitation, and adaptability. Mixed Houses achieve a balanced performance, indicating that the integration of vernacular wisdom and modern materials offers the best potential for liveability.**

The total liveability index reflects a moderately liveable environment, where vernacular ecological design provides resilience, but modern infrastructural systems lag. Future housing models should merge adaptive vernacular practices (like stilts, open layouts, and breathable materials) with government housing provisions (durability, sanitation, and safety) to achieve sustainable, flood-resilient, and culturally cohesive liveability in Majuli.

Chang ghars embody a deep understanding of climate, materials, and community life. They work with the environment rather than against it, representing a cyclical, low-carbon approach to building. PMAY-G houses, while symbolising modernity and permanence, often overlook cultural routines and environmental conditions.

**The study shows that meaningful housing development must integrate vernacular intelligence with modern infrastructure**. A sensitive, participatory approach can lead to homes that are not only safe but also rooted, adaptable, and regenerative.

Future housing policies must adopt culturally responsive and climate-adaptive approaches that integrate indigenous knowledge systems with modern infrastructure. Participatory design processes, region-specific guidelines, and post-occupancy evaluations should be institutionalised. Further research may extend this framework to other tribal regions and examine the long-term performance of hybrid housing models.

## References

M. Multani, *Assessing Liveability in Tribal Vernacular Housing and Government-Sponsored Housing of Assam: A Case of the Mishing Community*, B.Arch Thesis, Sarvajanik University, Surat, 2025.

Alexander, C., Ishikawa, S., & Silverstein, M. (1977). *A pattern language: Towns, buildings, construction*. Oxford University Press.

Bureau of Energy Efficiency. (2017). *Energy Conservation Building Code (ECBC) for residential buildings*. Government of India.

Bureau of Indian Standards. (2016). *National Building Code of India 2016*. BIS.

CEPT University, & United Nations Development Programme. (2021). *Habitat design for rural India*. CEPT University Press.

Lerup, L. (1977). *Suburban residential environments: Analysis, evaluation, and selection*. Van Nostrand Reinhold.

Mehta, M. R., & Bhattacharjya, R. K. (2019). Flood-responsive vernacular housing of Assam. *Journal of Architectural and Planning Research, 34*(2), 112–128.

Ministry of Health and Family Welfare. (2021). *National Rural Health Mission (NRHM): Framework for implementation*. Government of India.

Ministry of Housing and Urban Affairs. (2015). *Urban and regional development plans formulation and implementation (URDPFI) guidelines*. Government of India.

Ministry of Rural Development. (2021). *Pradhan Mantri Awas Yojana–Gramin (PMAY-G): Operational guidelines*. Government of India.

Oliver, P. (1997). *Encyclopedia of vernacular architecture of the world*. Cambridge University Press.

Oliver, P. (2006). *Built to meet needs: Cultural issues in vernacular architecture*. Architectural Press.

Rapoport, A. (1973). *The ecology of housing*. Van Nostrand Reinhold.

Rapoport, A. (1975). Toward a redefinition of density. *Ekistics, 40*(239), 133–139.

Sen, A. (1999). *Development as freedom*. Oxford University Press.

Sarmah, D. J., & Bhattacharjya, R. K. (2022). *Location map of Majuli Island (bounded by the Brahmaputra, Subansiri, and Kherkatia Suti rivers)* [Map].

Sustainable Development Solutions Network. (2024). *World Happiness Report 2024*. https://worldhappiness.report

United Nations Development Programme. (2024). *Human Development Report 2023–2024*. UNDP.

United Nations Statistics Division. (2007). *Indicators of sustainable development: Guidelines and methodologies*. United Nations.

World Health Organisation. (2018). *Housing and health guidelines*. WHO Press.