

Sustainable Housing in Rural Wayanad: Exploring the Link between Income and Housing among Indigenous Communities

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Abstract

This study examines sustainable housing development to address indigenous communities' socio-economic challenges in Wayanad, Kerala, India. The research aims to propose policy recommendations for promoting sustainable housing while addressing poverty. The methodology integrates field research and literature review findings to develop comprehensive insights. The study's novelty lies in its holistic approach, which integrates income, housing conditions, and community resilience. Findings suggest that community-driven initiatives and environmentally friendly construction techniques like rammed earth and cob construction can empower indigenous communities while fostering environmental stewardship. Policy recommendations emphasise community participation, climate responsiveness, and flexibility in dwelling unit plans to promote sustainable housing development. Overall, the study highlights the potential of sustainable housing to address socio-economic disparities and empower indigenous communities in Wayanad.

Keywords: Sustainable Housing, Income disparities, Indigenous communities, Indigenous Development, Community Empowerment

1. Introduction

Wayanad, a picturesque district in the Western Ghats of Kerala, hosts diverse Indigenous communities and biodiversity with a high percentage of endemism (Mathew, 2018). Kerala has forty-three Indigenous groups, according to the Ministry of Tribal Affairs (MoTA, 2018). These indigenous groups have deep-rooted connections to the land and nature, yet they need to be more immune to the broader forces of change that have ushered in complex transitions in recent decades. As traditional modes of sustenance evolve, the issue of housing becomes a focal point through which the interplay of culture, income, and quality of life unfolds (Rapoport, 2000) (Winger, 1968) (Streimikiene, 2015). There is a significant presence of households within the middle-income bracket, indicating the importance of agriculture as a reliable source of income in Wayanad (Prathapachandran & Devadas, 2023). Kerala has pioneered a new type of decentralised planning that emphasises sustainable development through community-based resource management, focusing on agriculture. These state-sponsored and choreographed organisations and initiatives have empowered underprivileged social groups, such as women and Indigenous populations, to improve their participation and livelihoods and reduce poverty (T. R. Suma, 2017). These sustainable interventions were centred on three major themes: forest conservation, community ecosystem-based

adaptive capabilities, and Indigenous land and population protection and sustainability. Exploratory research is commonly used to evaluate human-environment interactions to understand better how people perceive and use local resources for their well-being (Cuthil, 2002). Conservation of associated biodiversity is essential for India to meet some of its SDGs (Sustainable Development Goals). Sustainable-affordable habitat is a conceptual framework for achieving and maintaining sustainability through housing construction while conserving and protecting the environment and natural resources. Sustainable development principles and methodologies should be integrated into policy creation and planning procedures at a strategic level (Deepa.G.Nair, et al., 2005).

1.1 Research Objectives

The Primary objective of this study is to propose policy recommendations for promoting sustainable housing development and addressing the socio-economic disparities faced by Indigenous populations in Wayanad, Kerala. The study aims to investigate the relationship between household income, housing conditions, and duration of residency within Indigenous settlements, highlighting disparities and socio-economic mobility challenges. The study also discusses sustainable built practices that can help address the indigenous housing situation in Wayanad.

1.2 Novelty of the Study

This study combines poverty and housing conditions, presenting a cohesive framework that thoroughly explains how income, housing, and community resilience are interconnected. The study effectively combines theoretical insights with actionable solutions tailored to the cultural context by suggesting policy recommendations rooted in sustainable practices. Focusing on indigenous perspectives and community engagement, the study ensures authenticity and applicability to the local setting.

2. Literature Review

Sustainable housing initiatives can combat poverty and land alienation by addressing fundamental socio-economic and environmental challenges. By prioritising affordability through cost-effective construction methods and materials, sustainable housing projects ensure that low-income communities can access adequate shelter while freeing up resources for other essential needs. Moreover, these initiatives advocate for and secure land rights for marginalised groups, empowering them to build stable homes and establish tenure security, thus combating land alienation. Indigenous communities in Kerala grapple with land alienation and housing segregation, perpetuating poverty. Despite legislation and housing schemes, access to land remains limited, and housing quality has not substantially improved. Landowning indigenous communities like the Kurumans and Malayarayans show changes in housing and settlement patterns (Rajasenan, 2015). The deprivation index, which measures the quality of life, has narrowed down among the indigenous population in Kerala during 2001-2011. However, the level of deprivation in terms of housing, basic facilities, and economic status is still very high compared to the general population (Thara & Nair, 2013). M. Bagavandas's (2021) study on the Malayali Indigenous population indicates that infrastructure was critical at the village level but not as much at the household level (Bagavandas, 2021). Migration has influenced housing patterns and agricultural activities, which are essential aspects of the livelihoods of Indigenous people in Wayanad (Mano, Kumar, & Smitha, 2020). Indigenous labour migration is primarily driven by low wages (87.50%) and unemployment (push factors). The main pull factors are better employment opportunities (99.16%) and job security (95.83%). Most migrants (97.50%) seek agricultural labour work, and a few (2.520%) opt for non-agricultural jobs. Most (86.66%) are unregistered migrants, as registration is optional at police stations (Mano, A. Anil, & K.P, 2021). Housing

also goes beyond shelter, symbolising cultural values and socio-economic life, influenced by cultural orientations, and these elements are more evident in rural areas (Ochapa, 2018).

For more than two-thirds of the rural population, the land is a crucial source of livelihood and the most important source of survival (Sharma, 2007). Land ownership defines a household's social identity and provides economic security. It also allows family members and others to put their labour capacity to good use, reducing involuntary unemployment. Non-agricultural enterprises such as industrial manufacturing, real estate, and infrastructure development have evolved as alternatives to agricultural-based livelihoods since the dawn of the new era of globalisation and industrialisation (John Kujur, 2020). Many ideas on land alienation exist, all dealing with alienation from the means of production. The theory of primitive accumulation proposed by (Marx, 1867; 1974) is the process of separating producers from their means of production, transforming social means of subsistence and production into capital, and immediate producers into wage-labourers, through the forcible usurpation of common property, which is done through individual acts of violence and eventually parliamentary robbery (Glassman, 2006).

Non-Adivasis appropriated Adivasi land through various tactics during the colonial and post-colonial periods (John Kujur, 2020). Under neoliberalism, accumulating people's land and natural resources by dispossession has become the central mechanism of accumulation or expropriation (Harvey, 2017). Building on Harvey, Michael (Levien, 2015) describes how the people are displaced from their land mainly by the state machinery. He claims that the state primarily displaces people from their land through two methods: coercion or forcible displacement and persuasion of the public by legitimising land expropriation in the name of "public purpose" or "national interest" (Tura, 2018). Land alienation can exacerbate urban sprawl by facilitating uncontrolled development, fragmenting traditional land use patterns, and promoting inefficient land use practices, prioritising short-term economic gains over long-term sustainability and community well-being. Urban sprawl results from numerous individual actions, and among the possible causes are population increase, the economy, and closeness to resources and essential utilities (Wilson, Hurd, Civco, Prisloe, & Arnold, 2003). Researchers are now looking into ancient civilisations to see if they developed economic systems and practices centred on living in harmony with nature. Traditional knowledge systems were created with the community as the key stakeholder, and the cornerstone is a symbiotic link between man and nature. Promotion of individual and societal well-being rather than gauging development by growth rates and GDP (Kakoty, 2018). With 8.6% of the population being Indigenous, India has access to a vast pool of Indigenous knowledge that, if properly recognised, adopted, and mainstreamed, has the potential to provide long-term solutions to issues such as declining agricultural productivity and soil quality, biodiversity loss, water scarcity, pollution, and a slew of other social issues. Improvements in these communities' income, women's and children's health, and education because of targeted interventions would have a direct positive impact on national SDG indicators (Priya Priyadarshini, 2019).

3. Methodology

Statistical thinking is essential to data analysis, providing insights into the data under scrutiny (Hill & Berry, 2021). Descriptive statistics can provide initial insights into the distribution and variability of the variables, which can inform the choice of regression models (McCarthy, McCarthy, Ceccucci, & Halawi, 2019). Descriptive statistics and graphs can present data to policymakers and conduct exploratory data analysis (Titus, 2021). This study adopts a cross-sectional research design to comprehensively analyse the complex interactions between income and various housing dimensions within Wayanad District, Kerala,

indigenous communities. The sample size is determined using random sampling techniques, aiming for 400 indigenous households. This sample size provides a confidence level of 95% with a margin of error of 5%. Primary data is collected through structured questionnaires distributed among indigenous households. Descriptive statistics are utilised to gain a contextual understanding of the collected data. These statistics help summarise the distribution and variability of the variables under study. Regression analysis is employed to explore the relationships between income and housing characteristics. This analysis offers insights into how income influences housing preferences, quality, and affordability within indigenous communities.

4. Analysis

4.1 Built-Up Area

The analysis in Table 1 shows a strong correlation between the built-up area of houses and income distribution among households. The data shows that more than half of the households (53%) live in houses with a built-up area ranging from 25 to 34 square meters, indicating that the most common housing size falls within this range. Additionally, about one-fourth (22.75%) of households live in slightly larger houses with a built-up area ranging from 35 to 44 square meters. This information gives an insight into the prevalent housing sizes in the surveyed area. The analysis reveals significant variations in income distribution based on the built-up area of houses. Mainly, when the built-up area is less than 25 square meters, more than two-thirds (70.37%) of households earn less than Rs 5000, indicating that smaller living spaces are associated with lower incomes. On the other hand, as the built-up area increases to more than 75 square meters, there is a steady increase in the number of households in the income bracket of Rs 20,000 to 24,999, suggesting a link between larger living spaces and higher incomes. The data suggests minimal variations in income distribution in the middle-income ranges despite differences in built-up areas. This finding indicates that the house size may not significantly impact income for households falling within these income brackets. This minimal variation could be attributed to the intervention of housing schemes like PMAY (Pradhan Mantri Awas Yojana) and programs like Life Mission, which aim to provide affordable housing to individuals across various income groups. These schemes are designed to provide financial assistance and support for housing construction to individuals from various income backgrounds, mainly targeting the economically weaker sections of society. As a result, households in lower-income brackets receive assistance under these schemes, leading to smaller living spaces. Conversely, households in higher-income brackets have greater financial capacity to afford larger living spaces without relying on government assistance. Nevertheless, prioritising larger housing units in housing policy can have adverse effects, including a potential neglect of essential services and a delay in housing provision (Lochner, 2007).

Table 1 - Income vs. Built-Up Area of the House in sq m

S. No.	Household Income (Rs/Month)	Income vs Built-Up Area of the House in sq m															
		<25		25-34		35-44		45-54		55-64		65-74		> or = 75		Total	
		No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage

1	<5,000	19	70.37	40	18.87	6	6.59	1	2.44	0	0.00	0	0.00	0	0.00	66	16.50
2	5,000 - 9,999	6	22.22	12	58.49	55	60.44	19	46.34	9	56.25	0	0.00	1	33.33	21	53.50
3	10,000 - 14,999	2	7.41	35	16.51	16	17.58	8	19.51	3	18.75	5	50.00	0	0.00	69	17.25
4	15,000 - 19,999	0	0.00	8	3.77	10	10.99	7	17.07	1	6.25	2	20.00	0	0.00	28	7.00
5	20,000 - 24,999	0	0.00	3	1.42	3	3.30	4	9.76	1	6.25	2	20.00	2	66.67	15	3.75
6	25,000 - 30,000	0	0.00	2	0.94	1	1.10	2	4.88	0	0.00	1	10.00	0	0.00	6	1.50
7	>30,000	0	0.00	0	0.00	0	0.00	0	0.00	2	12.50	0	0.00	0	0.00	2	0.50
	Total	27	100	21	100	91	100	41	100	16	100	10	100	3	100	40	100
	Per cent of Total Sample Households		6.75		53.00		22.75		10.25		4.00		2.50		0.75		100

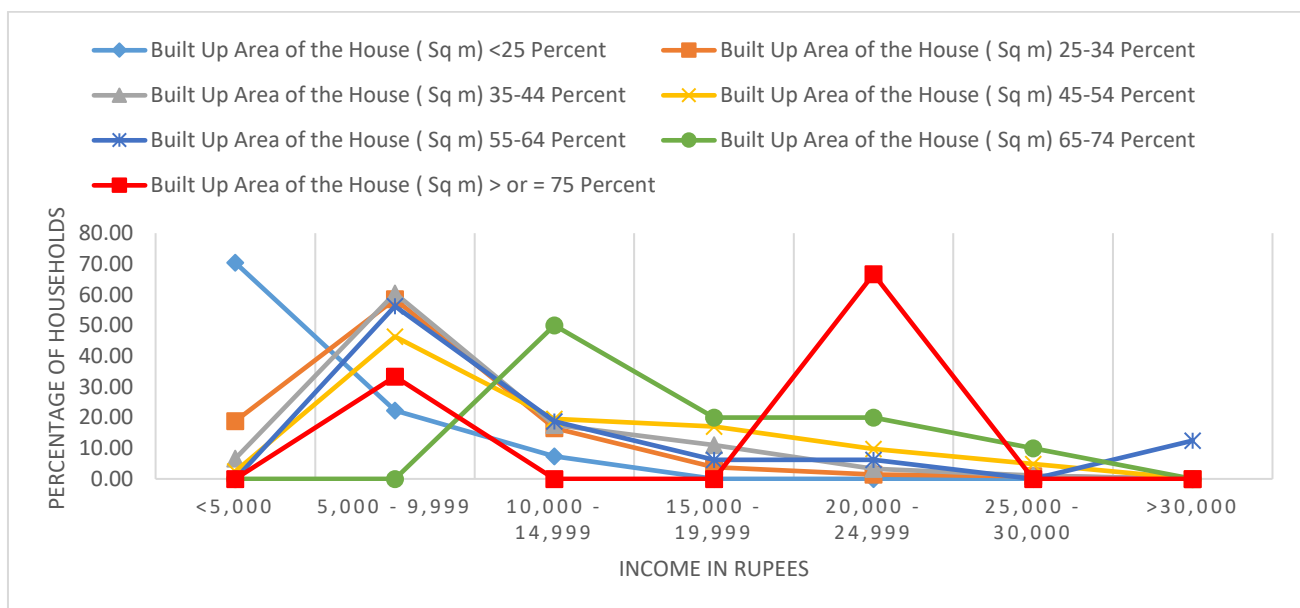


Figure 1 - Income vs. Built-Up Area of the House

The regression analysis examines the relationship between family income and house size (in square meters). The regression model explains approximately 20.6% of the variation in house size based on family income. The adjusted R-squared value, considering the number of variables, is 0.204. The regression model is statistically significant ($p < 0.001$), indicating a meaningful relationship between family income and house size. The intercept term is 736.05, but its statistical significance is not established ($p = 0.378$). For each additional square meter in house size, family income increases by 226.21 units. The size of the house coefficient is statistically significant ($p < 0.001$). In conclusion, the analysis reveals a meaningful positive relationship between family income and house size. On average, an increase of one square meter in house size corresponds to an increase of Rs 226.21 in family income. However, it is essential to recognise that while income explains a portion of house size variation, other factors not considered in the model might also influence house size.

4.2 Physical Condition of the House

Income plays a significant role in determining housing affordability and may be forced to choose between appropriate housing and other necessities (Lefebvre, 2002). The data analysis in Table 2 reveals significant findings regarding the housing conditions within the indigenous community. More than one-fifth (21.50%) of households in the indigenous community are categorised as dilapidated. Dilapidated housing refers to structures in a state of disrepair deterioration or require significant maintenance and renovation. These houses may have crumbling walls, leaking roofs, damaged foundations, and lack of proper amenities. The prevalence of dilapidated housing in the community indicates a significant housing challenge. A considerable portion of the housing stock needs urgent attention and improvement. The data highlights that more households in the lower income bracket, particularly those with an income of up to Rs 9,999, fall into the dilapidated housing category. This finding indicates a strong correlation between lower income levels and poor housing conditions. Households with lower incomes face more significant challenges in maintaining and improving their housing conditions due to limited financial resources. They might struggle to afford necessary repairs and renovations, which can lead to the deterioration of their homes over time.

Table 2 - Income vs. Physical Condition of the House

S.No.	Household Income (Rs/Month)	Income vs. Physical Condition of the House							
		Good		Liveable		Dilapidated		Total	
		No.s	Per cent	No.s	Percent	No.s	Per cent	No.s	Percent
1	<5,000	14	10.00	25	14.37	27	31.40	66	16.5
2	5,000 - 9,999	71	50.71	96	55.17	47	54.65	214	53.5
3	10,000 - 14,999	24	17.14	39	22.41	6	6.98	69	17.25
4	15,000 - 19,999	18	12.86	7	4.02	3	3.49	28	7
5	20,000 - 24,999	10	7.14	4	2.30	1	1.16	15	3.75
6	25,000 - 30,000	1	0.71	3	1.72	2	2.33	6	1.5
7	>30,000	2	1.43	0	0.00	0	0.00	2	0.5
	Total	140	100.00	174	100.00	86	100.00	400	100
	Per cent of Total Sample Households	35.00		43.50		21.50		100.00	

Routine dilapidation disproportionately impacts low-income homeowners, who are less likely to have the resources to pay for repairs (Bartram, 2023). In addressing the issue of dilapidated housing, targeted interventions and support are crucial. Viable solutions encompass a range of strategies. Firstly, implementing housing improvement programs is a pivotal approach, entailing financial assistance or subsidies for low-income households to facilitate repairs and renovations. Such programs can potentially uplift the living conditions and safety of the existing dilapidated housing inventory. Additionally, the development of affordable housing initiatives tailored explicitly to the requirements of low-income households offers a promising avenue. This may encompass creating low-cost housing projects meticulously adhering to safety and quality benchmarks. Moreover, capacity-building initiatives are pivotal, equipping communities with the skills and knowledge to undertake minor repairs and maintenance tasks independently, thereby reducing reliance on external contractors and associated expenses. Infrastructure development investments in indigenous areas are another critical strategy, effectively improving housing conditions and living standards. Lastly, fostering awareness and advocacy efforts is essential. These endeavours involve elevating awareness regarding the significance of housing conditions and advocating for policies that effectively address the housing needs of low-income households. In combination, these multi-faceted strategies hold the potential to alleviate the challenges posed by dilapidated housing and contribute to an improved quality of life for vulnerable communities.

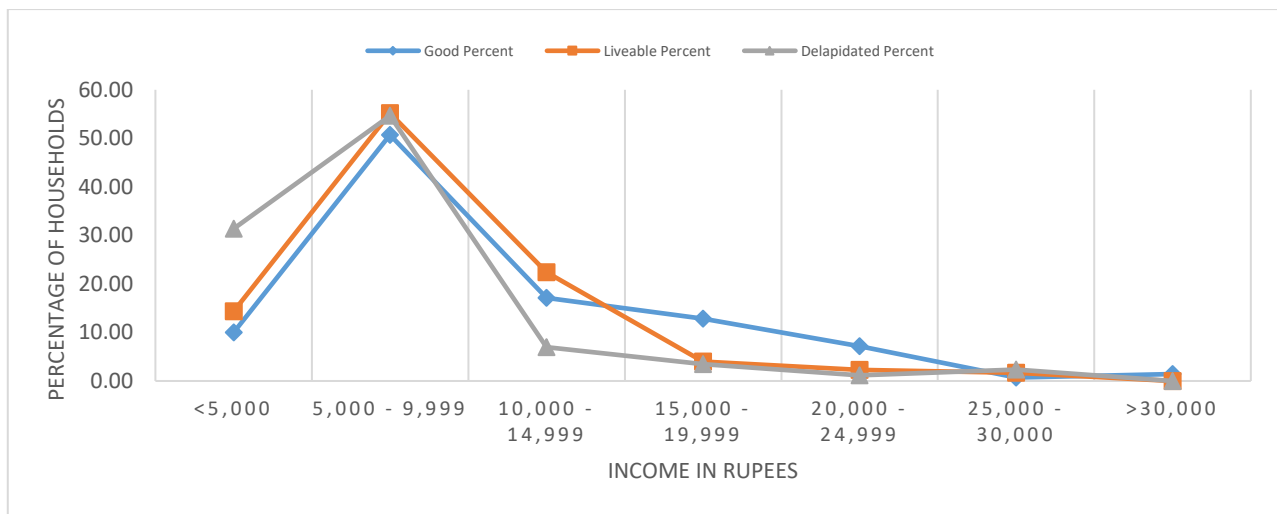


Figure 1 - Income vs. Physical Condition of the House

The regression analysis examines the relationship between family income and the house's physical condition (good, livable, dilapidated). The regression model explains approximately 5.84% of the variation in income based on the house's physical condition. The adjusted R-squared value is 0.0560, indicating that the model's fit is reasonable, but it still accounts for a relatively small portion of the variability. The regression model is statistically significant ($p = 1.00581E-06$), indicating a significant relationship between family income and the house's physical condition. The intercept term is 12208.81, and its statistical significance is established ($p = 8.52403E-48$). The coefficient for the physical condition variable is -1811.22, indicating that a change in physical condition is associated with a decrease in income by this amount on average. The p-value of $1.01E-06$ highlights the solid statistical significance of the physical condition variable in predicting income. Both the lower and upper 95% confidence intervals support the statistical significance of the coefficient. The negative coefficient suggests that as the physical

condition of the house deteriorates (moving from "good" to "dilapidated"), the income tends to decrease. The analysis indicates a statistically significant relationship between family income and the house's physical condition. Unfair agricultural prices in poor countries lead to the dilapidation of human and natural resources (Pinheiro, 2009). This holds in the case of Wayanad, as the majority are agricultural labourers. Specifically, the income tends to decrease as the house's condition worsens. This finding suggests that households with lower income levels are more likely to reside in houses with poorer physical conditions.

4.3 Age of House

The provided information in Table 3 indicates a significant shift in the age distribution of houses in the surveyed area, influenced by housing schemes like VAMBAY (Valmiki Ambedkar Awas Yojana), IAY (Indira Awas Yojana), PMAY (Pradhan Mantri Awas Yojana) and programs like Life Mission. According to the analysis, more than three-fourths (75.25%) of the houses have been built in the last 14 years. The data suggests that much of the housing stock is relatively new, and construction activity has recently been significant. On the other hand, only 5.25% of the houses are older than 25 years, indicating that a relatively small percentage have existed for an extended period. The analysis attributes the shift in age distribution to the intervention of housing schemes. Government initiatives aim to provide affordable housing to individuals across different income groups, focusing on assisting economically weaker sections of society. By offering financial aid and support for housing construction, these schemes have encouraged the development of new houses, leading to a higher percentage of houses built in the last 14 years. The data highlights an observable decline in houses aged less than five years as income increases. This finding suggests that higher-income households are less likely to construct newer houses. The government housing schemes target lower-income households, leading to more new houses in those income categories. The analysis notes that many households live in temporary kutcha houses while awaiting the benefits of the government housing schemes. Kutcha houses are typically made of mud, thatch, or bamboo and are considered less durable and stable than permanent housing structures (Oleksandr, Lüdeke, & Reckien, 2012). Such temporary housing indicates a need for better infrastructure and living conditions in the area, especially for economically disadvantaged households waiting for government assistance.

Table 2 - Income vs. Age of house in years

S.No.	Household Income (Rs/Month)	Income vs. Age of house in years									
		<5		5 to 14		15-24		> or = 25		Total	
		No.s	Per cent	No.s	Per cent	No.s	Percent	No.s	Percent	No.s	Percent
1	<5,000	16	43.24	34	12.88	15	19.23	1	4.76	66	16.50
2	5,000 - 9,999	11	29.73	160	60.61	36	46.15	7	33.33	214	53.50
3	10,000 - 14,999	5	13.51	46	17.42	14	17.95	4	19.05	69	17.25
4	15,000 - 19,999	3	8.11	14	5.30	7	8.97	4	19.05	28	7.00
5	20,000 - 24,999	2	5.41	6	2.27	4	5.13	3	14.29	15	3.75
6	25,000 - 30,000	0	0.00	4	1.52	1	1.28	1	4.76	6	1.50
7	>30,000	0	0.00	0	0.00	1	1.28	1	4.76	2	0.50
	Total	37	100.00	264	100.00	78	100.00	21	100.00	400	100.00

Per cent of Total Sample Households	9.25	66.00	19.50	5.25	100.00
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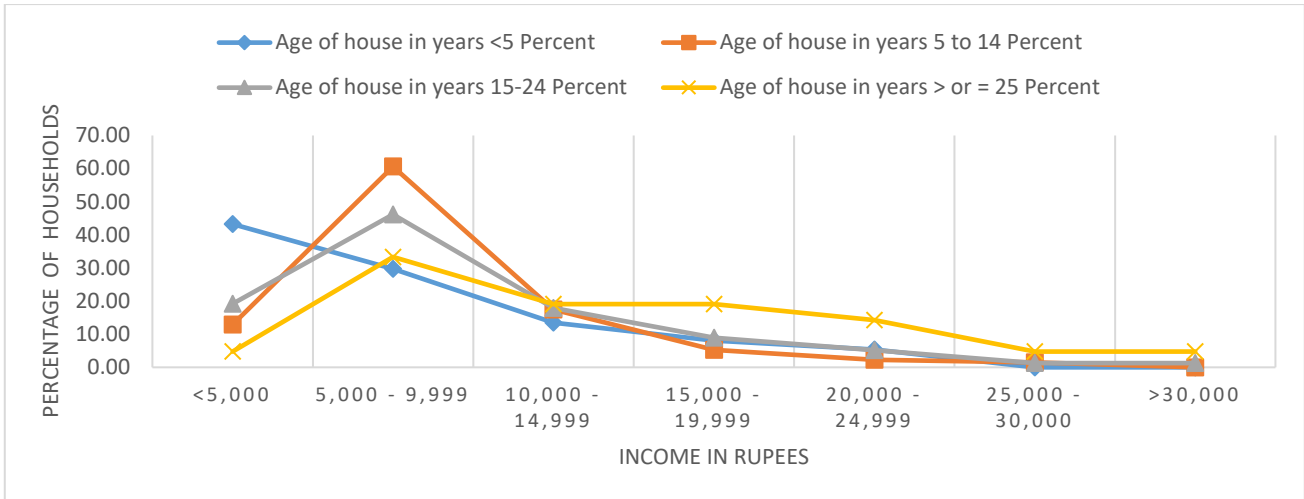


Figure 2 - Income vs. Age of house in years

The regression analysis reveals a significant relationship between the Age of the house and income group. The model explains approximately 4.41% of the income variation based on the house's Age, with an adjusted R-squared of 0.0417. The ANOVA test confirms the model's significance ($p = 2.31E-05$). The coefficients show that as the Age of the house increases, household income tends to increase as well, with each additional year in house age corresponding to an average income increase of approximately 1725.942 units. The intercept of 5020.859 suggests that for new houses, the expected income is 5020.859 units. However, the model's fit is limited in explaining the variability in income, as indicated by the adjusted R-squared value.

4.4 Duration of Residence

The data analysis in Table 4 provides insights into households' residency duration within their current settlements. The data indicates that more than one-third (34%) of households have been residing in their current settlements for 21 to 30 years, and around one-third (32%) of households have lived there for 31 to 40 years. The percentages for the other categories indicate varying lengths of residency within the community. The data analysis highlights that the percentage of households who have resided in the settlement for 31 to 40 years is higher in the lower-income category. This finding indicates a potential correlation between longer-term residency and lower income levels. The observation that a higher percentage of long-term residents falls within the lower income category raises essential points about the socio-economic dynamics within the community. Lower-income households need more mobility due to financial constraints. Moving to a new location or settlement often requires financial resources for relocating, finding new housing, and establishing oneself in a different area. Lower-income households may need more financial means to undertake such moves, leading to longer-term residency in their current settlements. The higher percentage of long-term residents in the lower-income category may suggest limited opportunities for upward mobility within the community. Economic opportunities, job prospects, and access to education and training may be restricted, making it challenging for lower-income households to improve their financial circumstances and move to better living conditions. Lower-income households need help accessing the financial resources needed to move to better housing or more prosperous areas.

The lack of financial resources also limits their ability to invest in housing improvements or seek better opportunities elsewhere. Social and community ties also influence long-term residency within the community. Lower-income households may have stronger community connections, and these ties provide support systems that contribute to their decision to remain in their current settlements. The observation that 5 out of 8 high-income individuals have chosen to reside in their current settlements for more than 31 years underscores the complex interplay between income and residential duration. While the statistical analysis did not reveal a significant overall correlation, these cases emphasise the role of personal factors and individual decisions that can override general trends. Higher-income individuals might prioritise factors like property ownership, social connections, or lifestyle preferences, leading to extended stays despite their financial capacity to relocate.

Table 4 - Income vs. Duration of Residence

S.No.	Household Income (Rs/Month)	Income vs. Duration of Residence											
		<10 Yrs		10 to 20		21 to 30		31 to 40		>40		Total	
		No.s	Per cent	No.s	Per cent	No.s	Percent	No.s	Percent	No.s	Percent	No.s	Percent
1	<5,000	2	13.33	4	7.27	30	22.06	19	14.84	11	16.67	66	16.5
2	5,000 - 9,999	4	26.67	27	49.09	64	47.06	90	70.31	29	43.94	214	53.5
3	10,000 - 14,999	6	40.00	18	32.73	27	19.85	4	3.13	14	21.21	69	17.25
4	15,000 - 19,999	1	6.67	5	9.09	10	7.35	7	5.47	5	7.58	28	7
5	20,000 - 24,999	1	6.67	1	1.82	3	2.21	6	4.69	4	6.06	15	3.75
6	25,000 - 30,000	1	6.67	0	0.00	1	0.74	2	1.56	2	3.03	6	1.5
7	>30,000	0	0.00	0	0.00	1	0.74	0	0.00	1	1.52	2	0.5
	Total	15	100.00	55	100.00	136	100.00	128	100.00	66	100.00	400	100
	Per cent of Total Sample Households	3.75		13.75		34.00		32.00		16.50		100.00	

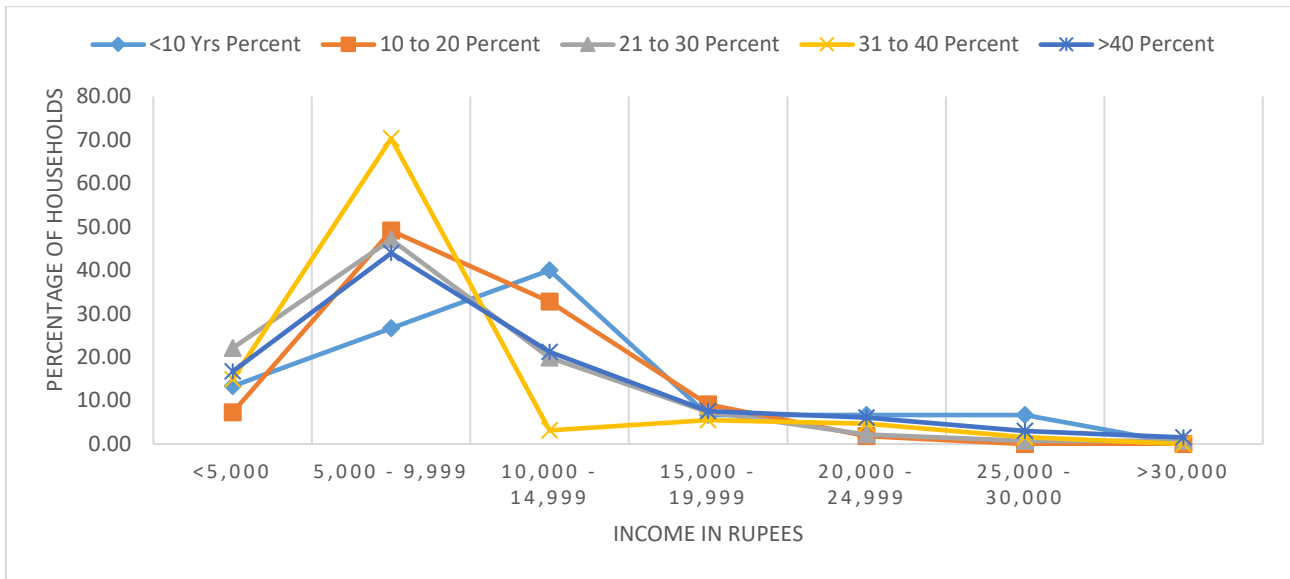


Figure 3 - Income vs. Duration of Residence

The regression analysis examines the relationship between family income and the duration of residence at the current place (categorised into different time intervals). The regression model explains approximately 0.06% of the variation in income based on the duration of residence. The adjusted R-squared value is -0.0019, indicating that the model's fit is very weak and does not effectively explain the variability in income. The regression model is not statistically significant ($p = 0.625108931$), indicating no significant relationship between family income and the duration of residence. The intercept term is 9280.91, and its statistical significance is established ($p = 5.93038E-20$). The coefficient for the duration of residence is -130.92, and its statistical significance is not established ($p = 0.625108931$). The p-value more significant than the significance level (0.05) indicates that the duration of residence does not significantly affect income. In the regression analysis, there is no statistically significant relationship between family income and the duration of residence at the current place. The model's fit is weak, and the duration of residence does not appear to be a significant predictor of income in this analysis.

The study by Michael B. Toney (1976) found no influence of economic opportunities on the duration of residence, indicating that income does not affect how long someone stays in a particular place (Toney, 1976). The observed longer-term residency patterns in lower and higher income categories might arise from differing motivations and circumstances. In the lower income group, individuals could be constrained by financial limitations, making them more likely to stay in their current settlements due to limited mobility options. Conversely, extended residency might reflect stable living conditions and well-established social networks in the higher-income group. The lack of statistical significance in the regression analysis could be attributed to various factors. Other variables not considered in the analysis, such as education, occupation, or family history, might play a more significant role in determining income levels. Additionally, the weak model fit could indicate the presence of confounding variables not included in the analysis, thereby not exposing the genuine relationship between income and residency duration. It is essential to acknowledge the complexity of socioeconomic dynamics and consider a broader range of factors when exploring these correlations.

5. Discussion and Recommendations

Based on the study's findings, several recommendations are proposed to enhance sustainable housing development at the dwelling unit level in Wayanad, Kerala. Firstly, it is suggested that eco-friendly construction technologies such as rammed earth for the basement and foundation, cob construction for the walls, and matured coconut palms for roof rafters be adopted. Additionally, incorporating hardwood for windows, doors, and joinery and plastering houses with locally available mud of different colours can promote sophisticated mud architecture and cultivate a skilled workforce in green architecture. Moreover, environmental friendliness should be prioritised throughout the construction process. This entails utilising local and familiar resources to reduce the carbon footprint associated with construction activities. Community participation is crucial at every stage, from planning to implementation, monitoring, and evaluation. Involving residents fosters a sense of ownership, ensuring housing projects' sustainability and long-term success. To address challenges such as termite infestation, it is recommended to implement measures that focus on protecting houses from such threats, particularly by addressing dampness issues. Furthermore, labour distribution should prioritise beneficiary participation, empowering residents by assigning tasks other than masonry, carpentry, and finishing works, thereby reducing construction costs and distributing the budget among the community. Climate responsiveness is essential in selecting materials suitable for Kerala's climate, avoiding alternatives that may not withstand local environmental conditions. Finally, advocating for plot sizes of 120-150 square meters with a built-up area of 60-65 square meters, vertical expansion options and flexibility in dwelling unit plans enable residents to customise their living spaces according to their preferences and needs.

A potential approach to crafting a sustainable housing policy benefiting indigenous communities while tackling poverty and land alienation involves giving precedence to community-led initiatives. This involves actively involving indigenous communities in the planning, designing, and implementing housing projects, ensuring that their cultural values, preferences, and needs are respected and incorporated into the policies. Additionally, the policy should promote affordable and environmentally friendly housing solutions, such as eco-friendly construction materials, energy-efficient designs, and access to renewable energy sources. This helps reduce housing costs for indigenous families, promotes sustainability, and mitigates environmental degradation. Furthermore, the policy should include provisions for securing land tenure rights for indigenous communities and protecting their ancestral lands from encroachment and exploitation. This can be achieved by legally recognising indigenous land rights, establishing community land trusts, and implementing land titling programs. By ensuring secure land tenure, indigenous communities can have greater control over their resources, enhance their economic opportunities, and reduce the risk of land alienation. Moreover, the policy should promote capacity-building and skill development programs tailored to the needs of indigenous communities, empowering them to actively participate in housing construction, maintenance, and management processes. This includes providing training in construction techniques, sustainable land management practices, and small business development to create employment opportunities and enhance economic self-reliance within the community. Additionally, the policy should prioritise social inclusion and equity by addressing systemic barriers and discrimination indigenous communities face in accessing housing, land, and essential services. This involves implementing affirmative action measures, anti-discrimination laws, and social protection programs to ensure equal opportunities and rights for indigenous peoples.

While acknowledging the importance of preserving traditional ways of life, the government should also be capable of developing policies that enable Indigenous populations to maintain a healthy lifestyle

without having to migrate to urban regions. The modern industry does not prefer the unskilled indigenous population of these locations. As a result, given their low skill level and environmental regulations, implementing "ecotourism" in forest settlements may be the ideal income-generating activity. The workforce that may be used in tourism-related activities is among the greatest in the service industry, providing a diverse range of job prospects for millions of people with low skill levels (Chakrabarty, 2011). "Indigenous tourism," according to Ryan and Huyton, is a type of tourism activity in which tourists are drawn to indigenous places to observe artistic performances, festivities, beautiful spots, historical heritages, and rituals (Rayn, 2002). Tourists respect the Aboriginal culture so the indigenous population can maintain the traditional culture (Chang, Lin, & Chuang, 2021). Overall, a comprehensive sustainable housing policy for indigenous communities should be community-driven, environmentally sustainable, socially inclusive, and economically empowering, addressing the root causes of poverty while promoting the well-being and resilience of indigenous peoples.

6. Conclusion

In conclusion, this study underscores the critical importance of sustainable housing development in addressing the socio-economic challenges faced by indigenous communities in Wayanad, Kerala. By integrating various aspects such as income, housing conditions, and community resilience into a unified framework, the study provides valuable insights for policymakers and practitioners. Emphasising community-driven initiatives and culturally sensitive interventions can pave the way for more inclusive and effective policies, ultimately fostering sustainable development and improving the livelihoods of the Indigenous population.

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