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Ethno-Architectural Contextualization of Housing for Smart Villages: A Multi-case Study in Assam, India

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“Ethno-architectural Contextualisation of Housing for Smart Villages: A Multi-case study in Assam, India”

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Preface.

This research was shaped by the need to respond to the current practices of architects and their role in rural housing and infrastructure development. More often than not, an architect is not involved in the development of the rural housing projects, at least not to the extent of the architect's capabilities. This arrives from the fact that an architect tends to incorporate their creative vision and intent which is possible in the case of projects with a bigger finance, but that is not possible for people who cannot afford an architect's service. So, to work in the rural context, the architect must join an NGO, a design firm or studio dealing with rural housing, or a government office of the rural housing and development. However, what happens in these cases is that the organisations normally tend to deal with disaster management or work on projects that dispense design templates that are repeated over and over in different villages of various contexts. It is a very high degree of generalisation that takes place while providing housing solutions to the rural population. In the case of disaster relief housing, it is acceptable due to the need of a quick reaction. Buildability and resilience of the housing solution is of utmost importance in the aftermath which overrides the social and cultural acceptability aspects of the relief housing solution. However, the same cannot be said for rural housing schemes and post-disaster reconstructions which are meant to be long-term solutions to the housing needs of the community in contrast to the short-term relief housing solutions. In the context of post disaster reconstructions and long-term housing solutions and schemes, the social and cultural aspects of the community and the place need to be integrated into the proposal and its implementation. In India, as part of the housing aid provided by the government, rural housing schemes have provided an opportunity for people below the poverty line (BPL) and people belonging to disadvantaged social groups, such as the Scheduled Tribe (ST) and Scheduled Caste (SC), to improve their standard of living through financial concession and support of the Indira Awaas Yojna (IAY) since 1985, rebooted as the Pradhan Mantri Gramin Awaas Yojna (PMGAY) in 2016. As observed in the data collection, the guidelines of the rural housing schemes are either too vague to follow or wrongly implemented leading to misuse by external stakeholders, loss of housing and reduced faith in the government interventions.

This research stressed on the importance of socio-cultural aspects of housing into the way rural housing schemes are designed and proposed changes to the way they are implemented. It has tried to bring the disciplines of architecture and socio-cultural studies within the same scope of rural housing and development. In doing so, the research has stepped into the common subsets between Architecture and Anthropology. The venture into the subsets introduced the research to the interdisciplinary areas of environment-behaviour studies and ethno-architecture. The similarity between the two was the use of ethnography and ethnographic tools to study architectural artefacts. However, the former perceived the approach as a design-oriented research while the latter described it as a useful tool for archaeological anthropology and ethnology through architectural artefacts. In other words, it is culture oriented. This research however, needed to establish a common ground between the two disciplines which did not lean on either side of culture or design. Which is why, specific to the kind of research being undertaken in this thesis, a niche research area was proposed coining it as 'ethno-architectural contextualisation'. Supported by the inclusive theory of contextualisation, the multi-disciplinary research has tried to develop a methodological approach that is effective in using the strengths of both disciplines to collect and analyse data.

At a glance, the term ‘Ethno-Architectural Contextualisation of housing for Smart villages….’ as it reads in the title of the thesis, appears to indicate roots in ethnology, due to the word ‘ethno-’. However, in this research, similar to the ethnological approach of ethno-architecture by Toffin (1994), it stands for ‘ethnography’ referring to the tools of data collection and analysis. Contextualism, true to its theory, indicates the recognition that the links between architectural artefacts and socio-cultural practices cannot be understood in isolation, and needs to include the context and its influence on them. Hence, the term ‘contextualisation’ as well as its theory was included into the mix. Since the thesis revolves around the study of housing design and construction the title could be simplified to ‘Architectural contextualisation…’ however, the significance of culture in shaping the vernacular practice of architecture is denied by its omission. It is crucial to me as the author and researcher of the thesis to use the specific terminology as the research is founded on the relation between architecture and culture.

The research decided upon a pragmatic approach since it was established, through the description of the situation of rural-urban development gap, that the outcome of the research needed a solution. It dictated a solution finding approach which is identified as the ‘pragmatic’ approach. The pragmatic-contextualism of the research methodology attempted to find a solution to the issues that factor in affecting housing and construction trends. The underlying motivation that guided the approach was to understand the process of causality where the village, community and household units constituted the context while the interrelated link between culture and architecture were the focus and effect of the causality. This approach helped establish the factors to consider into conceptualising, planning, or designing for housing in the rural context. Consequently, the conclusion to the pragmatic- contextualist approach helped in highlighting the ancillary areas of research and practice that effects housing and shelter in the rural context.

Accordingly, the analysis and discussion of the research brought the disciplines of environmental anthropology, social anthropology, economics, planning, architecture, and engineering to address the issues affecting rural housing. Bringing the various professions and practitioners are believed to create a stronger form of communication and information dissemination between users and external stakeholders in rural housing. A framework was conceptualised bringing their strengths and expertise together to provide the relevant input required to implement as effective housing scheme.

Since this thesis had started over three and a half years ago, my candidature confirmation and field research took place long before the Coronavirus Pandemic. In so many words, I did not have much else to do but sit down and draft the thesis, however, the lockdown restrictions did affect my daily routine which may or may not have affected my thesis. I cannot help but wonder, if I could have done more, polished the writing, submitted the draft sooner or added more criticality to my analysis. However, with concerns to the implementation of the Information Framework proposed by this thesis, I cannot speak to how the outcome could have changed or developed. The Framework has been developed based on the data and analysis conducted before Covid-19, hence despite curiosity to know the feasibility of the Framework in the context of a Pandemic, it is difficult to respond as it is still very new, and no verdict has been reached on how to tackle it.

Last but not the least, undertaking this research on rural housing within the context of rural development from the perspective of Smart villages has been a challenging and rewarding experience. This PhD has been a difficult undertaking, but it has enhanced my skillset as an

analytic thinker in addition to the research and writing training behind a desk as well as on the field. It has shaped me as a person as well as a professional. I hope the reader will find the thesis an interesting read that contributes to their way of thinking and contributing to the role of culture, architecture, and rural housing in development.

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To the staff who made the PhD easier, the librarians for their vast knowledge of related subjects and sourcing of study materials and learning new skills, the IT staff for fixing computer glitches so that I did not lose my work; and the department staff for helping me manage my working time, place and environment, the application for leave of absence, the ethics application, enrolment, and funding for the research. I would like to thank especially Jane Trewin for her support especially after each annual review that always made me feel better even when the review had gone badly.

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stress. The suggestion from Jyotirmoy Pathak came in handy at this time and catapulted me in a completely different course and context.

The past three and a half years have been tumultuous to say the least, however, the stress of relationships and socialising kept me well occupied that the PhD itself was an escape to a realm where I could indulge in my interests of architecture. It is not to say that the PhD was a breeze, but with all that was happening around me and draining my energy, it is an important part of my life that has helped me stay sane and grounded and helped me define myself as a stronger, independent, and fairly resilient person. Last but not the least, to whom I can completely surrender, is God who staged the dominoes just right since the day I was born for me to have arrived at this position in my life.

List of Publications

1. Katharpi, V. I. and H. K. Doloi (2020). Multiculturism and Socio-Cultural Integration in Bottom-Up Approach to Rural Housing: A Multi-Case Study in Assam, India COSVARD 2020: 3rd International Conference on Smart Villages and Rural Development. Eds. H. Doloi and A. Bora, 7-8 Dec 2020, Guwahati, Assam, India. *(to be published, February 2021)*

2. Katharpi, V. I. and H. K. Doloi (2019), Studying rural housing for Smart Villages in Assam – Case selection strategy, Proceedings of the 1st International Conferences on Smart Villages and Rural Development (COSVARD 2018), page 24-34, 12-14 December, Guwahati, Assam, India.

3. HUANG, X., V. I. Katharpi and M. Burry (2018). The New Assam Smart Village Dwelling: Meeting the Challenge of Absorbing New Technologies. COSVARD 2018: 1st International Conference on Smart Villages and Rural Development. Eds H. K. Doloi and S. Donovan, page 84-96, 12-14 December 2018, Guwahati, Assam, India.

4. Katharpi, V. I. and H. K. Doloi (2018). Understanding housing design and expectations of Assamese rural communities: Case Study Selection. In International Conference of the Architectural Science Association (pp. 619-626).

5. Katharpi, V. I. and H. K. Doloi (2017). Significance of Culture in Architectural Design of Housing in Assamese Smart Villages. Second Workshop on Construction Management and Smart Villages for Assam, Guwahati. Eds H. Doloi, A. Bora and S. Donovan. Assam Engineering College, Guwahati.

6. Katharpi, V. I., H. K. Doloi and D. Week (2017). Significance of Culture and Education in Developing Smart Villages in India. AUBEA 2017: Australasian Universities Building Education Association Conference 2017, Melbourne, Australia. EPiC Series in Education Science.

7. Katharpi, V. I., (2016). Redefining Smart Village: Retaining cultural identity in the midst of Digital waves. Growing Capacity in Assam: Proceedings of the First Workshop on Construction Management and Smart Villages for Assam. Cross-cultural analysis and capacity building in construction management practices focussing on housing and infrastructure sectors in Assam and Australia. Eds H. K. Doloi and D. Week. Assam Engineering College, Guwahati, Assam, Faculty of Architecture, Building and Planning.

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Chapter 1. *Introduction*

There are approximately 7.59 Billion people in the world, where 55% live in urban areas and 45% live in rural areas . A 2018 article by the Department of Economic and Social Affairs of the United Nations projected a 13% increase in the urban population by the year 2050 with 90% of this increase to take place in Asia and Africa (United Nations, 2018). This is all well and good, if looked at from the point of urbanisation being the way forward in development. However, the rapid transformation of settlements and the over-crowding of urban centres creates an overload on urban infrastructure and a lack of rural infrastructure that is unable to respond to the needs of the citizens in either strata. This research recognises rural housing as a part of Smart villages that is key to bringing a balance to the disproportionate attention to infrastructure and development in both the urban and rural sectors.

This chapter outlines the research within the Smart Assam Project, which is elaborated in the literature, Chapter 2. Section 1.1 establishes the significance of the research and section 1.2 states the need for action to be taken on rural development to bridge the rural-urban gap in the form of housing. Section 1.3 states the aims and objectives within the context of this research.

Section 1.4 briefly introduces the Smart villages program that defines the research context for the thesis. Section 1.5 poses the research questions that ensure the aims and objectives of the research are being met. Section 1.6 outlines the thesis structure. Section 1.7 distinguishes the scope and limitations of the research to ensure that the research does not take on more than can be achieved and stray from the objectives of the research. Section 1.8 explains the significance of the research to the existing knowledge, research, and practices. Section 1.9 concludes and summarises the chapter.

1.1. Introduction and Significance of the Research

This thesis aims to bridge the rural- urban gap by providing ‘Smart’ solutions in the form of socially and culturally acceptable housing solutions. Attempts to bridge the gap have been defined by developing the rural sector and investing in Smart villages. To understand the background and context, the causes of the rural-urban gap are listed with emphasis in the relationship to housing. It describes the background of development in relation to the rural-urban gap that is evident from the degree of urbanisation of the cities, towns, and villages in India. A few chosen factors are described that influence the gap which consequently affect the overall development of the country.

This research has been driven by the visible disparity in the living standards between urban sectors and rural sectors. This rural-urban gap is fuelled by unequal efforts in the respective sectors, being lesser in the case of rural development which overtime has become synonymous with Smart villages as is urban development with Smart cities. In the literature review you will find a brief description of the rural-urban gap, geographic and demographic details, culture, housing, architecture, and relevant history.

1.2. Need for Research.

There is a need to include an angle of community development that encourages cultural acceptance of development interventions. As outlined by Kenny (2007) community development is a holistic approach grounded in six principles. They are empowerment, human rights, inclusion, social justice, self-determination and collective action. United Nations

Organisation (2014) defines community development as "a process where community members come together to take collective action and generate solutions to common problems".

In short, Smart villages is a way of looking at rural development, where it is not only a settlement with basic needs and facilities, but also a platform for providing the global quality of life for the rural community with an inter-dependent relation with urban counter parts. Though it was conceived in response to the developmental load of urbanisation, it is not meant to be a satellite town or suburb to a metropolitan city. A Smart village can have an interdependent relationship with a city or town without losing its character through cultural assimilation of urbanisation.

Based on this foundation, this research intends to bridge the gap between the policy makers (government departments), implementors (planners), practitioners (the builders and architects) and the rural community on the perspective of socially and culturally acceptable liveable housing. The following sections describe how this intention is realised through the aim and a set of objectives and the research questions. To avoid being immersed in the research and straying from the goal of the research, the scope and limitations have been defined to guide the research within a defined area of study.

1.3. **Aim & Objectives.**

This research aims to define a user-oriented bottom-up approach for rural development in India that narrows the rural-urban development gap discussed in the background research. It needs to address the differences between the top-down approach and the bottom-up approach in rural development practice. The top-down approaches are the government and organisation perspective of what the rural communities need for development, while the bottom-up approach is the expectations of the rural communities on how they could be developed. It is expected that through this research a clarification of this gap will indicate the assumptions formed by either side (user end and provider end) of rural development. This refers to the difference in 'expectation versus reality' of how rural development can be achieved. The outsider perspective that urbanisation holds, tends to undermine the capabilities of the rural communities, which affects the suitability and acceptance of rural development programs. This research aims to contribute to the discussions around the misconstrued perspective urbanisation holds regarding villages and rural communities. This research aims to establish that rural housing is not about providing area and volume for shelter, but rather, a space to live.

To achieve this aim, understanding the literature supporting a user-oriented bottom-up approach is a necessary part of this research. Understanding the rural perspective towards rural development and incorporating it is a crucial part of the methodology. In considering the rural perspective, the culture of the community and how it influences architecture and infrastructure-led development becomes a factor in understanding this perspective towards development.

The changes in culture and adaptability of the community reflected in their built environment caused by external issues, such as political (e.g., the British administration introduced the Assam-type bungalows as a housing typology (Desai et al., 2012)), technological (e.g., the use of lightweight concrete blocks as construction material, and use of corrugated steel sheets instead of Galvanised Iron Sheets as roofs (Doloi, 2016)), environmental (Timber Ban in Northeast India has persuaded the construction style to shift from wooden frame structure to Reinforced Concrete Columns) etc. would have to be observed as context of the village. The intention is to understand how communities have adapted to technology, political situations,

and interactions with other communities with different cultural backgrounds that have led to their diversity in cultural context. These changes would be reflected in each village differently and the variation in their adaptability would highlight the characteristics that are specific to the community.

The following are the objectives to realise the aim of this research.

- *Relation*: explore the relationship between the community and their built-environment, and how culture dictates the relation towards a user-oriented bottom-up approach of rural housing development.
- *Scope or Context:* the boundary or confines of the components and their relation within an environment
- *Elements:* definition and observation of the components in an environment creating and influencing the relationship.

1.4. Introduction to Smart Villages

The concept of Smart cities led to the concept of Smart villages and the literature review outlines the background, evolution, and components of a Smart village.

The concept of 'SMART' has been around since the 1980's when it was used as a mnemonic acronym in a magazine article to discuss goals and objectives of management, for S=specific, M=measurable, A=assignable, R=realistic and T=time-related (Doran, 1981). Smart villages as a term comes across as a new concept, however, such concepts have existed since pre-independent India based off Gandhian philosophy and thoughts of Adarsh Gram (Model Village) and Gram Swaraj (Village Self-rule/Independence) (Gandhi, 1963; Vswanadham, 2013). As an example of the concept, the Social Work and Research Centre (SWRC), widely known as the barefoot college, shows the capabilities of the rural people if provided with the right atmosphere to thrive (Roy, 1997; Vswanadham, 2013).

Current research at the Smart Villages Lab (SVL) at the University of Melbourne further conceptualises the Smart villages concept. The very first book on Smart villages discusses the importance and significance of eleven key sectors required for holistic development of rural communities from a practical perspective (Doloi, 2019). The sectors are income generation, education and skills development, agriculture, housing, energy, waste, water and sanitation, transportation, health and well-being, environment, and governance. The second book defines rural affordability and affordable housing from the community perspective according to the existing practice (Doloi & Donovan, 2020). As part of the SVL, housing for rural communities is the key factor being tackled by the research within this PhD. To define the research better within the Smart Assam Project, which is the main focal point of the SVL, further background research was conducted into the workings of the Smart Assam Project.

For this project, the key was to look at housing and how its contribution to the intentions of a Smart village could be managed in a way that supported cultural and architectural integrity.

1.5. Research Questions

To achieve the aims and objectives the key question driving this research is:

What are the recommendations to inform a user-oriented bottom-up approach for a rural housing scheme?

On breaking down the key question, we arrive at the following sub-questions that aid in simplifying the search for an answer, based on which the research is designed.

RQ 1. How does the rural context of the house influence the housing design and construction practices? What is the causative context? What is the effect?

RQ 2. What are the main causes that influence the evolution of architecture and the trend of construction in the rural context within the cultural ecology?

RQ 3. What are the considerations to be made to develop a housing scheme that promotes better communication and implementation of the rural housing scheme?

Answering the above questions informs the research of the position that we subsume within the system of rural development as practitioners, implementers, and policy makers of rural housing. It will define the distance and range between the providing stakeholders (practitioners, implementers, and policy makers) and the user end stakeholders (rural communities) of housing. In doing so, it will direct this research as well as others in the field of construction and housing towards bridging the gap. The research will adopt ethnographic methods to answer the research questions. The next section elaborates on the research based on its thesis chapters.

1.6. Thesis Structure

This thesis is made up of eight chapters that are outlined below. Figure 1-1 shows the chapters, their key role and how they support the key contributions of the research.

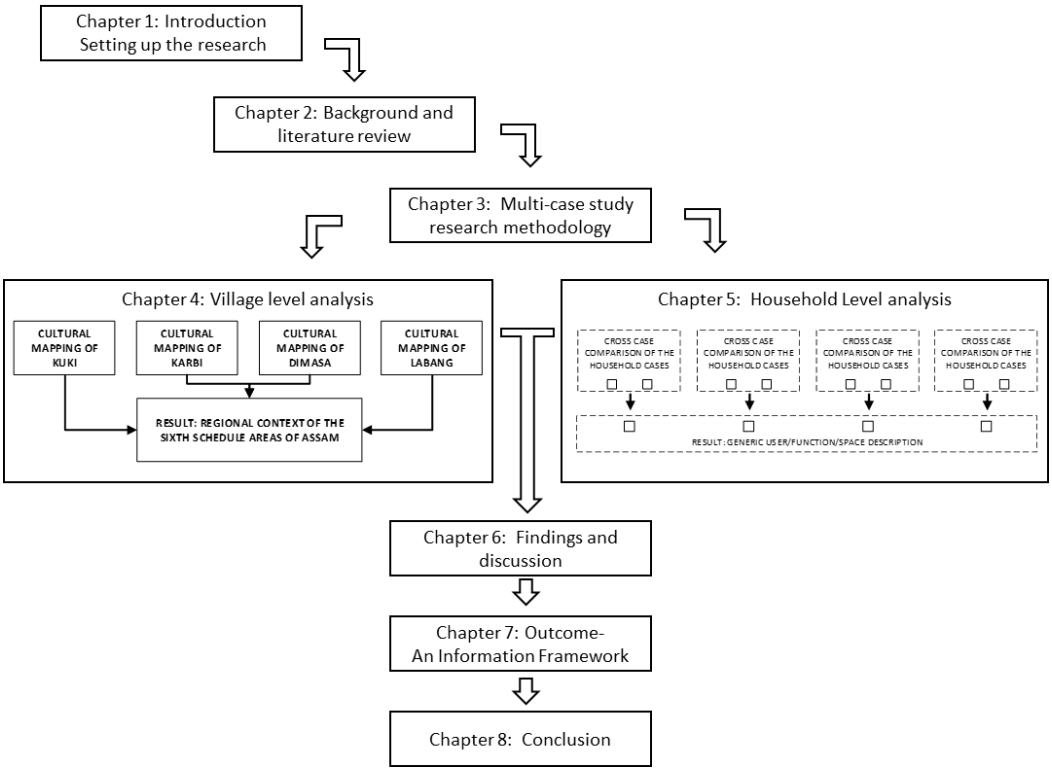


Figure 1-1 Thesis outline

Chapter 2 starts with an elaborate background review of the rural-urban gap in development based on the misconception of rural versus urban, the concept of Smart villages and its relevance to redefine rural development. It stresses on developing a user-oriented bottom-up approach to rural housing by recontextualising the role of housing in rural development. Culture, architecture, environment-behaviour studies, and ethno-architecture aid in shaping a

multidisciplinary theoretical approach to the aim and objectives of research. Each section helps to draw in the knowledge required to move forward in the research. Firstly, it provides the context and foundation needed to understand the current state of rural housing while redefining the need for closer attention to be paid to the cultural context of the rural community. Secondly, it encourages a user-oriented bottom-up approach to rural housing by highlighting the shortcomings of the top-down approach in current practice. Thirdly, it defines multidisciplinary research area that aids to understand architecture of rural housing through culture. It elaborates how culture is defined in the context of the research and the perspective for the researcher to understand the evolution and ecology of culture, which in this research is the architecture of rural housing. It further guides the perspective of the researcher as an architect and the architectural theories that support the design of rural housing. This chapter aids in developing the research methodology.

Chapter 3 aids in understanding the theoretical underpinning of the research along with devising the practical approach of data collection relevant to the research. Due to the nature of the research, a contextualist-pragmatic case study research approach is adopted. Considering the need for contextualising the research to social and cultural context of the rural housing, it begins with the focus on the research methodology for conducting a multi-case study research. It brings together theoretical perspectives held in studying culture and architecture in enabling the understanding of the research through the lens of environmental behaviour studies. However, the lens of environmental behaviour studies is not paradigmatic enough hence the theoretical framework is strengthened by the concept of behaviour settings. The data collection and analysis of the research is designed by combining multiple ethnographic methods and techniques that are supported by both fields of ethnography and architecture.

A mandatory ethics application aids in devising the procedure to be adopted for effective data collection. There is a description of the site profile and case selection criteria for the multi-case study research, and the templates used for collecting data. The practical approach of the data collection and analysis is explained. Cultural mapping (Field, 2010; Pillai, 2013; UNESCO Bangkok, 2017) is used to collect and document village level data, and behaviour settings (Barker, 1968; Schoggen, 1989) is used to collect and document the household level data. NVivo qualitative software analysis is used to aid in content and cross-case analysis of the data collected from the four village cases studied in this research, while the AEIOU (Activity, Environment, Interaction, Object and User) framework (EthnoHub, 1997; Robinson, 2015), a coding structure mnemonic is used to analyse the house layouts of the household cases. Content analysis (Krippendorff, 2004), cross-case analysis (Miles & Huberman, 1994; Patton, 2002) and causal analysis (Heathcote, 1989; Hume et al., 1912; Palinkas, 2014; Tacq, 2011) are used as the qualitative methods of analysis (Creswell, 2009; Merriam, 2009a; Stake, 1995b). Analytic induction is introduced as a strategy for ensuring reliability and generalisation of the results and replicability of the research methodology. This chapter concludes by introducing the analysis and evaluation chapters that follow in Chapter 4 and Chapter 5 for the village level and household level analyses, respectively.

Chapter 4 begins with the description of each village case before conducting individual content analyses of the cases based on the data from the cultural mapping conducted. The data is then analysed across cases to identify links among cases based on issues and themes identified during the data collection. This results in a generic understanding of the regional context of the cases being studied in the context of the sixth schedule areas of Assam.

Chapter 5 is introduced by the results of the household case selection criteria decided by the research methodology. The cases are analysed by using the AEIOU framework to analyse the layouts of houses that the family/household has lived in. The changes in the layouts are noted to identify the evolution of the houses based on the socio-economic, cultural, and environmental contexts of the household. A cross-case analyses of the house layouts across the villages result in a generic understanding of space, function and use based on the user and the context.

Chapter 6 brings together the results of the analysis conducted in Chapters 4 and 5 and discusses the causality of the house within a village according to the concept of contextualisation. The analytic induction aids in developing a hypothesis that explains the similarities and differences among the cases regarding their rural housing practices. According to the pragmatic approach, the hypothesis aids in developing a list of features that are recommended to be incorporated into the process of implementing rural housing schemes and thereby develop effective rural housing practices.

Chapter 7 focusses on the tangible outcome of the research which is an information framework based on the causal discussions in Chapter 6. According to the aim of the research, the framework repositions the role and responsibility of the user of the house as main builder while site analysts and construction practitioners take on consultatory roles. It is set of guidelines that regulates activity, function and responsibilities of consulting stakeholders contextualised within a rural housing project.

The thesis is concluded in Chapter 8 by reviewing the stages and steps involved in forming, conducting, and discussing the research. It revisits the outline of the aims and objectives by discussing the strategy and methodology within the given scope in each stage that have aided in answering the research questions that have been posed in Section 1.5.

1.7. Scope and Limitations

As this research is part of the Smart Assam Project, the scope of the research is framed by, and fed back into the broader aims and context of the project. However, the research is independent regarding the scope of the matter provided that the results contribute towards the larger project. Along with the scope that is provided by the project, this research intends to expand the directions in which the research can venture that are related to and can contribute to the project directly or indirectly.

Due to the nature of the research described by the aims and objectives, the research adopts an interdisciplinary approach where the theories and methods of data collection and research are supported by ethnography and architectural understanding of theories and designs. This would include understanding of spatial design and use as seen from the perspective of an architect supported by ethnography. The combination of the two disciplines is considered vital to proceed in understanding the community and the way they understand spaces for interaction within the context of the village.

Mapping, note-taking, and observations are among the techniques that are most effective in illustrating data and information being collected by the researcher. They will be used by the researcher in combination with other techniques such as interviews and questionnaire surveys depending on the context and objective at the time. Research has shown that in the context of this type of research it is not only the questions of surveys or interviews that are important but

also the observation of everyday life (Tedlock, 1991). Direct observations during interactions may seem irrelevant to the question asked, however personal interaction with participants often offer greater detail of authenticity and relatability to the situation.

Despite the scope of the research, limitations need to be defined to keep the research grounded and justifiable. First and foremost, it is limited by a time frame since it is a graduate research thesis affecting the scope of inclusion of the number of cases being studied. The number of villages, households and individuals included as participants are limited through the design of the research methodology.

The ethnic communities to be taken into consideration are limited to the communities recognised by and belong to the state of Assam, India. The number of ethnic communities will be further limited according to the region under study for the research along with the case selection process developed by the design of the research methodology.

1.8. Research Significance

This research is meant to clarify the grey areas in project briefing, proposing, planning, designing and implementation of development interventions which are the product of misconstrued perceptions regarding rural communities and vernacular practice. Clarifying the ambiguities in development interventions will aid the external stakeholders to work towards context specific development interventions that are suitable for the community and the place. Both national and international organisations for rural development will benefit from the understanding of the expectations of the community as the user-end stakeholders of developmental programs and interventions. This understanding will empower the rural sector in development removing the dependence on the urban sector for betterment and support converting the rural-urban gap into an interdependent relationship.

For academic purpose, this intends to be a base line or a reference for further research into culture, architecture, and development. It intends to educate current and future professionals as an area of opportunities for contextualising and culture-sensitive interventions. Education, research, and application of the knowledge gathered from this research aims to contribute towards bridging the gap between urban and rural communities. This will lead towards a holistic progress where either sector is not burdened with the issues of the other and are mutually beneficial for development.

1.9. Chapter Summary

This chapter has defined the context of the research, which is the rural-urban gap and the role of housing in Smart village initiatives that contribute to bridge the gap. A brief description of the aims and objectives of the research and the questions to be answered to obtain those aims and objectives is given. The chapters ahead will allow the reader to see how the aims and objectives of the research is met.

As outlined in the thesis structure, the next chapter will contextualise the research by explaining the background research followed by the relevant literature that guides the research. The scope of the literature review has been defined by the lack of cultural sensitivity and address to vernacular architecture in the rural housing schemes by the government of India. This encourages in identifying the basic theories regarding culture and architecture that aid in contextualising the research within the global literature on rural housing and therefore, defining the research gap.

Chapter 2. *Literature Review*

The literature review covers the three main topics of rural housing, culture, and architecture in the context of Smart villages and rural development, thereby defining the research gap. The chapter begins with the background research for the thesis which is a brief dive into the definition of rural for this research, the summary of the five-year plans by India highlighting the reasons for the rural-urban gap, the concept of Smart villages and an introduction to the Smart Assam Project. This provides the much-needed rationalisation of the significance and theoretical approach of the research in Section 2.1. Section 2.2 supplies the research with the arguments of how housing is an integral part of rural development and the role of architecture as a social representation of the rural. Understanding the rural housing schemes presently existing in India aids in learning the current practices adopted by the government and its effectiveness in implementation. This allows the researcher to understand the gaps in policy making and developing frameworks for rural housing.

To ensure social and cultural acceptability of the framework, it is important to understand the relevance of culture and architectural theories that support the perspective of housing within a Smart village in Section 2.3. As such, the literature review proposes an interdisciplinary approach based on theoretical foundations of cultural ecology, critical regionalism, and the research orientation shaped by ethnographic methods and architectural artefacts. It is divided into four sections of culture, architecture, environment-behaviour studies, and ethno-architecture. Section 2.3.1. defines culture in the context of this research and discusses the approach to understand it. Section 2.3.2 considers the concepts and theories of architecture that guide the understanding of the current practices in rural housing and representation of culture in architecture of houses in general. Section 2.4.3 examines the overlapped area of the two topics as a design-oriented multidisciplinary research of environment-behaviour studies. Section 2.3.4 discusses the similar yet contrasting culture-oriented multidisciplinary approach of ethno-architecture. The discussion leads to a proposed concept of ethno-architectural contextualisation that attempts to marry the culture-oriented and design-oriented approach into a combined approach incorporated with dual perspectives of both.

Section 2.4 discusses the research gap that is outlined through the background research and the literature review. This section summarises the clear gap in approach, implementation, and perception of rural housing schemes for the development of Smart village. Section 2.5 summarises the chapter.

2.1. Rural Development for Smart Villages

This section provides the definition of rural for this research and discusses the rural-urban gap and its contributors in the Indian context. It is supported by global literature to understand the links between the factors of population, migration and infrastructure contributing to the rural-urban gap. This establishes the background of rural housing in the greater context of development of Smart villages and further explains the role of Smart villages as a solution to bridge the gap between rural development and urban development. The definition and components of a Smart village are defined by the literature on Smart cities across the world and rural development policies in India. Finally, the Smart Assam Project is introduced which is the context for the research aiming at bridging the rural-urban gap through research and capacity building.

2.1.1. Definition of Rural

Before going forward with the literature review, it is important to acknowledge the difference between urban and rural beyond a simple dichotomy of their definitions. As such, defining the scope and limitations of the term "rural" ensures that there is a distinguished approach for housing and shelter in regions and areas that do not fall under the urban jurisdiction.

The lack of understanding the difference in the definition of urban versus rural across governments contributes to the disparity in recognising a rural issue from an urban issue, thereby applying incorrect approaches to development of the region based on its urbanity/rurality. Ratcliffe et al. (2016) defines rural as the opposite of urban clusters and urban areas, based on the population thresholds, density, land use and distance from a commercial centre. While urban is defined as more dense, highly populated, built up closer together; rural is less dense, lowly populated, and built up sparsely. Additionally, the UN Statistical Commission (2020) introduced the *Degree of urbanisation* as a method of demarcating settlements into cities, towns and rural areas.

By this definition, the settlements and areas that have been categorically described as villages by the Census of India is what constitutes rural areas. It is a village if it has lesser than 5000 people, low density population, absence of urban administrative units and more than 25% of the male working population is engaged in agricultural pursuits. However, rural social scientists have argued against the oversimplified binary definition of one based on the other, as urban areas can possess rurality while rural areas can possess urbanity in character (Halfacree, 1993).

Halfacree (1993) lists the authors that offered descriptive definitions of rurality of a space based on different aspects of the socio-spatial environment such as, statistical, administrative, built-up area, functional regions, agricultural and population size/density. Each author had defined rural according to their context of practice and research however, this supposed definition only offered a statistical description and not the actual definition. He argued that rural spaces, or rurality of a place is shaped by its social representation, or the essence of the society, thereby forming a unique locality. However, he concluded after much discussion that rural can be defined based on its socio-cultural definitions (Hoggart & Buller, 1987) and conceptualisation of space (Gregory and Urry, 1985; Harvey, 1973; Smith, 1981, 2008) and acknowledging their causative role in perceiving a place (Sayer, 1985; Shields, 1992).

As such, according to Cloke (2006) rural areas are characterised by limited infrastructure, extensive land use like agriculture and forestry, and by a cohesive community identity based on respect for the environmental and behavioural qualities of living within an extensive landscape. Anríquez and Stamoulis (2007) argues that the role of agriculture is a primary factor in rurality as it is linked to rural development, poverty reduction and overall development. As it provides income and employment, agriculture is a crucial part of the rural economy (Gowda et al., 2018). Wineman et al. (2020) includes economic advancement as an indicator of rurality of settlements. Therefore, for this research, the term "rural" refers to concept of a settlement, population and/or infrastructure that is highlighted by the significance of agriculture as its economic driver and the essence of society that is uniquely conceptualised through the 'place'.

2.1.2. Rural Urban Gap

While there is a rapid urbanisation trend generally, over 40% of the World population still lives in rural areas (United Nations, 2018). In the context of India, as reported by The Hindu Data Team (2018) about 34% now live in urban areas, an increase of about 3% since the 2011 Census. They have observed the growth in urbanization by studying the size of urban agglomeration, which denotes contiguous territories with an urban population density. It has demonstrated that the number of mega-sized urban clusters (population greater than 5 million) has remained almost constant over the years, while the number of smaller urban clusters has increased rapidly. Figure 2-1 shows the growing trend of urbanisation indicated by the increase in the number of urban agglomeration clusters of varying population since 2005 to 2015.

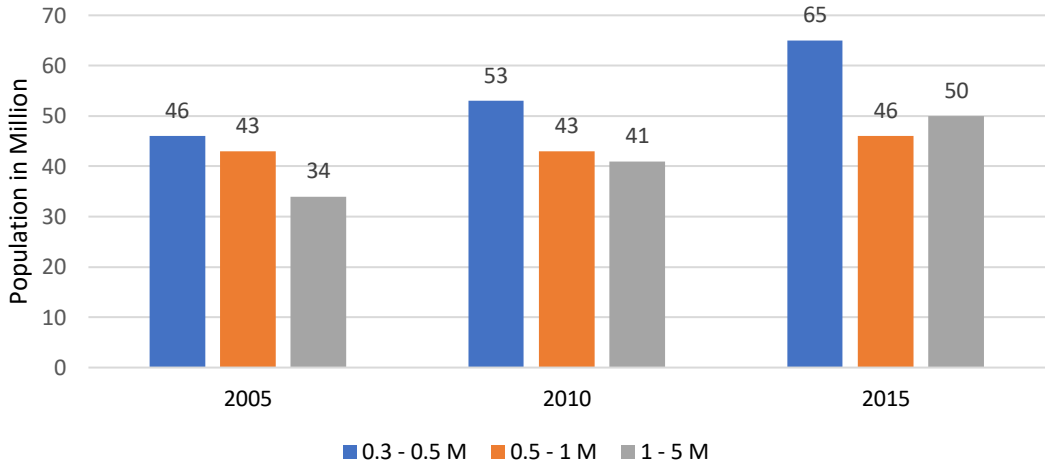


Figure 2-1 No. of urban agglomeration clusters

Focussing development in the urban sector encourages rural migration to cities for jobs and better quality of life, leading to ever increasing urban populations. The current situation is not feasible as the load of development falls heavily on the urban sector. However, the current scenario of rural development continues to encourage urbanisation while the gap of development widens. It is necessary to plan and implement policies that cater to the needs of both rural and urban for better overall development, so that the rural sector also contributes towards a holistic developmental approach for the country. However, to analyse the response by the Indian government and their efforts to the bridge the rural-urban gap, the following section offers a cursory glance at the implementation and evolution of the five-year plans of India highlighting the aspects of development that were addressed over the years since its introduction.

The Five-year Plans in India

According to a publicly accessible official report by Ministry of Statistics and Programme Implementation (2015), India developed centralised five-year plans in 1951. They were integrated national economic programs inspired by Joseph Stalin's first implementation of the five-year plans in the Soviet Union in the late 1920s. Establishing the National Planning Committee by the Indian National Congress in 1938, the Bombay Plan & Gandhian Plan in 1944, Peoples Plan in 1945, and Sarvodaya Plan in 1950 were predecessors to the Five-year plans of India. The objective was to improve the standard of living by using the resources of the country to increase production of resources and employment opportunities. It was based on

the assessment of availability and prioritisation of the resources to formulate plans for the most effective utilization of resources to be reassessed every five years.

The report goes on to describe that the first eight plans to have emphasised on the growth of the public sector with massive industrial investments such as agriculture, food production, price stability, employment, and physical infrastructure, while the following four five-year plans consciously decided to make more investments in the private sector (Ministry of Statistics and Programme Implementation, 2015). The first eight plans oriented their success around economic growth to progress towards a self-reliant development and the latter four plans incorporated social and environmental development to the plans to promote inclusivity and sustainability. The population influx and changing demographics proved to affect the projected supply and demand of infrastructure to support the development of the country, thereby affecting the comparative successes and failures of the plans. This was highlighted by the failure of the third, fourth and fifth plans that arose from the conflicts with Pakistan and the migration of Bangladeshi refugees before and after the 1971 Indo-Pak war. The revised focus towards developing social and environmental infrastructure to promote inclusivity and sustainability from the ninth five-plan and onwards, indicated an overall growth of the economy and a decrease in the rural-urban gap despite not meeting the targets of the plans. Though the main indicators of the success or failure of the plans have been indicated by the poverty rate, economic growth through agricultural and non-agricultural productivity, skill development and industrialization and employment, the main causes that affect the outcome is the population influx, changing demographics and investments made in infrastructure development.

Contributors to the rural-urban gap

As summarised above, population, migration, and infrastructure are the main factors that influence the result of the five-year plans. Governance and the political environment played a role in the early termination of the fifth five-year plan, however, the workings of governance in relation to the rural-urban gap is not discussed as it is beyond the scope of the research. Therefore, in order to understand the contributors to the rural-urban gap, literature on population, migration and infrastructure is reviewed.

Population

One of the significant factors that make development difficult in India is its population. As shown in Figure 2-2, almost 70% of the population live in rural and remote areas, while just over 30% live in urbanised areas (Government of India, 2011; Reserve Bank of India, 2013). The average literacy of the country is at 63%, 74% of the urban population and 58% of the rural population, indicating the disparity in access to education. Of the total population 22% that live below poverty line, 14% of the total urban population and 26% of the total rural population, respectively. This indicates that both migration and urban poverty are the result of inaccessibility to proper amenities and infrastructure in rural areas.

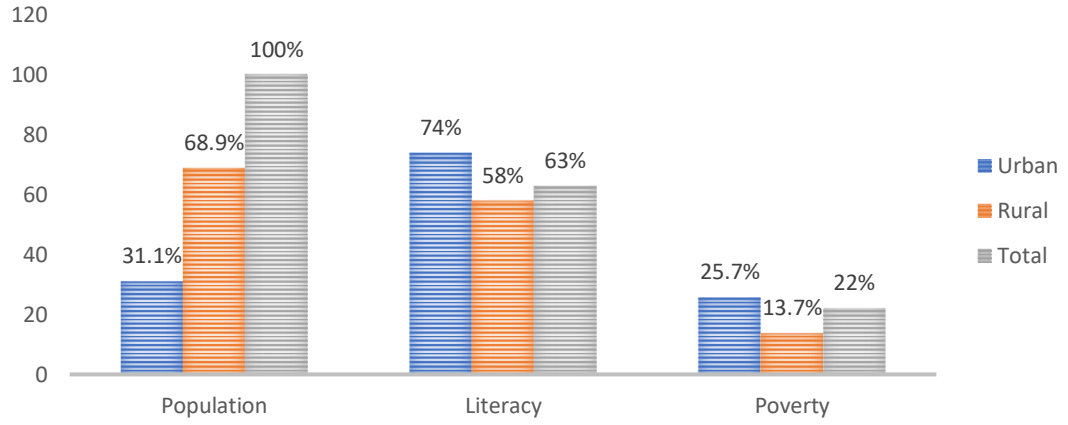


Figure 2-2 Population distribution

The lower literacy rate and higher poverty rate of the rural population indicates the disparity in the overall access of education, employment opportunities, and welfare which are the rights of the citizens of the country. These issues are further enhanced with the fluctuation in population through internal migration.

Migration

Migration frequently involves people moving to the cities and towns from rural and remote areas for better education or employment opportunities. According to 170 Demographic and Health survey data from 65 countries analysed by Young (2013), four out of five people migrated to urban areas for higher income and living standards while only one out of five migrated back to the comparatively rural and remote areas despite lower income and living standards. This has caused inequalities in living standards between urban and rural areas which has contributed to the rural urban gap. Gkartzios and Scott (2010a, 2010b) address the disparity of urban and rural issues in planning policy that is the result of migration towards less urban areas, coined as counter-urbanisation by Berry (1980) .

Internal migration, both urbanisation and counter-urbanisation has also led to the inability of urban areas to respond and provide for the citizens that rely on the infrastructure of the town or city. The shift in demographics affects the population of the settlements from and to which the migrants move, making it difficult to predict the future requirements of the city and creating a load on infrastructure that continues to drive the rural urban gap.

Infrastructure

However, aside from population and changing demographics, the infrastructure of the settlement has been proven to contribute towards rural-urban gap of development (Kanbur & Rauniyar, 2010; Manggat et al., 2018). As reasoned by Young (2013), due to the large population of the country and the rural-urban migration, the infrastructure of the country suffers as it is unable to respond to the demand of the fluctuating population. Institutions of infrastructure are affected either by not supplying enough, or in rare cases, are not being used by the intended population which affects the economy of the country. Deb (2018) compares the disparity in infrastructure development between urban areas and rural areas, referring to the latter as ‘backward areas’ due to the lack of basic infrastructure and facilities such as roads, electricity, water and sanitation facilities, schools, and hospitals, etc.

Baxter et al. (2008) argue that education and the ability to absorb and share information in the form of reading, writing, or hearing can enable the person to make informed choices to a better quality of living according to their needs. This makes the social and physical infrastructure for encouraging and providing education an important part of developmental infrastructure. More than $8 billion was allotted as budget for education by the Ministry of Human Resource Development (MHRD), 25% being allotted to the National Capital Region and 75% for the states and Union territories for the year of 2013-14 (Tiwari, 2016).

Analysis conducted by Cash (2016) of the budgeted expenditure on education by the department of Education of India showed that the non-planned expenditures, meant for the operation and maintenance of existing educational infrastructure, declined whereas planned expenditure, meant for new schemes and projects, increased. Cash also observed that only three to four percent of the total GDP was being spent on education as compared to other developed countries (Tiwari, 2016). As indicative of the analysis made by Cash (2016), Figure 2-3 shows the percentages of urban and rural literacy rates (India, 2011; Reserve Bank of India, 2013). The bar graph indicates the gap in rural and urban education opportunities that are being availed for the citizens despite the enormous budget being invested by the Department of Education.

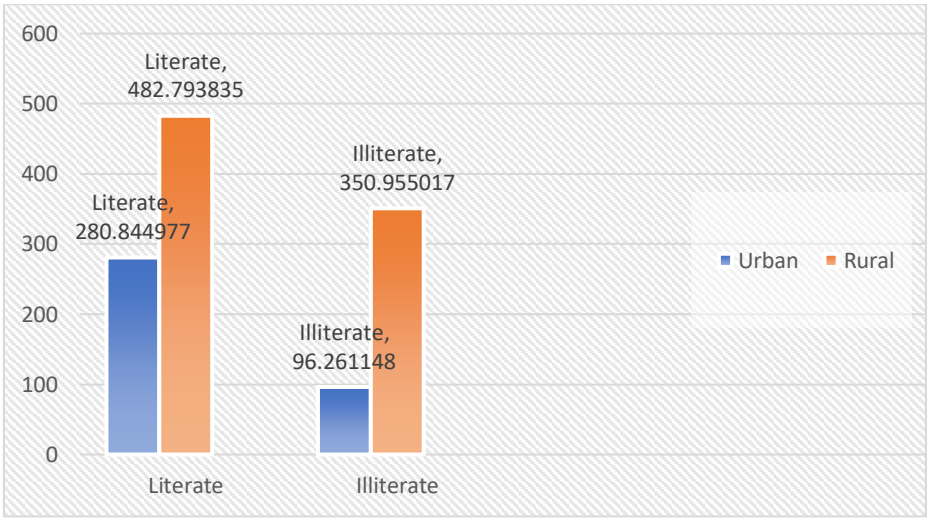


Figure 2-3 Urban and rural literacy (in million)

To summarise, the gap between the rural and urban sectors in India has been defined by the difference in the efforts put towards development and centralisation of commerce and industry (Sheth, 1969). It is further accentuated based on the demographic distribution across cities, towns and villages resulting from urbanisation and counter-urbanisation in India (Sekkat, 2017; Young, 2013). There are disparities in development and the facilities and institutes required to maintain a certain standard of living in the urban cities and towns as compared to the remote and rural villages of India. Standards that are accepted as the bare minimum requirement in one region may not be the same for another region due to different economic, social and environmental contexts (Young, 2013).

There has been slow reduction of the rural-urban gap since the Indian independence affected by policy making and implementation of policies and programs regarding rural development, however, as observed by Hassan (2016), there are other ancillary issues that contribute towards widening the gap. In economic standards, as analysed by Hnatkovska and Lahiri (2012), these gaps have been narrowing, however, that is not the case in terms of education attainment, occupation choices, poverty, health, wage and consumption gaps.

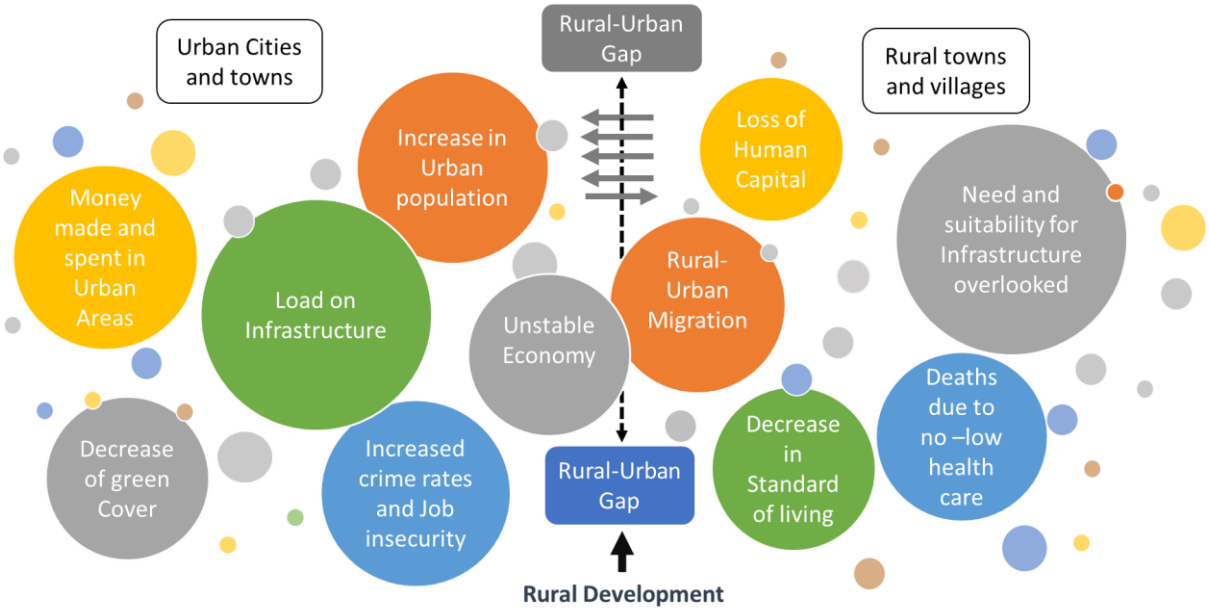


Figure 2-4 Rural- urban gap

Figure 2-4 is a graphical representation of the slowly reducing rural urban gap while there are yet many issues that are affecting the narrowing of the gap. The grey single-headed arrows across the dashed double-headed arrow separating the urban from the rural indicates the internal migration within the country, where only one in five people are counter-migrating to the rural (Young, 2013). The double-headed arrows represent the rural-urban gap, which is narrowing while countering the efforts in rural development, due to the population and migration creating an infrastructure-load across the rural and urban. The bubbles in the figure represent the ancillary issues that are the indirect results of the rural-urban gap, such as lack of human capital and infrastructure, higher mortality rates and a decreased standard of living in the rural. On the other side, the urban areas face issues such as overpopulation, inability of the infrastructure to support the needs of the citizens, urban poverty, job insecurity, increased crime rates and an overall unstable economy as investments and capital do not extend out of the urban economy.

This review of the literature shows that interventions aimed at development of both the urban and rural sectors are not lacking, however there is a need to understand the context and the appropriate approach to dealing with the rural-urban gap. These developmental initiatives are being pursued to narrow the urbanisation gap, however, the dominant role in these initiatives appear to be economic in nature. This begs the question whether the environmental and social aspects of the initiatives are being equally incorporated and executed. The next section defines Smart villages and its relevance to the holistic approach to development and its role in bridging the rural-urban gap.

2.1.3. Smart Villages

Since the 1980s, the term “Smart” has been adopted by other brands and organisations to boost sales by marketing products such as Smart Technology, Smart Phone, Smart Security, Smart Cards etc. This has been done to indicate a renewed and revised version of a product for the current ‘Smart’, lending a futuristic appeal to the product, an example of which is the Smart Cities concept.

Doran (1981) has used the word 'SMART' as an acronym (S=specific, M=measurable, A=assignable, R=realistic and T=time-related) to discuss aims and objectives in management. However, it is recontextualised to aid with the definition of Smart villages and Smart cities in the context of holistic development. The Smart Cities concept came into being in 2007 with the aim to measure sustainability of medium-sized European cities (Griffinger et al., 2007). Measurable factors, criteria and indicators were developed which were also adopted by other cities and organisations who wanted to be considered 'Smart' (Griffinger et al., 2007; IEEE, 2017a; Sullivan, 2014). Figure 2-5 is the list of indicators and criteria developed to measure Smart Cities under the six factors: Smart Mobility, Smart Environment, Smart Economy, Smart Governance, Smart People and Smart Living.

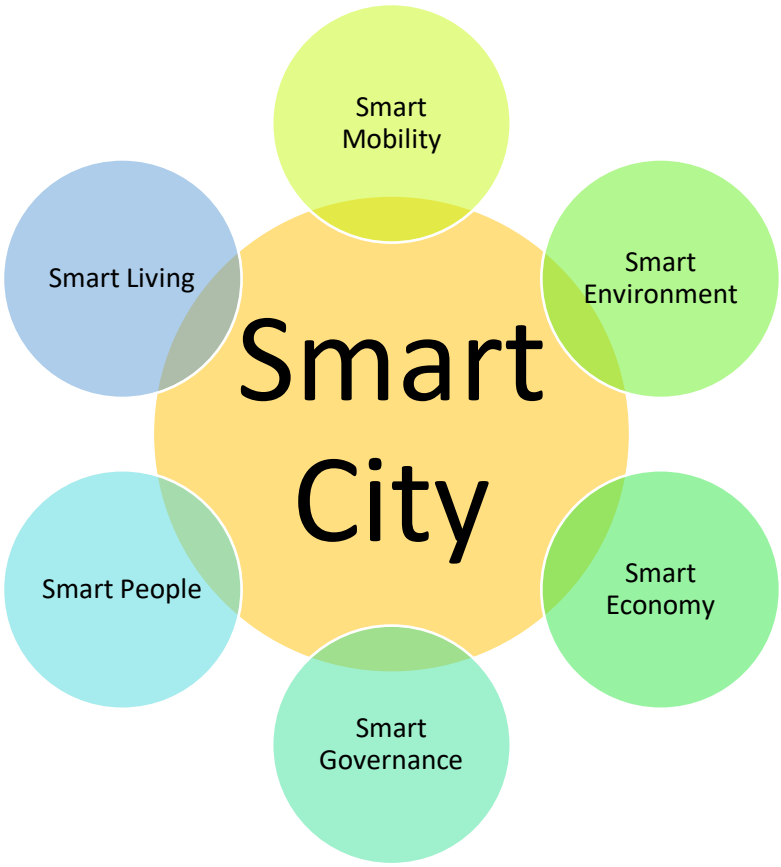


Figure 2-5 Components of a Smart City

In the international as well as national context, implementation of Smart villages has been realised through introduction of sustainable energy alternatives, increased accessibility to healthcare and education, technologically supported solutions, etc. while promoting community involvement and betterment (IEEE, 2017b; smartvillages.org, 2014; Villages, 2014). The overarching aim of the initiatives has been defined as "Global means to the local needs"; a settlement with basic needs and facilities, but also an opportunity to provide the quality of life for which people generally migrate to the cities (smartvillages.org, 2014). Week (2016) highlights the importance of community driven initiatives or community-based contracting in the examples of the 650 schools rebuilt in eight months by the community in Timor Leste ESRP. The same is also observed in the construction of boat repair shops, proper drainage systems, water supply and culvert of streams as part of the Indonesia LOGICA in Aceh, during the post Tsunami period where around 200 villages were affected (Week, 2016).

In India, the concept of Smart villages has existed since pre-independence, which was modelled according to the Gandhian philosophies of Adarsh Gram, meaning a model village, and Gram Swaraj, meaning Village Self-rule/Independence (Gandhi, 1963). The Social Work and Research Centre (SWRC), widely known as the barefoot college, is an example of the capabilities of the rural people if provided with the right atmosphere to thrive (Roy, 1997; TedTalk, 2011). Founded by Bunker Roy in Tilonia, Rajasthan, India, in 1972, it is a voluntary organisation that is aimed at the upliftment of rural people by providing education, skill development, health, drinking water, women's empowerment and electrification through solar power. His intention was to find alternative ways to address India's prevalent poverty and inequality issues which he achieved by approaching the people for their problems and solutions without relying on hired people for simple tasks.

N. Viswanadham (2013) investigated the Smart village ecosystem for global supply chain management with Pochampally Village as a case study to identify the service chain, resources, delivery techniques and institutions that are part of a village ecosystem to formulate growth strategies for a self-sufficient village. In India, the Ministry of Housing and Urban Affairs, adopted this concept and proposed to select 100 cities to be developed under the Smart Cities Mission. These cities were to receive financial aid for a five-year program from 2017-22, with aim to be measured and considered as a Smart city from 2022 onward, by undergoing urban renewal and retrofitting program making them citizen friendly and sustainable (Department of Urban Development, 2015). Stemming the overcrowding cities from rural migration, simultaneously, a Smart village initiative was launched.

In 2015, the Ministry of Urban Infrastructure and Housing launched a scheme to develop 100 Smart Cities and the Ministry of Rural Development launched a scheme to develop 100 Smart Villages (Department of Rural Development, 2015; Department of Urban Development, 2015; News, 2016). This included selecting villages to retrofit or remodel with the facilities of urban areas and using the objectives of the Rurban villages develop the Smart villages in India.

The National Rurban Mission (NRuM) identified 14 mission components, shown in Figure 2-6 , for achieving the vision of "Development of a cluster of villages that preserve and nurture the essence of rural community life with focus on equity and inclusiveness without compromising with the facilities perceived to be essentially urban in nature", thus creating a cluster of "Rurban Villages" (Department of Rural Development, 2015). Rurban is the cluster of settlements that are relatively close to each other, that "illustrate potential for growth, have economic drivers and derive locational and competitive advantages" (Department of Rural Development, 2015; Gupta, 2015; Sidhwani, 2014).

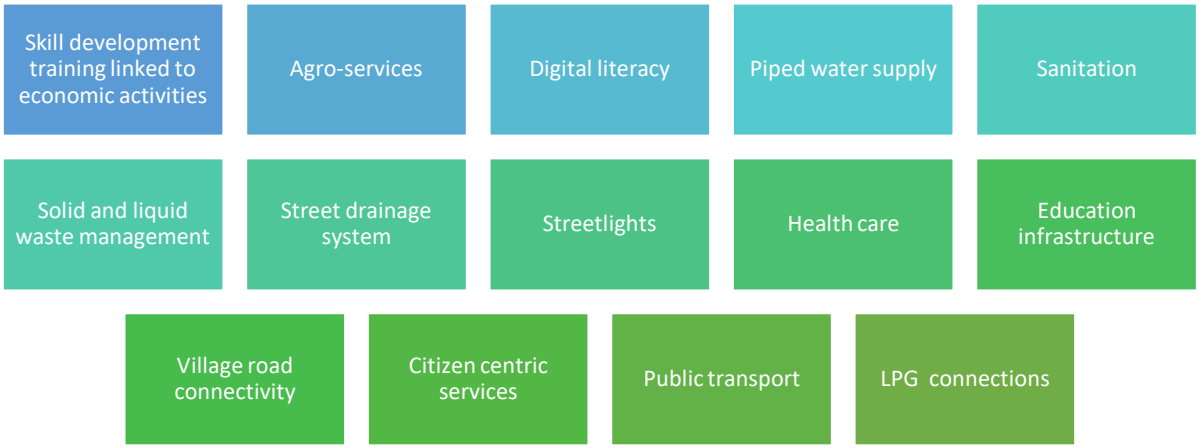


Figure 2-6 The 14 components of Rurban Villages (Department of Rural Development, 2015)

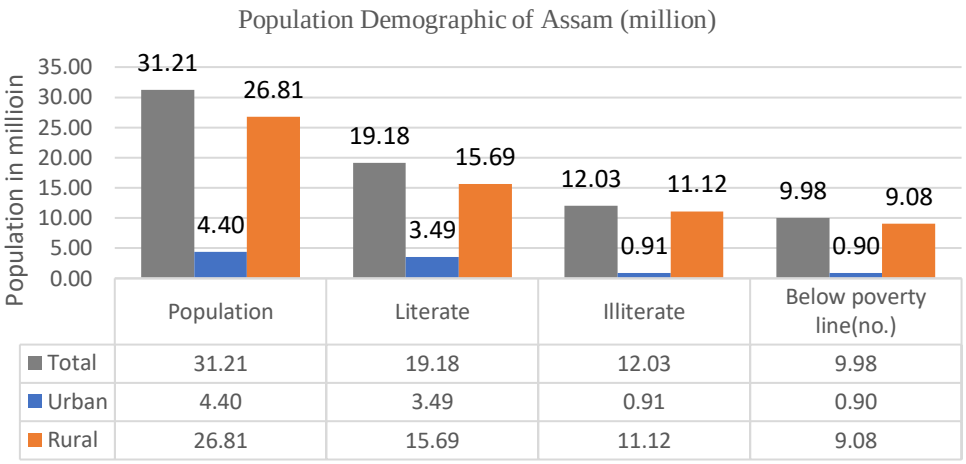
The mission provides accessibility to other villages and towns as well as global and digital connectivity, by providing public transport facilities and encouraging digital literacy. It provides health and sanitation by ensuring covered toilets, providing mobile health units, street drainage system waste management, plumbing and water supply. It ensures employability and livelihood by encouraging skill development supported by handicraft, handloom or any industrially driven skill that is present in the village and providing agro-based services such as industry for processing, storage and warehousing of the goods and produce. It aims to increase the quality of education and literacy rate by providing better education infrastructure with primary and secondary level schools within reasonable distance from the households, drinking water provisions, separate toilets for boys and girls and adequate classrooms. It ensures the supply of LPG connections by providing a retail outlet per village or per 1800 households and mandates providing streetlights as per the standard. To ensure maintenance and smooth functioning of the Rurban Mission, a common service centre is provided for every two or three village cluster through information and communications technology. Thus, the approach to developing Smart villages is by facilitating rural development through the 14 components as defined by the Rurban mission in Figure 2-6.

The department of Rural Development made efforts to provide proper housing, healthcare, sanitation, electricity, water and other facilities through the Rurban Mission, yet the quality of life has not improved significantly (Singh & Rahman, 2018). The overview of the 14 components of Rurban villages indicate the close attention to infrastructure-based development of village clusters. This outline of the Rurban mission promotes urbanisation of rural areas, however, the proposal and implementations does not include the social aspects of the community of the villages that could affect the implementation of a “Smart Villages” program by the rural community.

2.1.4. The Smart Assam Project

Assam has a population of 31.2 million people, demonstrating a wide disparity in the rural-urban gap compared to the national average. As shown in Figure 2-7, the columns indicate the total population in urban and rural areas, and their literacy and poverty rates. Percentage wise, the urban population is 14% (4.4m of 31.21m) and the rural population is 86% (26.81m of 31.21m). The overall literacy rate is 62% (19.18m of 31.21 m), 79% in the urban areas (3.49m of 4.4m). and 58% in the rural areas (15.69m of 26.81m). The poverty rate is 32% (9.98m of

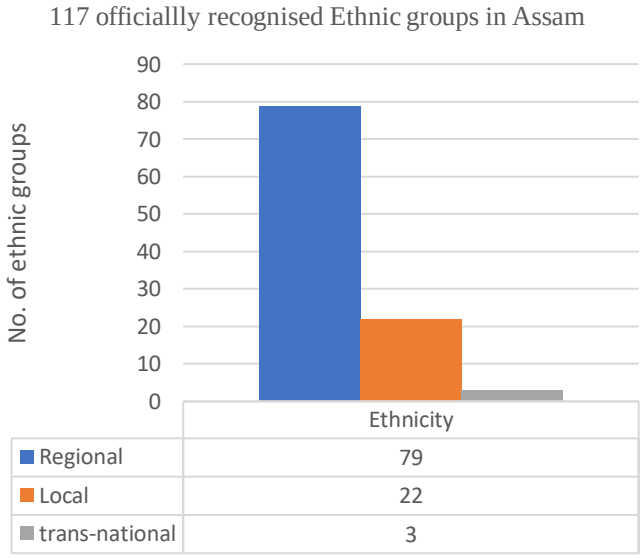
31.21m) with 20% in urban areas (0.9m out of 4.4m) and 34% in rural areas (9.08m of 26.81m) are below poverty line.



	Population	Literate	Illiterate	Below poverty line(no.)
Total	31.21	19.18	12.03	9.98
Urban	4.40	3.49	0.91	0.90
Rural	26.81	15.69	11.12	9.08

Figure 2-7 Population distribution in Assam

The People of India project has studied 115 of the ethnic groups in Assam. As shown in Figure 2-8, it found: 79 (69%) identify themselves regionally, 22 (19%) locally, and 3 trans-nationally (Government of India, 2011; Reserve Bank of India, 2013). This ethnic diversity across demographics of the state indicates an even greater variation in social acceptance of the Smart Village definition according to the physical, political, and cultural context of the community.



	Ethnicity
Regional	79
Local	22
trans-national	3

Figure 2-8 Ethnic groups in Assam

As part of the response to the imbalance in the socio-economic situation of the state and the necessity to bridge the rural urban gap, the Smart Assam Project, a collaboration between the Assam Government and the University of Melbourne, has been instrumental in providing a research foundation towards research-based policy making and practice. It is an initiative that aims to support the conceptualisation of the "Smart villages" in Assam by empowering the rural community with localised planning and policy support (Doloi, 2016; Doloi & Donovan, 2020; Doloi et al., 2019).

The project objective is to conduct research that creates a Smart Data platform as well as a new construction management course that is tailored to the context of Assam and its stakeholders, that is, the users, the manufacturers, suppliers, and the environment. The Smart Assam Project arises from the necessity for providing proper infrastructure in the rural and remote areas of the state. It has been founded on the importance of providing liveable shelters for the rural community, which are socially and culturally acceptable to the community based on three broad aims:

Firstly, the Smart Assam Project intends establish comprehensive assessments of construction skills, knowledge, materials, technology, and processes in relation to growing challenges of housing and infrastructure needs in cross cultural context and devising strategies for building capacities, improvements and growths including historical and cultural implications in future urban conditions in relation to the Smart villages program.

Secondly, it aims to develop frameworks for comprehensive integration of community in terms of the specific needs and requirements, and strategies for achieving optimal social value outcomes in housing and infrastructure projects in Smart village context. The framework is demonstrated using selected project case studies in Assam and provides guidance to relevant authorities, industries, and policy makers on maximising opportunities for communities by successful planning and delivery of housing and infrastructure projects within the Smart villages program.

Thirdly, it intends to encourage professional development and local capacity building in research, education and training required to support the Smart villages program and underlying issues associated with the urbanisation and development processes across the state.

In the Smart Assam Project, a series of workshops were held that brought stakeholders from academia together with public and private sectors for active participation across a number of key concepts around Smart villages in Assam. As part of the workshop held at Assam Engineering College, Guwahati, Assam, the students who attended the four-day workshop were asked to define the components required to achieve a “Smart village” (Katharpi et al., 2016). Figure 2-9 illustrates the responses. Based on the participatory exercise, the components of the Smart village include:

- Housing
- Accessibility to other settlements and global connectivity through telephones, postal and internet services
- Access to water, electricity, health, and sanitation
- Public infrastructure such as education, banks, community services and health care
- A good village environment where the community lives in harmony with the flora and fauna of the surrounding environment.
- A stable economy supporting employment, village livelihood, agriculture, and trade.
- Community and arts which support the cultural and social engagements of the village community.

Figure 2-9 Smart villages in Assam
(Katharpi et al., 2016)

In the first book on Smart villages by Doloi et al. (2019), eleven key sectors are defined to promote a pragmatic approach towards holistic development of rural communities. The sectors are income generation, education and skills development, agriculture, housing, energy, waste, water and sanitation, transportation, health and well-being, environment, and governance.

In the book *Village Swaraj* by Gandhi (1963), it is stated that "If the villages perish, India will perish too. It will be no more India". The statement brings to the forefront, the importance of villages to the holistic development in India. In the process of defining the Smart Village components, the participants of the exercise stressed the importance of socially and culturally acceptable solutions to rural problems to ensure feasibility of the solution. A critical aspect to ensuring a Smart village is the acknowledgment and retention of the essence of the village, which is the socio-cultural conceptualization of space, or rurality of the place. That is the soul of the village (News, 2016), unique to villages that means they feel at home, a part of that community, which defines a unique cultural context for each village. In conclusion, bridging the rural-urban gap is a matter of recognising the difference in the landscapes across the rural and urban settlements, and responding appropriately to the rurality and urbanity of the place and society.

2.2. Rural Housing for Smart Villages

Since the concept of Smart villages is a recent development, there is not much historical literature published on the subject. Based on the background research for the PhD, it is apparent that the theoretical and practical research on Smart villages relies on research conducted in relation to rural development. To clearly contextualise the research in the larger context of global literature on the holistic development of cities and villages, the literature review draws its concepts and theories from research on rural development and housing.

As described in the previous section, "Smart villages" is a concept that encourages rural development that is socially, culturally, and environmentally responsive. It provides a holistic approach to rural development by incorporating community participation. In other words, it facilitates a bottom-up approach for rural development (ELARD, 2017). As such, the Social

Work and Research Centre (SWRC) is a successful example of a bottom-up approach that has facilitated community participation to ensure global standards of living in the rural context (Roy, 1997; TedTalk, 2011).

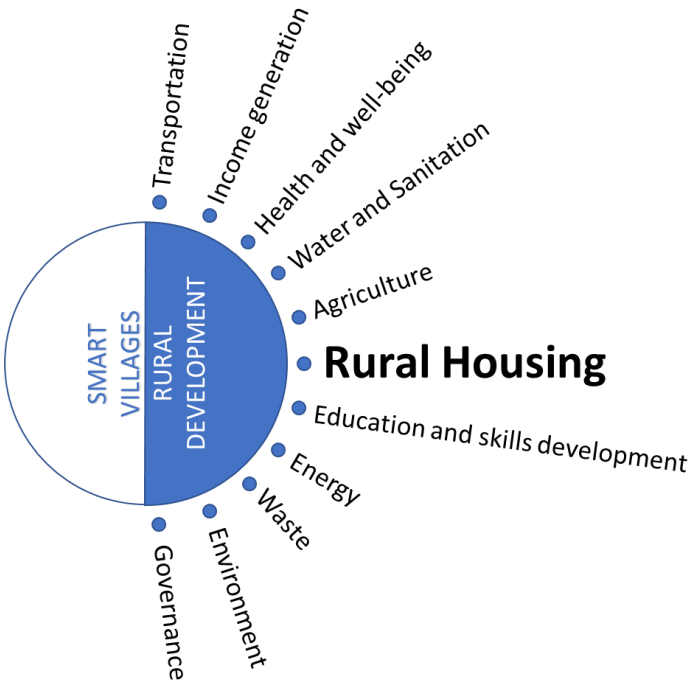


Figure 2-10 Rural housing for developing Smart villages.

Figure 2-10 indicates the approach of the research that encourages rural development through improved housing as one of the key elements defined by Doloi et al. (2019) for Smart villages. This section presents the treatment and approach of housing in the rural context of development and contrasts the current practice by discussing the rural housing schemes in India.

2.2.1. Housing within Rural Development

Shelter is a basic need for humans that is reflective of their relationship with the geographical landscape, cultural values and technological development (Memmott & Keys, 2016; Rapoport, 1975; Stevens & Starkey, 2007) Housing of the people and community contributes to understanding the geography and landscape of the region (Lu & Qian, 2020). In the context of rural studies and rural geography, housing and architecture are evolving as social representations and are crucial to analyse the rurality of places.

Gkartzios and Scott (2009) demonstrate the isolated treatment of housing within the context of rural development and planning policies in Ireland, arguing that housing is a crucial part of development. However, Gkartzios and Ziebarth (2016) argue that counter-urban and international mobilities, amenity-driven development, economic restructuring, as well as greater racial and ethnic diversity contribute to hindrances in recognising the relevance of housing in rural development. As such they encourage further research that informs a housing policy for rural development based on the research gap defined in three principal areas. First, the changing rural demographic and the socio-economic disparity between the long-time residents and the retiree migrants; second, the link among poverty, race and gender, and rural homelessness; and third, housing finance for house ownership. As such, with reference to the

contributors of rural-urban gap briefly discussed in section 2.1.2, housing plays an integral role in building the infrastructure to bridge the rural-urban gap of development.

To address the possible approaches to rural housing policy implementation in Ireland, Gkartzios and Scott (2014) discuss three different approaches: exogenous, endogenous, and neo-endogenous based on the contribution and participation among stakeholders. They discuss the failures of the former two approaches by demonstrating the lack of community participation and suggesting the neo-endogenous approach for effective integration of housing and rural development theory and practice. The approach relies on the effective empowerment of the local and indigenous community towards development and policy that strongly responds to the acceptability of the user, which is hereon referred to as user-oriented bottom-up approach.

Foley and Scott (2014) analysed the perceptions and interpretations by the stakeholders of rural landscapes. They observed a paradox that the 'character' of the rural landscape is what attracted people to move outward from the city, which overtime changed or was lost due to unregulated urban 'sprawling'. The importance of a rural landscape was apparent to the focus groups of locals of rural areas and the professionals who were respondents of the research, while the newcomers that were used to urban settings would suggest urbanising the space which also encouraged urban sprawling. Similarly, Tatum et al. (2017) demonstrated the varied 'notions of appropriate' architecture among local and non-local, architects, planners and users, towards the rural landscape. This indicated the disparity in the perception held and expected by the urban-folk versus rural-folk and resident versus foreign, in relation to their environment and surroundings as a result of counter-urbanisation, which is defined by Berry (1980) as an internal migration to less urbanised and comparatively rural areas. However, Donovan and Gkartzios (2014) argue the importance of incorporating vernacular practice and indigenous knowledge into planning and architecture of rural housing as a neo-endogenous approach, or a user-oriented bottom-up approach, as renamed for the research, to rural housing and development.

A comparative case study analysis of four post-disaster reconstruction projects by Davidson et al. (2007) presented the positive outcome of community participation through decision making regarding the organisation, planning and construction of the projects. In contrast, McDuie-Ra et al. (2013) demonstrated the shallow analysis of the socio-cultural and environmental context by the external stakeholders for the post-tsunami reconstructions in the Andaman coast in Thailand. This led to an inappropriate solution lacking social consideration of the indigenous practices and lifestyle of the Moken people living there which resulted being detrimental to the socio-economic and environmental practices of the community.

Gao (2016) addresses the difference between the top-down and bottom-up approaches to rural development by studying two ethnic villages in Yunnan province, China. The study indicated differences between the perception of representation of traditional culture in houses by the external stakeholders versus the community themselves. It suggested the need to incorporate the villager's opinions in the decision-making process to link the two contrasting approaches towards a better result of rural development. Pitts et al. (2019) addressed the gap in research and information dissemination for sustainable building in diverse rural areas thereby restating the need to include detailed guidance for external stakeholders. It also indicated the value of contextualization to optimise sustainable design recommendations.

In fact, having analysed the rural housing trends in the Indian countryside in the early 1980s, Khosla (1983) suggested the external stakeholders to commit to a complete emersion into the

rural context to ensure a thoroughly socio-cultural and environmental responsive architectural housing solution. However, despite the stress on the architect's involvement in rural housing, current practice has failed to incorporate the expertise and architecturally attuned perception to develop the social representations of the rural space. To further demonstrate this lack of architectural consideration in rural housing, the next section compares the rural housing schemes of Indira Awaas Yojna (IAY, 1996) and Pradhan Mantri Gramin Awaas Yojna (PMGAY, 2016). In doing so, the review of the approaches adopted by the current rural housing practices define the shortcomings of facilitating a bottom-up approach for housing in the rural context.

2.2.2. Rural Housing Schemes in India

The Independence of India brought to the forefront the social issues and inequalities of the masses that had been left behind by the British Empire. According to the Fields (1980), more than 65% of the population was living in dire conditions in need of rehabilitation in 1950s. The need to provide avenues for employment and income generation along with proper housing for refugees and villagers have been the focus of the government's welfare schemes since India's Independence (Department of Rural Development, 2013). As such, schemes, policies, and bills were developed to set aside financial support for infrastructure development and poverty alleviation under the five-year development plans of India. Over the years the departments under the Ministry were formed, dissolved, and combined to administer funding and aid for poverty alleviation and development (Ministry of Rural Development, 2017).

In 1952, an organisation for community development, known as the Community Projects Administration, was set up under the Planning Commission (Ministry of Rural Development, 2017). In 1974, the Department of Rural Development was formed as part of the Ministry of Food and agriculture, which was later upgraded to the Ministry of Rural Reconstruction in 1979. The National Rural Employment Programme (NREP) was initiated in 1980 to replace the food-for-works programmes, aimed to generate additional gainful employment in rural areas to strengthen the rural, economic, and social infrastructure, and improve the overall quality of life in rural areas (Vinodini Reddy et al., 1992). In 1982, it was renamed as Ministry of Rural Development and the Rural Labour Employment Guarantee Programme (RLEGP) was launched in 1983 during the Sixth Five-Year Plan.

There was no uniform policy for rural housing, however, the activity of constructing houses for the rural community was originally under the National Rural Employment Programme (NREP), and the Rural Landless Employment Guarantee Programme (RLEGP). Some states permitted only part of the construction cost to be borne from the NREP/ RLEGP funds and the balance was to be met by beneficiaries from their savings or loans. Other states permitted the entire expenditure to be borne from NREP/ RLEGP funds. Further, while some states allowed construction of only new dwellings, others permitted renovation of existing houses of beneficiaries. In 1985, Indira Awaas Yojna was introduced as a sub-scheme to provide aid for shelter among the people living below the poverty line as a poverty alleviation programme (Ministry of Rural Development, 2011). It was a focussed fund for the creation of housing for scheduled castes, scheduled tribes and freed bonded labour was set up under the RLEGP. It was subsumed under the Jawahar Rozgar Yojna (JRY) in 1989, which was formed by combining Rural Labour Employment Guarantee Programme (RLEGP) and National Rural Employment Programme (NREP). On 1st of January 1996, the IAY scheme was implemented

as an independent which provided finance along with a set of guidelines on implementing the rural housing scheme (Department of Rural Development, 2013).

Indira Awaas Yojna (IAY) Guidelines

IAY was a centrally sponsored scheme funded on a cost-sharing basis between the Government of India and the State Governments in the ratio of 75:25. However, in the case of North-Eastern States and Sikkim, funds were shared between the Government of India and these States in the ratio of 90:10, respectively. In the case of Union Territories, the entire funds under this scheme were provided by the Government of India. The target groups for houses under the IAY were below poverty line households living in rural areas, belonging to scheduled castes (SC)/scheduled tribes (ST), freed bonded labourers, minorities in the BPL category and non-SC/ST BPL rural households, widows and next-of-kin to defence personnel/paramilitary forces killed in action residing in rural areas (irrespective of their income criteria), ex-servicemen and retired members of paramilitary forces.

The fund aided with the construction of a house including a sanitary toilet and a smokeless *chulha* (cooking fire), and the upgradation of unserviceable households. It was mandatory to provide a sanitary toilet under the Total Sanitation Campaign Programme (Government of India, 1999). The IAY dwellings were required to be built on individual plots within the village to facilitate the development of infrastructure, such as internal roads, drainage, drinking water supply and electricity, ensure safety and security, and ensure proximity to workplace and social communication.

As part of the IAY scheme conditions, the involvement of a contractor or any external agency was banned with the intention that the house be constructed by the beneficiary. The beneficiaries were permitted to approach the District Rural Development Agencies (DRDA) to obtain expert advice on local materials and cost-effective disaster resistant and environment friendly technologies developed by various institutions.

No design was prescribed for the IAY dwelling units, except for the plinth area of the house was not to be less than 20msq. The layout, size and design depended on the local conditions and the preference of the beneficiary, considering the climatic conditions and the need to provide ample space, kitchen, ventilation, sanitary facilities and smokeless *chullha*, and perceptions, preferences, and cultural attitudes of the community. The barrier free concept was encouraged in houses meant for the physically challenged, with a view to facilitating their smooth and free movement in the house. In areas frequented by natural calamities such as fire, flood, cyclones or earthquakes, incorporation of disaster resistant features in design was encouraged. For environmental improvements and social forestry planting of trees in and around the IAY house was simultaneously encouraged, considering the region, location and geo/agro-climatic conditions. Cultivation of fruits and vegetables was encouraged for improving nutritional status.

For ensuring cost-effective dwelling units, officers dealing with the IAY at the state, district and block levels were to be trained in the design of various disaster resistant features to be adopted in the houses ensuring its implementation during their field visits. In addition, local carpenters and masons needed to be trained for skill upgradation and use of low-cost technology and local material under the Swarnajayanti Gram Swarozgar Yojana (SGSY, 1999). Awareness about the disaster resistant and environmentally friendly technology was raised through exhibitions of low-cost technologies at the district and block level, seminars, and

workshops with the help of the State Institutes of Rural Developments (SIRDs), Extension Training Centres were to be created among the beneficiaries. Suitable local non-governmental agencies with proven good track records were permitted to assist in construction of dwelling units under IAY. The supervision, guidance and monitoring of construction could be entrusted to these non-governmental organizations who were thought to popularise the use of sanitary latrines and smokeless *chulhas*, as well as innovative technologies and material designs for cost effective construction.

The purpose of the scheme was to provide financial bursaries for some of the weaker sections of society to upgrade or construct a shelter of respectable quality with a vision to replace all temporary (*kuccha)* houses from Indian villages by 2017. However, research estimating the housing shortage in India indicated a gap in the implementation of the scheme and found that rural as well as the urban population continue to live in dilapidated conditions or are homeless (Gopalan & Venkataraman, 2015; Kumar, 2014; Singh et al., 2013). The gaps were identified as a lack of transparency in selection of beneficiaries, lack of technical supervision and weak mechanism for monitoring construction leading to a low quality of the house, in conjunction with unavailability of loans by beneficiaries (Ministry of Rural Development, 2018). This led to the introduction of Pradhan Mantri Gramin Awaas Yojna (PMGAY) under 'Appropriate and Affordable Housing for All' by restructuring IAY with effect from 1st April 2016. It aimed at providing a *pucca* house with basic amenities to all homeless families and those living in *kutcha* and dilapidated houses(2016; Ministry of Rural Development, 2018).

Pradhan Mantri Gramin Awaas Yojana (PMGAY) – Restructuring IAY Guidelines

In response to the shortage in housing, the Ministry of Rural Development, Government of India, compiled designs of 'Affordable and Appropriate Rural Housing' in 'Pahal- a Compendium of Rural Housing Typologies' (IIT Delhi et al., 2016). Under the PMGAY or PMAY-G scheme, in collaboration with the United Nations Development Program (UNDP) India, Central Building Research Institute (CBRD), Roorkee and Indian Institute of Technology (IIT), Delhi (Department of Rural Development, 2015). The PMGAY scheme provides financial assistance of AU$ 2,400 in the plain areas and AU$ 2,600 in the hilly areas for self-building houses in the rural areas of India along with design samples (Pahal) that could be adopted by the beneficiary of the scheme. In contrast to the condition stated by the IAY guidelines of no involvement of external agencies and no design prescription to encourage self-design by the beneficiary, the PMGAY compendium includes various typologies of houses respective to the topography and climate of the states in India (IIT Delhi et al., 2016).

As part of the "Affordable and Appropriate rural housing for all" scheme, research was conducted by the UNDP to learn the trend of housing construction and develop suggestions for the IAY guidelines for the beneficiaries of the scheme. Figure 2-11 shows the map of Assam that has been divided into five zones based on the geophysical characteristics as described by the report that documented the research conducted prior to the design development by UNDP India (2016) for the "Affordable and Appropriate rural housing for all scheme".

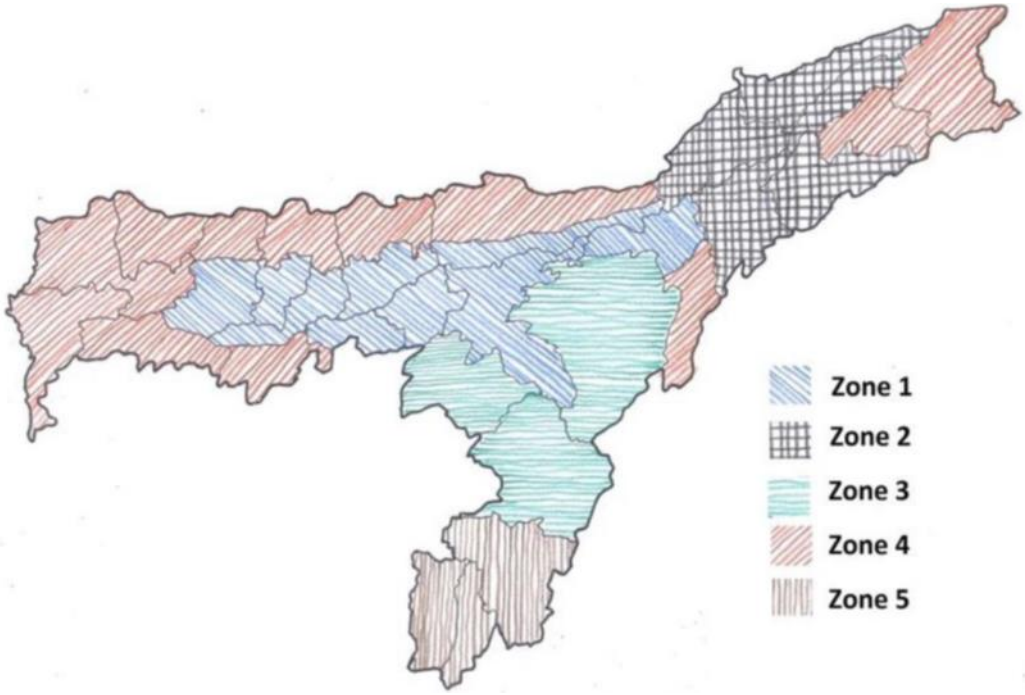


Figure 2-11 Zoning for house designs- Assam
(UNDP India, 2016)

Figure 2-11 shows that the districts of East Karbi Anglong, West Karbi Anglong and Dima Hasao are classified under Zone 3. As summarised by the report (UNDP India, 2016), unlike other zones, Zone 3 has higher vulnerability to cyclonic windstorms, earthquakes, and landslides due to the elevation of the hill ranges (Mikir, Rengma and North Cachar) in the region. It has more than 75% forest cover which serve as a resource of timber, bamboo, and stone. The districts fall under the administrative jurisdiction of the Karbi Anglong autonomous state (East & West) and Dima Hasao autonomous council, which are considered sixth schedule areas due to the highest concentration of tribal communities in the state. The zoning criteria for Zone 3 is shown in Table 2-1, as described in the report by UNDP India (2016)

Table 2-1 Zoning criteria for Zone 3
(UNDP India, 2016)

Vulnerability to natural Hazards	Low vulnerability to flooding and erosion. Medium to high vulnerability to cyclonic windstorms High vulnerability to landslides.
Physiography and access to building materials	Predominantly Hilly zone which includes the Mikir, Rengma and North Cachar hills. Average elevation ranging from 300m to 900m, with the highest elevation of more than 1300m, in peaks in Mikir range of Karbi Anglong and Barail range of NC Hills. Highest forest cover in the state, with more than 3/4th of the zone covered with a mix of moist semi-evergreen, mixed deciduous and bamboo forests. Access to bricks for house construction is difficult. Abundance of forest resources of timber, bamboo, and stone.
Cultural compatibility characteristics	Highest concentration of tribal communities – Dimasa Kachari, Karbi, Kuki are the main tribes with Khasi, Zeme Nagas, Barmans, Khasi being some of the others. The culture is marked by an intricate link with forest resources for daily living and house construction. Majority of the houses have traditionally been built with natural materials like timber and bamboo. Elevated houses are common in the sloping terrains. Wooden posts using secondary timber are most commonly used for structural framing of houses. Interwoven bamboo mats are the most common wall material. Presence of concrete block masonry in houses, an appropriate alternative to brick masonry.

The methodology included four phases of data collection conducted in Assam. The first phase was the at the district level through a questionnaire circulated to the Project Director-District Rural Development Agency (PR-DRDA) to collect information covering geographic parameter, disaster vulnerability, features of IAY house, socio-economic parameters, construction, materials, and recommendations to overcome IAY challenges.

The second phase was the block level data collection involving interactions with the Block Development Officers (BDO) at identified blocks, discussing the typology of rural houses, local flood patterns, access to materials and challenges in implementation. The third phase was a participatory design exercise involving consultations with a group of 20-25 people from the local community about their aspirations of a house, including some beneficiaries on the IAY list. This led to a representational drawing of an IAY house on paper which was presented to the entire group including the block level administrative team.

The final phase was settlement level data collection and was the most detailed level of interaction and documentation. It included visits to selected villages to study recently constructed IAY houses. House owners and local building material producers were interviewed to investigate their various aspects of their experience of constructing their houses including sourcing the materials, interaction with the masons and block level technician team, and design preferences. Local masons were also interviewed regarding the construction practices and preferences.

As a result of the methodology, six housing typologies were designed for the five zones across the state. Figure 2-12 was suggested as housing typology for Zone C of Assam. A brief glance at the design indicated that while the design had provided the construction details of the housing typology, it lacked in providing social and cultural acceptability in the housing solution (Katharpi & Doloi, 2017).

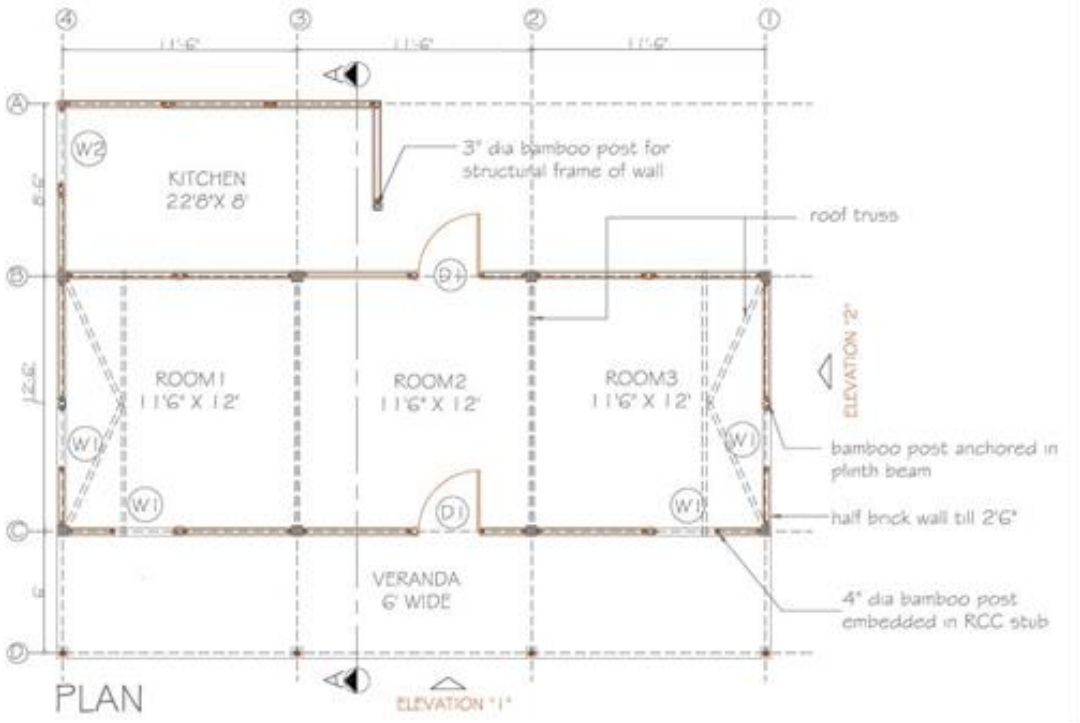


Figure 2-12 Pahal housing typology - Zone C
(UNDP India, 2016)

Unlike the traditional houses of Zone C in Assam, the proposed models of the houses in this region were built directly on the ground without any raised platform. While the layout compromises some basic public and private spaces, it failed to indicate the specificity of the internal areas perceived by the families in that community. For instance, the areas dedicated for females, males or guests were not specific enough, which is one of the key requirements of the families in the community. The open layout may be suitable for the physically challenged however, the segregated kitchen defeats the purpose of the open layout. The kitchen is isolated; it appears to be treated as a component that can be attached or detached to the main house since the entry is disjointed from the main house. The circulation and flow of spaces are hindered, and the storage area is not specified.

Further discussion on the methodology and the result indicated the shortcomings of the research such as under-representation, over generalisation and neglect of the context. Despite Assam having a varied identity of different cultures and over 115 ethnic communities (Ahmad & Raza, 1993; India, 2011; Reserve Bank of India, 2013), across 11,366 villages, only 17 villages were selected for the data collection. Similarly, out of 32 districts, only ten were represented in the research. Over 17 prominent ethnic communities including other minor communities are living in the hill areas of Assam within the districts of Dima Hasao, Karbi Anglong and West Karbi Anglong (india.gov.in, n.d; india.gov.in & Janasanyog). However, only three villages, one each from Amri development block from West Karbi Anglong, Bokajan development block in Karbi Anglong and Maibang development block in Dima Hasao, were chosen for the field research conducted by UNDP India for "Appropriate and affordable" rural housing for all (UNDP India, 2016). This indicated a gross under-representation of the diversity of the region in the research, while the six results representing housing typologies for five zones indicated an over-generalisation of the research approach and, hence, the results as well.

While the demarcation of the zones is according to the geophysical nature of the state, it ignores the socio-cultural and socio-political contexts of the districts in the state. The cultural characteristics that the researchers observed were focussed on the materials used and the current popular culture of construction rather than the demographic distribution and social culture of the communities. The preliminary research included more recent events as part of the context yet, not the historical context which would have aided the researchers to understand different communities better. This indicated a neglect of the socio-cultural and socio-political contexts of the districts across the state. The inclusion of the historical context as part of the research would provide the researcher with a reference to observe changes and the response of the community to the environmental, social, or economic changes that may have taken place since the establishment of the community in the village.

The interactions during the field research involved the government officials from the DRDA rather than the inhabitants of rural areas. In cases where the interaction involved the inhabitants of the rural areas, the sample set criteria excluded the people who did not already have a house built under the IAY scheme that provided financial help and guidance for rural housing. This purposive sampling according to the beneficiaries of IAY indicates an exclusion of a greater population of the rural community that needs the housing scheme and has not benefitted from the IAY. The methodology had more phases interacting with ineligible non-beneficiaries such as the DRDA district level and block level officers.

In conclusion, the comparison of the two rural housing guidelines indicates the need for defining a methodical system of extracting relevant information for rural housing from the

community themselves. It demonstrated the IAY guidelines as far more inclusive of the socio-cultural context and the current practice in the construction industry, however, it also indicated that it fell short of effective implementation. On the other hand, the Housing for All scheme under PMGAY indicated a haste in providing housing solutions by restructuring the IAY guidelines that excluded the cultural and social contexts of rural housing. Both rural housing schemes demonstrate initiative to provide proper housing for the rural and the less fortunate sector of society, however there is a clear disconnect in determining an effective outcome of their efforts.

As indicated by the literature review so far, housing is an integral social infrastructure in rural development and the lack of proper implementation of the rural housing schemes is due to the top-down approach where the housing is provided rather than facilitated. This is further perpetuated by the fact that the role of architects and architecture are not recognised and initiated in facilitating socially and culturally acceptable housing solutions. Therefore, the next section is a discussion based on the understanding of culture, architecture, and the multidisciplinary conceptual field of environment-behaviour studies within the context of rural housing and development. It will also discuss ethno-architecture, an approach as well as an architectural typology that supports the pursuit of developing a user-oriented bottom-up approach to rural housing. Collectively, the following section aids in shaping the theoretical foundation of the research.

2.3. Ethno-architectural Contextualization

From the literature discussed above, it has been clarified that the approach to housing in rural development has been inefficiently tackled, thereby further contributing to the rural-urban gap. It has indicated that, under the five-year plans, housing schemes have been assessed and provided from a socio-economic perspective while neglecting the socio-cultural aspect of housing and shelter, especially in the rural context and the architectural practice of the community. It becomes clear that there is a relation between culture studies and architectural practice. Hence, it becomes even more important to tread the path carefully, including the research approaches of both fields while ensuring that the one does not take precedence over the other.

Therefore, the following sections will elaborate the definitions and scope of culture within the research; define the architectural theory that best supports a well contextualised rural housing practice; discuss the multidisciplinary field of design-oriented research that brings together the significance of culture in defining architecture, called environment behaviour studies; and discuss the similarly interdisciplinary field of culture-oriented research called ethno-architecture. In conclusion the literature will propose a theoretical approach that creates a culturally responsive perspective of housing design and practice.

2.3.1. Culture

The word ‘culture’ is a very broad term and can refer to different meanings in different contexts. The definition given below is from the dictionary.

> *Culture is defined as the social behaviour and norms found in human societies; a central concept encompassing the range of phenomena that are transmitted through social learning in human societies.(Merriam-Webster Inc., 2004)*

The meaning of the word can change from place to place, people to people and even from research to research. The author of House form and culture, Amos Rapoport (1969) defines culture as a set of ideas that a group of people socially agree to conduct themselves and live in harmony with (Steward, 1972).

Social critic and philosopher Dwight Macdonald (1962) posits that there are two kinds of these sets of ideas, that is, culture.

> *One that is the traditional kind that is chronicled in books defined as high culture; and another which is a parody of high culture that is a more novel kind that is meant for the masses and hence called Mass Culture, or Masscult.*

The way that Macdonald (1962) talks about Masscult and from the examples given, one can gather that culture is understood and explained as a kind of trend that is fashionable and acceptable today, and it is not, tomorrow. His collection of essays in Against the American Grain, seem to express his disappointment of the evolution and general perception of culture which is seen in the evolution of trend in American culture, or of American grain. His essays provide a different way of looking at the same perspective for the research. As culture keeps evolving with newer trends of clothing, catch phrases, bags, shoes, art, etc., architecture also evolves. What is considered the fashionable contemporary design of today may not be as fashionable tomorrow. Vernacular architecture of the community that may have been socially agreed upon as acceptable a few decades prior, may not be fashionable to continue constructing as shelter to live in now. Because of diluting high culture, Mass culture can easily change the way of defining folk culture for a specific community.

This dilution of culture is explained by anthropologist, Steward (1972, 1986) through his studies of four rural communities in Puerto Rico. He explains the levels of socio-cultural integration among people as a nation, a subgroup or as individuals, and differentiates that some ideas of social interaction may be valued differently among others and these differences distinguish one from another subgroup or individual within a larger community.

Understanding Culture

Culture is referred to as the food, language, clothes, and buildings that indicate towards a way of thinking. As we try to dig deeper into understanding culture, we realise that simply eating the food or dressing in the costumes is not enough to understand the culture of a community. We could learn the language and the nuances in pronunciation, grammar and body language while speaking it to understand a little further, however, to truly understand the culture one would need to understand the value system that dictates the patterns and mannerisms that ultimately are seen in the dressing and architecture, tasted in their food, and heard in their music and language.

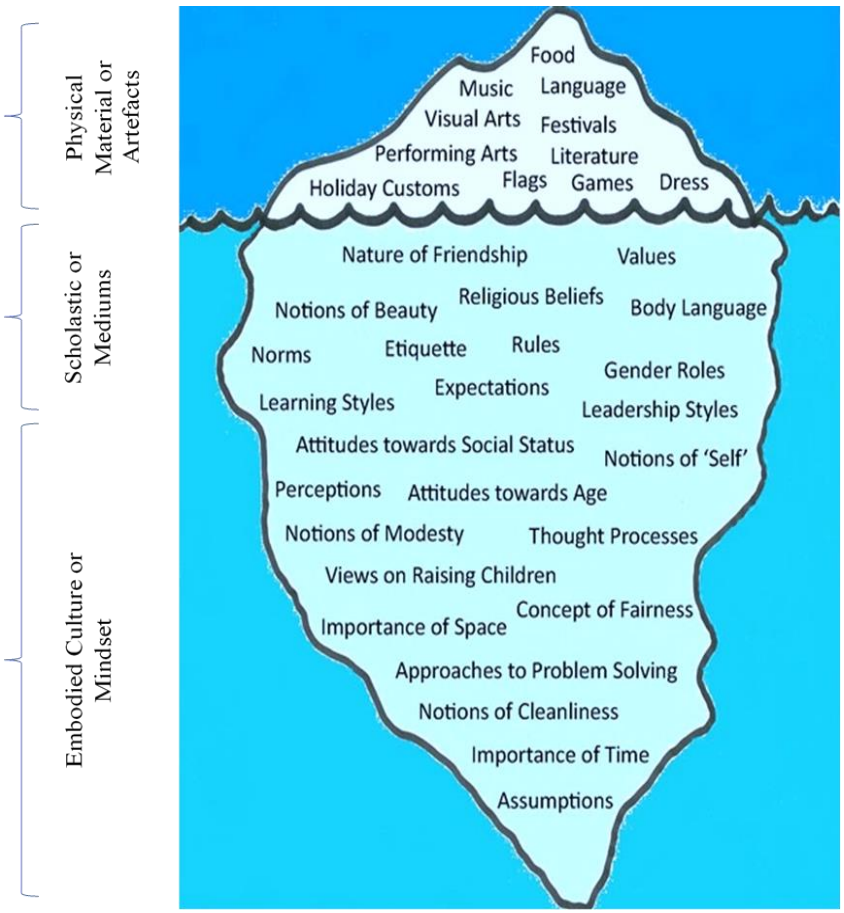


Figure 2-13 Adapted from James Penstone's cultural model of an iceberg. (Penstone, 2011a).

To better study Culture, it can be divided into Cultural Capital which includes the Tangible Resources and Intangible Aspects (Lareau & Weininger, 2003). The intangible is the values and value system, which ensures the distinct quality of the tangible material the dressing, food tastes, language, and design of spaces. Pierre Bourdieu (1986) divides the "capitals" of culture into three sections depending on the depth: physical material, scholastic and embodied culture. It is best illustrated as an iceberg (Penstone, 2011a) as shown in Figure 2-13, which is difficult to comprehend as most of the body is out of sight.

Culture encompasses three aspects: our values and aspirations which define our mindset; the processes and mediums through which we develop, receive and transmit these values and aspirations; and the tangible and intangible manifestations of these values and aspirations in the real world, which we see around us as the artefacts of culture (Hawkes, 2001). The embodied culture that dictates the value system of a community is not fully understood, and the values being expressed by the physical material are misinterpreted as seen in Figure 2-13. It is necessary to formulate a methodology that facilitates understanding of the cultural values of a community.

Evolution of Culture

Each community goes through a set of processes that facilitates the evolution and development of the community. The processes are unilineal when the evolution process is defined by a set of steps and changes adapted by the community. The processes are multilinear as the evolutional process is not strictly defined by the steps and changes, as one community may

experience the result of the changes differently from another. The multilinear theory of evolution facilitates the cultural differences among communities, whereas unilineal facilitates the understanding of generalisation of cultural evolution (Steward, 1972).

Giedion (1964) points out the beginnings and evolution of architecture that were observed in Sumerian and Egyptian Civilizations. Temples, Ziggurats and Pyramids were studied and compared to show how the different civilizations expressed their ideas through their cultural beliefs, and how these expressions of ideas were experimented, refined, and perfected over time to display the evolution of their culture through architecture. The basic form of Ziggurats and Pyramids demonstrated the unilineal evolution of culture, while the details of the forms and the reasons and values attached to the architecture of the monuments demonstrated the multilinear evolution of the two cultures. The concepts and theories of the changes and relevance of culture to the built environment are discussed in Section 2.3.2.

For this research, which focuses on the differences among the details of the cultures that result in distinct architecture of rural housing, it assumes the multilinear theory of evolution of culture. This theory further produces a concept of understanding culture through cultural ecology, which is the cultural "adaptation to environment". The following sub-sections go deeper into the explanation and understanding of culture and how it can be studied.

Cultural Ecology

The meaning of ecology is simply "adaptation to environment" and this process of adaptation to the environment through means of culture of a community, which led to the evolution of culture is termed as cultural ecology (Steward, 1972). Steward (1972) proposed the concept of cultural ecology by arguing that culture explains the nature of humans rather than the genetic potential for adaptation, accommodation, and survival. He explains that culture is a product of continuous evolution of interactions, environment, and community. He argues that explanation of the nature of human communities will be found using cultural historical concepts and methods rather than biological concepts.

He uses the phrase "web of life" over and over to include the concepts evolution, ecology, culture and people (Steward, 1972). While he uses the term "environment" to explain the built and unbuilt aspects of the ecology, he refers to the term community as "a very general and meaningless abstraction" and prefers to use "people" in its stead (Steward, 1972). However, in recent years, it has been observed that the term "community" has changed from a general and meaningless abstraction to a more meaning full term to include all living organisms acting upon something or capable of interactions. And consequently, the term "interactions" has been defined as use of the environment by the community that is encouraged and facilitated by the mechanism of relations and the giving of value and meaning to the environment around the community through activities that are part of the daily life (Rapoport, 1969, 1975).

With respect to this research, the definition of culture is place specific and it is defined as the social habits and activities and their expressions that are the result of the Environment, Community, and Interactions, in which Environment includes the climate, geography, politics, resources and history; Community refers to the people, families and households; and Interactions refers to any interactions, events and functions that take place within the Environment of the village.

Hawkes (2001) points out the importance of understanding this repeated intersection resulting in Culture, as criteria that enables a development policy to be successful. He proposes the formation of a cultural framework as the fourth pillar of sustainability, along with social, economic, and environmental frameworks, instead of a cultural policy for ensuring sustainable development. As part of the framework, the changes in the Community, Environment and Interactions are what he proposes need to be understood and observed rather than being measured (Hawkes, 2001). It necessitates for the development a culture-sensitive framework to guide rural development policies.

With respect to the research, understanding the meaning and evolution of culture within a cultural ecology produces understanding of housing as the environment of the cultural ecology at a household level. The meaning of culture has been expanded to include the value systems and intangible elements that dictate the physical manifestation of culture. To design culturally and socially acceptable housing solutions, it is necessary to understand the value systems and intangible elements within the village and community that are physically manifested in the architecture of the houses.

2.3.2. Architecture

In section 2.2.1 of this literature review, housing is established as crucial to rural development, where the role of the architect is relevant in conceptualizing a social space that reflects the socio-cultural aspects of the rural through vernacular architecture. Gaps were identified in the rural housing schemes in section 2.2.2, where the unsuccessful implementation of the IAY guidelines led to its revised approach with a booklet of designs under the PMGAY scheme. In that it was revealed that the culture, defined in this research as the intersection of Environment, Community, and Interactions, of the communities in Assam was under-represented and over-generalised. This further necessitates understanding architecture to better represent the vernacular practices of conceptualising space in the region.

Architecture is defined by Collins et al. (2018), as “the art and technique of designing and building, as distinguished from the skills associated with *construction*. The practice of architecture is employed to fulfil both practical and expressive requirements, and thus it serves both utilitarian and *aesthetic* ends. Although these two ends may be distinguished, they cannot be separated, and the relative weight given to each can vary widely.” Architecture is an element and a tool through which the environment of a cultural ecology can be changed to support the cultural evolution of a community. In some cases such as war over territory or among opposing communities, it is used as a means to modify culture by the victor (Fernie, 2002; Piquard & Swenarton, 2011). Architecture is the design of physical space based on the person or persons using the space for a specific function.

This same learning can be taken away from Khosla (1983), when he analysed the issues in rural housing in relation to architecture and criticised the failure to incorporate architecture in rural housing schemes. As a solution to the gap in rural housing, Khosla (1983) mentioned Laurie Baker’s works and his ability to “carry his architecture beyond its pure functionalism into the realm of cultural continuity with the past.” He praised Baker’s involvement in the process of building, by closely working with his team of masons and constantly discussing alternative solutions to overcome the problems arising on site and the reflection of the vernacular traditions of the regions he had worked in. He concluded that the rural housing schemes would have to take inspiration from such practice to avoid producing “box solutions”.

Vernacular, Traditional and Regional Architecture

Vernacular architecture is the kind of architecture that emerged when humankind started to make use of the natural resources around them to provide comfortable shelter that is responsive to the climate (Singh et al., 2009). It is a pure reaction to an individual and society's habitat needs and has allowed people to build houses are per the requirements and ease of construction. It is defined as a typology that is designed by an amateur without any training in design yet guided by a series of conventions built up in his locality using traditional practices and technologies (Brunskill, 2000; Oliver, 1997; Rapoport, 1968).

It is sometimes confused with traditional architecture however they differ in the characterisation of their design styles. Vernacular architecture is strongly functional, a pure reaction to an individual and society's habitat needs and has allowed people to build houses are per the requirement and the construction practice, ignoring fashion and aesthetics (Brunskill, 2000). While traditional architecture bears elements of polite design, such as temples and palaces, with the intention of going beyond the building's functional requirements (Surhone et al., 2010).

The vernacular typologies revolve around active and passive architectural principles of energy conservation and using local materials, which are near the site to avoid embodied energy lost in the transportation of these goods to the construction site. It is contextualised to the place and its surroundings, such as environment, culture, and local materials. Whereas, traditional architecture arises from the architectural principles formed by vernacular architecture, but it does not renew itself with change in context. It replicates, repeats, and uses the familiar pattern, motif, intent and objective of a culture and communities, which is evident in palaces and temples, with a commitment to maintaining a link to the past styles of building and construction. The construction of vernacular buildings can be produced by amateurs; and construction of polite architecture depends on expertise (Brunskill, 2000; Rapoport, 1969).

When these styles of architecture are replicated across the region without contextualising the design of the building to its immediate context, but rather the context of the regional socio-economic factors, indigenous peoples/ community cultural needs and topography of territory, it is broadly termed regional architecture. Hu (2009) defines regional architecture as 'a reasonably coherent network of regional organizations, institutions, bilateral and multilateral arrangements, dialogue forums, and other relevant mechanisms that work collectively for regional prosperity, peace and stability'.

In the terms of Macdonald (1962)'s opinion of culture, regional architecture is Mass cult of architecture which is replicated across a regional context; traditional architecture is the high cult of architecture which is built with more attention to aesthetics over functionalism; and vernacular architecture is folk cult of architecture which is practiced by the people and community as the immediate response to the environment, climate, resources and value-systems of the people.

However, for the purpose of this research, the works and writings by prominent architects need to be reflected upon to see the retention of culture in architectural design of rural housing. This will allow the researcher to understand the architectural theory that has to be defined to support the role of architecture in social and cultural acceptability of rural housing. Works by Laurie Baker (Baker, 1993, 1997, 1999; Bhatia, 1994; Jain, 2010; Kushwah & Badkul, 2017),

Geoffrey Bawa (Aldrich, 2018; Robson, 2014) and B.V. Doshi (Steele & Doshi, 1998) is studied to understand the practical approach undertaken by them.

Critical Regionalism

In the literature review into rural housing schemes in India, it has been pointed out that there is firstly, a disparity in how the scheme should be approached and secondly, the communication of the approach. To understand the approach required in the schemes, the approaches adopted by architects in their works and writing need to be analysed. In reviewing the works executed by Balakrishna V. Doshi, Geoffrey Bawa and Laurie Baker, it was observed that all three architects approached architecture with climatic responsiveness and use of local materials. However, the differences among them are significant.

Laurie Baker's works were focused on low-cost construction of houses and communal buildings that were easily constructible by the local communities (Baker, 1993, 1997, 1999; Bhatia, 1994; Jain, 2010). He promoted use of local materials and his architectural practice approach involved him interacting with the local builders to learn the local methods of construction (Khosla, 1983). This ensured that his designs were cost-effective and energy efficient with maximized space, ventilation, and light along with a striking aesthetic sensibility. He is considered a pioneer of sustainable architecture as well as organic architecture (Jain, 2010) since his involvement in the construction process encouraged his practice to be educated by the vernacular architecture of Thiruvananthapuram, Kerala, India (Bhatia, 1994). His works were recognised and documented by the 'Centre of Science and Technology for Rural Development' (COSTFORD) in Thiruvananthapuram, Kerala. However, the approach of this non-profit organisation did not pick up in mainstream practice within the government approach across the other states in India.

Geoffrey Bawa, who had originally studied law at Middle Temple, aspired to pursue architecture when he bought an abandoned rubber estate on the south-west coast of the island between Colombo and Galle at Lunuganga, planning to create an Italian garden from a tropical wilderness and realised he lacked technical knowledge to accomplish it (Robson, 2014). He was influenced by colonial and traditional Ceylonese architecture, and the role of water in it, but rejected both the idea of regionalism and the imposition of preconceived forms onto a site (Aldrich, 2018). His distinct style and approach to architecture is now globally known as "Tropical modernism" (Robson, 2014).

Balakrishna V. Doshi's works reflect the influence of modernism through his associations with Le Corbusier and Louis Kahn, though he also drew inspiration from traditional architecture and the eight principles to enrich contemporary practice (Steele & Doshi, 1998). His architecture has a brutalist nature as his buildings tend to express a statement of boldness through institutions, space, structure, light, and materiality as do the principles of his architectural approach.

However, for the research, few things need to be considered from the existing guidelines in the context of rural housing. Firstly, the vernacular architecture practiced by the communities need to be understood to know what the local construction practice is; secondly, the guidelines of the scheme based on local practice need to be generalize-able to allow replicability across regions, which refers to regionalism, and thirdly, the rural housing solutions must be contextualised globally referring to modernism of architecture. In short, a rural house that is

specific to people, while general to a regional and global context. This can be described as critical regionalist architecture.

Critical regionalism is a concept coined by Lefaivre and Tzonis (1981)who believed that regionalist architecture tended to lose its identity due to its generalisation. It proposed a theory for architectural contextualism in which it is not only the physical context, or social context, but also the global context in terms of design and construction styles that influence the architectural identity of a place. It was developed as an approach that was rooted in local vernacular while allowing globalisation. According to Frampton (1983), critical regionalism is a form of modernist architecture, which is conscious of the geographical context of the building, however, in the rural context the vernacular architecture of communities in rural areas need to be considered. Frampton (1983) came up with six pillars to achieve critically regionalist architecture, however, his contemporaries found his justification too rigid to be successfully critical of the architecture. Kushwah and Badkul (2017) mention Geoffrey Bawa and B.V. Doshi among others as prominent architects whose architecture is critically regionalist as per Frampton's definition.

However, while this theory of architecture acknowledges the significance of multiple contexts in the approach to architecture, critical regionalism does not strictly conform to community as the major contributor to define the context around architecture (Frampton, 1983). In other words, critical regionalism uses contexts other than the socio-cultural to determine the direction of architectural design. Hence, critical regionalism of architecture can be considered a suitable approach in the context of the research since it includes more than one contextual factor within its confines to aid architectural theory and practice.

Having said that, since the significance and central role of culture and vernacular practice has been clearly defined by literature in regard to approach to rural housing development and policy, it is vital to define an approach that maintains the focus of the research. The combined approach of ethnography and architecture from the perspective of design is discussed in the next section.

2.3.3. Environment-behaviour Studies

As a way to bring the theories regarding culture and architecture closer to each other for the purpose of helping both disciplines understand built-environment and the inhabitants, Rapoport (1971) proposed an interdisciplinary concept called Man-environment studies. It is a multidisciplinary study as it is a design-oriented research that is informed by sociology, psychology, anthropology, and human geography. It was based on looking at the ecology of culture and architectural design as analogous to one another, however, over time his theory has come to be known as environment-behaviour studies (Rapoport, 2008). It encourages the adoption of ethnographic methods for data collection to strengthen the understanding of the *behaviour* of the subject while using an architectural analysis approach to understand the texture and depth of the *environment.*

Islam (2003) has applied Rapoport's theory of defining vernacular design to understand the evolution of vernacular architecture of Bangladesh. However, due to its multidisciplinary roots, the theoretical foundation of environment-behaviour studies has been difficult to define. Singh (1998)'s metaphor of "islands of knowledge in an ocean of ignorance" has been used to explain the situation of environment-behaviour studies. Rapoport (2008)suggests bridging the many

diverse, highly specialised, and widely scattered islands of knowledge to strengthen the multidisciplinary domain of study that can aid researchers as well as practitioners of environment-behaviour studies.

In support of understanding the behaviour of a subject within a specific setting, the theory of behaviour settings was developed by Barker (1968) under the discipline of ecological psychology. It argues that human behaviour is radically situated: in other words, the behaviour of a person or persons is determined by the situation and environment they are in. Rapoport (1992) has borrowed the concept of behaviour settings to address human behaviour that culturally changes according to the environment or 'habitat'. Similar to environment-behaviour studies, Memmott and Keys (2016) discuss the field of architectural psychology that borrows from the concepts and theories in anthropology, geography, psychology, ethnology, sociology and architecture addressing the psychology of people within a specific environment.

2.3.4. Ethno-architecture

Based on the ethnographic approach to architecture, ethno-architecture is recognised as an unusual terminology which is a contraction of the words 'ethnography' and 'architecture' (Hurley, 2007). It is referred to as a methodological approach to research as well as a typology of architecture (Arboleda, 2020; Lozanovska, 2015; Memmott & Go-Sam, 1999; Toffin, 1994). The dual treatment of the research approach indicates the layered potential of the approach to identify links between culture of a community and their habitat.

Memmott and Go-Sam (1999) used the term 'ethno-architecture' to refer to an architectural typology that is constructed using traditional materials and methods of construction developed by the community according to vernacular cultural practice. It was used to identify and study the Australian indigenous architecture that was a result of the physical and social environment. Lozanovska (2015)used the same term as an architectural typology to explain multiculturism in cities and the effects to the cityscape due to in-migration of different communities. The architectural typology resulted from the incorporation of culture of a community into the architectural building or artefact.

Toffin (1994) addressed ethno-architecture as an approach that aided the understanding of pre-industrial, "traditional" habitats by observing the link between indigenous housing patterns and cultures. It mentions the works by Bourdieu (1970); Leroi-Gourhan (1945); Lévi-Strauss (1958); Morgan (1881)demonstrating the interdependence of inhabited space and social culture. It defines ethno-architecture as a composite science that borrows from ethnology and architecture, encouraging a theoretical practice that borrows from either field of research. In more recent research, Gabriel Arboleda (2020) demonstrates the approach to architecture borne out of ethnographic application that incorporates active participation of the community to develop effective social housing solutions.

In conclusion, environment-behaviour studies aid to bridge the concepts of culture and architecture demonstrated by ethno-architectural studies of a community's social culture and their inhabited spaces. Both environment-behaviour studies and ethno-architecture complement each other in research as the former is an architect's perspective being sculpted by anthropology, while the latter is an anthropologist's perspective on culture and people fashioned by the architectural artefacts.

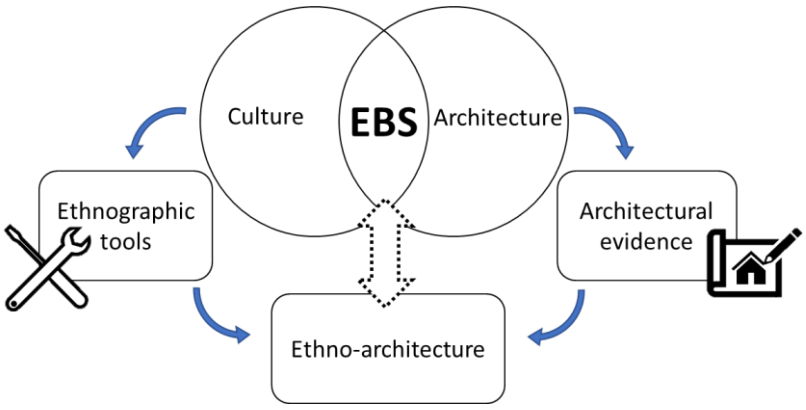


Figure 2-14 Ethno-architectural contextualization

Figure 2-14 visualises the overlapping areas of culture and architecture that define environment-behaviour studies indicated as an acronym 'EBS', and its mirroring link to ethno-architecture, which is represented as the result of using ethnographic tools and architectural evidence. Recognising the duality of both concepts, the research will opt to classify the consolidated approach under ethno-architectural contextualization as the terminology is more indicative than environment-behaviour studies of the areas and topics being addressed in the research. The next section consolidates the literature reviewed in this chapter to define the niche research gap in the existing literature and how it aids the development of Smart villages through rural housing.

2.4. Research Gap

Having reviewed the relevant literature, a clear research gap has been identified. The literature indicates the need to revise the role and nature of housing within the context of rural development and Smart villages. It has demonstrated the significance of anthropological and architectural research in planning, designing, and building housing that is socially and culturally acceptable in the rural context.

The background research has demonstrated the development gap between rural and urban sectors that can be bridged by diverting the biased attention of development away from the urban sectors towards the rural sectors. Recognising the difference between the urban and rural settlements had indicated need to apply separate approaches to development depending on their urbanity or rurality. The population of a settlement, migration across settlements and infrastructure are outlined as the main contributors to the rural-urban gap stemming from the partial treatment of urban versus rural development. 'Smart villages' is a concept that redefines and encourages rural development to narrow the rural-urban development gap. In conjunction with the Smart villages wave introduced by the Government of India, the Smart Villages Project by the University of Melbourne and the Government of Assam has contextualised the research on Smart villages through 11 key factors, of which rural housing is recognised as the crucial social infrastructure that affects these contributors to the rural-urban gap. This has further identified the need to integrate housing as part of facilitating development.

Housing and architecture are social representations of rurality that are integral to understand rural studies, rural landscapes, and rural geography. Research has shown that the approach to rural housing needs a higher degree of participation and contribution from the users pointing towards a neo-endogenous approach, simplified as a user-oriented bottom-up approach. It further demonstrated that the integration of community culture and perspective were crucial to

the success of any exogenous or top-down approach, which meant modifying the approach to be user-oriented. Comparison between the rural housing schemes in India (IAY Guidelines and the PMGAY scheme) indicated the lack of community participation and contribution in implementing the schemes, clearly demonstrating a top-down approach. The articulation of culture and its significance in rural housing was misinterpreted and neglected by the government as demonstrated in Section 2.2.2. This indicates the need to identify the elements that aid in the integration of community culture and perspective to reorient rural housing to a user-oriented bottom-up approach.

The literature review into culture, architecture and the interdisciplinary field of environment-behaviour studies aided in defining the research perspective to define a user-oriented bottom-up approach to rural housing. Rural housing that is culturally sensitive is required to ensure that the communities feel a sense of belonging to the place that they are provided to live in. The definition and examples of culture differs from place to place as well as community to community. Culture of a place or region can be defined by the historical, geographical, political, and socio-economic contexts. These contexts need to be taken into consideration while trying to understand the culture of the community living within that place or region. As noted in the review, the meaning and scope of culture has been indicated in its expression through the architecture. As mentioned in Section 2.3.2, there have been small scale efforts on the part of independent stakeholders and the works by Laurie Baker (1993, 1997, 1999) substantiated the need for proper articulation of cultural and architectural representation in the rural housing schemes developed by the government. The literature brought together the two committed yet interdependent fields of anthropology and architecture under the umbrella of environment-behaviour studies which is defined as a design-oriented research.

However, the similar multidisciplinary concept of ethno-architecture provided a culture-oriented perspective to the same interdisciplinary field between culture and architecture. The literature encourages researchers and practitioners from either field of research to learn from the other to produce a better understanding of their own field. The combination creates a more wholesome approach to rural housing development. Therefore, in guiding the progress of this research, a niche area of research has been proposed which incorporates both anthropological and architectural perspectives under ethno-architectural contextualization. By integrating ethno-architectural interpretation and practices, solutions can be devised for ensuring cultural inclusivity in rural housing within the Smart village context. As demonstrated in Figure 2-15, ethno-architectural contextualisation is the gear that will aid in developing Smart villages through rural housing.

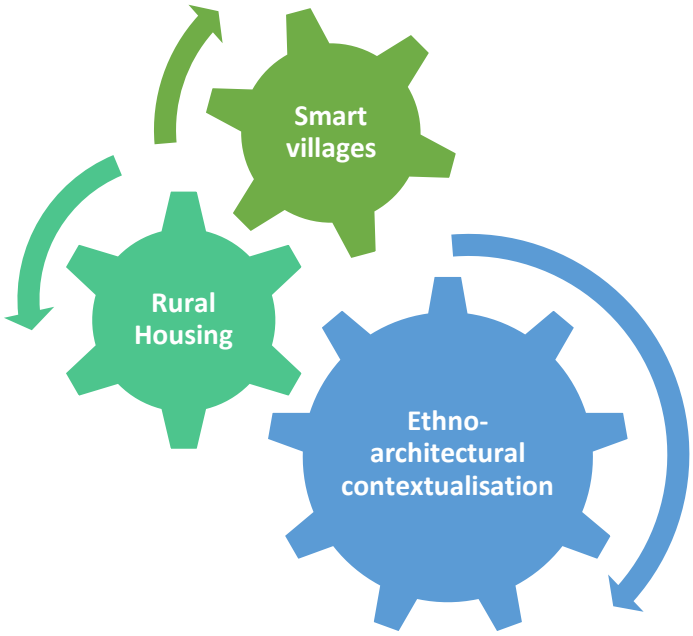


Figure 2-15 Research gap

In conclusion, the literature review clearly demonstrates the need for redefining the role and nature of housing in rural development for Smart villages. It aids in forming a research perspective to develop a user-oriented bottom-up approach informed by the combined perspectives of both culture-oriented and design-oriented research. The combined perspective of ethno-architectural contextualisation allows the research to visualise, understand and explain housing within the rural context in a community oriented and user-end based cultural manifestation. Thereby demonstrating the missing link between cultural values, perspectives and interpretation, and its manifestation in housing design and construction practice in the rural development. As outlined by the research questions in Chapter 1, in order to develop a user-oriented bottom-up approach to rural housing, it is critical to define the scope and nature of the context of housing and compose the methodology that would be best suited to inform the gap which is the focus of the next chapter.

2.5. Chapter Summary

In this chapter, the literature review established the context of the research within the field of rural development enhanced by the concept of Smart villages and its role in narrowing the rural-urban development gap. The definition of rural was established to clarify the scope of the research regarding housing for smart villages, redefining the crucial role and socio-cultural nature of housing and architecture to propagate rural development. The comparison of the rural housing schemes demonstrated the lack of communication and information dissemination in top-down approaches to rural housing indicating a policy reorientation for better integration of community participation and contribution and better reflection of the rural.

In order to propose a successful integration of community participation and contribution, the literature delved into developing a research approach to incorporate the perspectives of both anthropologists and architects. This was done by reviewing literature regarding culture and architecture and their interdisciplinary areas of research of environment behaviour studies and ethno-architecture, offering their unique perspectives held by architectural research and anthropological research, respectively. Both research encouraged the use of ethnographic tools

to understand traditional habitats with differing foci. In environment behaviour studies, the focus was the design and construction of the habitat, while in ethno-architecture, the focus was the social culture that thrived within a specific form of dwelling. Combining the two perspectives, the research proposed an approach that offered the dual perspectives based on the interdependence of ethnography and architecture, called ethno-architectural contextualisation.

Based on the literature reviewed, the next chapter will discuss the research methodology which is developed to conduct a multi-case study research that aids to understand the different cultures of four ethnic communities based on the environment of the villages and their individual houses. This process will in turn aid in understanding the housing design and construction practice based on the cultural values and perspectives. This will provide the dual perspectives offered by ethno-architectural contextualisation by studying the cultural ecology of the village and the house. The next chapter will elaborate on the theoretical framework that guides the methodology, the case selection process, data collection, synthesis, and analysis methods.

Chapter 3. *Research methodology*

This chapter discusses the theoretical framework that guides the data collection and analysis of the research. Section 3.1 discusses the multi-case study research design formed by the literature review of epistemic approaches, strategies, and the theoretical framework within which this research has been nested. The methods that aid in data collection and analysis according to the objectives of the research are briefly mentioned. Section 3.2 explains the preparations made to conduct multi-case study research in the region of Assam, the focus area of the study. A description of the site, which is the sixth schedule area of Assam, is given. The methodology of the case study selection criteria, the data collection templates, and data collection phases based on a pilot study are discussed. Section 3.3 briefly mentions the difference between the theoretical preparation and the practical data collection conducted in the fieldwork. It demonstrates the data collection process through note taking, observation and photography. Section 3.4 discusses the phases involved in data collection, and the system of documenting and synthesising the raw data.

Section 3.5 explains the process of data analysis and evaluation with the intention to produce a generalised result that is verified by a qualitative method. Section 3.6 is a brief conclusion of the outcome expected from the data collection methodology. Section 3.7 is the summary of the chapter.

3.1. Multi-case Study Research Design

The term ‘context’ has been mentioned repeatedly in this research. Firstly, to explain the background of the issues, secondly, to explain the factors that influence the issues and then thirdly, to form a question to address the issues. This research stresses the concerns within a context to arrive at a solution that meets the objectives of the research. The research is based on the belief that problems can best be solved by observing the context. Hence, the theory of contextualism or contextualist theory has been used to address the whole process of understanding the issues, understanding the factors that cause the issues, and devising a methodology to counter and/or solve the issues that have been established in Chapters 1 and 2.

3.1.1. Epistemology

Firstly, it is important to understand the theory that underpins this research. Contextualism is a theory that does not accept basic statements as justification like Foundationalism (unless the statements are contextual). Nor does it only rely on coherence as justification like Coherentism (Annis, 1978). It is an alternative to the traditional theories that take into consideration the contextual parameters of an issue, object or unit to be studied. Zhou and Zhang (2015) used this theory of contextualism to encourage community renewal through responsive urban planning for the old city of Beijing in China. The paper concludes that contextualist planning considers the physical context as well as the social context, not only at the city or community level but at the national level as well. Pitts et al. (2019) demonstrated the significance of contextualism for sustainable design recommendations that are optimised for diverse rural areas in South-West China.

For this research, I am taking ‘contextualism’ to mean that, firstly, everything in and around the house of a person/ family is important to decision-making for the kind of house they need, which includes the village, and secondly, everything in and around the village is important to

inform the community and social construct that dictates the culture of the village which informs the individuals. Figure 3-1 below represents this idea of contextualism. The unit household is nested within the community which is nested within the village, and each nested layer influences and is influenced by the others.

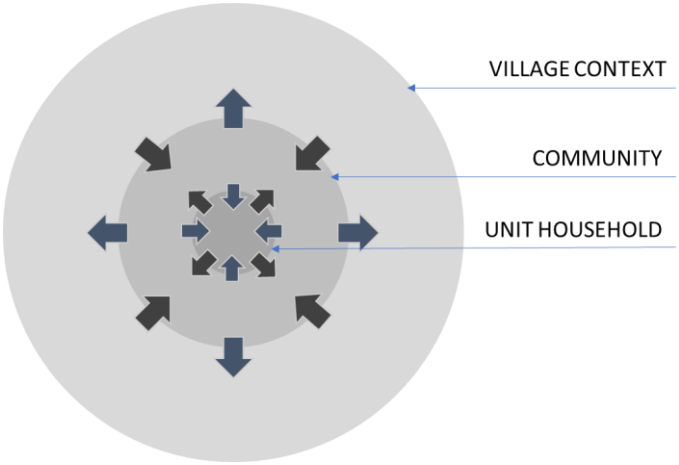


Figure 3-1 Contextualism

However, the contextualist theory, similar to the emancipatory research paradigm (Groat & Wang, 2002), implies that there are no boundaries to how much can be considered part of the context of the culture and architecture of a village and its housing. Other perspectives have been introduced and developed over time that help to set limits for contextualism. For this research, an epistemic belief that includes the context of the object to be studied will be defined.

It is also important to understand the worldview this research is based on. Creswell (2009) discusses four kinds of worldviews or epistemic beliefs: postpositivist, constructivist, advocacy/ participatory and pragmatism. The postpositivist approach assumes that there are multiple realities, which is concurrent with contextualism; however, it uses scientific methods to conduct research and is experimentalist in nature. Its purpose is to verify a theory, which is not the requirement of this research. The constructivist approach assumes multiple realities to perceive a case. It intends to understand the individual and the participants through cultural and historical construction. It tends to generate a theory; however, a resultant theory is not the defined aim of this research.

The advocacy/participatory approach takes a step towards including the marginalised individuals in society and issues of social justice. It is an umbrella term that includes approaches such as feminist perspectives, radicalized disclosures, critical theory (as mentioned by (Merriam, 2009a)), queer theory and disability inquiry, which are further elaborated by Creswell (2007). It holds the view that research inquiry needs to be intertwined with politics or have a political agenda, which would deviate or overshadow the aims and objectives of the research.

The pragmatic approach is pluralistic, which again means acknowledging multiple realities, while maintaining a problem centred and practice-oriented perspective. It focuses on the problem at the centre of the research rather than the methodology, which allows it a freedom to choose methods, techniques, and procedures to obtain the objectives of the research. Due to this flexibility, this worldview can adopt mixed methods as well as different forms of data collection and analysis.

In conclusion, the epistemic justification to be considered in tackling this research is a pragmatic-contextualist approach, which ensures the inclusion of multiple realities and contextual parameters with the focus on the problem to arrive at practice-oriented solutions. This orientation thus requires a practice-oriented solution seeking methodology which considers the surroundings and causal relations that come into play in the ecology of a village. This mixed methods approach will be explained in section 3.1.4

3.1.2. Approach/Strategy

Understanding the epistemological basis for this research, this now needs to be translated to a strategy to carry out the research. As established by the literature review, the issues faced by a community or region are very specific to the case, indicating that the study would have to be case specific to demonstrate issues and solutions within the case. While Creswell (2007) presents five approaches: narrative research, phenomenology, grounded theory, ethnography and case study, there are two more kinds of qualitative methods of research discussed by Sharan B. Merriam (2009a): basic and critical. She explains that there is the basic qualitative research and six others (narrative, phenomenology, grounded theory, ethnography, critical and case study) which have common attributes that qualify them as qualitative research, yet each having a different focus resulting in variations of the methodology and outcome. The other approach presented by Merriam is the critical qualitative, which has been taken into consideration by Creswell in his epistemic categorisation under the advocacy/participatory approach.

Merriam defines case studies as "the intensive, holistic description and analysis of a single instance, phenomenon, or social unit (1998) or in the terms of the process of conducting the inquiry (case study research), the bounded system or unit of analysis selected for study (the case) or the product, the end report of a case investigation (2009a)." John Gerring (2004) defines case study research as an "intensive study of a single unit with an aim to generalise across a larger set of units". He refers to Yin (1994b) who defines it as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident". Stake (1995a) defines a case study based on the unit of analysis- the case, and summarises it according to the description, interpretation and understanding of the case.

Patricia Brown explains the use of qualitative case study research by reviewing the works and approaches by Yin, Merriam and Stake, referring to them as foundational writers (Brown, 2008). She explains her case study approach as being "supported by the pragmatic approach of Merriam, informed by the rigour of Yin and enriched by the creative interpretation described by Stake". She suggests that their different approaches can be set "across a quantitative-qualitative continuum where Stake's interpretivist approach and Yin's postpositivist attitude represent the extremes of an approach", while Merriam's pragmatic constructivist approach strikes a balance between the two. Harrison et al. (2017) illustrates the explanation of the approaches of Yin (2014), Merriam (1998, 2009a) and Stake (1995a, 2006) to reaffirm the theoretical stance taken on by Brown (2008).

From this review a case study approach seems an appropriate strategy to answer the research questions. It is appropriate because the intent of conducting a case study is to show the case as a defined unit subject or example that can be observed to inform the kind of problems arising in such cases and the kind of solutions adopted by the components of the case to survive or stabilize their situation. With reference to Figure 3-1, a case study is to be undertaken to

understand the villages as a nested case within the regional context and the households as a case nested within the village context. The case study will provide understanding of the problem and the context, which will be undertaken through a mixed methods pragmatist approach.

More than one case should be studied to understand the typicality and diversity of the problems faced and solutions adopted to inform the policy makers and practitioners of rural development and housing. This research will use multiple cases to demonstrate the influence of context and the relevance of the contextualist-pragmatist theory to execute this research. The purposive case selection criteria of the cases will be explained in Section 3.2.2.

3.1.3. Theoretical Framework

Based on the epistemology of the research, the methodology will be a contextualist-pragmatic case study approach (Annis, 1978; Creswell, 2009; Merriam & Merriam, 2009; Merriam & Tisdell, 2016; Stake, 1995b, 2006; Yin, 2014). Based on the literature on culture and architecture, the different disciplines are brought together by the role of 'inhabitant' in each discipline through the theory of cultural ecology and critical regionalism (Frampton, 1998; Steward, 1972; Tzoni & Lefaivre, 1990). The common area of research between the two disciplines is the multidisciplinary field of environment-behaviour studies (Rapoport, 2008) and ethno-architecture (Toffin, 1994).

As demonstrated in Section 2.3., the interdisciplinary research areas of environment-behaviour studies and ethno-architecture are combined under ethno-architectural contextualisation. However, for this research, which is intended to be more pragmatic than constructivism, the discipline of ecological psychology was borrowed in combination with the contextualist theory of culture and architecture to tackle the research methodology(Barker, 1968; Schoggen, 1989).

Having defined the theoretical foundation of the research, the dual perspectives of ethno-architectural contextualisation led to the research methods for data collection and analysis. Figure 3-2 illustrates the multidisciplinary study framework, which uses the pragmatist case study approach to rationalise the methods used for data collection, analysis, and evaluation of the results. Each part of this framework is explained with the relevant literature, unpacking how this research is underpinned.

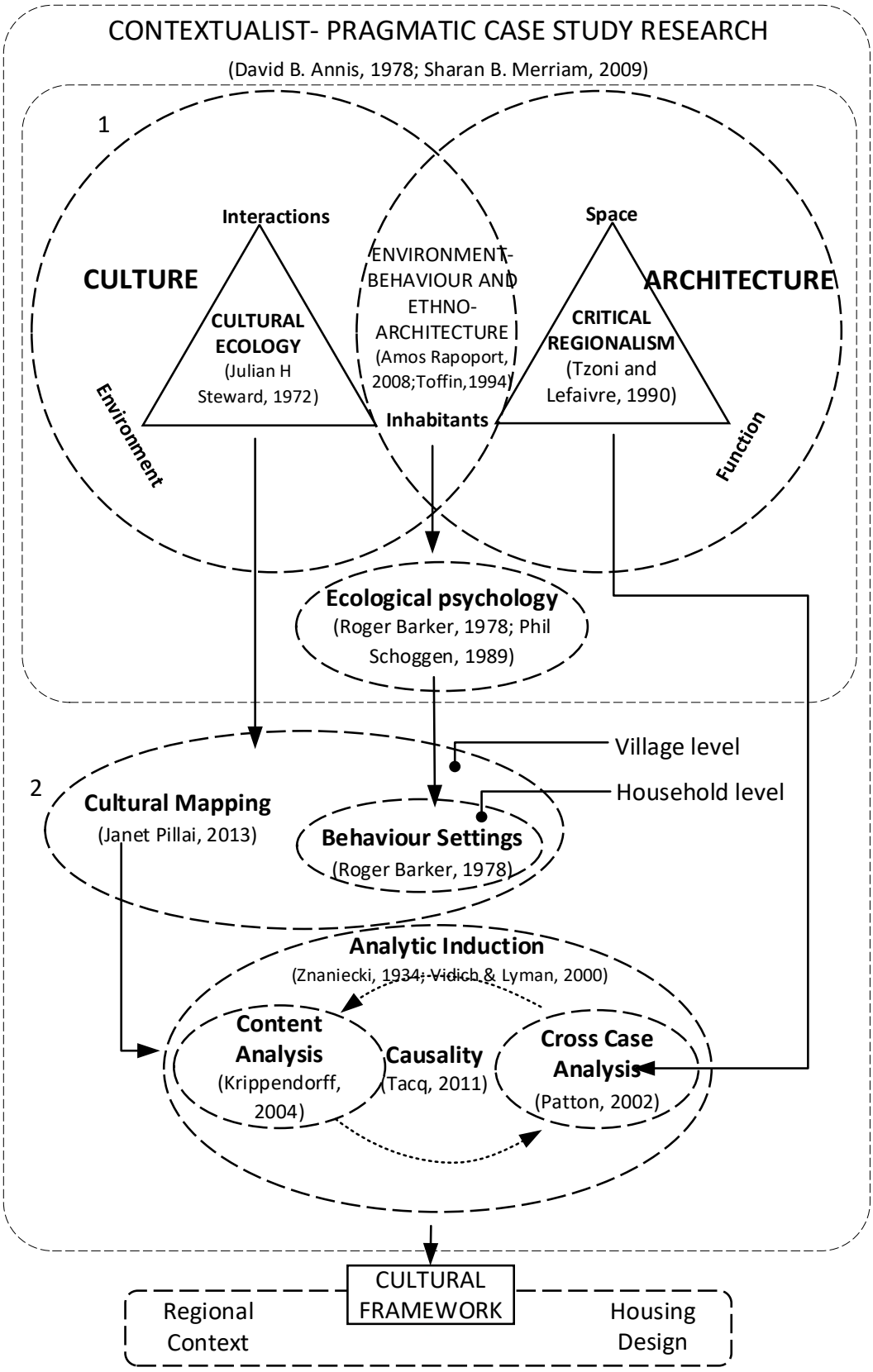


Figure 3-2 Research methodology: theoretical framework to evaluation

As illustrated in Figure 3-2 by the arrows linking the theoretical bubbles that outline the research methodology. On the left, the arrows navigate a clear link between cultural ecology and cultural mapping to provide the culture-oriented perspective of the community and the

village context. Whereas, on the right, critical regionalism forms an indirect connection to behaviour settings through the interdisciplinary area of environment behaviour studies and ethno-architecture, and ecological psychology, providing a design-oriented perspective of the unit-family and the house. This method is intended to provide an ethnographical approach to collecting and analysing the data, which is supported by the literature, while architectural contextualism guides the evaluation of the results so that the outcome addresses rural housing solutions.

Figure 3-3 below shows the overlap of the two disciplines, culture, and architecture, linked by the common denominator, the inhabitant/s. The overlap of the disciplines has been identified as environmental behaviour studies (Rapoport, 2008) and ethno-architecture (Toffin, 1994), however an arrow from the environmental behaviour studies towards ecological psychology indicates the contribution of the discipline in defining the research methodology. It is important to understand all the influences on the research because these will define the perspective of the research with respect to the aims and objectives. The composite figure demonstrates the theoretical foundation of ethno-architectural contextualisation.

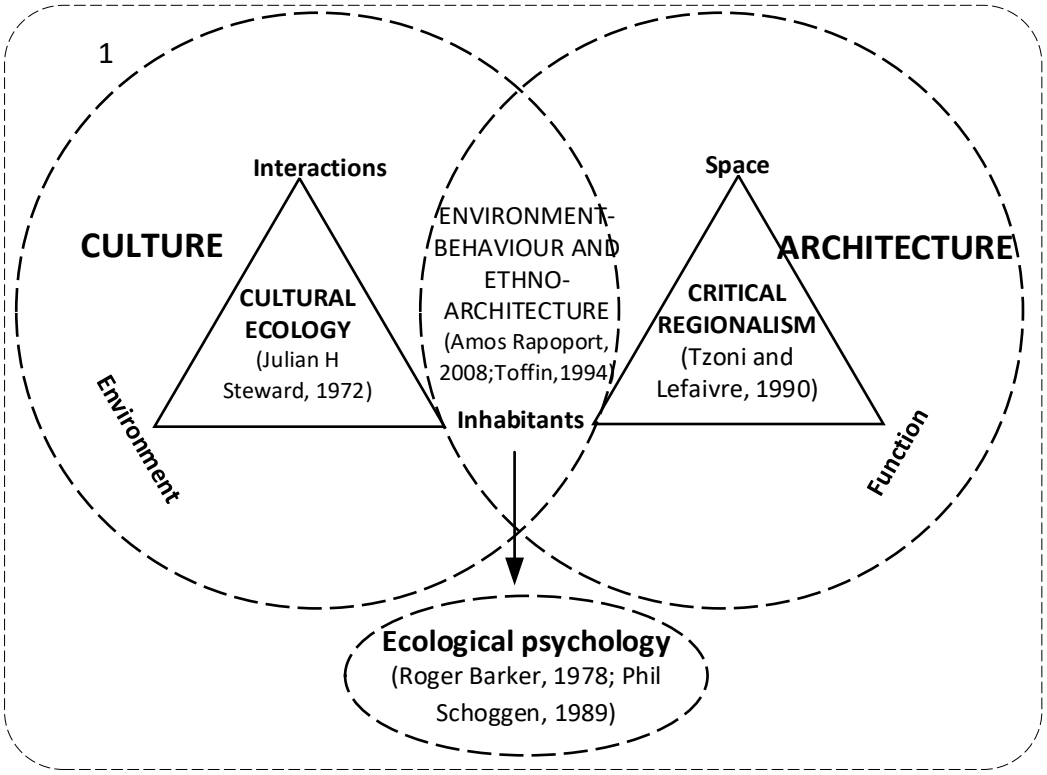


Figure 3-3 Ethno-architectural contextualization and ecological psychology

Figure 3-4 below, shows the data collection methods. The nested eclipses show that the theory of cultural mapping is used to visualise the village as a case and context to the household case while the theory of behaviour settings is used to study the household cases. The methods of data collection using cultural mapping and behaviour settings are executed in separate phases that are explained in Section 3.2.4. Considering that the nature of the research is a multi-case study intended towards generalisation of the results simultaneously requiring a method of evaluation across the cases, the approach used is the analytic induction (Vidich & Lyman, 2000; Znaniecki, 1934). This approach ensures the replicability and generalisation of the results as it intends to arrive at a hypothesis or theory for the cultural ecological phenomenon that is

true for each of the cases studied and analysed. This method of analysis conducts in-depth within-case and cross-case analyses to understand each case as a separate cultural ecology. This is followed by causal inferences that are repeated in each case until a generalised theory or hypothesis is created as a pragmatic and contextualised result of the analysis. The definitions and procedure of how these theories are to be used are described in Section 3.1.4.

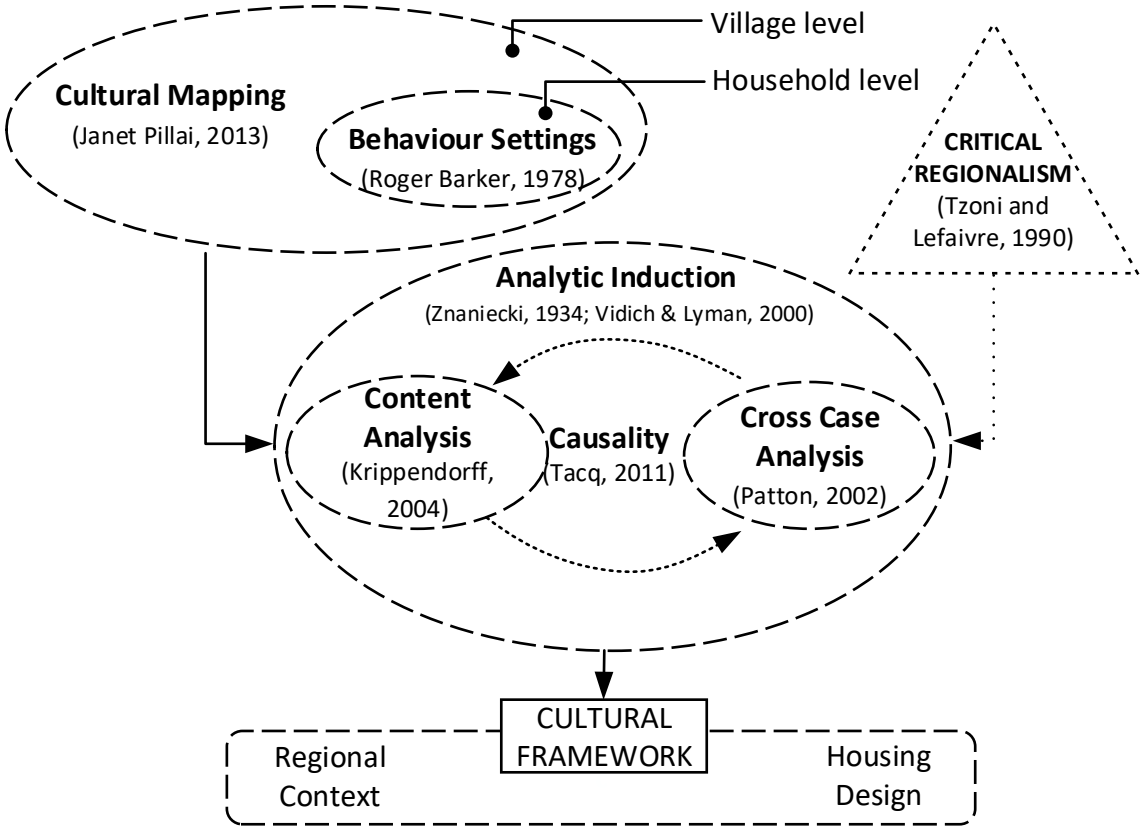


Figure 3-4 Methodology of data collection, analysis, and evaluation

The overarching theory that ties the theories and concepts together is contextualism as represented in Figure 3-2, that emphasises that the context of the object under observation requires close attention to fully understand what is actually going on in the big picture (Annis, 1978). The next section unpacks the methods that have been outlined in the theoretical framework.

3.1.4. Methods

As outlined by the theoretical framework, the methods used in the research design are meant to aid in understanding the context as well as the case itself. Due to the contextualist theory, the context which is the village is studied as a macro-case before studying the houses of as the main case. Hence the following methods are discussed according to the scale of the data collection, that is, village-scale and house-scale. The phases of the data collection are divided along the same lines as explained in Section 3.2.4. The following section discusses the methods used for the data collection, analysis, and evaluation of the research.

Data Collection

The data collection methods and techniques were selected based on the relationships and components of cultural ecology being considered. The methods and techniques chosen to

collect data were based on the kind of information to be gathered and used. Methods were required to provide a visualisation of the village, aid in understanding the village environment and the nature of the shelters that had been self-constructed by the community. Techniques were used in relation to the methods, which had been separated based on the scale and capacity of the data collection.

Cultural Mapping – Village Scale

As previously stated, the theory of cultural ecology, as defined by Pillai (2013), is the mechanism of Place, People and Use for understanding culture through cultural mapping and the repeated intersection of cultural ecology leads to cultural accumulation that over time defines as the culture of the people of a place (Bourdieu, 1986).

To understand the relationship between environment and community, techniques that allow data collection of the elements of the environment and the community were employed. Cultural mapping (Field, 2010; Pillai, 2013; UNESCO Bangkok, 2017) is an effective method as it helped to understand the environment of the village and how the community treats it or is affected by the factors in the environment. Cultural mapping was first mentioned by Clark, Sutherland, and Young (1995), in the conference proceedings of the APGS, Canberra, explaining the uses and applications of the method in planning sustainable communities. It has garnered recognition by UNESCO as a crucial tool and technique for preserving tangible and intangible cultural assets of a community (UNESCO Bangkok, 2017). Janet Pillai demonstrated the uses and applications of the method towards culture-based urban planning by applying cultural mapping to understand the character and insights of a place and its community. This facilitated the difference of perspective of assumption versus expectation for a culture- led development in urban planning (Pillai, 2013).

The environment in this case, was not limited to the houses, streets, and open farm areas, but was inclusive of the surrounding areas beyond the village, for example the neighbouring village, a road passing by the village, or a forest that may have wild animals. The external factors of influence such as politics, climate change, economy and cultural assimilation also formed part of the environment that was taken into consideration (Frampton, 1983). The benefit of using this method was that it assumed a participatory mode of observation as part of its data collection, which agreed with the contextualist pragmatic approach of the research. The method included a transect walk, interviews, observations, questionnaire/surveys and focus group discussions with the elders of the community to effectively study the cultural ecology at the village scale.

Transect Walk and Mapping

A transect walk is a rapid appraisal tool for describing and showing the location and distribution of resources, features, landscape, and main land uses along a given transect, which refers to the paths, streets and roads running across the village (Lorenzo & Motau, 2014). This technique was helpful to understand the spatial character of the village contributing to the cultural mapping. This technique was facilitated by observations that were collected in a notebook, as well as through photography and video recording of the surroundings. The tangible elements such as temporary and permanent structures, community spaces, water bodies, farmlands, forestry, plantations, and gardens, etc. were mapped on a plan. Sectional drawings and perspective sketches facilitated the understanding of the spatial environment of the village during the exercise.

Focus Group Discussions

An example of the guiding questions asked during the focus group discussions are shown in Template 1 of Appendix A, and Table 3-1 shows the elements that were mapped during the village level data collection. While interviews and observations are usual approaches to data collection, focus group discussions provide additional data and an opportunity for participants to listen to each other's responses and make additional input increasing the richness of their contribution (Patton, 2002).

The inclusion of a focus group discussion in the data collection for the environment helped the participants arrive at a more aligned, and possibly common story of the village as the elders collectively recalled. This stage of the cultural mapping involved the elders of the community who are the mediums that hold the oldest form of tradition and have observed the changes in the cultural ecology of the village. The group was provided with a sheet of paper to sketch ideas and memories that they may have of the village. The questions asked along with the use of the paper served as a cultural probe to understand their perception of tradition, culture and values (Gaver et al., 1999). The technique of cultural probes or design probes was developed for idea generation, inspiration and understanding the values, thoughts, and culture of people to stimulate a designer's imagination. However, with respect to the research and the way the techniques were applied, the technique was meant to stimulate the imagination and recollections of the village community.

Questionnaire Survey

The data collection for this method concluded with the collection of demographic data through a survey, which was used to select the households for the relationship between community and interactions established within the context of their houses. Though survey is a method of its own with a theoretical validation, the form of survey as shown in the appendix A was used to learn about the demographics of the village (Gray, 2009). The household selection executed by following the criteria defined in Section 3.2.2, from the data collected through Template 2 which is an example of the instrument used for the survey. Demographic information from the census data of the Government of Assam gave added information to observe demographic trends.

Elements for Mapping

As mentioned in 3.2.1, environment, community and interactions are the broad topics under which the study was conducted. Therefore, the scope of the mapping was collected based on these dimensions. As shown in Table 3-1, elements that were mapped were divided into tangible and intangible elements. Tangible elements included the physical forms and spaces that are visible and observed in the transect walk. Intangible elements included the activities and systems among the tangible elements observed during the transect walk. The data on intangible elements and confirmation of the tangible elements was collected during the focus group discussion from the elderly members of the village who participated in the exercise. Their input on the data collected indicated the attitudes, behaviour, norms, and values that are intrinsic to the socio-cultural factors that influence the culture of the village and community.

Table 3-1 Elements for mapping

SCOPING OF MAPPING (DIMENSIONS)	TANGIBLE ELEMENTS	INTANGIBLE ELEMENTS
Environment Community Interactions	Buildings Domesticated Animals/ Shed People Streetscape Open spaces/ Farm/ Vegetable Gardens Vehicles Tools	Histories and Memories Activities, Practices, Services and Events People and Animal Movement/Circulation Skills and Knowledge Expressions and Aesthetics Networks/Organisations Attitudes and Behaviour Norms and Values

Behaviour Settings – House Scale

As previously stated, the methodology borrows Roger Barker's theory of behaviour settings to study cultural ecology at the household level. It explains small-scale social systems, as well as the behaviour of person/s within a natural environment. Though mainly used in psychology, environment and behaviour, the theory was applied to a community depending on the environment that they have built or maintained around them. Factors that surfaced from the study were the key indicators to communicate the translation of the cultural significance of an artefact or practice (Schoggen, 1989). In other words, the factors mentioned in the exercise were the key indicators in understanding the cultural significance of their houses and how they used them.

The theory of behaviour settings was used to recognise the relation between spaces, functions and the individuals and objects involved in the resultant interactions. This theory was the most suitable method to identify the environment, community, and interactions of the cultural ecology of a household. The following techniques were used in adherence to the theory to observe the household and its members, and to understand the culture of a family unit within a village.

Interview-based Projective Floor Plan and AEIOU Framework:

To understand the behaviour setting of the occupants of the house, the participants were interviewed about: the history of their residence; construction of their house; changes made to their house; aspirations of future changes to be made to the house; the daily routine of the occupants in the house; and their opinions on the traditional house versus their current house. A sample of the interview questions is in Template 3 in Appendix A. The interview was accompanied by a projective technique where the participants were asked to illustrate their answers and opinions by drawing on a blank piece of paper. The typical daily routines of the occupants were collected using the AEIOU framework which is explained below.

The projective technique: The projective technique was originally developed in the field of psychology. It is effective at extracting information from participants as it requires them to project their subconscious (Zubin et al., 1965). It was used to visualise the floor plan with the aid of an explanation or inquiry on the traditional house plan by asking the participants to sketch their own house. The activity of sketching the house plan served as a cultural probe enabling people to share their thoughts on design and use of space (Gaver et al., 1999). This technique of inquiry helped extract the subconscious perceptions and views that the members of the household had about their house and surroundings.

AEIOU Framework: AEIOU is an acronym for Activity, Environment, Interactions, Objects and Users, the elements under observation in the method. It is an observation method invented by the Doblin Group in 1991, to analyse the intersection of users, activities, and interactions in

a set environment under the headings of Activity, Environment, Objects, Users and Time which spelt AEOUT. For simplification of naming the observation method, Time was replaced with Interactions (Robinson, 2015). It is a heuristic approach to observe the cultural ecology within a house as the Environment, the family as the Community and their daily routine and lifestyle as the Interactions (EthnoHub, 1997).

Though interactions take place everywhere across the village, that is, on the farm, in the streets, or any other place within the village, for this research the observations were limited to the interactions within the selected households. This technique was adapted by the research to know the daily routine of the occupants of the house, which in turn, indicated the varying uses of the rooms by the occupants at different given times of the day. The data was collected person wise, based on their activity and the various places they used for those activities. Template 3 in Appendix A contains the semi structured household interview form in which the data regarding their daily routine was collected.

Analysis and Evaluation

Comparative research is a basic form of investigation that is used in scientific and philosophic inquiry (Deutsch, 1987). Mack and Clark (1984) conducted a mixed phase study on the buttress design of Notre Dame Cathedral, where one of the phases was a comparative case-study observed in context and the cultural values that the community have retained through architecture of their surroundings.

Pragmatically, the comparative approach provided in-depth understanding of the cases in rural settings along with the factors that influence and determine the user-perspective and choices with respect to housing decisions. The principles to be considered that are of value to the community were indicated from the cultural responses.

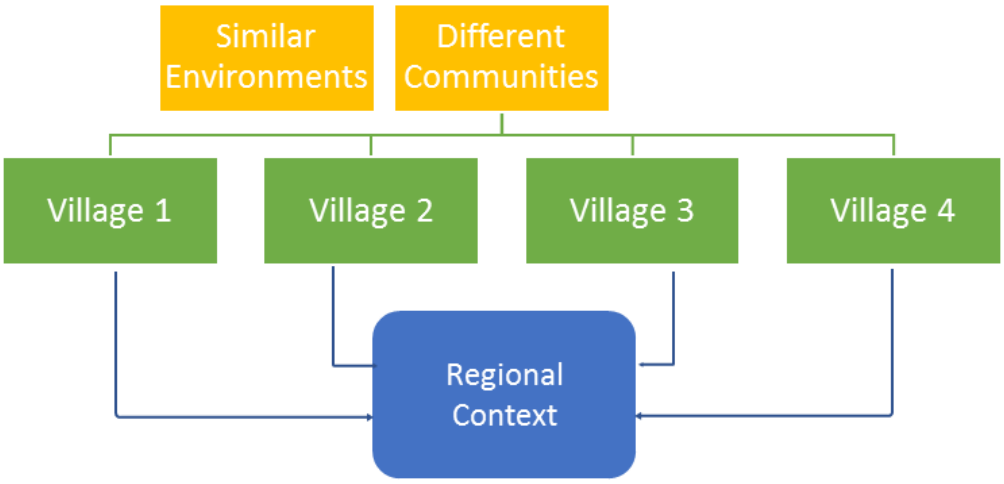


Figure 3-5 Analysis model: cross case analysis, village level

Figure 3-5 shows the four selected communities within a similar description of the physiographical characteristics of the environmental context. Due to the variable selection of the community aspect, the resultant cultural ecology process in each case were different. Each village case was studied individually, and then cross case analysed to define the similarities in the environment aspect, and differences to variables in the aspects of cultural ecology, which aided to understand the regional context of the cases.

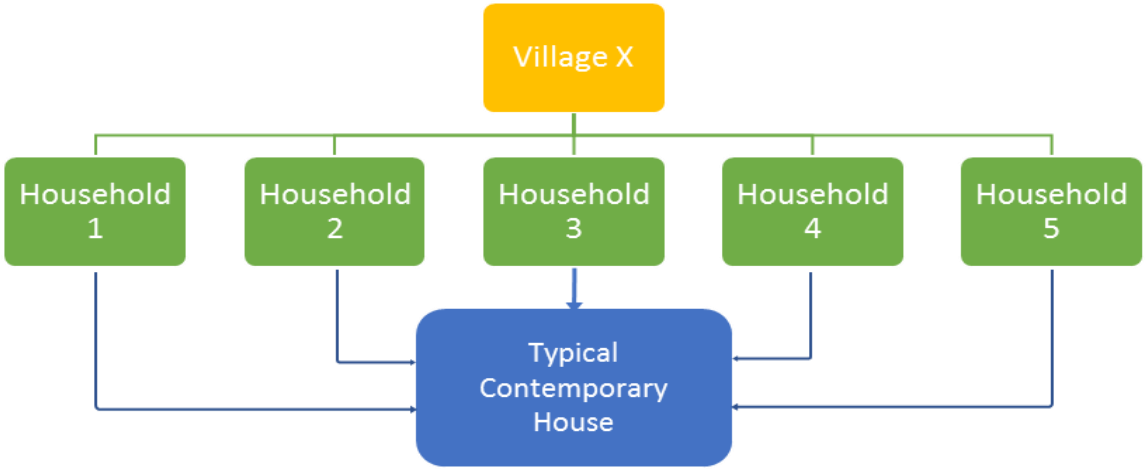


Figure 3-6 Analysis model: cross case analysis, household-level

The analysis model shown in Figure 3-6, shows case analysis of each household individually and then the cross analysis at the household level. The houses were studied as individual units and then cross analysed to arrive at generic architectural design concepts and principles that had developed overtime within the specific cultural ecology of the village. Same as the regional context of the village cases, the household cases aided in understanding the contemporary house that is typical according to the community and environment of the village as the context.

This produced a list of similarities and dissimilarities which, based on the theme, were either environment specific or socio-cultural specific. The analysis was conducted with the aid of NVivo, a qualitative analysis software. Nvivo aided the understanding of the cases by highlighting their commonalities and distinguishing features. By running queries on the similarities and differences of the cases, NVivo facilitated the cross-case analysis.

This list aided in framing a realist view of the case, however, without a causal analysis of the processes of cause and effect within a bounded system, it did not demonstrate a pragmatist outcome. The lack of understanding of the causal relations and causal processes within the cases fails to inform the cultural ecology of the village and consequently, the effect on the socio-cultural identity of the community due to changes that occur in the regional scale of the village context. Hence, causality, causation, causal links, and causal processes were within the scope of the pragmatist-contextualist approach to rural housing. The indications of the causality and causal links within a case became evident from the content analysis of the cases.

As previously stated, the analysis approach used is analytic induction, which aids in arriving at a theory or phenomenon that is true for each case studied and analysed. Analytic induction is an interpretive strategy that seeks universal explanation to the phenomenon in question (Znaniecki, 1934). It involves a process of generating and then testing hypotheses against each successive case or instance of a phenomenon, which is the exceptional or negative case deviant to the working hypothesis (Bühler-Niederberger, 1985), referred to as a “process of revising the hypotheses with hindsight” (Lincoln & Guba, 1985). In other words, a hypothesis is tested against each case individually and iterated if it does not fit any of the cases; a simultaneous creating and testing of a hypothesis that explains the causal relationships across cases. Hence, the scale-wise discussion of the data analysis is discussed in Chapter 4 and Chapter 5, and the causal analysis hypothesis for the cultural ecological phenomenon is discussed in Chapter 6. The procedure followed in this research is further explained in Section 3.5. However in the case of this multiple case study research, the next steps were a content analysis (Merriam,

2009a) of each individual case and a cross-case analysis (Stake, 1995a, 2006) of the codes and themes gathered from the content analysis. The following paragraphs explain the methods used for understanding the cases through content and cross-case analysis.

Content Analysis

As discussed in Section 3.1.2 on theoretical approaches assumed for the research, the data collected from each site was qualitatively analysed individually as separate case studies. The method of content analysis and the qualitative analysis software, NVivo was used for this purpose. Content Analysis is a method of studying the data by interpreting and coding textual material (Krippendorff, 2004), which is the basic principle on which NVivo functions. There are strong similarities between thematic and content analysis however, the difference lies in the possibility of quantifying the data by measuring the frequency of different categories and themes (Vaismoradi et al., 2013) which NVivo allows the researcher to code in the form of files and references. For the research, the content analysis of the textual data from the various modes of data collection produced a large quantity of data for the causal and cross case analysis. This is further explained in Section 3.4.1.

Cross Case analysis

After having descriptively analysed each case individually, a method needs to be applied to enable generalisation of the results. Due to the similar environment, the findings based on the contextual factors were then further cross analysed to define the similarities that are present in each site. The differences in the findings indicated the influences related to either the community or interactions. Cross case analysis is a method of extracting knowledge from individual cases by exploring the similarities and differences that enhance generalizability and deepen understanding and explanation (Miles & Huberman, 1994). It is a means of producing generalisations and understanding based on the patterns in the codes and themes in the references (Patton, 2002),which can be produced by running queries regarding the themes of the analysis on NVivo.

Andersson et al. (2002) used cross case analysis across nine case studies from Australia, Canada, and Sweden to study family businesses in the rural tourism and hospitality sectors. They examined goals for start-up, development, and ultimate disposition of the businesses within the theoretical framework of the business and family lifecycle. Similarities in the cases indicated the significance of lifestyle considerations, location preferences, and uncertainty over disposition of the businesses.

Causality and Process Theory

Having analysed the data, it is necessary to validate the results to ensure credibility, which in this case, is the within-case and cross-case analysis. Since the research is intended to arrive at a socially and culturally acceptable housing solution, the research requires an evaluation method that can confirm the socio-cultural meaning of the results. As a result of the evaluation, the method adopted requires validating the causality established by the causal analysis using process theory.

For qualitative cross case analysis, Ragin (1989) represents each case as a combination of causes and effects that are then compared with each other, which he refers to as qualitative comparative analysis (QCA). He uses Boolean algebra where his variables are attributed as binary values of ‘1’ and ‘0’. There are three other strategies that establish causal relations,

experimental, statistical, and analytical induction. It is described as "a nonexperimental qualitative sociological method that employs an exhaustive examination of cases in order to prove universal, causal generalisations" (Vidich & Lyman, 2000).

Causality is the relation between cause and effect where the existence of an event or phenomenon gives rise (causes) to another event or phenomenon (effect) (Tacq, 2011). It can be singular in nature or multifactorial (Palinkas, 2014). Adrian Heathcote (1989) equates causality to interaction using conservation laws in quantum field theories. Causal inference is the process of indicating causal links between two or more events or phenomenon where the cause must necessarily exist prior to the effect (Hume, 1738).

The positivist/ empiricist approach to causality assumes that qualitative research methods are not fully capable of proving causality, unless they use experimental or statistical analysis to determine the outcome (Light et al., 2005). The constructivist opinion is that causal relations "do not exist unless by imputation" (Lincoln & Guba, 1985) "and the existence of causal relations depends on the presence of minds, speakers, observers or the like" (Weber, 2008). The realist approach understands causality as consisting of real causal mechanisms and process, without determining a regular outcome (Maxwell, 2004). Realists challenged Hume's theory of regularity, which neglected contextual influences (Pawson & Tilley, 1997; Sayer, 1992) and mental processes (Davidson, 1980; McGinn, 1991) as integral to causal explanation.

The pragmatist approach, however, arises out of causality since the pragmatist view specifies actions, situations and consequences (Creswell, 2009). In other words, cause, causality, and effect that explain the causal process within a context through the pragmatist approach. The description until now seems to indicate over-lap between the two perspectives however, they differ in outcome of the approach. Realism accepts what is as it is, while pragmatism accepts what is driven by the consequences of causation (Cherryholmes, 1992).

Hence, the research took process theory as a form of causal explanation, over variance theory (Mohr, 1982). Process theory, as its name suggests, deals with the events and processes and the analysis is conducted based on the causal inference connecting the events in a causal relationship (Maxwell, 2004). Variance theory, on the other hand, deals with difference in values among different variables and the correlations between them. Process theory reflects a qualitative design while variance theory reflects a quantitative design. For the pragmatics of the data analysis, explaining causality using process theory brings out the nuances of the causal inferences while the nuances may be lost in the explanation through variance theory. This causal analysis is further explained in Section 3.4.1

Further understanding into the environment based architectural evolution of the traditional housing was derived from data collected regarding material and construction methods, while the understanding into community based architectural evolution is derived from data collected regarding changes made to the room sizes, shapes, orientation, and use. There may be some data that seems to respond to both the environment and the community, in which case, it indicates the relation and interrelated influence one has on another when building a house.

For this research, the use of this method will allow the researcher to visualise the links between the contexts of the cases and therefore understand the contextual factors that cause a certain reaction in rural housing. This method will inform factors to be considered in the Framework. The next section discusses the preparation required in conducting multi-case study research.

3.2. Conducting the Case Study: Preparing for Data Collection

To design the research methodology, it is necessary to define the case profile, the selection criteria, and aids to be used for data collection. This preparatory step makes the researcher aware of the environment in which the research is to be conducted. Selection criteria needs to be defined to avoid any unsupported random assumptions that can hurt the research intent. In that same light, a random case selection of households within a village may not be feasible and could lead to unclear understandings of the context. Reasons for the criteria that have been taken in consideration are discussed. The role of the Human Research Ethics application in forming the research design and the data collection templates is explained. The following sections provide understanding of the research context and support the development of the research design.

3.2.1. Context of Zone C

As per the literature review in Chapter 2, the culture of a community or place can be understood by observing its cultural ecology and its components. This section briefly reintroduces the cultural ecology of Zone C as per the Pahal Zonal divisions established by the UNDP research "Appropriate and affordable rural housing for all", as noted in Chapter 2.

As a result of their exercise, only one house design is documented in the Pahal-compendium of rural housing typologies(IIT Delhi et al., 2016). The research methodology employed by the exercise was studied as part of the literature review on rural housing schemes in India. The review indicated over generalisation and under-representation of the diversity of the state in the results and methodology adopted for the research. The selection of the case study used the concept of cultural ecology and contextualism determine the factors that enable selection of appropriate case villages and households for the field-research. These selection criteria are explained in Section 3.2.2.

For convenience and in keeping with the findings of the literature review, the characteristics of the environment of the sites are from the Zone C region of Assam (UNDP India, 2016), which has the same physiographical context as the house studied during the literature review. This ensured that the environment aspect of the cultural ecology of the villages closely resemble one other. The criteria of the environment aspect described by affordable and appropriate rural housing (UNDP India, 2016) are:

a) Low vulnerability to flooding and erosion.
b) Medium to high vulnerability to cyclonic storms.
c) High vulnerability to landslides.
d) Predominantly hilly terrain.
e) 75% forest cover with a mix of moist semi-evergreen, mixed deciduous and bamboo forests.

Karbi Anglong, West Karbi Anglong and Dima Hasao (formerly North Cachar Hills) have predominantly hilly topography and dense forest area. The districts occupy a special status because they are governed by Autonomous Councils created under the Sixth Schedule of the Constitution of India, although they are within territorial jurisdiction of Assam. The councils are democratic, decentralized institutions with participation of the people at the grass roots level for election of representatives in the councils. The three districts provide a large part of the bamboo consumed for the paper industry – Hindustan Paper mills (UNDP India, 2016)

The predominant feature of the traditional houses is the extensive use of bamboo in construction and household products, storage shelves, partitions, etc. Given the long history of its use in the region, every family has male members who are skilled at working with bamboo. Most families have easy access to bamboo as it grows abundantly in the forest near their settlements or is available to purchase from private groves. There is a variety of designs using bamboo which have evolved depending on both the traditional practice in the region, and the affluence of the house owner. Each building typology has a different level of durability. The structural arrangement mostly consists of a frame on which interwoven bamboo panels are fixed to create the wall enclosure. Hence, in this research, the regional context of the cases was limited to Zone C of Assam.

3.2.2. Case Study Selection Criteria

As previously stated, randomization of the cases is not advisable for the intent of the research so a set of criteria was defined for selection of both village and household cases. The selection criteria were defined to facilitate the selection of four villages and five households from each village for studying different cultural ecologies that result in distinct cultures and architectural design of rural housing.

Leslie Kish (1949) devised a procedure for conducting a household survey with randomly selected participants, however, the participation was subject to an objective to be met by the participants based on the purpose of his survey. His arguments and reasoning indicated a less random and a more decision led respondent selection which he called the objective respondent selection. He argued that a more objective selection procedure needed to be designed when there is more than one individual meeting the criteria within a household in contrast to when only one member of the household meets the criteria. He also mentioned that even though all individuals in the house meet the criteria of the respondent selection, the exercise would give unfavourable results. In other words, his sample selection to conduct household surveys required a degree of defining a criterion based on the purpose of his survey. Hence, for this research, a purposeful method of case selection was adopted.

All case studies seek representative samples (Gerring, 2007). However, Gerring (2009) has defined nine case selection strategies: typical, diverse, extreme, deviant, influential, crucial, pathway, most-similar, and most-different. Among the nine, typical, diverse, and extreme case selection strategies are most representative of cases critical to this research.

The purpose of the case selection criteria was to select a typical yet diverse case which is representative of the villages in the sixth schedule regions of Assam. Both strategies of case selection facilitate selection of cases that are representative of case study inferences (Seawright and Gerring, 2008). The typical case strategy directs the criteria to define the community to be studied, while the diverse case strategy directs the criteria to choose representative cases that belong to different ethnic communities of the region. This same purposeful approach was adopted to select household cases for data collection. The following explains the criteria for the case selection.

Village Case Selection

A set of criteria, shown in Table 3-2, were developed based on the characteristics of a typical village case. Case selection was finalised based on the on-ground information before conducting the data collection. A preliminary assessment of the villages around the district

headquarters of the districts in Zone C was conducted to define the case or cases that fit the description of a typical case according to the criteria.

Table 3-2: Case selection criteria

CRITERIA	DESCRIPTION
Cultural	Should be more than 75 years old.
	The cases should belong to different ethnic communities.
	At least one should be a matrilineal community.
	Presence of religion.
Population	200-400 individuals in each case
	40-70 households in each case
Connectivity	Within a 20 km radius of the district headquarter.

The typical characteristics of the cases were the age limit and religion. The significance of including a matrilineal community among the different ethnic communities was to add diversity to the typical cases to represent the ethnic diversity of Assam. This encouraged the case selection criteria to include a matrilineal community. Labang, a tribe resembling both Khasi and Jaintia, which constitutionally belong to the neighbouring state of Meghalaya, was selected (Ahmad & Raza, 1993; india.gov.in, n.d; Taher, 1993). The fourth representative case was based on the next major tribe population after the Karbi and Dimasa, living in the region that constitutionally belong to the neighbouring state of Nagaland (Ahmad & Raza, 1993; india.gov.in, n.d; Taher, 1993)

The population of the case study villages define the number of observations that can be obtained from a single case. Restricting the size of the case does not ensure a reduced number of observations; however, it is one of the criteria that indicate the typicality of the case. To further add to the typicality of the cases, they were selected within a limited distance around the district headquarters to ensure a degree of socio-economic and socio-cultural integration of cultures due to the proximity to urbanisation. This criterion also acted as a diverse characteristic as there are three district headquarters, hence, different levels of influence of urbanisation depending on the district.

Based on these criteria, cases tended to reflect varying versions of traditional villages in the region depending on the degree of cultural assimilation. Studying these typical cases enriched the research by allowing for an understanding of the cultural mechanisms that direct the community to evolve and thrive within their environment.

Age limit: The age of the settlement was a relevant criterion as it affected historical data about the community. It allowed an understanding of cultural changes in the community due to historical events that took place in the region. Prior to independence, due to the distinct nature of the environment and people living in the North-eastern region of India, the British considered a separate form of governance for the region. By 1835, the then government of India enumerated the region as excluded (currently Nagaland, Manipur, Tripura, Mizoram) and partially excluded areas (currently Meghalaya, Dima Hasao, East and West Karbi Anglong) under the Indian constitution Act of 1835 (Reid, 1944). During the British occupation, the tribes could practice their own customary laws within their region, however post-independence, a national culture tended to be imposed on the regions due to the administration and governance that was being adopted in rest of India. This change in administration systems and the structure of governance increased the rate of cultural change.

Post-independence, Assam included the partially excluded areas, Arunachal Pradesh, Nagaland and Mizoram within its jurisdiction (Barpujari, 1998). Without any state borders in place,

people of different communities inter-mingled and interacted more freely. This borderless intermingling and interaction are assumed to have led to more socio-cultural integration among the ethnic communities of a then-united Assam. This criterion took into consideration the partition of the state of Assam into Meghalaya (1972), Nagaland (1963), Mizoram (1971) and Arunachal Pradesh (1972) since independence.

Immigration from Bangladesh to India has occurred continuously since the split of the two countries at independence of Bangladesh (Barpujari, 1998). The Assam Accord of 1985 was supposed to dissuade the migration into Assam through the National Registration for Citizens (NRC). The NRC deadline for immigrants having entered Assam during the creation of Bangladesh was the 24th of March 1971. However, it has been difficult for migrants to prove their residency. This criterion indicates the degree of un-surety regarding the historical belongingness of the community to the region due to the post-independence immigration and border disputes. For my research, this ensured village case selection that is historically indigenous to the region incorporating the age of the settlement as a criterion.

Exponential growth in the use of technology has led to rapid urbanisation and development over the past 50 years. The advancement of technology has influenced economic, religious, environmental, and social behaviours, and impacted people's behaviour and responsibility to society and the environment (Magnusson et al., 2005; Rivera, 2014; Sobotka, 2017; Younes & Al-Zoubi, 2015). The age limit criterion ensured that the village community was established before the introduction of technological gadgets into daily life allowing understanding of the effects of technological advancements since the village had a reference for when the village was not technologically supported.

These specifications ensured that the villages studied either had a traditionally built house or older people with knowledge regarding traditionally built houses, specific to the culture of the village community. The age limit criterion aided in locating a case that had retained a traditional way of life and housing.

Socio-cultural factors: The districts chosen for this research, which fall under the Zone C classification in Assam, are Dima Hasao, Karbi Anglong and West Karbi Anglong. As these districts are considered tribal areas, or sixth schedule areas, they are administrated under the autonomous district council of Dima Hasao and the autonomous state council of Karbi Anglong, for both Karbi Anglong district and West Karbi Anglong district (india.gov.in, n.d; india.gov.in & Janasanyog, n.d.; Janasanyog; Ministry of Home Affairs, 2011). The case study villages belong to different communities living in the different districts within the hill regions of the state. The major tribes in these districts are Dimasa and Karbi, were selected for optimum representation of the region. The other two cases were representative of the neighbouring states Meghalaya to the west and Nagaland to the east. The different districts are under separate administrative systems offering a different view on the influence of socio-political scenery of the region. Selecting villages belonging to different ethnic communities also played a part in understanding the socio-cultural factors that determine the way a village thrives or decays due to the effects of urbanisation from the district headquarters.

As stated, the contextualist theory resembles the emancipatory research paradigm (Groat & Wang, 2002) by acknowledging multiple realities or dimensions or contexts, as referred to in Creswell (2009) under advocacy/participatory approach. The emancipatory research paradigm encourages the inclusion of gender, which in terms of contextualism, is a factor within the

context of the social construct of the community. The concept of cultural ecology encourages consideration of human behaviour of genders that create differences in the socio-cultural and socio-economic contexts evident in matrilineal communities and patrilineal communities (Hoffman et al., 2010; Steward, 1986; Velázquez, 1978). Thus, gender plays a part in selecting a village case with diverse character due to the inclusion of matriliny as a socio-cultural factor.

Religion: Religion is one of the elements of a community that defines the social norms, practices, and values. The values that are reflected in the cultural and spiritual beliefs held by the community will be better reflected by a community that has retained its original cultural religion as opposed to a community that may have been converted to either Hinduism or Christianity. This distinction in demonstration of values is evident in the design of the church (Giedion, 1964).

The basic form and the details of the Ziggurats and Pyramids demonstrate the distinct reasons and values attached to the architecture of these monuments (Giedion, 1964). The difference in how the Sumerian and Egyptian civilizations expressed their cultural beliefs, and how these expressions of ideas were developed, refined, and perfected over time indicated the role played by religion and spirituality. This criterion indicates that religion is a typical characteristic of the community and the physical manifestations in the form of sacred spaces or rituals lends a diverse characteristic to the cases.

Population: According to the census data of 2011, rural Assam has an average village population of 1057, in 214 households. Dima Hasao has 224 individuals in 43 households per village and Karbi Anglong has 311 individuals in 57 households, indicating these districts have smaller populations and larger households than the state average.

The information obtained from the census is used for government planning and statistically represents the national population. When there is a variation in the sample size along with the of the case studies being investigated, it can negate the results in the data collection due to the contrasting majority and minority of the numbers within the cases. To obtain a degree of consistency among the cases, across the districts, the size of the village community was decided based on the average number of households per village, thereby defining a typical characteristic of the case.

Proximity to Urbanisation: The case villages were within a specified radius of the district headquarters. This criterion reduced the coverage area of all the districts to the development blocks, or tehsil, which are in the jurisdiction of the district headquarter. These are the Haflong development block for Dima Hasao district, Donka tehsil for West Karbi Anglong, and Diphu tehsil for Karbi Anglong district.

The proximity of a case to urbanisation or a community of a different ethnic background demonstrated a degree of cultural assimilation in the case study villages. Additionally, the non-connectivity and inaccessibility of the village from the district headquarters can contribute to a delay in conducting the research.

House Study Selection

This section describes the criteria based upon which typical, yet diverse household cases may be selected. To study the culture of a community represented by a household, the cultural ecology of the household, i.e. the intersection of environment, community and interactions, needed to be defined (Bourdieu, 1986; Steward, 1972). It can be considered analogous to the

house, its boundary and surroundings, the family members, and their activities that they do with each other or by themselves. Part of the research was to study the environment that the households reside in and observe and learn from them the activities that take place in a space within the environment.

Each village has different types of households representing different demographic characteristics within a single village. The selection and study of distinct households assists in understanding the generalised cultural ecology of the village, which in turn aids in understanding the social culture of the community of the village. An array of inferences can be drawn from the data of each household, which may not necessarily be present in each case leading to disparate conclusions. The need to systematically reduce the number of variables in the data synthesis and analysis facilitated the need of a questionnaire/survey component to be added to the research design instead of opting for random case selection, which is further discussed in Section 3.2.4.

Sample Size: The sample size as well as the selection criteria of the households was based on the house type and the economic conditions. Five typical cases were defined:

a) High income in traditional homes,
b) Low income in traditional homes,
c) High income in contemporary designed homes,
d) Low income in contemporary designed homes and,
e) An average income household living in a home that is both traditional and contemporary.

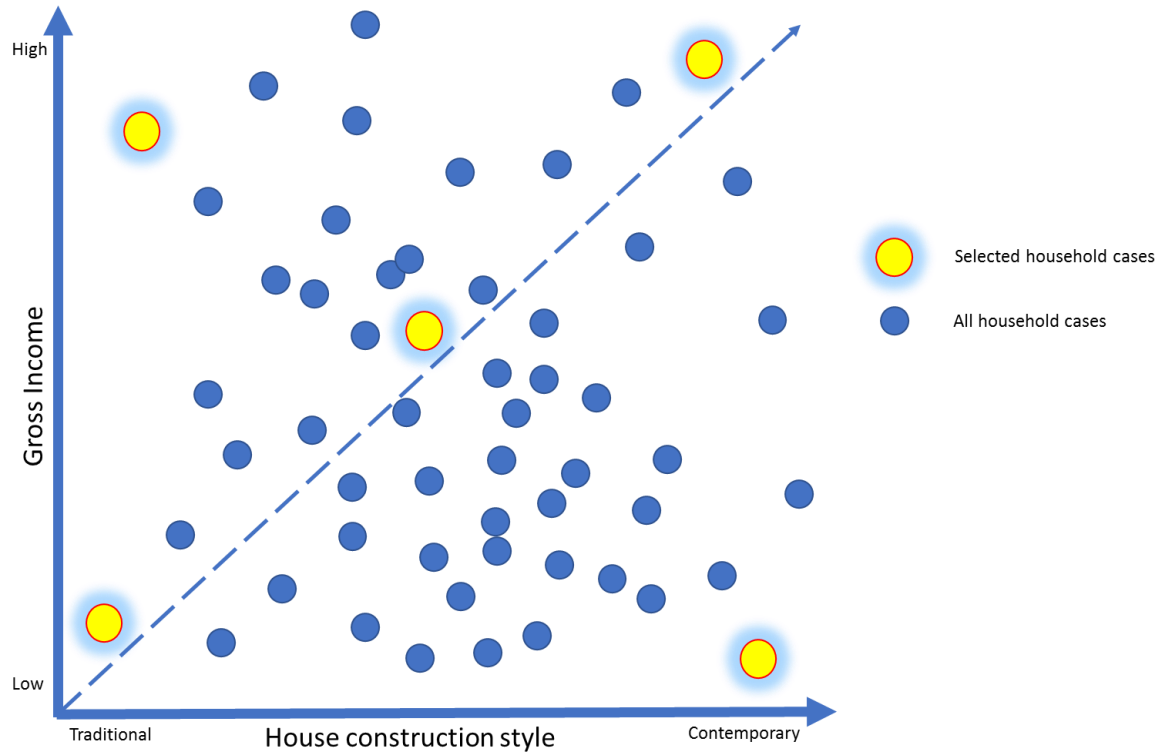


Figure 3-7 Gross income (affluence) vs house construction style

Figure 3-7 illustrates the relationship between house type and economic condition of the households. High income in the context of the rural community refers to a family with enough

income to afford amenities and modern luxuries including renovation and re-construction of their house. Low income refers to a household that is opposite in terms of income and affordability of amenities and modern luxuries including renovation and reconstruction of their house. Identifying traditional cases is one of the main aims of the research to produce culture-sensitive design, while contemporary cases indicate the direction of construction and design trend of houses within the community. The comparison between traditional and contemporary styled cases indicates how the concept and value of culture has been translated and expressed through design of both styles.

The demographic profile of the village depicts the general socio-economic status of the village. The household size, relationship with the head of the family, age group, gender, level of education, occupation, and income range are crucial details for distinguish between household profiles. Information on religion, caste, or category, previously residence, type of property, possessions and pets, distance from work or school, etc enhance the understanding of the socio-economic profile of each household. These details are also significant in understanding use and design of space that is specific to each individual.

The number of members and the relationship with the head of the family: The number of members in a family indicates the factor that the gross income must be divided by. The average household income depends on the size of the family and affects how a household can effectively benefit from a scheme.

Age group: Children and adults of different age groups have different requirements, which are reflected in the design of age-specific architecture (Moulaert et al., 2017; Neufert, 1970; Perissinotto et al., 2002). Where 3 different generations live under one roof, there are common spaces with flexible usage, and segregated spaces for the elderly, physically disabled or younger children. In these cases, accessibility and safety must be incorporated in the design to ensure the health and safety of the members. This segregation and attention to safety and accessibility may not be a factor in houses with a single generation or with members aged between 18 and 40 (Salvendy, 2012).

Gender: Gender representation is a criterion that has had obvious reflections in the results of research conducted by various scholars in related fields of community development (Chigbu, 2015; Harris & Atalan, 2002; Perissinotto et al., 2002; Sadoughianzadeh, 2013). Houses tend to have dedicated female spaces which are meant to be more private than the rest of the house (Alitajer & Molavi Nojoumi, 2016). Gender also plays a role in matrilineal societies or families, or when the main income earner of the house is a female. Since usage and improvisation of space is determined by the head of the house, the masculine and feminine perspective of space will influence the environment created and the kinds of interactions that take place within the house. Due to gender roles that may already be imbedded in the culture of the community, both genders will use an interior or an exterior space differently according to the interactions that take place with other individuals in the household.

Education, occupation and income range: The level of education of an individual has been related to improving analytical and spatial awareness (Hoffman et al., 2010; Ritchie et al., 2015). In most cases, children from villages are sent to the nearest town or urbanised village for higher studies. This provides children with the opportunity to observe and learn from other communities and cultures which they bring back to the village as part of their identity. The more family members who have visited urban areas or lived away from the community, the

more exposure to cultural diversity. This diversity directly influences cultural assimilation by the members of the household. The diversity in cultural assimilation influences the identity of the household and their social culture.

Social category: Classification of households based on religion and social categories such as schedule caste, schedule tribe or any other minority helps avail benefits of schemes and policies (Department of Rural Development, 2013, 2015; Ministry of Rural Development, 2017). They are designed to provide the minority groups with support for the betterment of their socio-economic status. Income, gender and seniority can also play a role in availing the benefits from government schemes and policies, such as the IAY/PM-GAY rural housing scheme (Department of Rural Development, 2013).

Physical contextual factors were not part of the selection criteria however, they are part of the variation in context that distinguishes households. This variation adds to the diversity of the cases to be studied for the household study. A questionnaire was designed to collect demographic profiles of all households of the village. Though it was designed with the intent to be used among the rural communities in Assam, the survey template could be replicated with the appropriate modification to obtain the required information according to the regional context.

The members of the household are the main influencing factor, and the composition of each household identifies the nuance of the information gathered from the questionnaire. In other words, to understand the kind of Environment (that is a rural house) for a people, who live and interact in a space, the Community (household members) along with the Interactions (social culture and activities) are the criteria that require to be identified. This helped in understanding the cultural ecology of the households, and each case study in turn defined the similarities and dissimilarities and circumstances that highlight the essence of the culture of the community with respect to architectural design and space.

In this research, case studies were selected based on typical and diverse characteristics of the villages and households outlined in the criteria. This purposeful method of case selection narrowed down the number of cases to be studied. The next section discusses the data collection templates and the process of refining them according to the aims and objectives of the research.

3.2.3. Data Collection Templates

Two sets of questions were developed, one for the focus group discussion and one for the household interview. A questionnaire was prepared to collect demographic data of the households of the village. The data collection templates were designed according to the requirement of the Human Research Ethics Committee and a pilot exercise was conducted to test the viability of the templates. The next section briefly describes the human research ethics application for the research. Followed by a description of the pilot exercise conducted to test the data collection templates before finalising the data collection templates.

Human Research Ethics Application

It is a requirement at the University of Melbourne that any social science research must be approved by the University's Human Research Ethics Committee. This process aided in developing the final version of the data collection templates and data collection process over three months of iterations that were developed and approved by the application process.

The application process required imparting details of the fieldwork based on the aim and objective of the project, methodology, and research design. Details such as, site profile, type of data, data sampling, recruitment of participants, obtaining consent and data management were required to assess the ethical risks involved in the data collection. As part of the process, mitigation of the risks had to be listed accordingly. This crucial step ensured the structure of the research methodology and data collection process.

In the first attempt, there was confusion regarding the details of the ethics application. Project summary and the research design; participant recruitment and consent; data collection technique and analysis; risk management strategy and justification of the risks by expected benefits; dissemination and data management; and the monitoring of the research by a responsible researcher while in the field, were among the issues that were not properly clarified.

The second ethics application raised questions regarding participant recruitment and obtaining approval of the participants in the rural and completely different cultural context. This led to the application being moved from minimal risk to a standard project, meaning that the risks involved in the data collection were considered more than minimal and had to be approved by the University level Human research ethics committee instead of the Architecture, Building and Planning faculty. The ethics committee had listed the issues and comments which had to be clarified before resubmission.

This led to detailed examination of the application for approval, however, it also led to a fully clarified research design which was granted approval in mid-May 2018. As part of the iteration and response to the comments the data collection templates had to be edited until the committee was satisfied with them. The next section describes the pilot conducted to test the data collection templates. A sample of the revised and approved data collection templates is in the Appendix A.

Pilot for Data Collection Templates

A pilot study was conducted to test the ability of the templates to extract useful data from the survey participants. This pilot exercise was carried out with family members and acquaintances in a Karbi village in Zone 3 region of Assam. Since the intent of the exercise was to test the templates and not to collect data, any answers given by the participants were not retained. The data collection templates were adjusted according to the following observations made during the pilot exercise:

- A transect walk or walk around the village before the actual interview was helpful in relating and referring to the responses of the participants.
- The participants seemed very eager to share their history as well as perspectives on the current and pre-existing factors that affected their village. Questions related to history and traditional perspectives seemed to encourage the better discourse.
- The use of a blank piece of paper for the participants was helpful in translating and documenting their responses.
- The demarcation of village boundary is different for each community and the context or Environment of Culture may not be restricted to the residential areas, streets, and open spaces of the community. A thorough understanding of the larger context beyond the village boundary is required depending on the traditional customary laws of each community.

- The questions on history and changes to the Environment (residences, streets, and open farmland) led to explanation of traditional house design.
- A survey of the number of family units and basic profile is enough to satisfy the criteria of sample selection for the house study.
- Data collection template 3 for the house study seemed thorough and sketching the house plan on paper was helpful in documenting the house as observed by the participant. This was done to test the line of inquiry and not for data collection.
- The questions that were asked regarding the house as an individual unit provided responses that tied back to the factors that affected the village. This re-assures the importance of studying the extent of the village as understood by the community as the Environment in which the community interacts.

In summary, this pilot showed that the data collection needed to be conducted in a certain sequence in which the non-participatory observations and data collection methods facilitated the interviews and focus group discussions. This ensured that the discussion was clear and referable to both the researcher and the participant. The templates were refined to accommodate the observations of the pilot study.

Template 1: Focus Group Discussion Questions

The focus group discussion provided the data required for the cultural mapping of the village. The list of questions in template 1 in the appendix guided the focus group discussion. The questions were intended to establish the historical context of the village as remembered and visualised by the eldest living members of the village, and to confirm the data collected through the transect walk prior to the focus group discussion.

The main aim of the questions was to establish the changes that the village has been through, how the changes have affected the community and the way the community has adapted to the changes. The questions framed the perception the community has of traditional and cultural architecture, which facilitated understanding of the value system of the culture of the community. The questions were divided into four sections as follows:

Background

The first section of the template focussed on the history and background of the village. The interview started with questions pertaining to the history of the village and community such as migration and the reason for choosing the location to settle and build the foundation of the village. These questions aided in defining the historical context of the village and indicated a few outstanding factors that were already present in the village when it was established.

Factors that Influence the Village

As previously stated in Section 3.1.2, the contextualist-pragmatist approach includes factors that create a distinct cultural ecology and influence the existence and growth of a settlement as significant elements for effective cultural mapping. As shown in Table 3-1, the cultural ecology of a village includes: transport networks and commutation; accessibility; connectivity and presence of facilities and amenities; presence of a social structure and a resourceful nature, and the history of the village environment.

In the third section of the template, factors that influence the village include the past and present environment of the village. The questions cover factors including accessibility and connectivity

to health care, education, medical facilities, changing livelihood options and employment, climate change, changing demographic and changing political influences, interactions with communities of other ethnicities, definitive social and religious norms, and natural resources.

Traditional House

In the third section of the template, the questions are about the design of the traditional house of the community as recalled by the elders of the village, as a house is one of the first physical and tangible elements established by a community. It has been observed that there is a decided and socially accepted way of building a house with a few differing design elements (Rapoport, 1969), however, the basic understanding and use of a shelter is specific to the cultural ecology (Frake, 1962). Hence, for understanding the influence of the natural existing environment on the built environment and the community, it is necessary to know what the socially accepted version of a house is, which is the traditional house of the community.

The design is defined in terms of indoor spaces and outdoor spaces, accessibility and circulation, private spaces and public spaces, function-based layout of the spaces, sacred and profane spaces, selection and use of materials, and construction. To develop this definition the participants were asked to illustrate the design of the house on a piece of paper. In some cases, a traditional house may exist in the village, which simplifies the data collection.

The Village Within a Larger Context

The questions in the final section of the template contextualise the village with respect to nearby villages or towns. The factors that influence the village vary from case to case depending on the surrounding context of the village, which affect the evolution and rate of growth of the village. This leads to different levels and different manifestations of cultural assimilation. It is determined by the relations and interactions the case village has with their neighbouring settlements and settlement clusters leading to completely different cultural evolution and the cultural assimilation (Steward, 1972). The questions asked about the degree of cultural evolution from the traditional way of life as recalled by the participants. The degree of cultural evolution and cultural assimilation is indicated through the changes that have taken place in the village.

Template 2: Questionnaire/Survey

The questionnaire in template 2 of the appendix relates to the demographic distribution of the village facilitating household selection based on the criteria stated in the Section 3.2.2. The questionnaire is designed in stages to gather as much demographic data as possible to understand the cultural ecology of a household.

The questionnaire was divided into four parts. Parts A, B and C focussed on the general details of the household and Part D focussed on individual household members. The information was divided in a way that allowed calculation of the case selection based on the house type, demographics, and material/possession information. Though initially designed to aid in case selection of the household cases, the information collected in Part D aided in visualising the intricacies of the household that can determine the way a house is designed and used by the household members.

Part A: General House Information

The location of the house with respect to other houses in the vicinity and the wider village, orientation of the house, plot topography and soil type were considered relevant to understand the Environment of the Household. These details gave house type information. This aided in understanding the context of the household during the observation and analysis stages of the research.

Part B: General Household Profile

Part B collected demographic information including number of household members, age and gender since these factors influence the requirements of a family in terms of living space. The number of members in the family may not determine the size or define a ratio that is proportional in terms of space per person, but this difference between two families results in how economically or lavishly a person may use the space and objects around them in a house. In other words, two families of four people will have different living requirements based on the ages and genders of the family members. Additionally, the interrelationship among family members can influence the layout of the spaces within a house (Alitajer & Molavi Nojoumi, 2016; Mustafa et al., 2010; Sadoughianzadeh, 2013). A family member's relationship to the head of the family along with the age group may determine the accessibility to spaces for the elderly parents or visitors to the house. In some cultures that have segregated spaces for males and females, the circulation around spaces is designed to promote the distinction of spaces.

The average income indicated the degree of affluence of the household such as their ability to go on vacation or make unhindered lifestyle choices. The household's access to education, healthcare, and basic amenities such as water and electricity were also indicators of affluence. Different social groups within the same community may practice religion differently and as a result, the space for practicing their religion may be segregated from or combined with the rest of the house. As some globally recognised religions have specific designs for their religious space within their house, some local religions may also have the similar traditions and customs of segregating a space dedicated to religious practices. Some cultures believe house gods look over the house and its members and this can be reflected in house design.

The questionnaire also asked whether the residents had previously belonged to another village or settlement. This was the case when a person relocates for their partner or spouse but may also be due to establishment of a local school or institution that provides job opportunities for the community.

Part C: Material and Possession Information

Part C asked about material possessions. Combined with Part B it allowed the researcher to calculate the income/spending group of the household. and the relevance of the questions asked is explained by a concept in sociology called materialism. It theorises that the materials around an individual reflect an individual's socio-economic status (Karabati & Cemalcilar, 2010). The kind of exposure that an individual's choices are determined by where one grew up, played, studied or worked (Dittmar, 1994). It is observed that along with the physical dimensions of a house, the furniture and other materials of the household and the interactions within the space, by changing the space in form and essence. The nature of the possessions also indicates the social perspective of the household as one of the units that make up the generic societal opinion of what is acceptable or recommended in the community (Rapoport, 1969). Possession of

domestic animals as pets or farm animals also change the way the household is socially perceived by the community.

According to Barker (1968) an individual's behaviour patterns are modified and adapted according to the environment around them, and the kind of functions and activities it provides. Villages mostly depend on agriculture and thus storage spaces for tools and agricultural produce are typically required by the household. Presence of an additional room or shed that may or may not be detached from the house indicates that the household has gone through changes in their lifestyle. The description of the exterior spaces is also an indicator the kind of interactions that the household engages in with their neighbours or the kind of outdoor activities that they might enjoy. The flora and fauna within their house and boundary environment also add to the description of the exterior spaces that are useful during the analysis stage.

Part D: Individual Specific Information

The questions in this part of the questionnaire were directed to each individual member of the household. The relation to the head of the family, gender and age group indicates the kind of spaces that they might require (Salvendy, 2012; Wilson, 2000). In the case of no pre-existing design elements for a particular family member, this will provide information relating to what and how the family adapts the space according to their needs.

The level of education and occupation of the individual indicates their exposure to external influences, i.e., the school or workplace, which can influence the ways they use the interior and exterior spaces of their house. The distance from their house to their school or place of work and the mode of transport they use to commute also indicates the influence at both the household and village level or context beyond the village.

Questions relating to hobbies and additional skills possessed by the individual were asked to further determine the use and improvisation of space. The hours spent indoors vs. outdoors add to the perception of space and time that is preferred or required by the individual for their daily tasks or interests. This added information indicates the flexibility of the usage of both interior and exterior spaces by the individual to accommodate more activities and interactions.

Template 3: Household Study Interview

Template 3 is a set of guiding questions for the household study interview designed to gather as much information about the house as possible. The questions were mainly aimed at understanding how lifestyle changes have influenced housing in rural communities. This follows the behaviour settings method of data collection mentioned in Section 3.1.4. The questions were based on changes that were made to the housing, decisions that led to the changes, factors that influenced the decisions, and other related side-effects of their choices. The questions were divided into sections based on:

History

Learning the history of the house helps in understanding the diachronic evolution of culture (Steward, 1972) through the evolution of the house or houses that the occupants have lived in. The questions asked in this section were historic in nature in the sense that they referred to the location, accommodation, and conditions of the houses as they were when built.

The House, As Built and Used by the Occupants

Using the stimulation of the projective floor plan technique in combination with the interview questions, the participants shared their perspective of the house/s they lived in, how they used them, and/or how they had modified them to suit their lifestyle as per the affluence. The various changes in the house and surroundings indicated the occupant specific criteria that was taken into consideration for modifying their spaces according to their requirement. These changes were studied alongside the changes in the number of occupants over time. This exercise either produced multiple house-plans with many changes to the house design or a single house plan with minimal changes depending on the length of stay of the family in the village. The daily routine of each household member based on the activity, place, time, and objects used was also collected.

In Comparison to the traditional house

With cultural evolution, cultural assimilation and modernisation, the current perception of what is socially acceptable tends to differ from the traditional perception of culture as recalled by the older generation of the village (Steward, 1972). The participants were asked to share their opinions on their current house and what they preferred in comparison to the traditional house design. In addition, the participants were asked if they have any plans for making changes to the house.

This section of the interview established the different and changing perceptions towards the traditional and contemporary rural houses. The traditional house as described in the Focus Group Discussion and the house/s that had been described in the previous section were used as references for this exercise.

Conclusion

In conclusion, the reiterations made to the templates based on the ethics application process and the pilot exercise refined the templates to ensure the answerability of the questions. The observations in the pilot also aided in understanding the scheduling of the data collection according to scale and objective of the data collection method. The next section discusses the scheduling of the tasks according to the methods and techniques, as well as the scale and type of data to be collected.

3.2.4. Phases

Based on the pilot exercise, the data collection process was divided into two phases for the corresponding scales of the data collection area. Phase 1 corresponded to cultural mapping method to conduct the contextual study of the villages, while Phase 2 corresponded to the household study of the villages. As that each village is unique, it was necessary to understand each village and each house, individually to respond to each village's housing needs, which is not within the given scope of this PhD. However, this research method is adaptable to villages in other regions. This section briefly mentions the methods and techniques employed according to the phase and scale of the data collection.

Other reasons for dividing the data collection into phases based on scale of the data collection are:

- The data and assumptions made in the previous village are expected to be carried over to the next village, however, the assumptions are to be made based on the cultural mapping method and not the observations made in the household study.
- It was also expected that the cultural mapping of the first village will not be as effective as it will be the first run added to a degree of nervousness on the part of the researcher. This could cause some gaps in the data collected in the previous village as compared to the next. Returning to the village will provide the researcher with an opportunity to fill in the gaps formed in the first run of the method in the villages.
- The gap between Phase 1 and Phase 2 allows the primary data from the questionnaire to be extracted to facilitate the household selection necessary for Household interview in Phase 2.

It was in the interest of the research that the cultural mapping of the villages is conducted in a single visit to the villages before returning to conduct the second phase of the data collection which is the household study. Figure 3-8 is indicative of the scale/phase-wise process of data collection methods.

Figure 3-8 Returning to the villages for Phase 2.

Figure 3-9 shows the two methods used and the techniques employed for data collection. The use of these methods in the proposed sequence provided a systematic way of collecting and documenting the data. Having the participatory techniques after the non-participatory, ensured an in-depth discussion with the participants during the interviews, focus group discussions and the projective floor plan technique. The answers that they provided during the participatory techniques were relatable and referenceable, equipping the researcher with follow-up questions and probes as required for better information extraction from the participants.

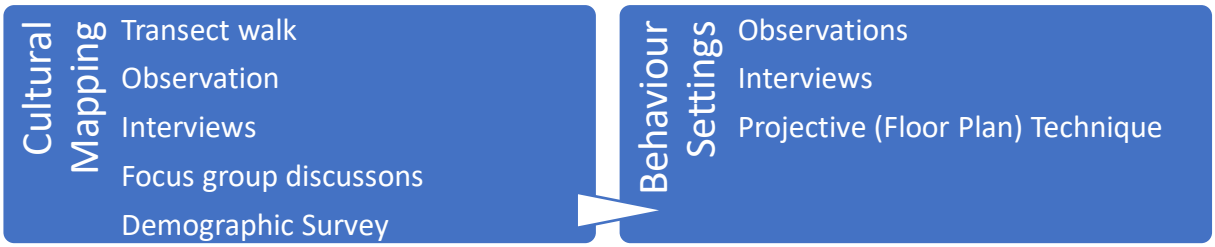


Figure 3-9 Methods and techniques

The composite methods involved sketching, photography, participatory observations depending on the consent of the household, interviews, and a projective floor plan technique. The participatory interviews incorporated with a projective (floor plan) technique enabled participants to describe their house and the way they used and designed the spaces. An example of the questions asked are in Template 3.

3.3. Conducting the Case Study: Data Collection Process

The data collection process was designed to facilitate systematic data collection based on the scales, methods, techniques and intended outputs of the research. The methods and techniques

corresponding to the village scale and household scale were divided into two phases and their foci defined for each phase. This section of the chapter elaborates on the actual procedure and data collection conducted in the field.

3.3.1. Data Collection- Expectation vs. Reality

The field study was conducted over 12 weeks. There were variables such as inaccurate data from unreliable sources, accessibility and connectivity to rural and remote areas, communication gaps and finding the right people for the right task, weather, and its consequent effect on the roads to the villages along with socio-cultural events that could neither be avoided or postponed, just like the weather. All of these played a part in causing delays that led to adjusting the original plan set out during the planning stage of the research.

Village Selection

It was difficult to select the case study villages before arriving in Assam. Since the village selection required diversity, the four villages had to belong to different ethnic groups. Though non-government websites have data on the population and demographics such as gender, literacy rate, and employment rate, these sources were not reliable. It was also difficult to obtain geographic data on the villages. Google maps did not have accurate location data or names for the villages. The data on the distance of a village from the nearest town was inaccurate as the point from which the distance is measured is the edge of the town. This led to having to reselect villages after arriving in Assam.

Accessibility and Connectivity

Most of the villages that were close to the town were either highly populated or developing into a multicultural community due to the proximity to urbanisation. And those that were of the desired population size with lower degree of urbanisation, were inaccessible due to poor road quality. In the case of the villages selected near Hamren, according to the regulations, to establish a town committee a certain population is required to reside within the town and the main town itself has quite a low population, the town committee decided to include villages that were far off and inaccessible through road which resulted to almost 10kmsq town committee area with a population of 8747 (indikosh, 2018). This added to the difficulty in selecting village cases near Hamren.

Communication Gap

All communities spoke in their own language, which is Karbi, Kuki, Jaintia and Dimasa. However, in the case of Kuki, the residents of the village either knew Hindi or Nagamese, and in the case of Dimasa, the residents spoke either Haflong Hindi or Assamese which simplified the communication. In the case of Karbi, being a native Karbi, the researcher could communicate with them and a translator volunteered to help with more complicated aspects. The residents of the Jaintia village knew a little of the Karbi language and the head man allowed a member of the community to sit in on the interviews and translate. In the case of the interviews, the duration was longer than anticipated as the same question and answer had to be asked in two different languages. Other than the language barrier, there was also the gap in understanding what the research was about, which led some of the participants and volunteers providing unnecessary and irrelevant information. As a consequence, several trips were made to locations that were culturally and historically significant yet irrelevant to the research.

Weather and Socio-cultural Events

Another aspect that impacted the research was that the monsoon season had not completely ceased though the worst of it had passed. Due to the rains in the region, there were more potholes and the roads were muddy in Karbi Anglong and West Karbi Anglong. In the case of Dima Hasao, the rains had loosened the earth causing landslides on the National Highway. Further, October until late December was also the harvest period for the communities in all the three districts which kept the people quite busy. After the harvest period, the villages that were still yet to complete the data collection were celebrating the harvest which left them quite incapable of participating unless they were informed ahead of time.

Further, delays were caused because of the Christmas and New year holidays and the elections that were taking place all over the country at the time of the research. The elections were a problem because there were fears of hostility the consequence being it was thought to be unsafe to collect data as the question could have been misinterpreted as being related to the local elections.

3.3.2. Data Documentation

The collected data was synthesised into satellite maps and digitized plans using AutoCAD and Photoshop, with figure ground plans and colour-coded indicators, for cultural resources, aspects, buildings, historical locations or monuments, land-use patterns etc. Table 3-3 shows the tools and techniques that were used for data collection and synthesis.

Table 3-3Manual tools and techniques of data documentation

MANUAL DATA COLLECTION TOOLS	MANUAL DATA VISUALIZATION TOOLS
Non-intrusive tools • Observation • Notes • Sketches • Photographs • Lists • Inventory forms Intrusive tools • Guided Surveys • Interviews Archival Materials • Historical photographs • Documents • Publications • Artefacts	Narratives • Reports • Descriptive Writings • Transcripts of Oral Interviews Pictorial representations • Sketches • Illustrations • Photo essays / Collages Graphic Representations • Diagrams • Statistical Diagrams • Tables • Timelines • Mind Maps • Geographical maps • Plans using AutoCAD and Photoshop

Interviews and observations were the primary modes of data collection, while satellite maps, plans, sketches, and photographs provided context to the collected data. Template 2 was used to gather demographic data on the villages concerned. The semi-structured guiding questions as shown in Template 1 and Template 3 in the appendix are a sample of the questions that were asked and were used as guides for the interviews that was discursive in nature along with the research questions that they were meant to respond to.

Data was recorded in the form of audio or video recordings where needed, while notes, sketches and photographs were also used. Survey forms were maintained in the form of hardcopy for ease, which was later be photographed to ensure a softcopy back-up in case the hardcopies were lost or damaged.

3.4. Data Synthesis

The data were sorted in NVivo according to the collection method and type, which in this case were: maps, images and noted observations from the transect walk; interview transcripts from the focus group discussions and household interviews; data sheets from the questionnaire survey; plans of the traditional house from the focus group discussion; and the house plans obtained from the household interviews.

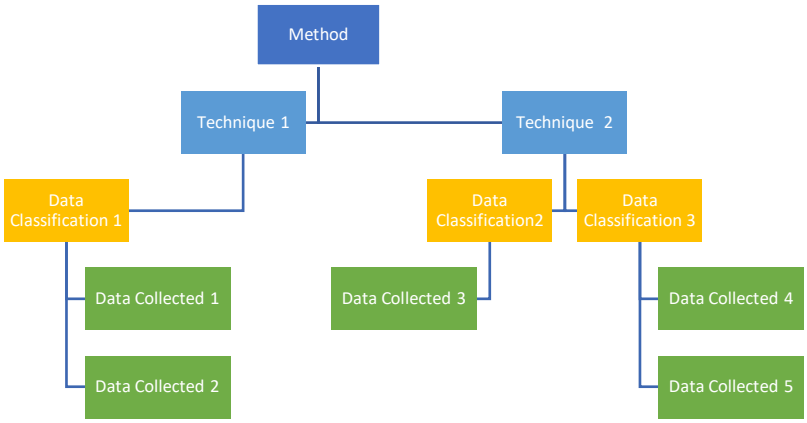


Figure 3-10 Example of the hierarchy map of data collection

Figure 3-10 is a generic example of a hierarchy chart to show the classification of data according to each phase and methods, techniques, data types and description based on the dimensions that the *observations* and *evidence* having been collected. The classification and categorisation of data facilitates in coding the data according to themes which prepares the data for analysis. The following Section 3.4.1 and RQ 1 illustrate the data classification and categorisation according to Phase 1: Cultural mapping and Phase 2: Behaviour settings respectively as discussed in.

3.4.1. Cultural Mapping

Cultural mapping, as described in 3.1.4 , is the mapping of cultural resources (Pillai, 2013) and this method has been extended along with following techniques to obtain the data that is required for the research. This method was used to gather the contextual material required to understand the village. As explained in Section 3.2.4., specific to the need of the research and according to the data collection schedule, the method started with a transect walk, followed by a focus group discussion, and concluded by a questionnaire survey.

Table 3-4 Phase 1: Data type and description

TECHNIQUE	DATA TYPE	DATA DESCRIPTION
Transect walk	Maps, photographs, and notes	Pathways, Built structures, Landscape: farms and forests, Resources and Points of cultural importance
Focus group discussion	Interview transcript, notes and sketches	History, Factors that influence the village, Changes in the ecology and An illustrated description of a traditional house
Questionnaire survey	Survey data sets	Type of house, General household profile, Material and possessions and Individual specific information such as: age, gender, education, employment, and income

Table 3-4 shows the techniques used for cultural mapping, the type of data collected and elements and resources that can be mapped. The transect walk collected data such as pathways, built structures, landscape, farms, forests, resources, and points of cultural importance. The focus group discussion was conducted based on themes of history, factors that influence the village, changes in the ecology and an illustrated description of a traditional house. The questionnaire survey collected data based on themes on the type of house the household resided in, general household profile, household information based on material and possession and an optional section regarding individual specific information. Households that completed the fourth section of the questionnaire survey were considered eligible for Phase 2: Behaviour settings, which is the household level data collection.

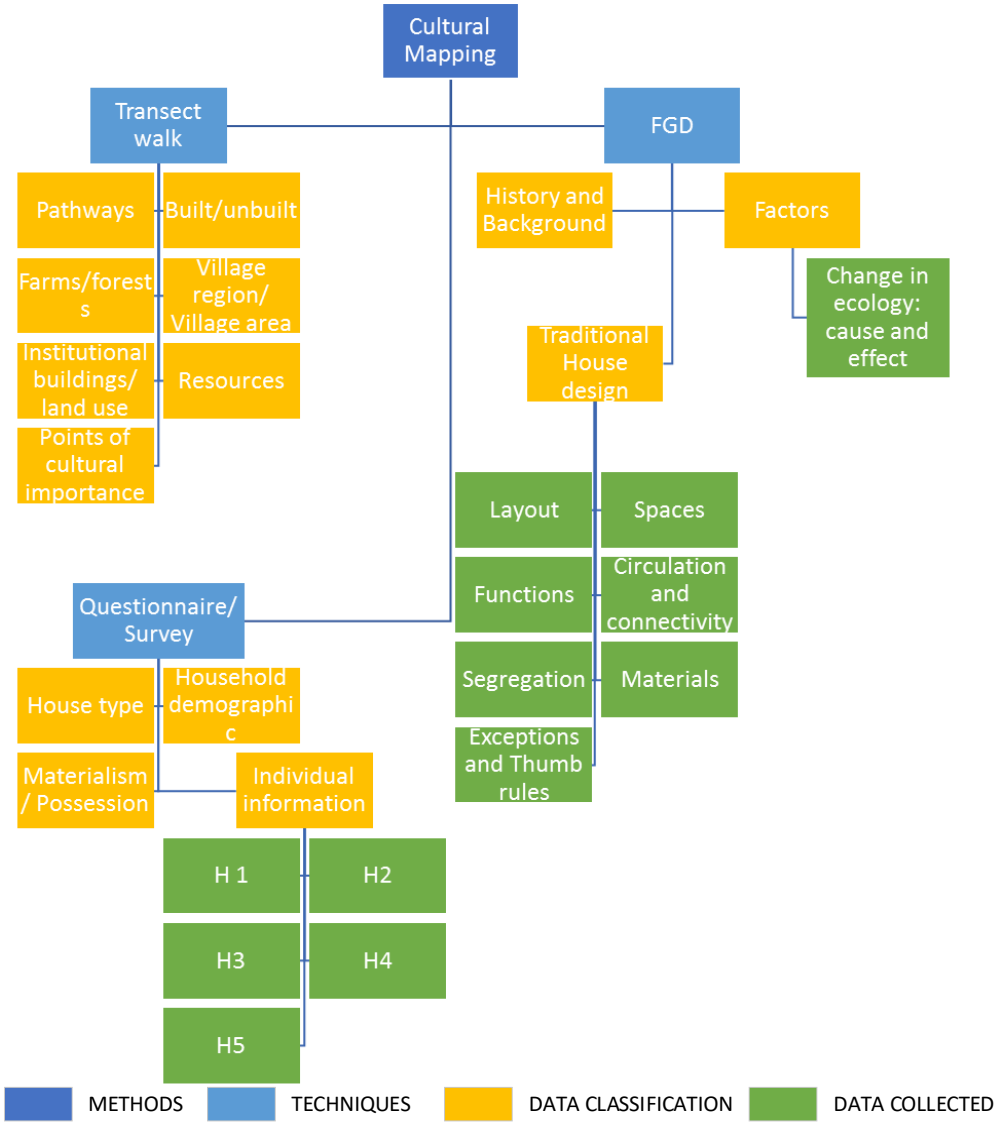


Figure 3-11 Hierarchy of data collection in Phase 1

The raw data from the data collection conducted for cultural mapping was imported into NVivo and classified according to the hypothetical hierarchal chart shown in Figure 3-11. The illustrated classification results in providing the following information:

- Contextual visualization: Environment, History, and background
- Factors in the ecology and the change observed over time.

- Traditional housing, architectural concepts, and design.
- The socio-economic pattern/distribution and composition of the village demographic.
- Household case selection.

The household case selection is explained in 3.2.2, the households that completed the section D of the questionnaire/ survey were considered eligible for the household selection. Thereafter, if the number of households were more than five, a scattered graph was plotted to select the household cases depending on the diversity of their position on the plot. The (x, y) values of the household were calculated based on the house type scale 'H' and affluence scale 'M'. The house type scale 'H' is simpler to calculate as it uses basic addition, while an equation 3-1 was used to calculate the affluence scale 'M'.

House Type Scale H:

The purpose of calculating the house type scale was to find out the eligible houses for the next phase of the data collection which is the semi-structured household interview. This information is gathered through the data collection Template 2, part A described in Section 3.2.3, the sample of the template 2 is in Appendix A. The calculation is based on whether the houses are traditional or contemporary or mixed. The house type scale was decided based on the type of house they owned and preferred, the construction materials used and preferred, and the number of rooms in their house. The materials were given different scores and their combination was also considered. Table 3-5 shows the scores given to arrive at the results for each household:

Table 3-5 House type scale

HOUSE TYPE SCALE	DESCRIPTION	SCORE
House type	Traditional score	0
	Mixed	0.5
	Contemporary	1
No. of rooms	Living room, Bedroom, Bathroom, Kitchen, Storeroom, and Dining room.	0.5
	Guest room, Worship room, Study, etc.	1
Material	Wood, Bamboo, Thatch. and Mud	0
	Wood, Bamboo, thatch, mud (along with either Tin, Steel, Concrete, Cement, Stone and other unnatural or non-local materials)	0.5
	Wood (along with either Tin, Steel, Concrete, Cement, Stone or other man-made or non-local material)	1
	Brick and mortar	1
	Steel	1
	Tin	1
	Concrete	1
	Cement or Stone	1

For calculating the score of the house, the house type was scored as '0', '0.5' and '1' for traditional, mixed, and contemporary type of houses, respectively. The room score was dependent on the type of rooms they had. Rooms such as the living room, bedroom, bathroom, kitchen, store, and dining room were scored as '0.5' as those are normally the kind of rooms that a house in a rural area would have. However, having a separate, guest room, worship room or a study room would be something of a luxury in a rural setting hence, those rooms were scored as '1'.

The construction material score differed based on combination. Since wood is a common material in either traditional or contemporary construction, the scoring varied from '0', '0.5' and '1' based on the presence of other local or non-local materials. Wood + local materials = 0, wood + local materials + non-local materials = 0.5 and Wood + non-local materials and

number other local materials = 1, and each of the non-local materials used were given a score of '1'.

This was done to score the houses based on the construction style and material allowing each house to be valued according to the score calculated. Once this score was calculated, the households were plotted along the x- axis of a graph that brought the research a step closer to finding the household cases.

Affluence Scale M:

Affluence is described as the state of having a great deal of money or wealth (Merriam-Webster, n.d.). This indicates the degree to which the household can spend on expenses such as education, travel or in this case a house renovation or construction. It is affected by the size of the family as much as it is affected by the gross income. The affluence of directly proportional to the money, material possessions and wealth, and inversely proportional to the size of the family. Hence, the affluence score of the household is decided based on the Equation 3-1 presented below:

$$M = \frac{I}{N} + \sum mx + \sum lx + t$$

Equation 3-1 Affluence equation

The affluence scale denoted by M was made was based on the data that was collected in the part B and C of the questionnaire/survey. It was calculated based on income score (I/N, where I is the annual gross income, and N is the number of people in a household), material possession score (mx, where 'm' is the score of the material possessed and 'x' is the number of the material possessed), livestock possession score (lx, where 'l' is the livestock score and 'x' is the number owned) and number of tools owned by the household (t, where 't' is the number of tools owned). The equation for calculating the affluence is as shown in Equation 1 below:

The material score of each item is based on the following criteria:

- Cost: How expensive is it?
- Life: What is the longevity of the item?
- Necessity: How necessary is the item to daily life?
- Luxury: Does the item have luxury value?
- Revenue: Does the item have potential for bringing revenue for the owner?
- Resale: Does the item have a resale value?
- Use: Is the item useful in any other part of the owner's life?
- Maintenance: How much does the owner have to spend in maintenance of the item?
- Dependence: Does the item lead the owner to be dependent on the item in daily life and activity?

A score was given out of 5 where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree. Where the answer was whether the item in question is expensive or not, 1 = very cheap, 2 = cheap, 3 = neutral 4 = costly and 5 = very costly. This system of scoring the items led to the score table as shown below in Table 3-6.

Table 3-6 Material score table

AFFLUENCE SCORE (M)	COMPUTER	MOBILE	VEHICLE	RADIO	FRIDGE	TV
Cost	4	3	5	1	2	2
Life	4	3	5	5	3	3
Necessity	3	5	4	1	2	2
Luxury	5	3	4	1	3	4
Revenue	4	2	5	1	1	1
Resale	3	1	5	2	3	3
Use	5	5	5	2	3	3
Maintenance	4	4	4	1	3	2
Dependency	4	4	4	1	3	2
Total	36	30	41	15	23	22
Average	4	3.3333	4.5556	1.67	2.556	2.444

It is observed that vehicles have the highest score followed by computers, mobiles, fridges, and TVs with Radio scoring the least. This indicates the importance of the material object based on the criteria listed on the first column. The score pattern and the final score are represented as graphs in the following Figure 3-12 and Figure 3-13:

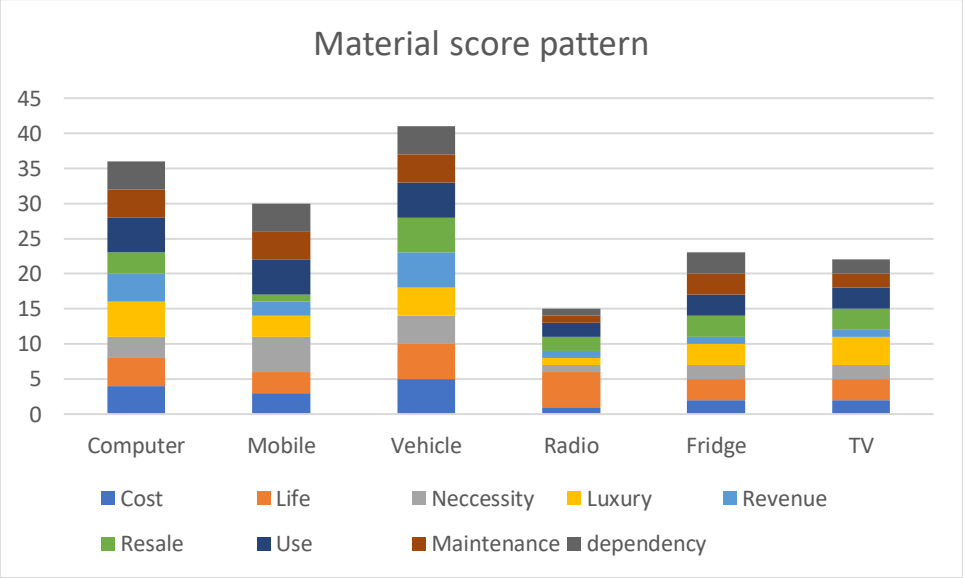


Figure 3-12 Material score pattern

Table 3-6 shows how each item is valued in the daily life of a household based on the criteria indicated by the colours on the bar and the thickness of the colours indicated the score of the item within the criteria. For instance, the scores between the fridge and Television are similar however, the thickness of the luxury criteria indicates that the television added more to the luxury of the household in comparison to the fridge, while the dependency on a fridge is more than a television as its role in daily life to preserve food.

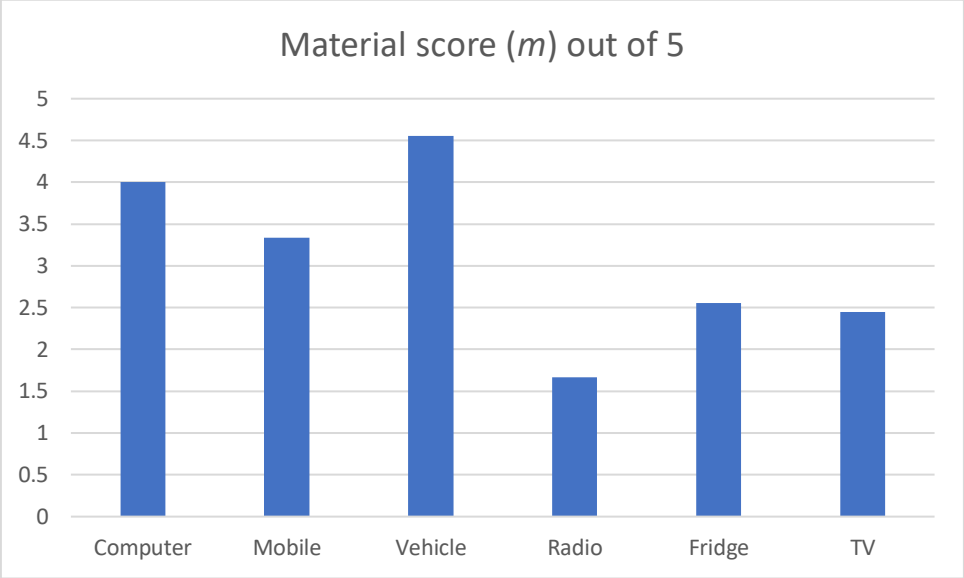


Figure 3-13 Material final score

Figure 3-13 shows the score of the items out of 5. Figure 3-12 and Figure 3-13, suggest that the least important item that a family could have is a radio, while the most important would be a vehicle. Similarly, the livestock score based on:

- Cost: How expensive is it?
- Profit: How much profit can be made with it in business?
- Life: What is the longevity of the item?
- Growth: How much does growth in numbers profit the household?
- Use: Is the item useful in any other part of the owner's life?
- Maintenance: How much does the owner have to spend in maintenance of the item?
- Dependence: Does the item lead the owner to be dependent on the item in daily life and activity?

Table 3-7 Livestock score table

LIVESTOCK SCORE (L)	COW	GOAT	CHICKEN	PIGS	DOVE
Cost	5	3	1	4	2
Profit	4	4	5	4	1
Life	4	4	4	4	4
Growth	3	4	5	5	2
Use	5	2	2	2	1
Maintenance	5	1	1	2	2
Total	26	18	18	21	12
Average	4.3	3	3	3.5	2

It is observed that the cows have the highest score followed by pigs. Goats and chickens score a tie and dove with the least. This indicates the importance of the livestock animal based on the criteria listed on the first column.

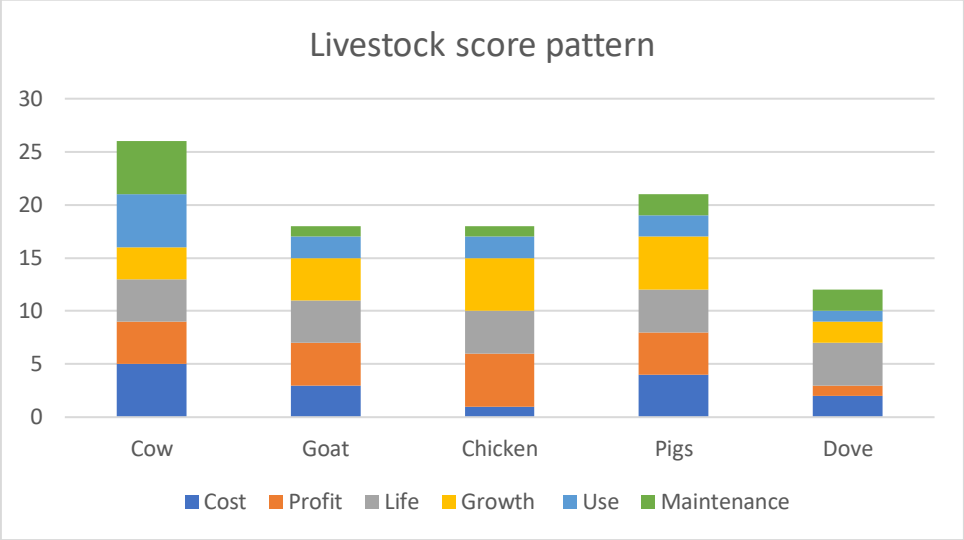


Figure 3-14 Livestock score pattern

Figure 3-14 shows the score pattern of the livestock items which indicate the criteria and value of the item within the criteria. Goats and chickens have the same total score of 18 however, the growth and profitability of chickens is greater, and the purchase cost is cheaper. The graph suggests that the most important livestock that a household could own is a Cow and the least important livestock is a Dove or birds other than a fowl.

Figure 3-15 Livestock final score

Figure 3-15 shows the score out of 5 for each type of livestock. Figure 3-14 and Figure 3-15 suggest that cows are the most important livestock and doves or birds other than fowl are the least important. The equal score of goat and chicken indicates its equal importance among the livestock, however, Figure 3-14 shows the differences in how the animals are valued.

Household Case Selection - Scale of M versus H

By combining the results from the house type graph and the affluence graph we arrive at scattered graphs, where the house type is plotted along the x-axis and affluence along the y-axis as shown in Figure 3-7 and explained in Section 3.2.2. It gives a scattered graph of the houses depending on their house type and affluence, and this way it becomes easier to visualise the information provided by the data and accordingly choose the five diverse cases for the next

part of the data collection, which is the household interviews. This exercise was conducted, and outcomes are presented in Chapter 5 showing the scattered graphs to aid in household case selection.

Data Mapping for Cultural Mapping

Classification and coding of raw data allows the researcher to visualize the context of the households in multi-dimensional view rather than in the planar form that the data was collected in based on the cases, methods, and data classification. Figure 3-16 shows the circumscribed data mapping from the cultural mapping of the data collection. The four quadrants represent the four village cases. The data can be visualized as a circumscribed layer of data based on the techniques used and divided into sections based on the type of data collected. The outer most circumscribed layer is the transect walk, the middle-circumscribed layer refers to the Focus group discussion divided into four sections as the data description and the inner most layer refers to the multiple questionnaire survey data sets collected.

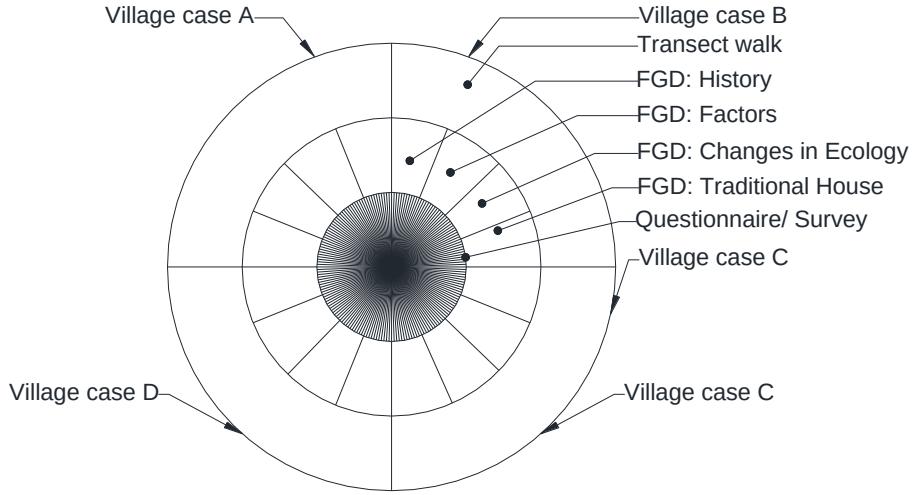


Figure 3-16 Circumscribed data mapping phase 1: Cultural mapping

It is represented in such a way to represent the sequence of the data collection and the sectional divisions. In this scale of analysis, the transect walk allows the research to visualise and map out the village as a composition of pathways, houses, trees, water bodies, open ground, vegetable patches and farmland, and so forth. The questions and topics covered in the focus group discussion reveal the perception of housing that is culturally and socially acceptable to a community; and indicate how the community adapts their housing according to the global context of development. The discussion gives an insight to the perception that the community has towards the global standards of housing and its feasibility in the village and allows the research to learn what kind of influences determine a liveable housing solution accepted by the community. In doing so, the analysis of the villages answers the following research questions in the village level.

RQ 1.How does the rural context of the house influence the housing design and construction practices? What is the causative context?

RQ 2.What are the main causes that influence the evolution of architecture and the trend of construction in the rural context within the cultural ecology?

RQ 3.What are the considerations to be made to develop a housing scheme that promotes better communication and implementation of the rural housing scheme?

3.4.2. Behaviour Settings

Behaviour settings, as described in Section 3.1.4, aid in understanding the behaviour due to changes in environment, which is also referred to as settings/s (Schoggen, 1989). This method has been modified to extract the central data which pertains to the household. Specific to the requirement of the research, the data is collected through a semi structured interview along with projective floor plan technique.

Table 3-8 Phase2: Data type and description

TECHNIQUE	DATA TYPE	DATA DESCRIPTION
Semi Structured interview	Interview transcripts notes and sketches.	History, Factors that influence the household, Changes in the ecology and Floor plan layouts of the house/s Space use and function by the inhabitants
Projective floor plan		

Table 3-8 shows the techniques used, the type of data collected and elements and resources that can be mapped using behaviour settings. The two techniques are used simultaneously to obtain the data in the form of interview transcripts and notes on the history, factors that influenced the household, changes in the ecology; and sketches of the floor plan layout of the house that illustrate the functional use of the space by the inhabitants.

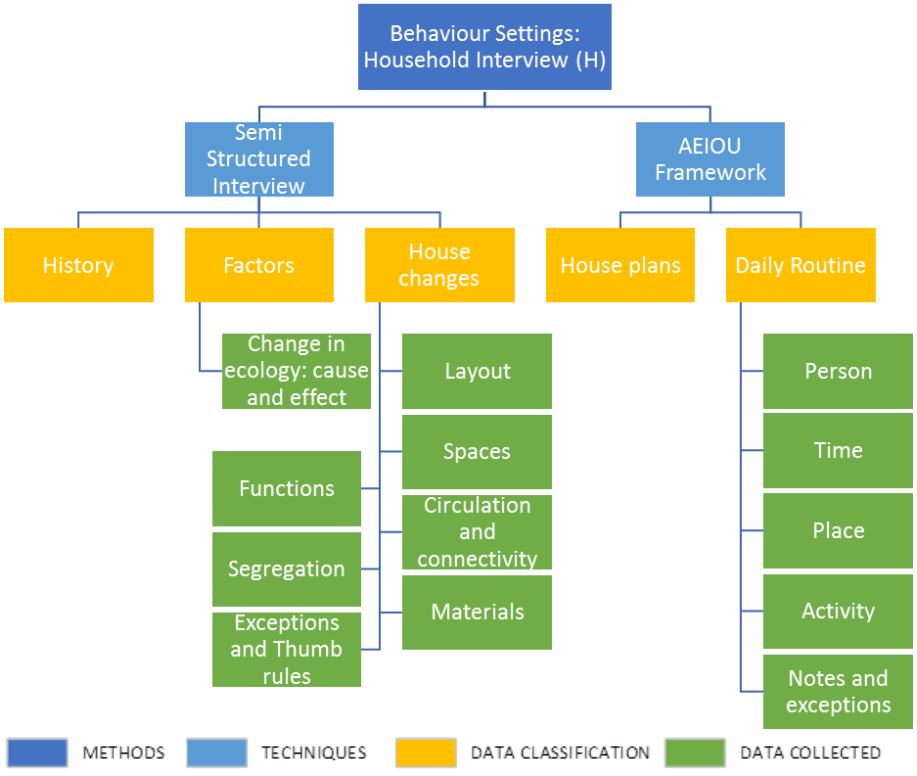


Figure 3-17 Hierarchy of data collection in Phase 2

The raw data collected for behaviour settings is imported into NVivo and classified according to the hypothetical hierarchal chart shown in Figure 3-17. The illustrated classification of results provides the following information:

- Contextual visualization: Environment, history, and background of the household

- Factors in the ecology and the change observed over time.
- Contemporary housing, changes from traditional architectural concepts and design specific to the village context
- Shared time, shared functions, shared spaces. What does the family do together? Degree and opportunity of communication? What is the kind of family structure among these houses?

Data Mapping for Behaviour Settings

Such classification and coding allow the researcher to visualize the households and the changes to the house design and layout in dimensional view. Figure 3-18 is a schematic representation of the circumscribed data mapping of the raw data collected from the behaviour settings of the data collection. The four quadrants represent the four village cases having five 'H*x*' tags radially placed on the outer side of the circle, with the exception of the quadrant with three 'H*x*' tags, where 'H' denotes house, 'while 'x' represents the house number according to the transect map. The 'H*x*' tags represent the households interviewed in Phase 2. The ones with five 'H*x*' tags represent the Kuki, Karbi and Dimasa village and the one with three 'H*x*' tags represents the Labang village. The next set of radially placed smaller circles represent the semi structured interview which was divided into three sections of History, Factors and House changes. Further inward, the 'H' tag represents the resultant generic description of a household that will be extracted from the data collection of Phase 2. The innermost sets of small circles in each quadrant represent the generic description of the houses based on the history and background, factors, and the generic design.

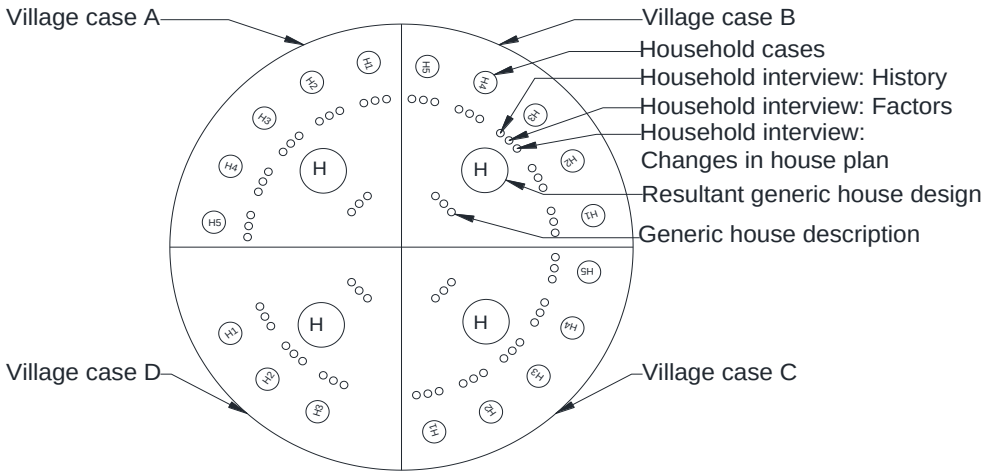


Figure 3-18 Circumscribed data mapping Phase 2: Behaviour settings

The cross analysis of the resultant descriptions established the similarities and differences among the cases. The similarities inform the physical contextualisation while the differences inform the social contextualisation.

In this scale of analysis, the questions from the semi structured interview of the households help in answering the similar questions answered by the village scale analysis, but in the household scale. The respondents in the interview help in understanding the unit household perspective of global housing standards and their feasibility and how that has resulted into the contemporary houses that are being built in the villages today. The changes to the houses in the form of demolition, construction and renovation, the research understands the influence of

global standards and the global context of development. The demonstration and explanation of the changes allows the research to grasp how these influences are affecting the perception of acceptable housing. In doing so, the analysis answers the following questions in the household level.

RQ 1.How does the rural context of the house influence the housing design and construction practices? What is the causative context? What is the effect?

RQ 2.What are the main causes that influence the evolution of architecture and the trend of construction in the rural context within the cultural ecology?

RQ 3.What are the considerations to be made to develop a housing scheme that promotes better communication and implementation of the rural housing scheme?

Combined Data Mapping

As shown in Figure 3-16 and Figure 3-18, data from each village is mapped according to the techniques and data type, that is, the data from transect walk, FGD, Questionnaire survey, the house selection, the household interview, and projective floorplan. The data mapping figures are combined to produce the resultant circumscribed layers as shown in Figure 3-19.

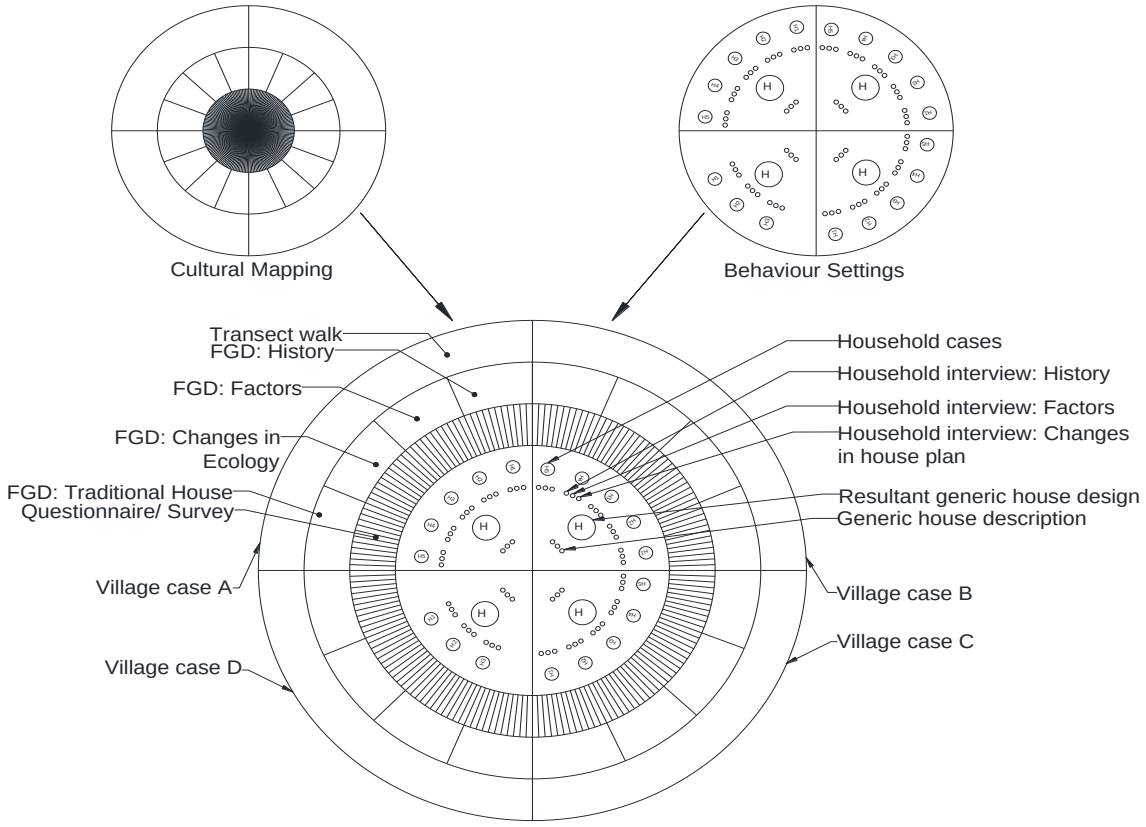


Figure 3-19 Resultant circumscribed data collection framework from cultural mapping and behaviour settings

This figure helped in understanding the data that had been mapped and to which parts did they correspond. It helped the researcher visualise how the data was working inwards to the solution that corresponded to the peripheral and contextual data. Collectively, the analysis helps in answering the research questions brings the research closer to answering the key research question which is:

What are the recommendations to inform a user-oriented bottom-up approach for a rural housing scheme?

3.5. Data Analysis and Evaluation

As previously stated in 3.1.4, NVivo is used as an aid to conduct the data analysis, through both content and cross case analysis. Table 3-9 shows the data collection methods, type of raw data being collected and analysed in NVivo, the case classification to simplify the type of cases involved in the research, and the primary themes based on which the references are coded into nodes.

Table 3-9 Content analysis

DATA COLLECTION TECHNIQUES	RAW DATA	CASE CLASSIFICATION	THEMES
Transect Walk Focus group discussion. Questionnaire survey Household Interview	Interview transcriptions and annotations Sketches Maps Images Questionnaire/survey	Village Household Individual	Context Causality Design

Figure 3-20 is the schematic representation of the analysis of the raw data into expected outcomes which is the similarities and differences that will inform the guidelines that ensure effective communication and implementation of rural housing. The following sections schematically illustrate the conversion of raw data into textual data for content analysis. The textual data is coded into themes to understand the causal relationships in the cases. The results are cross case analysed by running queries in NVivo to arrive at similarities and difference among the cases.

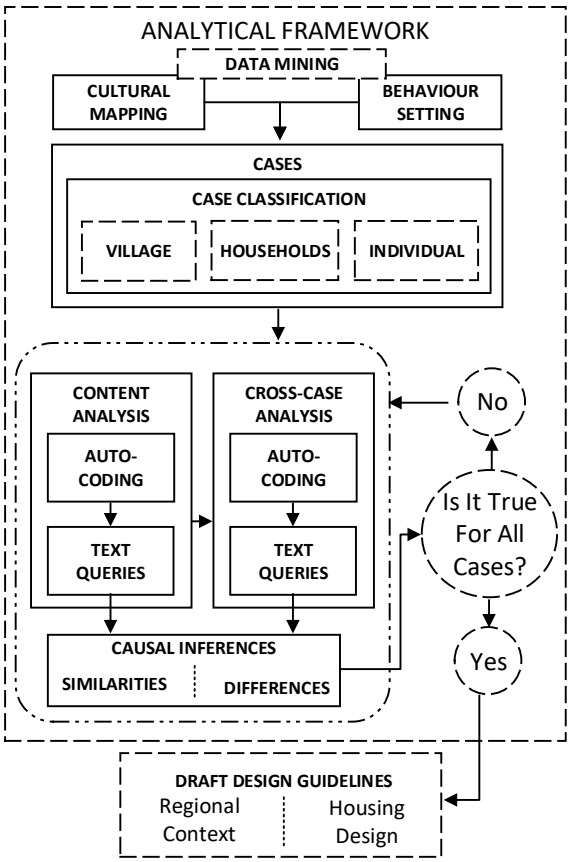


Figure 3-20 Analytical framework

3.5.1. NVivo qualitative software analysis

As previously stated in Chapter 3, to conduct a successful case study research the cases need to be descriptively analysed. Content analysis with the aid of NVivo was used to analyse each case individually. Figure 3-21 is the schematic representation of data mining which is a necessary step to content analysis of case studies (Stake, 1995a). The raw data is first divided into case classifications depending on the unit of analysis which is village, household and individual. In NVivo, the raw data is turned into textual data or references and are divided according to the case and case classification. The data from the transect walk and focus group discussion were classified under village since the data is about the village in general. The data from parts A, B and C of the questionnaire/survey and the household interview were classified under Household classification while the data from Part D of the questionnaire/survey was classified under Individual.

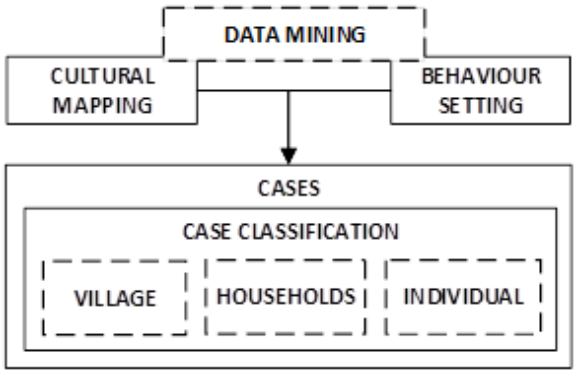


Figure 3-21 Schematic data mapping and simultaneous content analysis

The references are then further coded into themes and nodes based on data type and relevance as shown in Figure 3-25 (Merriam, 2009a; Smith, 1978; Stake, 1995a; Yin, 1994a). This step is conducted by using the auto-code feature in the software and also through double checking the references in the text data. This process is repeated for within-case and cross-case analysis to inferences regarding the causality in the data.

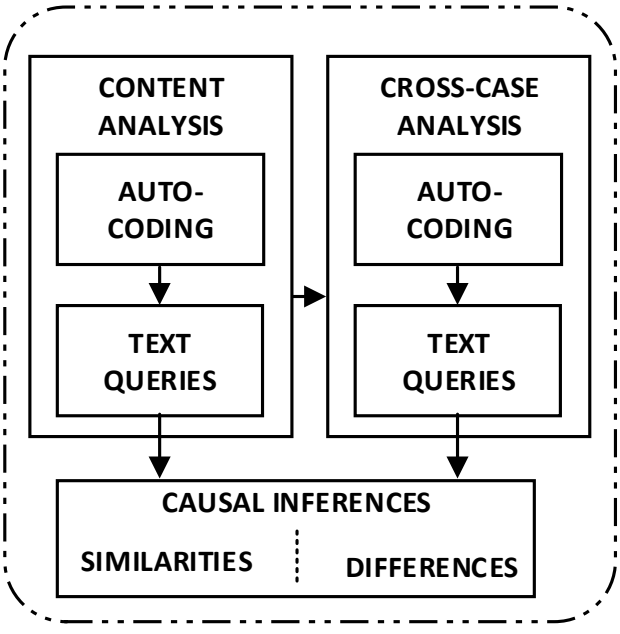


Figure 3-22 Schematic of the NVivo qualitative software analysis

Figure 3-23 is a hypothetical representation of a text search query in NVivo that can be visualised as a word tree to indicate the links in the content being analysed within a case or across cases (Adu, 2016). The same text search query can also be visualised as a word cloud based on the frequency of the words in the content being analysed within a case or across cases as shown in Figure 3-24 (Adu, 2016).

Figure 3-23 Word tree on NVivo

Figure 3-24 Word cloud on NVivo

The visualisations aid in analysis by observing the links being formed among words in the textual data which in turn indicates links across cases depending on the cases that the textual data is from. NVivo allows these observations to be saved and noted down as memos and annotations which later aid in presenting the analysis. Based on the coding and analysis conducted through the query results, the observations are either noted down as a similarity or a difference among the case results.

3.5.2. AEIOU Analysis

As mentioned in the initial introduction of the techniques adopted for data collection in the household level in Section 3.1.4, the AEIOU framework is a used to gather the data related to use of spaces in the house according to the occupants. This framework is further elaborated to analyse the data based on the activity, environment, objects, and users in a specific room. The

data collected from the plans sketched through the projective floorplan technique provides the additional data which will enhance the information gathered in the AEIOU framework.

Table 3-10 AEIOU framework for analysis

ROOM	ACTIVITY/ FUNCTION	ENVIRONMENT/ SPACE	OBJECTS/FURNITURE	USER / FREQUENCY		
The room corresponding to the plan from the projective floorplan technique	The various uses of the space or room along with the intended use.	The kind of texture of materials, public vs private, open vs enclosed, fixed vs flexible etc	The furniture and objects kept in the room	Occupant access, at what times and how often occupant	non occupant belonging to the same village case	non occupant user not belonging to the village case

Table 3-10 is the table of headings under which the data is classified and analysed to understand the use and function of a space. The comparison of the use and function of the various rooms in the house used by the different occupants and guests of the house indicates the value and perception of the space. This provides a complete picture of the functionality of the layouts that is collected through the household data collection.

3.5.3. Analytic Induction

The results obtained from the NVivo qualitative software analysis and AEIOU framework provide a list of similarities and dissimilarities of the cases within the village cases as well as across. This aid in framing the draft design guidelines which is an intended outcome of the pragmatic research. However, in keeping with the aims and objectives of the research, the results are qualitatively evaluated to test out the causal inferences and produce a theory that fits all cases using analytic induction (Vidich & Lyman, 2000; Znaniecki & Bierstedt, 1969).The process of developing a generalised hypothesis that is true for all cases results in a draft of the design guidelines.

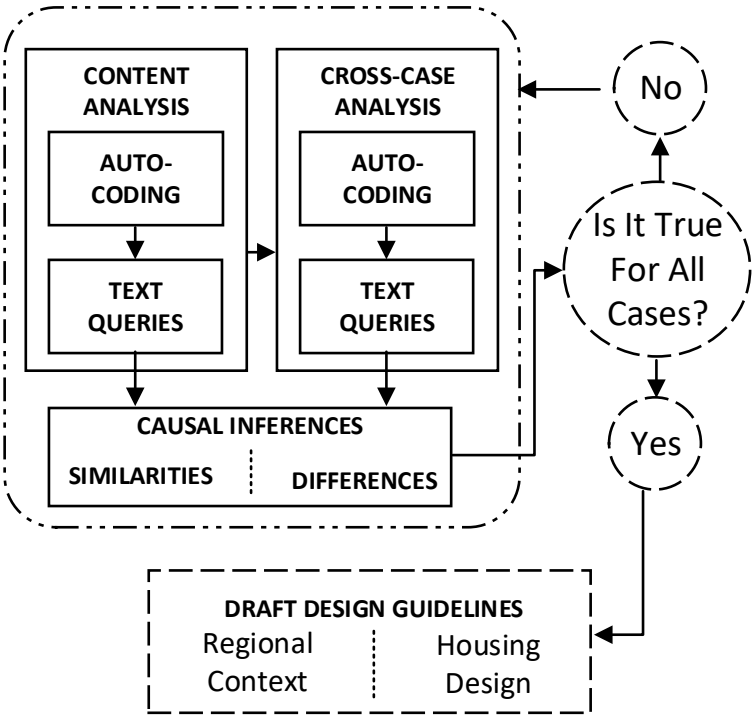


Figure 3-25 Schematic of the NVivo qualitative software analysis and analytic induction

The cross analysis supported by the causal explanations indicate the factors in the regional context that are either similar or different due to the environment, community, and interactions. Figure 3-26 is a hypothetical visualisation of the references and query results being coded into separate boxes of similarities and differences.

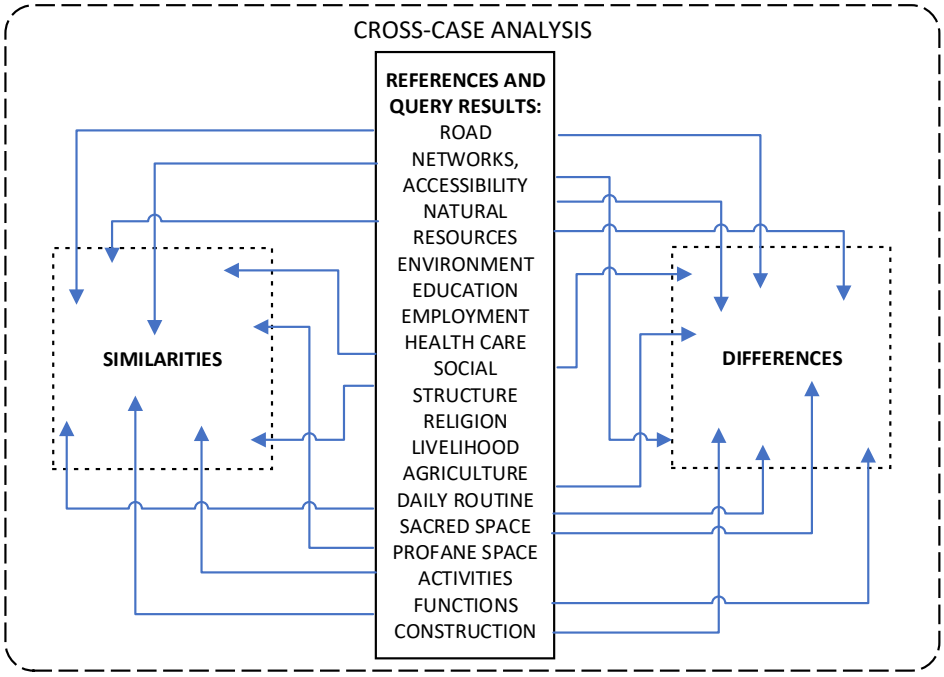


Figure 3-26 Cross case analysis into similarities and differences

Upon further analysis and refinement, the similarities and differences across the cases are identified. The results are generalised based on the similarities and the differences identified from the cross-case analysis. While the regional context is a generalised as a similarity, the differences in the village and household cases aid in highlighting the points where it requires deeper analysis of the data to understand the factors and try generalising the results based on this. Figure 3-27 represents a cultural framework being developed representing the similarities and differences of the results based on the cross-case analysis.

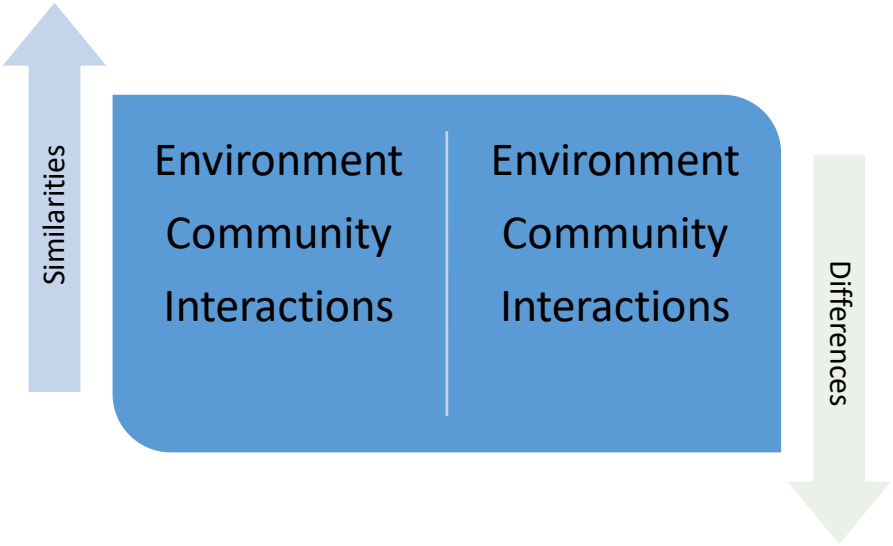


Figure 3-27 Cultural Framework

This complete analysis process aided in answering the sub research question, as stated in Section 1.5, in a general perspective of villages in the region. The careful attention to the environment specific similarities and socio-culture specific differences aids in arriving at a pragmatic solution for the research, which is a framework that will inform the policy makers as well as the builders and inhabitants of contextualised housing. The next section discusses the evaluation of the results from the analysis to ensure the reliability of the answer to the key research question:

What are the recommendations to inform a user-oriented bottom-up approach for a rural housing scheme?

In conclusion, this method of analysis and evaluation not only offers validation to the results of the research, but it also validates the methodology adopted for the research. In doing so, the research is given the opportunity to test out the hypotheses of the research methodology so that it can be replicated and generalised for future research.

3.6. Expected Output

As stated, the various methods of the research are divided into distinct stages depending on the focus of the methods. Table 3-11 describes the methods used of the data collection, analysis, and evaluation. Cultural mapping, the method for village case, and behaviour settings, the method for household case, are separated into two distinct data collection methods as the focus and scale of the cases are different. The outputs listed down in the table demonstrated the viability of the various techniques used to facilitate the methods for separate and distinct outcomes from the data collection exercises. The outcomes of the data collection and analysis aided in formulating a cultural framework for rural housing in Hills of Assam.

Table 3-11 Methodology: methods and techniques

METHODS	TECHNIQUES	OUTPUT
Cultural mapping	Transect walk	• Primary non-participatory observations and assumptions of the village. • Cartographic mapping environment, community, and interactions.
	Focus group discussion	• Historical mapping, • correlation and validation of the data collection from the previous technique, • additional data collection through participatory observation.
	Questionnaire/survey	• Demographic profile, • Socio-economic context of the village, • Household sample set.
Behaviour setting	Non- participatory Observation.	• Spatial observation • Photographs, sketches, and other visual representations
	Participatory interview	• Household mapping • Cultural ecology of the household
	Projective floor plan technique	• Schematic drawing of the house • Relation among, spaces and rooms, family members and activities within the cultural ecology of the household • Understanding the architecture of each household as corresponding to the socio-economic background of the household
NVivo qualitative software analysis	Content analysis	• In-depth understanding of the individual cases. • Traditional house as the exceptional case
	Cross case analysis	• The type and degree of influence of context on the cultural ecologies of the village as well as the households. • The cultural nuances of architectural design of the case study households • The relations among environment, community, and interactions across cases • Understanding of the regional context of the villages *Components of the cultural framework
AEIOU framework	AEIOU analysis	• The use and functionality of a space/room. • The evolution of a house layout according to the changing needs of the occupants. • The cultural nuances of architectural design of the case study households *Components of the cultural framework.
Analytic induction	Causality	• Understanding of Cultural ecology. • The relations among environment, community, and interactions within the case • Relation among individuals and households in the community • Suggestions for iterations of the existing methodology * Draft of the cultural framework

The methods described in the chapter allows the research to arrive at the expected outcome which is a framework that can be used by external stakeholders in the construction industry to provide culturally and socially acceptable housing options. It adds rigour to the research in terms of replicability and generalization of the results. Based on the contextualist-pragmatic approach, the outcome of the data collection, analysis and evaluation process requires to be a framework that is practically applicable in the field. The framework needs to be a set of clear guidelines that navigates the approach to rural housing by any stakeholder within the rural

context in Assam. Completing the data analysis of the data collected and evaluation of the results lead to answering the research questions posed by the research in Section 1.5.

For this, the analyses of the cultural ecologies of the cases will have to be characterised according to results that address the context and the design of rural housing. The result of which is a set of guidelines that address the difference and similarity in the context as well as the house design itself. Figure 3-28 indicates the rural housing design guidelines which will be a framework as the resulted outcome of the research.

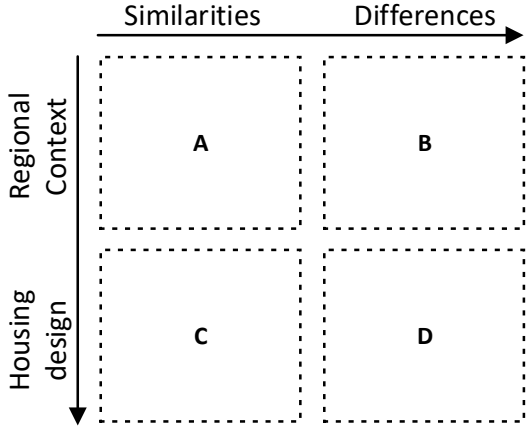


Figure 3-28 Cultural Framework: Rural housing design guidelines

From the above-mentioned methods and techniques will provide:

- The understanding of the scope of the context to consider understanding the culture of a community, which is the Environment as an aspect of Cultural Ecology.
- The understanding of the extended context which is outside the physical boundaries of the village and the influence that it can have on the community and the Cultural Ecology of the village.
- The understanding of the factors that influence the decisions of the community and each family unit of the village.
- The understanding of the inter-connected relation and relevance of culture of a community to architecture of housing
- The understanding of architectural designs and principles that are- the bioclimatic responses to the Environment; cultural representations of the value system of the embodied culture of the Community; modifications made to the vernacular design as response to Interactions due the changes in Environment and Community.
- Development of a framework to support professionals and policy makers to ensure full integration of housing in community-specific contexts.

This research will define the significance and importance of the role of the planner, environmental analyst, social analyst, and economic analyst along with the architect and engineer in the planning and designing process for providing rural housing for rural communities.

In conclusion, Figure 3-29 is the complete flow of epistemological perspectives, approaches, theories, methodology for data collection and analysis and output. This schematically summarises the complete journey and outcome of the research. The diagram presents the road map of the thesis, how the aims, objectives and research questions aid in framing the theoretical

framework aided by the relevant literature, followed by framing a research methodology that aids in data collection and analysis which eventually result in the answers to the questions posed in the beginning of the research.

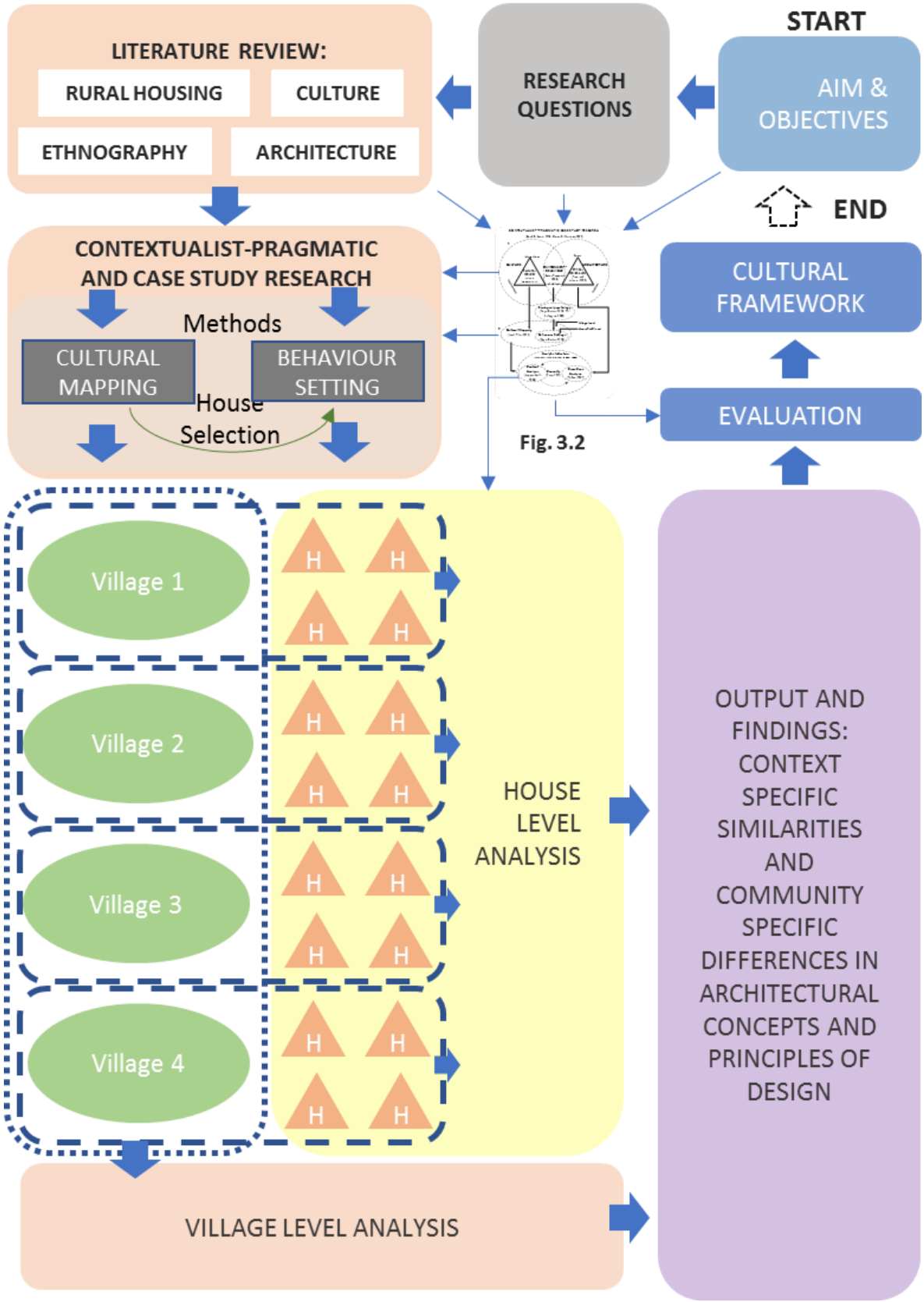


Figure 3-29 Research design

3.7. Chapter Summary

In this chapter, the theoretical framework of the research methodology was established by borrowing from the contextualist theory that allows the inclusion and consideration of multiple "realities" allows the research to include the various dimensions (environment, economy, social, historical, spiritual, political and demographic) and aspects (Environment, Community and Interactions) as factors that influence the resultant culture of the village, while pragmatism aligns the research with a problem-oriented solution deriving hypothesis. This allows the intent of the aims and objectives, mentioned in Chapter 1, to be considered within the scope of the research and encourages the adoption of a Multi-case study research strategy. Based on the objectives of the research, the theoretical framework is completed as it introduces the methods and techniques to be adopted for the data collection, analysis, and evaluation.

The village scale data collection is conducted through a cultural mapping of the houses, farmlands, plantations, pathways, gardens, water sources, etc. and a questionnaire survey to map the population of the village based on its demographic. The unit house scale data collection is conducted through observations and an interview companied by a projective floor plan technique. The respective data collection methods result in two levels of analysis according to the phase of data collection, where the focus is understanding the house and household discussed in Chapter 5, within the context of the village, discussed in Chapter 4.

A similar process is adopted in both scales with slight variations according to the data. Content analysis of each case provides deeper understanding of the cases while cross case analysis across the different villages and household types. This produces a list of similarities and differences which form a cultural framework as demonstrated in Figure 3-27 and Figure 3-28, which is specific to the region and the environmental context that is common to the villages studied. A discussion on causality in Chapter 6 will aid in understanding the phenomenon of the cultural ecologies that is observed in the cases. Evaluation through analytic induction will provide a generalised hypothesis that explains the phenomenon. The next chapter is Chapter 4 which analyses and discusses the data collected in the village cases.

Chapter 4. *Village Case Analysis: Regional Context*

This chapter focuses on the Village cases and their analyses. According to the methodology described in the previous chapter, the analysis of the data is conducted in two stages, a within case content analysis and a cross-case analysis. In Section 4.1, each case is presented according to the data collected through cultural mapping followed by a discussion NVivo qualitative software analysis that aids the content analysis of the data. In Section 4.2, a cross-case analysis is conducted by discussing the factors that have been identified by the content analysis of the village cases.

The outcome of this is a list of similarities and dissimilarities based on the regional context and the cultural context of the village. The results are indicated through the similarities and differences observed in the design of the traditional house regulated by the culture of the people in the respective villages, within the context of the village and its environment. Section 4.3 summarises the chapter while setting up the household level analysis in the next chapter.

4.1. Content Analysis

Before diving into the analyses of the village cases, the data collected, and the context of the data collected needs to be addressed and presented. As explained in Section 3.1.4., the following section conducts a content analysis of each village case before analysing the traditional house design of each ethnic community being studied through the village cases. The four case studies are outlined individually, building the narrative of each place, through a personal description of the experience: the results of the focus groups and the traditional houses seen (Stake, 2006). The content analysis obtained from the cultural mapping of each village aided by the NVivo qualitative software analysis answers the questions regarding the ecology of elements that influences a household and house design.

It is based on the data collected in the first phase of the data collection which is the cultural mapping. The cases are described based on the data collected and the information gathered through the transect walks and focus group discussions. The data is presented as case studies in three sections corresponding to the data type below. The first is a transect map that aides in describing its accessibility to the case site, roads, context of the site to other sites, and describes the walk through the site as a narration of the experience of walking along the paths across the village; the second is the data from the research and the case study's traditionally socio-economic environment and the socio-economic environment established in the present day; and the last section is the presentation and discussion of the traditional house design.

The results of the investigation of the traditional house are informed by the context where the house is located. This context is determined through the transect walk, the focus group discussion, and the house site visit. The results answer three questions that were asked to guide the village level case study. Firstly, what was the historic socio-economic context that originally existed that resulted in the traditional house? Secondly, what were the factors in the context influence the design of the traditional house? Thirdly, to what degree did the context influence the design of the traditional house? These questions will aid in the cross-case analysis to understand the relevance and significance of the factors in each context that result in similar or dissimilar architectural results.

As explained in Section 3.5.1, the textual data and coded data has been run though a text query that indicates the files where they have been mentioned along with contextual references. The results vary when the specification of the text search is changed from exact to generalised. The word tree formed by the text query shows the links of topics based on the root word mentioned in the references. The results produced by the text query have been analysed and discussed to aid in the content analysis of the data collected. The richness of the results varies from case to case. Some of the relevant results have been discussed below according to the case while other results obtained from the exercise are recorded in Appendix B. The discussion of the data has been divided based on accessibility defined by the transect walk; history and background, administrative construct, social construct, religion, communication, and knowledge sharing, electricity and telecommunication, water supply and plumbing, livelihood and healthcare discussed in the focus group discussion; traditional house through the projective floor plan technique; and concluded with the content analysis aided by NVivo.

4.1.1. Case 1: Kuki

The Kuki village was the first among the villages to be studied that fit the village case selection criteria. It served as a pilot case study to inform the data that could be collected from the data collection methods.

Accessibility – Transect Walk

This village is located at the foothills of the Kuki Pahar as known by the inhabitants of the village. It is located near a river originating from the springs higher up in the hills. The closest town is Diphu 48 kms away, while the closest government office and guesthouse is located at Dillai Market about 15 kms away. Access to the site was through a mud road used by the locals on two, three and four-wheeler vehicles. Trucks use the road to transport the stone from the quarry located near the village at C in Figure 4-1. The village area starts from the edge of the Nepali locality B as shown in Figure 4-1, continuing on towards the hills situated northwest of the village.

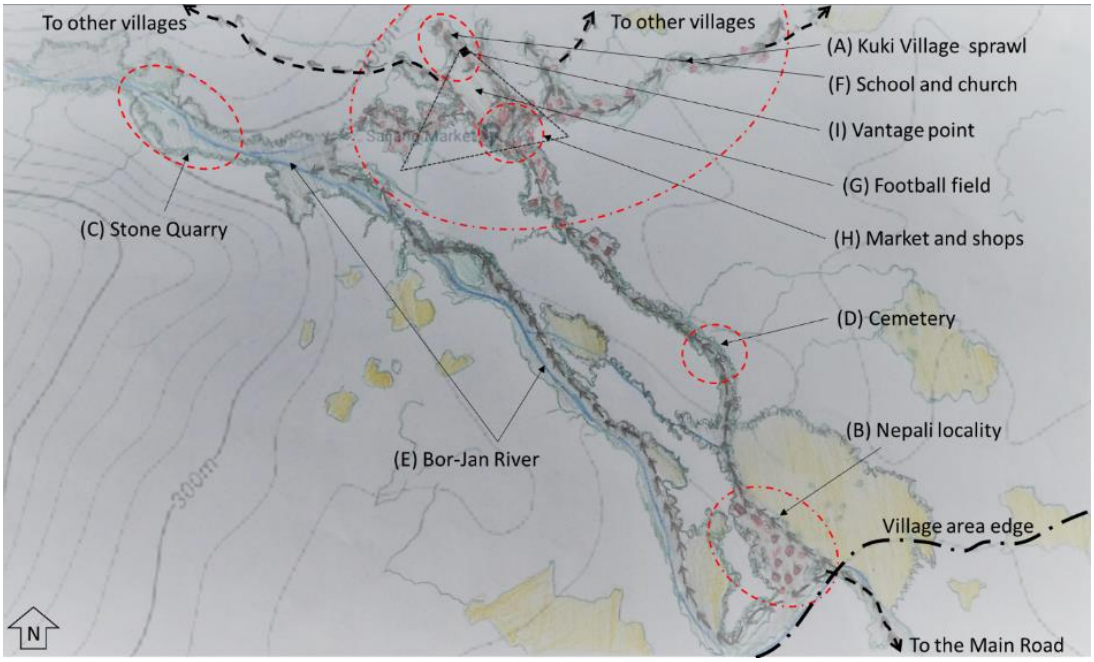


Figure 4-1 Transect map of the village, layered with a contour map obtained from google maps, Kuki.

On the day of the data collection, it had rained, and the earth was wet and slippery making the transect walk difficult and slow. Though there are more villages further up in the hills, due to the rain, they are accessible by vehicles only during the winter, while the rest of the year the inhabitants travel on foot. Image 4-1 shows a view of the hills at a distance that have been hidden by fog and few houses from the Nepali cluster settlement. Image 4-2 shows the Nepali cluster settlement at the edge of the road leading to the Kuki settlement. The assistant headman of the Kuki community agreed to aid in the transect walk by guiding me around the settlement and the relevant landmarks.

Image 4-1 Kuki Pahar hidden by the October fog, Kuki village.

Image 4-2 Nepali cluster, Kuki village

Moving closer to the village, there are rice fields on either side of the road before the bushes become denser as seen in Image 4-3. Halfway to the Kuki village sprawl A, is a cemetery in a small clearing with wooden crosses placed upright on the ground as shown in Figure 4-1. On approaching the village, houses started to appear on either side of the road until the street scape started to resemble a small plaza with shops and tea stalls selling snacks and stationery for the citizens as shown in Image 4-4. This was the Market place H, which is the location for the weekly market that started in 2007, drawing people down from the hills and from towns such as Hidippi, Bokajan, Dillai, and even Diphu and Dimapur occasionally.

Image 4-3 Farmland, Kuki village

Image 4-4 Marketplace, Kuki village

Upon moving on from the market area, we came upon a field which was cleared to serve as a multipurpose space for activities such as meetings, festivals and playing football. On the left of the field was an Assam type building on stilts about a meter or so that had been abandoned and left to decay; it had been the community hall. This abandoned building was strategically placed at the junction of the paths across the village. Straight past between the community hall and the field was the mud path that continued into the hills, this was one of the access ways to the other remote villages located at higher altitudes as shown in Image 4-5. As the mud path sloped upward three meters from the football field in elevation, was the communal church as seen in Image 4-6; and the structural frame of the new community hall as seen in Image 4-7, was being built using brick cladding and a concrete base and frame. Higher again was an Assam type long building which housed the primary school of the village educating up to grade 5 (10-11yrs old) as shown in Image 4-8. On the way down, we took a path that wound outward from the village and discovered an abandoned house which had been traditionally built as shown in Image 4-9. We descended from the top right corner of the field as I mapped and noted the visuals of the village and its neighbouring landscape as seen in Image 4-10 from that vantage point I as indicated on Figure 4-1.

Image 4-5 Mud path to other villages in the hills, Kuki village

Image 4-6 Church, Kuki village

Image 4-7 Community hall under construction, Kuki village

Image 4-8 Primary school, Kuki village

Image 4-9 Traditionally built abandoned house, Kuki village

Image 4-10 Kuki Pahar, village surroundings, Kuki village

Going the other way on mud path next to the community hall and away from the football field, the village continued to expand westward with houses, plantations, gardens, and bamboo clusters until the path ended at the edge of a small cliff next to the meandering flow of the Bor-Jan River with a partial view of the stone quarry, Image 4-11. Though there were reports of illegal quarry mining, this is among the few legal quarries in the area and there was a regular flow of trucks from the quarry.

Image 4-11 Path to the stone quarry, Kuki village

We returned to the market area to continue mapping the eastern section of the village sprawl. From the corner of the market area, seen in Image 4-12, there is a mud path that leads further into the forest connecting to other villages on Kuki Pahar. Another mud path to the right leads

down to more houses in the eastern section. This part of the village is comparatively more densely packed compared to the western section. However, the density of the houses reduces as we continue east till, we reached the ‘last house’ as seen in Image 4-13 within the precinct of the village though the mud path continued onward to connect to other villages nearby.

Image 4-12 Access to neighbouring villages, Kuki village.

Image 4-13 Village context: view from the ‘last house’, Kuki village

On returning to market area for a break at one of the tea stalls, it was decided that we would sit down to conduct the focus group discussion with the council members and elders of the village. The Table 4-1 below lists the various landmarks that were observed during the transect walk of the village.

Table 4-1 Elements observed vs. Description of elements.

LANDMARKS	
Built up	Houses School Church Community Hall Shops and market area
Physical Landmarks	Foot-ball field Cemetery River Stone quarry
Landscape	Mud path/road Wet cultivation Jhuming cultivation Vegetable gardens Fruit plantations Bamboo clusters

Focus Group Discussion Outcomes

The discussion was open to the elders of the village and the eagerness of the citizens, required me to obtain consent from ten people for the discussion. Of the ten, seven were the actual participants who responded to the questions, while two of them were there due to interest while the tenth was the owner of the tea stall. Since the village is primarily a Kuki village and none of the Nepali community participated in the exercise, the results of the discussion are mostly regarding the Kuki people and socio-economic perspective. The discursive conversation covered many topics. It was recorded, the results were transcribed and are summarised below:

History and Background

The village was established in 1937, when a few of the community decided to migrate from their village in Manipur, India. The village had originally been established where the Nepali locality is currently settled. It started with ten families, and according to the norms of a Kuki village, they had a head man and a village council among them. The region was originally a dense forest with many tigers and elephants, which over time have reduced or retreated into the forest as the village has thrived. The area of the village extended from the stream at point B.1 up to point B.2 in Figure 4-1, the connect mounds of hills on either side, the stone quarry at Point C in Figure 4-1 encompassing about two to three km^2 in area are included within the village area. The village had originally been established where the Nepali locality is currently settled., however, in the 1950s due to the Indo-Nepal Treaty of Peace and Friendship, a group of Nepalis who had migrated to the region had requested the village Headman of the time to allow them to settle there. The Kuki community moved to the current location to accommodate them within the Kuki village area.

Everyone living within the Kuki village area follows the Kuki Customary laws, this means that the headman made all the final decisions on any matter related to the village. This includes the Nepali community as well, who have settled within the Kuki village area. The reason for

maintaining separate clusters was not directly addressed, however, indicated that due to the differences in their culture and religion, that is, the Kuki are Christians while the Nepali are Hindus. Despite the separate clusters, the two communities occasionally come together to work on community projects such as the annual cleaning of the village, or clearing areas for cultivation, or to discuss funding for a service such as electricity or plumbing that would benefit both communities.

Administrative Construct

Each Kuki village has a council of members that aid in running the village. Each council has four members made up of the headman (*Haosa*), assistant headman or the secretary (S*emang*), Senior council member (*Pachong*) and junior council member (*Lhangsam*), however according to Haokip (2013) the respective designations are Chief (*Haosa*), a defence minister (*Pachong*) and two cabinet members (S*emang* and *Lhangsam*). The headman-ship of the village is hereditary, meaning that the headman is usually the son or a male belonging to the family of the founder of the village. The next headman is selected by the previous headman; however, it is up to the community whether the candidate is accepted as the next head man.

It is assumed that the headman has great power due to his position. The four members of the council would normally discuss any issue or problem before letting the community know. On arriving at a decision on any issue, including that of appointing the next head man, a small feast is held where a pig is slaughtered and each of the community is meant to partake of the meal to indicate acceptance of the decision. Not eating the meal will indicate rejection of the headman's decision. At this point, the headman would normally ask why the decision was not accepted and at his own discretion he may decide what to do with the objection. However, there are cases when the decision is rejected by the majority of the people, and in such cases, the headman incorporates their concerns before making his decision, and any decision taken by a previous headman cannot be overturned. For instance, the father of the current head man had allowed the Nepali families to settle within the Kuki village area, hence the current and any future headman cannot ask them to move out.

Social Construct

The societal construct is mainly patriarchal, meaning that the representative of the village is male as noted in the administrative construct, and the representative of the family is the eldest male of the family, although, depending on the gravity of the situation, in cases where the eldest male in the family is below 18 years, the eldest female is consulted. Like the village council, a women's council is also present in the village to deal with issues that concern women directly. The women's council is very important to the functioning of the village as they manage the care of the children and the catering during festivals and community gatherings.

Religion

The Kuki were traditionally Sun worshippers, however, over since the 1950s the whole community has converted to Christianity. They had festivals that were related to the harvest of the produce that is celebrated on the 1st of November, a prayer and ritual for peace and harmony of the community (Chawang Kut) which is now celebrated along with the New year, and small festivals or feasts that were dedicated to the various produce such as ginger (*thing kut*), barley (*mim kut*) and rice (*chang kut*). Birthdays are celebrated as a community by feasting for 7 days which overtime has come to incorporate praying in the church for the child and family. Deaths

are also a community event where the whole family holds a day of mourning before burying the dead. As a sign of community, each family helps the family with either, food or helping in the field. Religion is a huge part of the community as it influenced their community gatherings that revolved around the typical Christian practices of having a church, celebrating Christmas and Easter, and having the Sunday off.

Communication and Knowledge Sharing

Early communications were done by fire or smoke signals by burning chilli which signified an upcoming war or invasion. There was no formal traditional education nor formal script to communicate with people from other villages, communication was done by walking between villages. With the introduction of Christianity and the translation of the Bible into Kuki language using roman script, postal news was exchanged by going to the post office at Bokajan. This was practiced until 1990, after which the village was connected by the telephone line, which was provided by the government, and by 2004-05 the mobile network was established.

The primary focus of education in the community was towards agriculture, hunting and building houses and other crafts. They learned the trade and required skills by accompanying their parents or older siblings to the fields, starting by weeding out the grass before graduating to learning how to use the plough and sickle. However, due to the evangelical missions by the British, the Christian-converted Kuki had adopted the roman alphabets from the British to read and translate the Bible which led to enrolment into formal education.

In 2005, the village came together to establish a school that teaches up to year 5 before the students are sent to either Bokajan or Dimapur to complete their studies. Currently, all the inhabitants of the village are educated up to the minimum of year 8 who have dropped out to help with the cultivation and running the family in the village. There are some who have a bachelor's degree and continuing with their education in Guwahati.

Electricity and Telecommunication

Electricity was provided in 2006, which is when few of the families bought televisions and other electrical appliances that became part of their life which persuaded them to spend more time. Before then they relied heavily on oil and kerosene lamps. The hours spent in the field farming versus the time spent at home changed from before and after the introduction of electricity. Previously, their day would start before dawn and they would turn after dusk before turning in in one hour or so of returning. However, with electricity and mobile connection, they could stay up longer, either to watch a movie on the television or to study. The families who still relied on agriculture maintained their previous routine of early to bed and early to rise, however, some other families could stay up as their avenues of income had been diversified by technology.

Water Supply and Plumbing

As mentioned, the village is established close to a water supply where the women would collect water. The women used this time to socialise among each other while doing laundry or collecting water for drinking and cooking. All the members of the village would take bath by the river, either in the morning before starting the day or in the evening after returning from the cultivation areas. This practice of using a common space for water collection and bathing has still been maintained. While the community originally went up to the nearby river, they now use the water from the water tank that is supplied from the river as shown in Image 4-14.

Image 4-14 Water tank and public bath, Kuki village

The initiative of providing a common water source through a water tank and well for the village has been introduced by the village council themselves and not a government initiative. The council collected the required finance from each family over a period to accomplish it. Though the water from the river is supplied to the main water tank, there are not direct to house plumbing pipes lines. A few pipes have been laid down along the pathways of the village to a point where there is a tap which cater to five to eight houses around the tap. The taps around the village are used for dish washing or collecting water for drinking and cooking, however, the main water talk location is still used as the common bathing area for all the local inhabitants. In the case of people who have studied or worked in towns choose to build personal areas for bathing near their houses to bathe in privacy which is not a usual practice in the village.

Livelihood

The community originally depended on jhum cultivation which is slash and burn which started with the sowing period by February, followed by the monsoon season around May and Harvesting after that starting around August and ending by December or early January. The one month's time before the cycle was repeated was meant for renovating their houses which were made of Bamboo and thatched roof, with occasional use of wood and mud depending on the time, availability and need of the seasons. That was the daily practice of the community before the advent of technology and education.

For trade and economic purpose, the inhabitants used to either go to Dillai Market, Hidippi Market, 5kms away or to Dimapur Market, 45 kms to buy and sell their produce. However, over the recent years, a weekly market has been popularised for the Ghost Pepper, a hybrid of *Capsicum chinense* and *Capsicum frutescens,* and Organic ginger which are locally grown and supplied for sale in whole-sale rates of 2$/kg, along with maize, yams and rice among others which are less popular. For the rest of the week, the shops and tea stalls in the village serve as a commercial centre for the villages nearby by stocking goods, such as tea, sugar, salt, biscuits, shampoo sachets, notebooks etc. As the commercial centre, three-wheeler auto-*rickshaws*

would drop off passengers there and served as a station for few drivers who would come for their afternoon tea before heading home.

Health care

Malaria, Jaundice, Typhoid and Gastric from eating chilli were considered usual illnesses as they were not epidemics. Traditionally, the health care and medicine were based on herbal remedies, however, overtime, along with education and technology, they were familiarised by western medicine and would go up to Diphu or Dimapur, 25 kms in Nagaland. The government had also established a medical infirmary in the village, however due to its remoteness, it has become a weekly program that allows the inhabitants to meet with a chemist rather than a doctor or nurse to tend to their illnesses. For more serious issues, they would still go to either Diphu, Dimapur or even Guwahati, depending on the criticality of the situation. Being the closest village to vehicular access, this village is also responsible for aiding the inhabitants of the other villages that are located further up the hills in the forest. The medical sub-centre in the village is the only one for many villages located on the cluster of hills in the region.

Projective Floor Plan - Traditional House

Figure 4-2, Figure 4-3 and Figure 4-4 are AutoCAD drawings that indicate the architectural information gathered from the projective floor plan exercise during the Focus group discussion. Image 4-15 is the closest resemblance to a Kuki traditional house. The description of the house has been documented below:

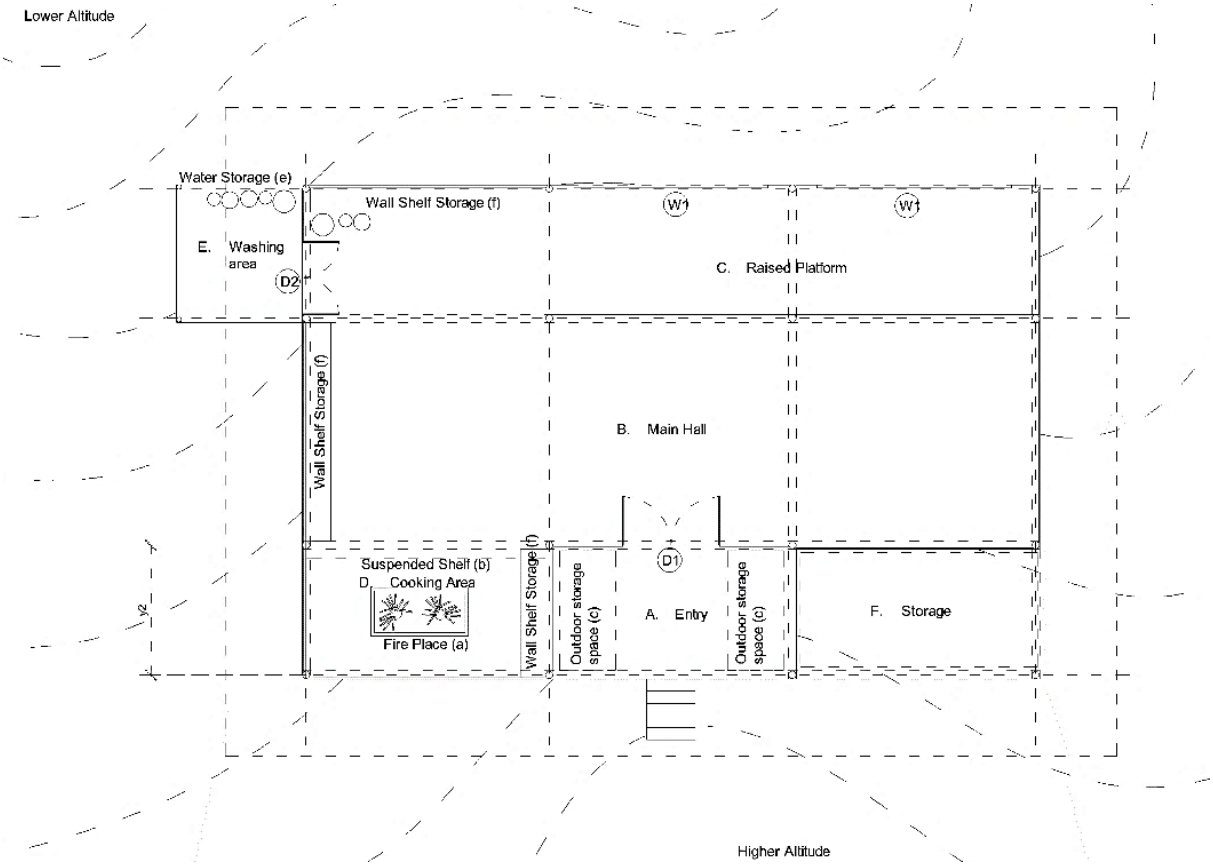


Figure 4-2 Kuki traditional house plan

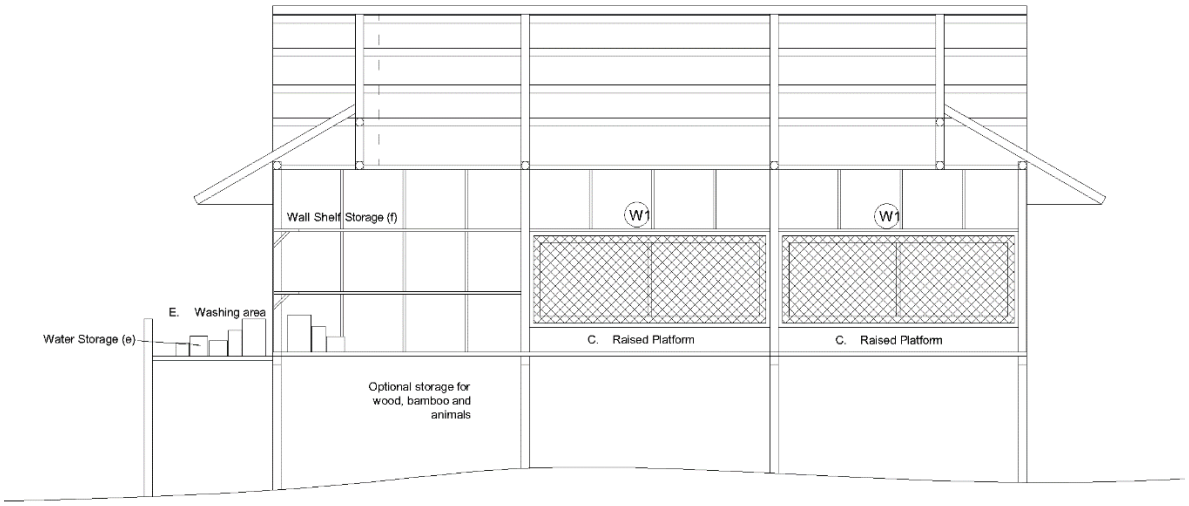


Figure 4-3 Kuki Traditional house section (Longitudinal)

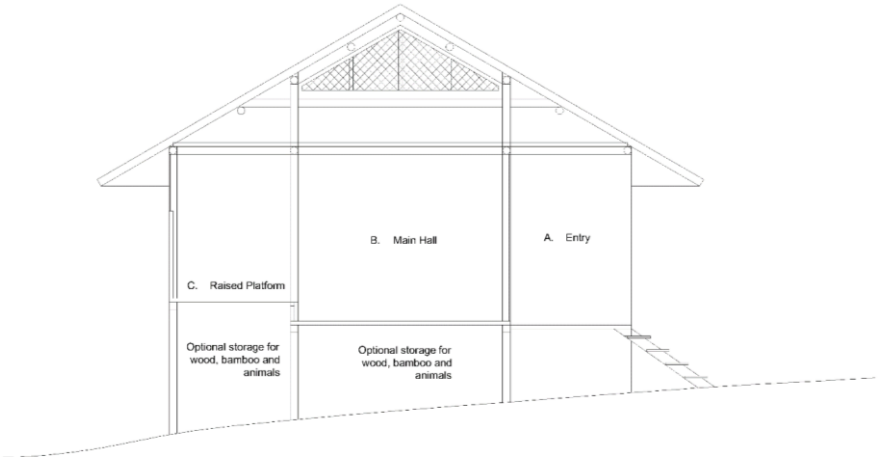


Figure 4-4 Kuki traditional house section (Cross-section)

Image 4-15 Kuki traditional house

The house is traditionally built on stilts which are about a meter above the ground. Since the Kuki normally settle on hills and slopes, one side of the house will have a higher elevation

from the ground. The entrance to the house is from the higher elevation from the ground elevation. This is done for a couple of reasons, with safety being the primary reason. Living in a highly forest area, the orientation of the house allows a single-entry point for both people and animals alike. The rest of the house remains slightly elevated from ground which makes entry into the house difficult. The other reasons are so that the space under the floor is used as storage and to allow the flow of rain from under the house as seen in the Figure 4-5 (right). The entry to the house is on the longer side of the house which is oriented longitudinally along the pathway or street of the village as seen in Figure 4-5 (left). In case it is the last house on the street, this orientation does not matter if the house is oriented with the entry facing the village. Orientation of the entry being faced in any other direction is considered 'unlucky' as it is anti-social.

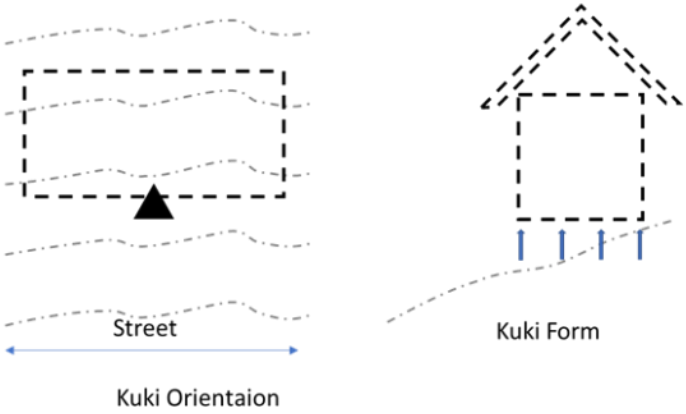


Figure 4-5 Kuki traditional house: orientation and form

The house in built with bamboo and thatch however, depending on the requirement and feasibility of the construction, additional materials like wood and mud is also used. Number of columns used in the construction depends on the size of the house, it can be built with 12 columns in a grid of 4 x 3 where four columns are placed on either side of the house on the long side and the remaining four are placed along the centre of the house. For larger houses, there may be 16 columns, where four columns are placed on either side of the house and the remaining four are placed on the inner side of the house as shown in Figure 4-2. The posts on the second row from the back of the house are very important to the foundation of the house. As a rule, the second row of columns from the back are never to be moved back ward during the life cycle of the house. If any extensions or reconstructions are to be made, they should all move towards the street and not away from it. Due to this rule, the houses are built few metres away from the street to allow changes to the house.

The roof of the house is made of a bamboo frame truss with thatch layered on it as shown in Figure 4-3 and Figure 4-4. The roof is usually a gabled roof however, it may have a Dutch gable roof on either or both ends of the roof to allow a shaded opening for smoke to flow out of the house as shown in Figure 4-3. The roof is built at least 5 to 6 feet above the floor level to allow a loft for sleeping or storage of personal items. While constructing the floor, sections of the floor on the sides of the house are raised by 12-15 inches. These raised platforms which are made of either wood or bamboo, are used for sitting or sleeping, or for storing rice after harvest. The walls of the house are built of bamboo, such that they have openings of approximately 4 feet high and 6 feet wide located on the longer sides of the house. The windows have a single shutter that is hinged from the top opening inwards and latched on to either the beam or loft above. This system allows air ventilation and circulation during summer.

The house is generally a single room house for all the functions within the house as seen in Figure 4-6. The raised plinth of the house is accessed by a bamboo or wooden step ladder. There is small landing or porch before the main door. This space is for cleaning their feet or leaving their footwear at the door to avoid getting the interior dirty. Depending on how big the porch is, it can also be used as storage space. Upon entering the house, the kitchen is in either one of the corners closer to the door. The storage for water and a door to the open-air utility area is in the next corner from the kitchen away from the door. The floor of the utility area is made of bamboo.

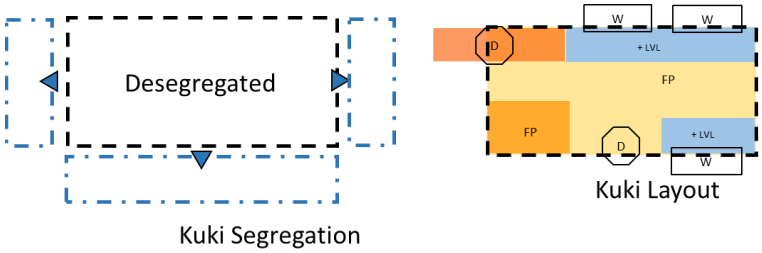


Figure 4-6 Kuki traditional house: segregation and layout

Due to lack of internal walls and partitions, there is not clear segregation of space except through the articles and items around, such as the fireplace and shelves on the wall indicated the kitchen and the hollowed-out bamboo and bottle gourd for containing water indicated the direction of the utility area. The rest of the room with its raised platforms is multipurpose where people could rest, work, or use it for storage. The open layout of the house indicated openness and transparency in the community which was evident from the field visit.

NVivo qualitative software analysis- Kuki

On conducting a text search query using textual data linked to the Kuki case in NVivo, the result indicating the root word ‘village’ is shown in Figure 4-7. It is based on the generalised word input: Village OR Access OR Social Traditions OR Practices OR Communications OR Knowledge OR Community OR Infrastructure OR Livelihood OR Resources OR services OR Traditional OR House. Other supporting text search query results relevant to the discussion are recorded in the Appendix B.

Figure 4-7 Text query, root term: Village

The result indicates links accessibility and connectivity to other communities and settlements, socio-cultural, religious, and agricultural practices, education, healthcare, government support

and infrastructure development and the physical environment. This indicates links to the very physical context of their settlement reaffirming the observation that their livelihood is primarily related to the availability of water, area, and nature of the land for cultivation of rice, maize, ginger, and other crops etc. As noted in the focus group discussion, the location of their settlement at the foot of the hills has allowed a market to flourish which provides livelihood to the people. This has improved the connectivity of the village with the outside world and with other remote villages that are located on the hill and encouraged development of the village. The other results are around the root term 'Go' and 'centre' in Appendix B further support the links to accessibility and the intent of the village case to provide the community infrastructure as a community. Thereby indicating the development of rural settlement linked to the topography and physical context of the village.

The results indicate links topography and natural resources available in the region to telecommunication and government support. It is observed that not all the services available in the village are arranged by the government like the water supply and school. The government support available to the community like electricity, healthcare dispensary, telephone lines and houses from rural housing schemes like IAY and PMAY-G is not adequate due to the physical context and the lack of road accessibility. As noted from the transect walk, there is a clear establishment of a market, school, and healthcare unit, however it has been indicated that there is a need to increase the accessibility to healthcare in case of more serious health concerns.

It further indicates links to the exposure to other communities (civilizations) communication through script, the role of Christianity in education and reading, the importance of the nearby towns, the presence of a primary school in the village, telecommunication services such as telephones, mobiles and the internet and the traditional way of communication. This indicates the influence of religion, technology, and government intervention. The introduction of new aged ways of communicating and learning has been mentioned as a cause of changing agricultural practices and livelihood.

The result indicates that the religion of the community is considered part of the current culture. The traditions followed by the community before the introduction to Christianity has been kept intact in terms of the cultural festivals celebrated by the community around the cultivation and harvest of crops such as ginger and rice. According to the Christian culture, the dead are buried in the cemetery within their village area. Almost all of the people living in the village are educated. The daily routine of the people is based around the time spent in cultivation. The context of this village is unique since there is a Nepali community living within the village area. However, due to lack of mention of the Nepali community in the focus group discussion, it hints at minimal interaction with the community despite living within the same village area.

Figure 4-8 and Figure 4-9 are the text search query results around the root words 'family' and 'house'. It is based on the generalised word input of 'House OR material OR space OR room OR construction'. The result indicates the role of patriarchy in defining the social structure of the community. Orientation of the house to the road or street is very relevant to the social culture of the community as it indicates the attitude of a family towards society. Despite indicating patrilineality, there is an indication of gender equality regarding access to spaces since there is very minimal segregation of space using walls and partitions.

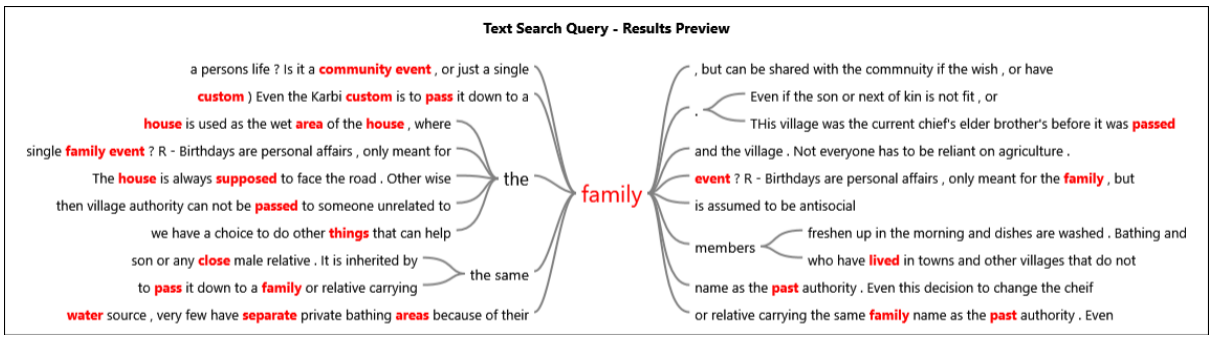


Figure 4-8 Text query, root term: Family

Similar to the generalised result of the Kuki village, the results regarding a traditional house links to the physical structure as well as the social structure with special value given to the kitchen and hearth. As expected, wood and bamboo are part of constructing a traditional house as they are locally available resources that are easy to use. The construction of the house is relevant to the social representation of the household within the community as the foundation of the main structural columns of the house cannot be moved once planted.

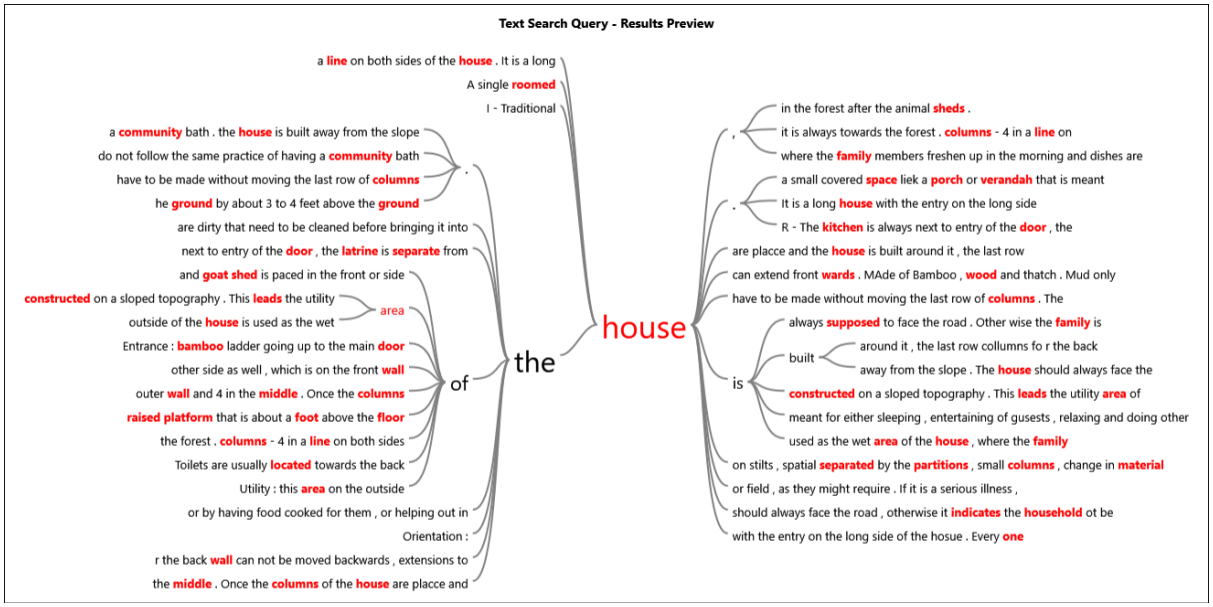


Figure 4-9Text query, root term: House

In conclusion, the physical environment is the primary influencer of defining house form as it provides the resources for the community to survive and determines the livelihood choices and accordingly, the kind of shelter the household would be accommodated within. The presence of a Nepali community within the village boundary indicates the co-existence of the two communities with limited inter-cultural assimilation due to lack of interaction. In fact, the evolution of the settlement is more reliant on technology, education, and communication. This analysis indicates the inter-relation of house, family and village that aided in informing the ecology of the Kuki village.

4.1.2. Case 2: Karbi

This village is the second case in the data collection, however, zeroing down on the village that was finally studied for the exercise was difficult. Since Karbi are among the major populations in the region, there were many villages, however, they did not fit the selection criteria set by

the research. It took over a week of driving around the district and into many villages until this case was finalised. This village is unique in regards that it is considered within the Hamren town committee area due to the low population of Hamren town itself, however, it is too far from the town centre to avail any benefits of the town committee. Hence, the accessibility to the village is limited and it continues to function as a village.

Accessibility – Transect Walk

The village is 5 kms North of the Hamren New market which can be accessed on foot within an hour since public transport is not available. The road to the village is muddy on rainy days or has loose dirt on dry days which makes it difficult for other vehicles to climb the hill to access that village unless it is a Mahindra Bolero or a Maruti Suzuki 800. It took one hour to reach the village due to the quality of the road and the distance added by the winding of the road.

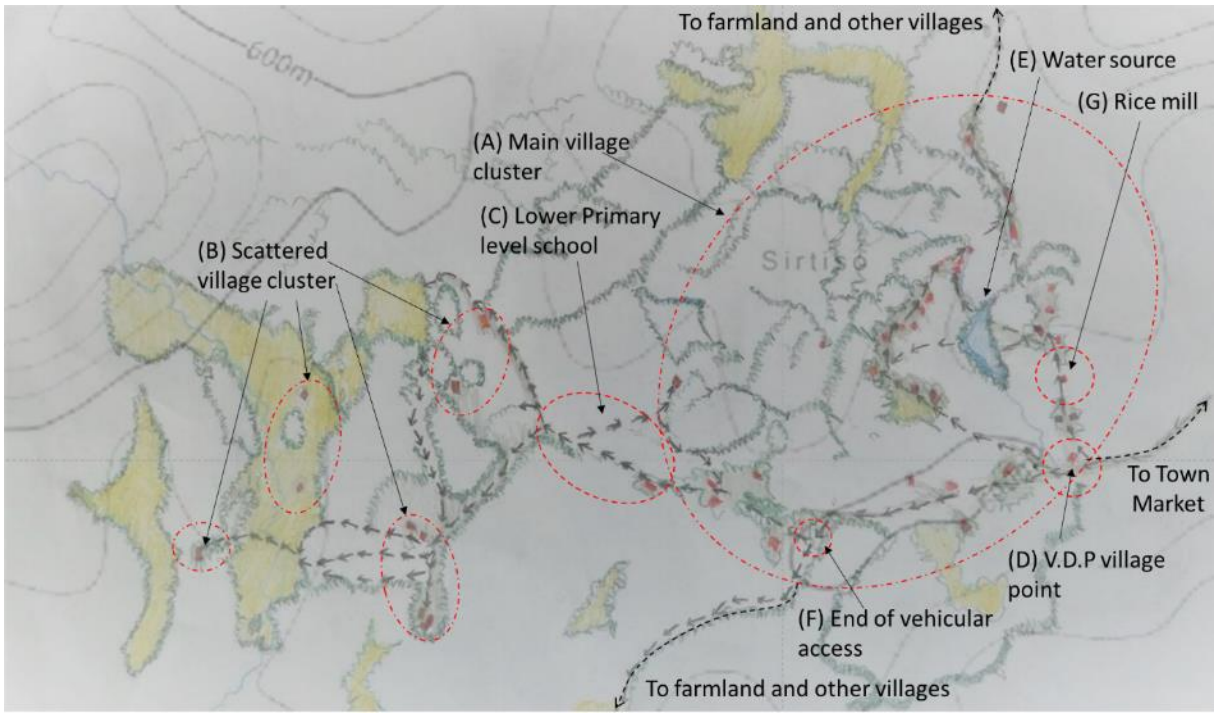


Figure 4-10 Transect map of the village, layered with a contour map obtained from google maps, Karbi.

While the actual area of the village started further down the hill, the main cluster of houses (A) is located on the top beyond the official village point (D) as shown in Figure 4-10. There are few other clusters (B) across the hill that are surrounded by forestry and cultivation fields as shown in Image 4-16. The furthest that is accessible on a vehicle is until point (F) before reaching a small clearing of plain where the school (C) is located. It took two days to conduct a transect walk of the village where cluster (A) having 28 houses was covered in the first day and clusters (B) having seven houses was covered on the second day. The path leading from point (D) into the cluster by the rice mill was taken to cover as many houses as possible.

Image 4-16 Village context: Post-harvest, Karbi village

There were a few houses after the rice mill, before the path started descending in the bamboo grooves. Beyond the dense wall of bamboo, the ground levelled to a plain where there were pockets of wet cultivation of rice. A small stream was flowing through the paddy field, which was gradually continuing to descend towards a small spring which is among the water collection locations for the community. Past the spring, the path started to climb back into the hill where more houses were located. The path split into two and we took the path leading north to see the few houses located on the edge of the cluster.

The houses were located with small clusters of trees in between which could lead on to believe that there might not be more houses ahead, when in fact, on walking a few metres ahead, the shrubbery would open to clearing where broom flower or bamboo was being dried with a few houses further ahead. These small clusters of houses would be built on either side of the path connecting the village, or on one side if the ground was not big enough for the path, the house and yard.

On returning from the northern cluster, we took the path that led south and back to the starting point (E) of the transect walk and continued along the vehicular mud path. There were fewer houses along the path with one house on the south side of the vehicular path while the rest of the main cluster was on the north. There were few paths to the south that lead to the slash and burn cultivations areas scattered across the village area. This path led to the village headman's house, the Primary school and the rest of the village which was expanding eastward due to the slash and burn cultivation areas.

The next day, the transect walk continued from the headman's house and primary school towards the remaining seven houses that were widely scattered over the hill across streams and cultivation fields. The foliage in this area (B) was mostly composed of bamboo and broom flower bushes and they were tall enough to hinder vision to locating the next house which took quite a while as even the paths were not clear. In addition to that was the fact that this side of the village was being re-explored after years of letting the forest ground recharge and there were rumours of leopards in the area. Frankly, I was afraid and there were no network bars

showing on my phone screen in case I needed to send out an SOS message, and after what felt like an hour which might have been about fifteen-twenty minutes I came across a clearing that had a skeletal frame of a house with tinned roof and a small bamboo and thatch hut. On walking past it for another five minutes, the path led to a field of rice cultivation which was being harvested by a lone woman working there whom I almost missed among the tall stalks of rice.

She was very kind to show me around the rest of the houses that were scattered nearby across the fields of rice and clusters of bamboo and broom flower as shown in Image 4-17. I later came to know that vehicles did make their way to this side of the village as shown in Image 4-18, however with difficulty as the rains made it difficult to drive through it. The trek across the houses and back to the headman's house took another three hours, where the focus group discussion was conducted. Table 4-2 is a list of the landmarks noted in the village during the transect walk.

Table 4-2 Elements observed vs. Description of elements.

LANDMARKS	
Built up	Houses School
Physical Landmarks	V.D village point. Rice Mill Streams Paddy field
Landscape	Mud path/road Wet cultivation Jhuming cultivation Vegetable gardens Fruit plantations Bamboo clusters Broom flower cultivation Forest

Image 4-17 Village context: Jhumming areas, Karbi village

Image 4-18 Village context: mud roads, Karbi village

Focus Group Discussion Outcomes

The focus group discussion was conducted with the headman and two other elders of the village. As it is further explained in the administration construct of the village, the village is unofficially split into three parts while two accompanying elders are the headman over the few families living within the respective sections. The confusion was cleared over the course of the discussion. The outcomes of the focus group discussion are as follows:

History and Background

According to the oral traditional, the original settlers came from Chinthong, which is another village belonging to the same clan as the current head man. The area was heavily forested and had many elephants. The settlers had moved there when they came to know of the existence and extent of the Umtilli *Havar* (meaning village area in Karbi) and Langprat *Havar* and decided to establish the village borrowing part of the Umtilli *Havar*. Over time, the population grew and the Umtilli *Havar* expanded and split up into many small *Havars*, one of them which became the Hamren town.

The village is said to be at least 1200 years old as it is said to be older than Hamren, established in the late 900s; and Rongkhang Rongbong which is the traditional capital for the Karbi community, established in the early 1100s. According to folklore, the village was established during the time of war between the Karbi and the Cachar and the location was used as a store for the armoury and shields by the Karbi army, also belonging to the same clan as the village headman. The village started as a hamlet of two families that grew as men of other clans married into the family and settled there until all five clans of the Karbi community were represented in the village.

Administrative Construct

According to tradition, a Karbi settlement is considered a village only if all the five clans of the Karbi community exist in the village allowing them to form a village council called '*Ser Wan Kep'*. The literal translation of the words is 'Golden' 'Member' 'Ten', referring to the ten members who make up the council. It is composed of the *Rong Asar (headman/ Chairman); Risoh Basa* (Vice headman/ chairman), *Hemaih Akong* (Chief weapons and tools

manufacturer), *Hemaih Akibih* (Assistant weapons and tools manufacturer) *Pherangkeh Akong* (Public Relations), *Pherangkeh Akibih* (assistant in public relations*), Klengsarpo* (Youth leader), *Mekkarh Akleng* (Eldest among the citizens), *Phumen Phulok Akong* (Elderly Wise Person*) and Phumen Phulok Akibih* (Assistant elderly wise person). They are collectively responsible for the village and nearby hamlets (settlement without a *SerWanKep*) and their citizens.

Traditionally, the headman of a village can only be appointed by another headman when he gives part of his *Havar* to create another *Havar,* just the way it was carved out of the Umtilli *Havar.* However, in the past 50 years or so, the village has been split into three, based on the families that the headman of the village is supposed to be responsible for, but the village land has remained common. The other headmen of the village were appointed by the Headman of other *Havar,* which is not the traditional practice. The miscommunication of traditions occurred due to the unfavourable attitude towards Christian conversion during the late 1800s isolating few communities of the tribe from the nearby villages that were converted. The socio-political unrest of the 1950-70s post-independence further miscommunicated the traditions as the region which was originally a self-ruling community became reliant on the Indian government. The Indian system of governance ignored the customary laws and administration and appointed another headman who is officially registered. This resulted in the dissolution of the *SerWanKep* in the village.

The positions in the council except for the *Klengsarpo* are inherited through the clans and is appointed by the previous position holder. However, the decision can be contested by the village members depending on the performance and confidence of the community on the next elected appointee to the position. Like the Kuki, decision making power remains with the headman in all issues that were discussed with all council members. Same as the Kuki, the acceptance of the headman's decision is acknowledged by the partaking of a meal with the headman. Not taking it would indicate disagreeing with the decision.

Social Construct

Since in marriage, the children take the father's name, the community is mostly patriarchal. The inheritance is handed down equally to both genders however, the responsibilities of the house are taken up by the son or closest related male, like the assigning of the responsibilities in the village council. In the case of decision making, the issues and discussions are split among gender lines due to which the council was all male and females had smaller council made up of the wives of the council members for issues that involved women. However, there have been efforts to modify the council to include women into the traditional village council so that there is a common table for discussion of issues. There is social equality between the genders.

The chores of the house are divided among the male and female, where all males are expected to learn carpentry to a degree to build houses, while the females learn how to weave. Though cooking and cleaning in the house is predominantly a female chore, males may also learn to cook since they spend so much time in the field, they sometimes cook their midday meals in a bamboo in the middle of the field. The cleaning of the compound area and making of a fence around the house is a male chore.

Cultivation is a skill that is shared by both genders, however, in the case of bigger families, where the need for labour is not very high, a female of the house may remain in the house to keep the house or do other chores around the house such as feeding the animals or tending to

the vegetable garden or look after the young. In case of smaller families where labour is highly needed, the children are taken along to the field. Babies and toddlers are carried by the mother with the help of a shawl tied around their torso and shoulder. Children who can walk can roam free around the field. As they near the age of 7 or 8, the children start helping in the field by removing weeds. Overtime, they start learning how to do cultivation.

Religion

The community traditionally follows animistic form of religion depending on the clan. Each clan has specific type of rituals that are conducted for the well-being of the community or family. Among the five clans, there is a sub-clan who are considered priests for the whole ethnic community who may conduct rituals and prays on behalf of the whole tribe collectively. However, the elders (*Sarthe)* or clan heads (*Lindok*, from the word *'Lyngdoh'* which is Khasi for 'Lord' or 'Minister') conduct prayer and rituals that are specific to the clan. For instance, the headman's grandfather, who is of the warrior clan was said to have been able to communicate with the tiger spirit that resided in the hills east ward of the village. However, the tradition is not maintained by the previous headman and current headman.

The residence of the tiger spirit in the nearby hills may also have contributed to the location of the village. Lately, there are some households who have opted to follow Hinduism and one family who is Christian in the village while the majority claim to follow the traditional religion with few modifications that resemble Hinduism.

Communication and Knowledge Sharing

The Karbi community relied on verbal communication. However, in the case of messages that were sent from the traditional capital by the Lindok of the clan or the *Lindokpo* (Traditional King; *po* means father) the message was relayed by sending a 'key' to the recipient that is a dried bamboo strip that had been tied in knots that represented specific meaning. The method of tying the knots on the *Key* indicated both the message as well as the identity of the sender. As mentioned earlier, the meaning of the knots was only known by the clan head in each village who is part of the *Ser-Wan-Kep* who would translate the message to the citizens of the village if instructed to do so. This form of communication among the traditional officials in the traditional village is continued in some cases however, the use of telecommunications has aided in relaying messages more effectively and quicker, which can change the method of administrative communication.

There was no formal education and everything that needed to be learned was learned through practice, assisting, imitation and oral traditions same as most of the ways of learning new things. The *Ser-Wan-Kep* was responsible for ensuring the dissemination of information and knowledge relevant to the social system and history of the community. While the parents were responsible for further dissemination of knowledge to their children. The importance of formal education was not widely accepted since there was no direct application to their agriculture-driven livelihood. However, the community has changed this perception in the recent decades and stress the importance of education by sending their children to school in Hamren. In some cases, the children are sent to live in hostels or in a relative's house.

Electricity and Telecommunication

Electricity was supplied to the village since 2012, however, telecommunication coverage from Hamren was available since 2007. There is no landline connection or postal service to the

village though it is considered part of the town committee area. Due to the electricity supply, some of the households have televisions that has influenced the social life in the community. Some of the households have televisions which have affected the daily routine in the village and hence affected the time dedicated to farming and cultivation by the adults of the household.

Water Supply and Plumbing

The water supply to the village is dependent on the natural springs and streams that occur scattered across the hills within their *Havar*. This is the practice that they have continued to this day. The village does not have any formal plumbing service provided by the Hamren town committee. The location chosen for their community bath area is dependent on the elevation. It is at a point where the slope of the hill appears to flatten creating a small pool before the stream continues downhill. A small dam is created towards the upper slope to create a deeper artificial pool and inserted with a hollow bamboo to ease water collection. Doing this also aids in fishing for small fishes that thrive in the pool. Below this pool is where the citizens of the community gather bathe and wash clothes. This way use of the water is separated at the source. Image 4-19 shows a concrete wall built to create a small pool for water collection, along with a metal pipe inserted in the wall to act as a tap. The routine of visiting the water source for bathing or washing of clothes is mostly done after spending the day in the field before heading home for dinner. Some people may also choose to bathe in the steams that pass near their cultivation fields before heading home.

Image 4-19 Water supply, Karbi

Livelihood

The community depends on Jhum cultivation for maize and rice along with fruits trees such as banana and pineapples, and broom flower on the slopes of the hills however, there were cases of wet cultivation where the ground is almost flat as seen in Image 4-20. The wet rice cultivation is successful by digging the earth in sections to create troughs for the water to collect. These sections are separated by the raised earth around the trough which is also used as a narrow path the connect across the paddy field. Image 4-20 shows a part of the village

Havar that is being used for wet rice cultivation. From the image we can also see that the ground is very gradually sloping to the left as we see the change in stalk heights. The community is very reliant on the agricultural practice for their livelihood. The rest of the areas are used for growing Bamboo, Broom grass, beetle palm and other fruits and vegetables to support their daily needs.

Image 4-20 Wet cultivation fields, Karbi

As part of looking after their cultivation fields, there are a few tree houses, or huts on raised platforms that looked over the field. This served as a makeshift temporary house for households during the sowing and harvest season. Image 4-21, shows a temporary hut in the field overlooking the dry cultivation fields.

Image 4-21 Temporary huts in the field, Karbi

Despite being located so close to the town centre, the inaccessibility has made it difficult for the village to grow economically. The village is dependent on the weekly markets that take place in the two marketplaces in the town. As additional income, citizens from the village would work as daily labourers after selling their goods to the stores on market day.

Health Care

Traditionally, medical issues were catered by relying on medicinal herbs found in the forest while serious health issues were considered curses that could be remedied by prayer and animal sacrifice. This belief and practice continue today coupled with western remedy. There is no formal health care dispensary unit in the village as it is within the town committee area. This persuades the citizens to visit the town for medical purposes, however in case of serious conditions, the patients are taken to Diphu having to stay over to be looked at. Due to the humidity and altitude of the village, Malaria is a common problem for the citizens which is treated in Diphu.

Projective Floor Plan- Traditional House

Figure 4-11, Figure 4-12 and Figure 4-13 are AutoCAD drawings that indicate the architectural information gathered from the projective floor plan exercise during the Focus group discussion. Image 4-22 is the closest resemblance to a Karbi traditional house. The description of the house has been documented below:

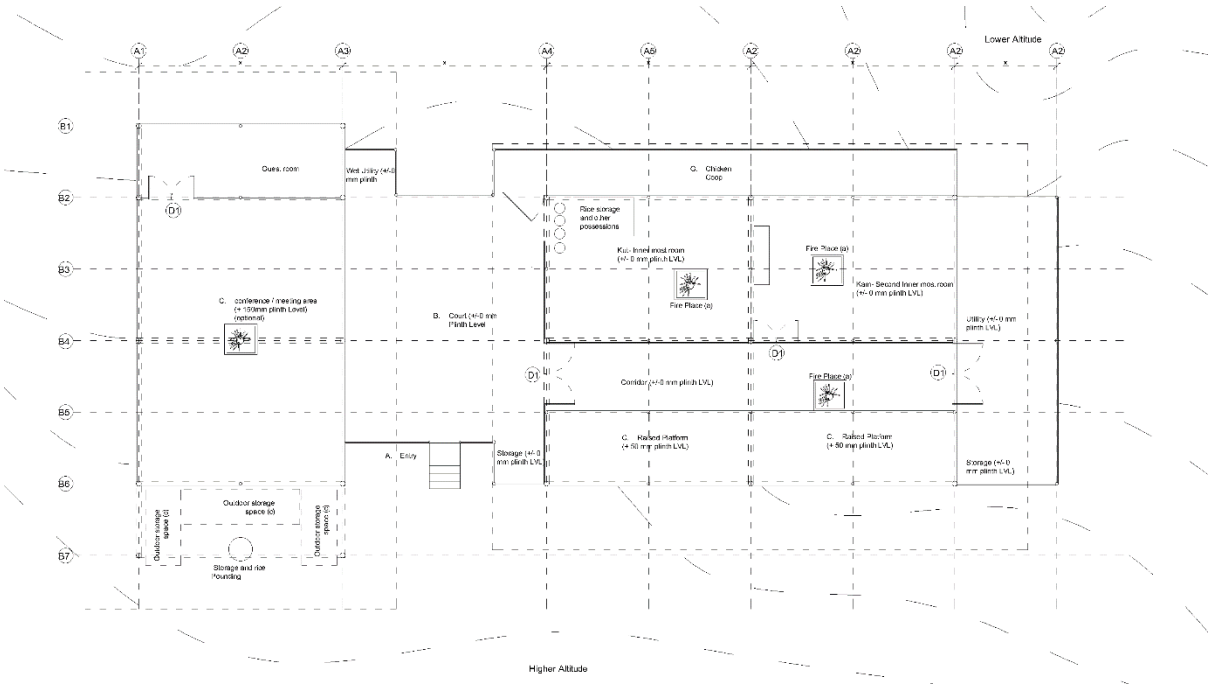


Figure 4-11 Karbi traditional house plan

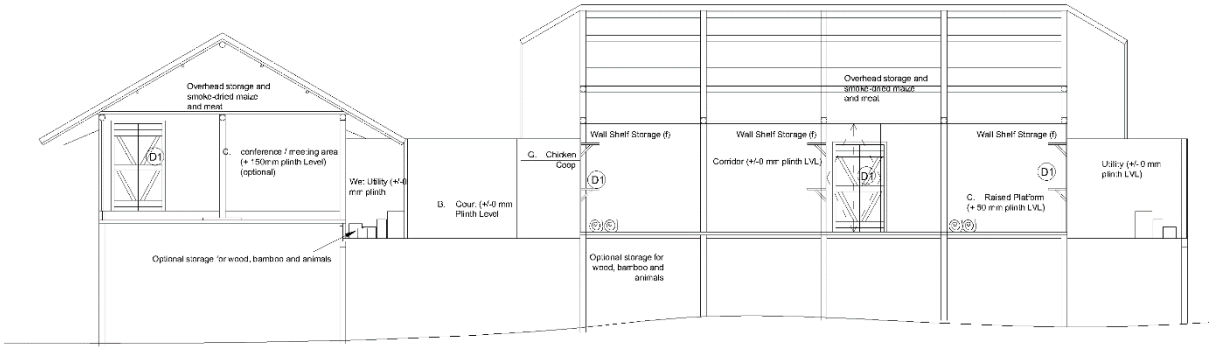


Figure 4-12 Karbi traditional house section (Longitudinal)

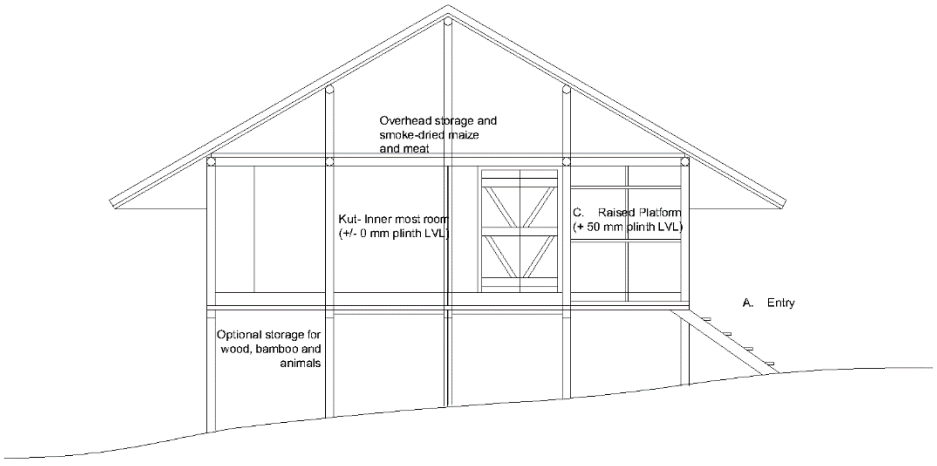


Figure 4-13 Karbi traditional house section (Cross-section)

Image 4-22 Karbi Traditional house

The house is built on stilts which can be either wood or bamboo, located on a slope facing the street that is on a higher altitude as shown in Figure 4-14. This is done since the elevation for access into the house is less compared to other parts of the slope. In response to the rains, the roof of the house is sloped, and the raised plinth allows rainwater run off during the rainy season. The orientation of the house is along the slope of the hill to reduce the height of the gap between the plinth and the ground below and also because the length of the columns needed to support the house in the rear is lesser than if it was oriented against the slope. Orientation of the house along with the internal layout of the house ensures segregation of private, sacred, and utility spaces away from the street, while storage of wood and bamboo and the activity of pounding rice is located on the front, which is not noted in Image 4-22 since it has undergone changes to adapt to the times. The space under the plinth is sometimes used as storage for wood or as a pigsty.

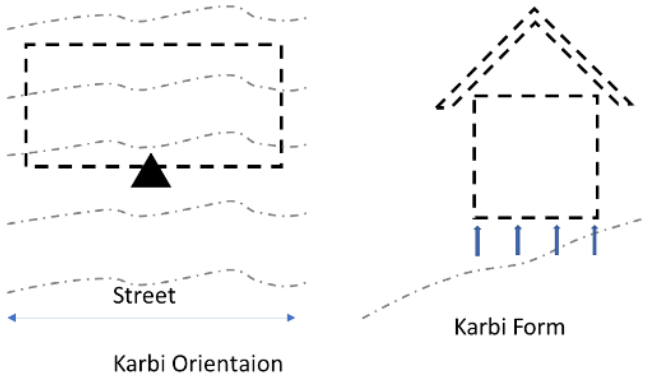


Figure 4-14 Karbi traditional house: orientation and form

The Karbi traditional house is unlike most vernacular houses in the region for the fact that it is built in two parts in the house. The house has a main house called *Hem-pi*, which is specifically for the family and only relatives of the family are allowed to enter; and another section of the house which is meant for guests who are not related to the family or someone who is of higher standing than the owner of the house, called the *Hong-pharla*. The two sections are connected

by an unshaded platform called *Hong-jai*. The entry to the house is through a wooden ladder that leads up to the *Hong-phlang*. In Figure 4-11, the *Hong-pharla* is on the left and the *Hem-pi* is on the right. Figure 4-15 shows the segregation of space based on familiarity (left), and the layout (right) of the house.

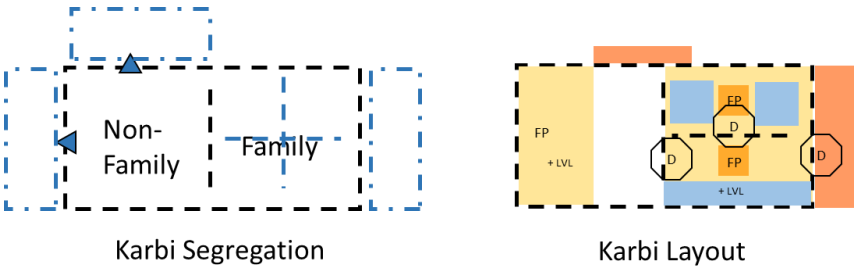


Figure 4-15 Karbi traditional house: segregation and layout

Hong-phlang – It is an open space that is used for drying clothes, drying paddy, chillies etc. the *Hong-phlang* connects to the vo-kroi which is the chicken coop that is built along with the house located on the side of the *Hem-pi*. There is a utility space which is meant for washing of hands, feet or utensils located on the back end of the *Hong-phlang*. This way the dirty collected on the feet is washed off before entering the *Hem-pi* or the *Hong-pharla*. Having a utility accessible from the *Hong-phlang* ensures the segregation of people based on gender and social familiarity. The overhung section of the *Hong-phlang* is called the *Hong-kup* which serves as storage space for tools and firewood.

Hong-pharla – It is a roofed platform that is raised by 300- 450mm from the plinth level of the Hong-phlang. It is walled off on three sides of the platform except the one facing the *Hem-pi*. The *Hong -pharla* is a space that is specifically used for entertaining guests or for sleeping if they stay overnight. In case of a big family, the *Hong-pharla* is used for sleeping by the male children above the age of 15. If there is a married couple staying in the house who have decided to continue staying with the parents instead of building their own *Hempi-Hongpharla*, or a *Hem-prek* which is a small hut next to the parents' house which is only meant for sleeping since the cooking for the family is still continued at the main house, *Hem-pi*. In other cases, an extension is added to the *Hong-pharla* by building a room next to it, called *Inglong*. This room can also be used as a storeroom or for silkworm cultivation.

Hem-pi – It is the main house which is for the family. It is separated into three main sections- *Kut, Kam* and *Tibung*. It is in the case of the simplest division of space in the *Hem-pi* where the *Kut* is the innermost room in the house which is accessed through the *Kam* and *Tibung* is the long stretch of slightly elevated space on the wall side of the house. One of the thumb rules of constructing the house is that while constructing the wall, the height is determined by the top of the ear of the patriarch of the house. By doing this, the *Tibung* turns out to be a sleeping alcove or a storage space. The *Kut* is used by the matriarch and patriarch of the family, while the children use the *Tibung* to sleep. In the case of bigger families, the *Tibung* can be divided into sections by adding a bamboo partition, hence creating smaller alcoves. In some cases, the *Kut* is also divided where the outer room of the divided sections becomes the *Kam* and the inner room in the *Kut*. In this case, the daughters of the house may use the *Kam* as it is comparatively private to the *Tibung*. With this division, the space which was previously the *Kam* is simply a corridor with a fireplace, called *Theng-tor*. Though the *Kut* is the most sacred space among all the divided sections, it has a fireplace however, the main fireplace for cooking food is in the

Kam. This is because, there is a segregation of space based on the social hierarchy of the family members in the house.

At the end of the *Theng-tor*, is a door that leads to a utility space that is for females, called *Pang*. It can be extended so that there are unshaded areas where they can dry clothes or rice paddy. The shaded space is called the *Pang Kup*. The females can use the space for bathing if it is too late in the evening to go the stream. Due to the orientation of the house on the topography, the *Pang* normally ends up at a great height above the ground, hence the corner which provides the most height is sometimes used as a washroom by the family members at night. This layout of the house provides privacy to the females.

Figure 4-12 and Figure 4-13 are Autocad drawings that indicate the sectional views of the house on a gradual slope. As indicated, the loft space under the roof is used for storage of rice wine fermented in hollowed out and dried bottle gourd. The purlins in the roof are used to suspend a shelf above the fireplace to smoke dry meat or maize or chilies or even rice when it rains and the *Hong-phlang* and *Pang* are not usable.

The basic materials used for construction are wood, bamboo and thatch. The main structural columns at the corners and the central column that supports the ridge beam of the truss, are logs of wood to ensure structural stability of the house. The other columns are sometimes replaced with bamboo. The floor in the *Hong-phlang* and *Pang* is made of bamboo, while wood is preferred in the rest of the rooms, however, depending on availability, quality of bamboo and skill of the workman, bamboo is also used. The walls of the house are made of woven bamboo strips which are tied to the structural columns of the frame of the house. Storage of utensils and good are increased by building shelves on the bamboo walls by using extra reinforcement of bamboo strips to support the weight of the articles on the shelves. The roof is made with bamboo in a truss structure and the thatch laid on it in layers to ensure that is waterproof. The walls have no windows for extra light in the rooms, however the gap between the roofing and the walls allow diffused light in during the day. The fireplace in the *Kam* is always lit to provide extra light in the room which is considered a traditional rule in a house.

The complex and highly segregated layout of the house a complexity in the social structure of the family based on gender, age, and marital status. The clear segregation of public versus private, family versus non-family, and the different stages in-between indicate a complex social familiarity. Though the people of the village come together as a community, the unit families behave as nuclear families which is indicated by the scattered expansion of the village and through the segregated layout of the traditional house.

NVivo qualitative software analysis- Karbi

On conducting a text search query using textual data linked to the Karbi case in NVivo, the result indicating the root word ‘village’ is shown in Figure 4-16. It is based on the generalised word input: Village OR Access Or Social Traditions OR Practices OR Communications Or Knowledge OR Community OR Infrastructure Or Livelihood OR Resources OR services OR Traditional OR House. Other supporting text search query results relevant to the discussion are recorded in the Appendix B.

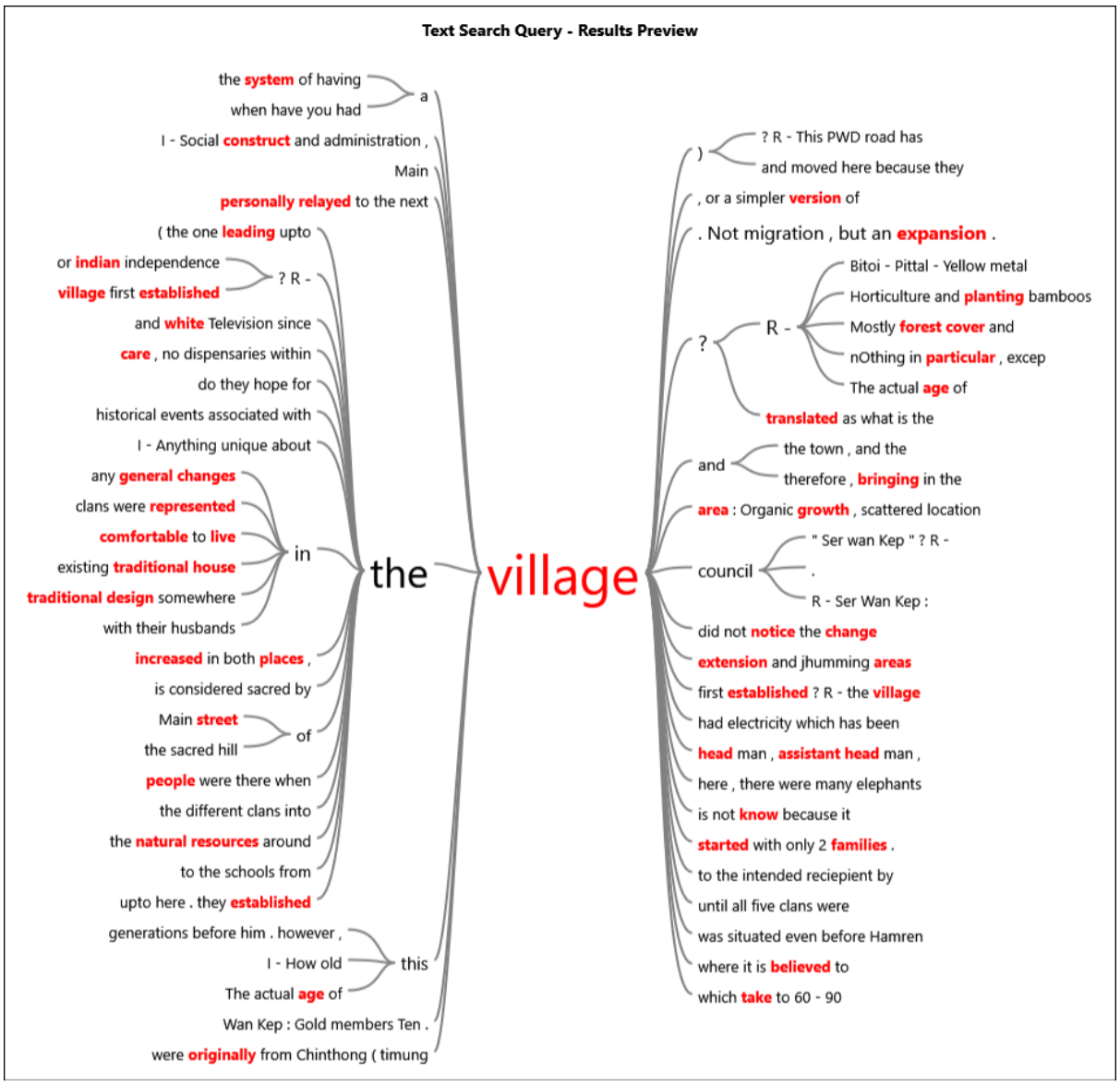


Figure 4-16 Text query, root term: Village

The result indicates links accessibility and connectivity to other communities and settlements, socio-cultural and agricultural practices, need for government support and infrastructure development and the forest cover in the region. The result indicates the relevance of access to the market for trade and commerce and for access to schools in Hamren. Agriculture is the most important and prevalent mode of livelihood which is linked to the topography and the area of land that the community has for cultivation of crops and planting other products. There is a school however, it does not function well enough to impart education which convinces parents to send their children to stay away to study.

The results indicate that messaging using a traditional code system was designed for communication across village councils in the absence of a formal script. The practice is still prevalent along with the presence of telecommunication. Education is encouraged through school as well as agricultural practice.

The focus group discussion indicated the relevance of the connectivity to the market, employment, healthcare, and education in the town, however, the missing links in the text search query indicates that it is a missing factor in the social and community infrastructure of

the village. There is lack of a community development infrastructure indicated by the presence of a signage that indicates the village being part of a village development plan, however, there is no healthcare facility or access to public transport. This indicates the lack of government support and intervention. However, the reason for this can be allotted to the inaccessibility to the village from the town. Not having motorable roads have caused a setback in the development of the village infrastructure.

The results indicate that electricity is provided by the town committee due to the political promises however, water is not provided since it is readily available at the location. Telecommunications are not provided, however due to the location of the village, there are pockets of mobile network and satellite connections in and around the settlement. Aside from those, postal services and public transport is not available despite being included within the town committee area. These issues are directly related to topography and road access.

Figure 4-17 and Figure 4-18 are the text search query results around the root words ‘family’ and ‘house’. It is based on the generalised word input of ‘House OR material OR space OR room OR construction’. The results indicate links to the specific layout of the house based on the social familiarity among people in and out of the family and the various activities and functions intended within a house. The results indicate a stringent form of social culture within the community as well as the family unit.

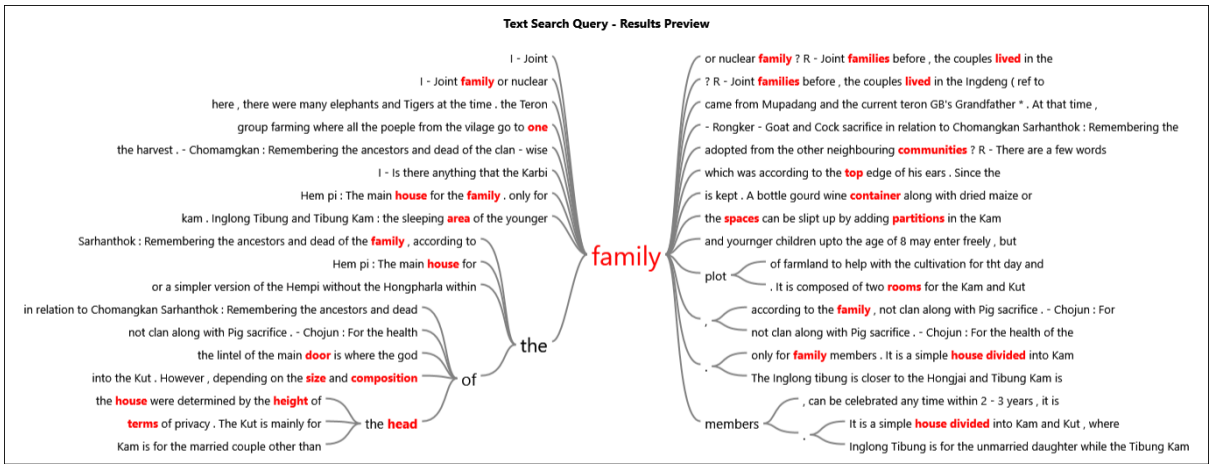


Figure 4-17 Text query, root term: Family

The fireplace of the house is noted as an important feature as it is present in almost all the main partitioned rooms. The results indicate a significance of maintaining hierarchy and exclusivity of spaces based on the familiarity, gender, and age of the people. Though it was noted that tradition has changed however, the mention of the cultural traditions and practices indicate the reminiscent nature towards the past. The discussion was oriented more around the layout and design of spaces than the construction of the house. The result indicates the importance of the agricultural practice and the forest cover in defining the design and construction of the house.

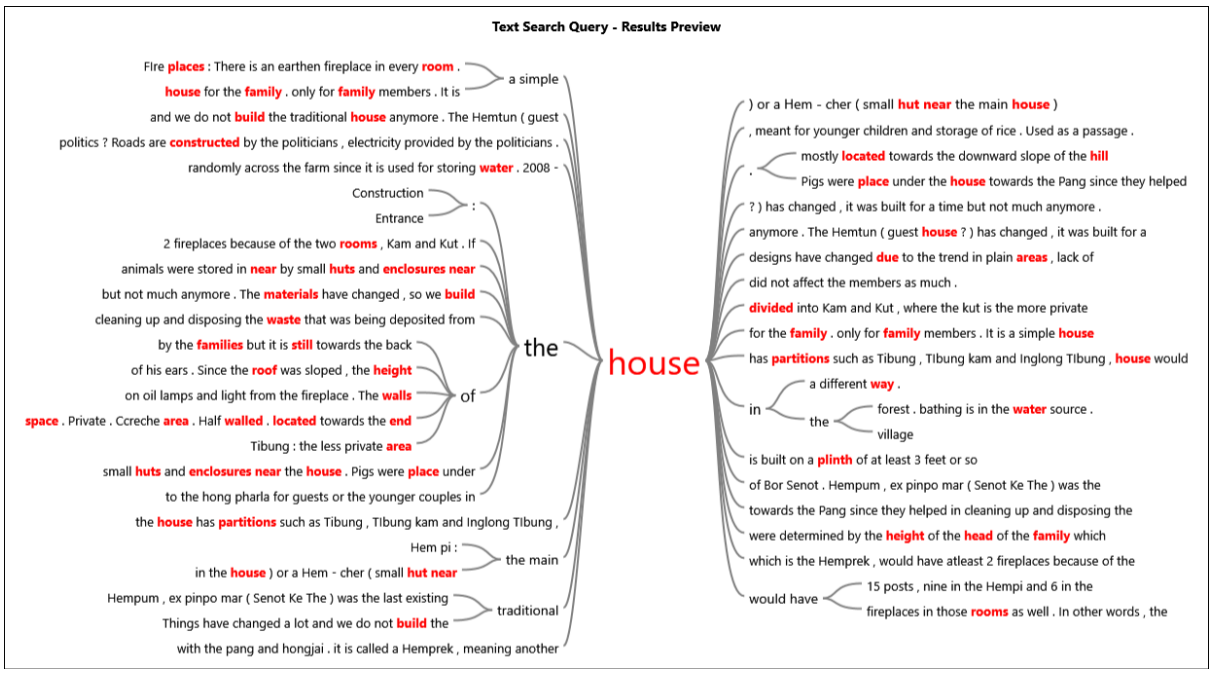


Figure 4-18 Text query, root term: House

In conclusion, the analysis of the case indicates the reminiscent attitude of the community towards the traditional practices along with the need for government support and intervention in providing social and development infrastructure. The role of topography has been a hinderance to the accessibility and connectivity to globalisation and development despite being closely located to Hamren. This indirectly indicates the influence of the degree of urbanisation available in the vicinity of the village.

4.1.3. Case 3: Dimasa

This village is in Dima-Hasao which is under a separate autonomous council than Karbi Anglong, having a different socio-political environment and hence resulting in different policies and implementation.

Accessibility – Transect Walk

The village is 20kms away from Haflong in the south and 9.6 kms away from Gunjung in the North and to other urbanised townlike settlements situated along the National Highway (NH) 627 which passes through the village area. The boundary of the village is not clearly outlined however, the southern border of the village is landmarked by the Shiv mandir E on NH627 as shown in Figure 4-19. A 1-2 km forested boundary D is maintained around the main settlement area of the village to ensure the maintenance of green cover and resources available from the forest.

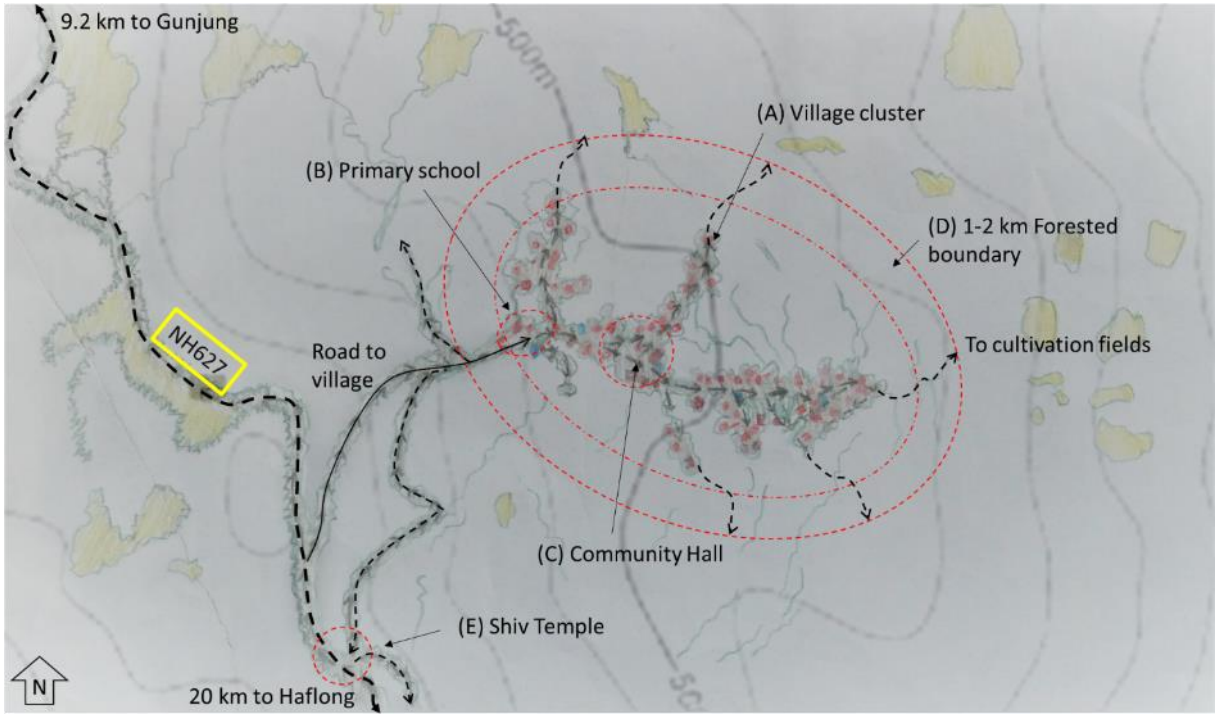


Figure 4-19 Transect map of the village, layered with a contour map obtained from google maps, Dimasa.

On arriving at the village, I was surprised that the village had the remnants of a motorable road not only connecting it to the towns but also that it continued into the village as seen in Image 4-23. I half expected to be told that we would have to trek a few kms before reaching the actual village after we stopped at the village centre near the Community hall C. We met with the translator and source who volunteered to show us around the village explaining a few social rules about the community which started with a sit down for tea to discuss the consent for the data collection.

Image 4-23 Remnants of motorable roads, Dimasa

Image 4-24 Primary school, Dimasa

Image 4-25 Paved paths, Dimasa

When all was agreed upon, the volunteer took me to the primary school B, seen in Image 4-24, which is where the main village started. On the right from the school was road to the North of the village, it is the most recent expanded section of the village and has fewer houses which are slightly dispersed from one another. The paths are paved wherever required to connect the houses from each other as seen in Image 4-25 and continued through the forest to the cultivation areas. Each house has a bamboo fence that is at least 2-3 m high around their house boundary because of the strong winds in the region as seen inn Image 4-23 and Image 4-25. As a rule, the trees within the village area should not be cut down, hence maintaining a balance of green cover within the village where possible. As seen in Image 4-26, there are goat sheds and patches of fenced vegetable gardens along the road, indicating that the fencing is not meant to distinguish property of one's household from another's.

Image 4-26 Animal sheds (top left and right) and vegetable gardens (bottom left and right) outside the house fence, Dimasa

We returned to the school to continue down the other paths in the village. we came to the junction where the path forked to create a triangular space which was the village centre. We took the left path to the east and passed a water tank on the right side of the path as we sloped down into this part of the village. The water tank is the main water supply store from the main grid before it gets distributed the other smaller tanks scattered across the village as seen in Image 4-27. We continued and saw the similar scape of 2-3 m high bamboo fences, domestic sheds and vegetable gardens on the side of the street and the paved path continuing in through the forest to the cultivation areas as shown in Image 4-23, Image 4-25 and Image 4-26.

Image 4-27 Main water supply tank (left) and distribution water well and tank (right), Dimasa.

We returned to the triangular piece of land where some of the village had volunteered to help construct the new community hall for the village next to the old run-down building as seen in Image 4-28 and the end of the road in Image 4-23. The is an initiative made by the community and not a government investment.

Image 4-28 Community house under-construction, Dimasa

We continued past the village centre and came to a weather-beaten tarred road curving to the left as seen in Image 4-29, while the village expanded to the right connected by the natural footpath as seen in Image 4-30. The distance between either side of the paths is wider on this side of the village while the same rule of maintaining green cover in the village exists. The path continues till it tapers off as it splits into two narrower paths that lead into the agricultural lands through the forest.

Image 4-29 Weather beaten roads in the village, Dimasa.

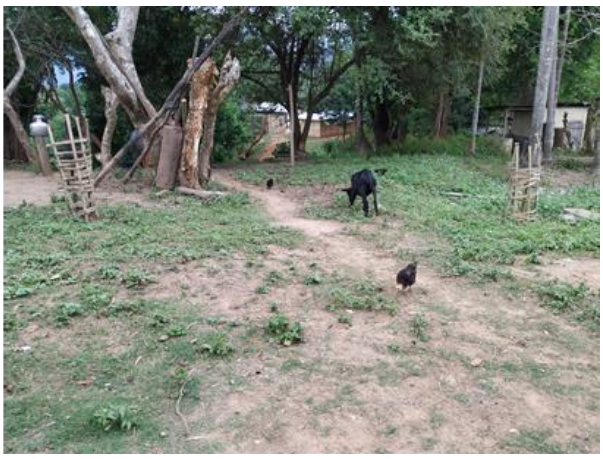


Image 4-30 Natural footpath, Dimasa

This concluded the transect walk and we returned to the volunteer's house for the focus group discussion. Table 4-3 is a list of the landmarks noted in the village during the transect walk.

Table 4-3 Elements observed vs. Description of elements.

LANDMARKS	
Built up	Houses School Community Hall Decorative Textile training centre Water supply Tank
Physical Landmarks	Shiv Mandir
Landscape	Mud path/road Weather beaten tarred road. Paved footpaths Vegetable gardens Fruit plantations Bamboo clusters Surrounding forest

Focus Group Discussion Outcomes

The focus group discussion was conducted with six members of the village. The average age of the group was around 40-50 years, three middle aged men, one college graduate his wife and one office retiree. The group shared as much as they could recall, and the presence of a female lent more insight to the social construct of the village. The results of the discussion are documented below.

History and Background

The Dimasa people lived in Dimapur, a city that is said to have been named after the Dimasa (Gait, 1906). Due to over-population the community moved to Maibang in the Mohur district and established a traditional capital. The previous generation of the current residents were originally part of the residents of Boro Wapu, a village near Maibang. In 1877 due to over-population and lack of fertile land, the community moved out of Boro Wapu to a location that was more inwards from its current location. However, 50 years later in 1923, the community decided to move to the current location which had better access to the road connecting Haflong and Gunjung and consequently to other towns and cities.

The Dimasa Hasao district does not accurately represent the Dimasa kingdom that had existed centuries ago, however, the subdivisions within the district are divided based on the traditional

districts of the Dimasa kingdom. The outlines of the village area within the district are shared with the council.

Administrative Construct

The council of the village is conducted by three members all of whom are male. A headman, an assistant to the headman and a conveyor of decisions. The names of the persons elected to the village council is shared with the Dima Hasao autonomous council. Discussions to an issue regarding the community is made with the adult males of each household in attendance, however, the final decision is made among the main three members. However, there can be cases where the community may object to the decision made and the three members must take this into consideration before finalising the decision. Unless the issue in concerns females directly, no females are included in these discussions and meetings regardless of the age or seniority in the household. Only males that are above 18 may join in the discussion and decision-making process.

Each village is considered as belonging to the family that established the village. The members to the council are chosen by the community however the criteria for the eligibility are that the headman candidates should belong to the headman's family who established the village. The community discusses and decides whether to accept the candidate suggested by the current headman. The role of the assistant and conveyor is also appointed in the similar way.

Social Construct

Unlike the male dominated administrative construct, the social construct is fairly equal aside from the gender roles regarding duty and responsibilities. However, upon marriage the female is not expected to move out of her parent's home and move in with her husband, the Dimasa couple can choose whose house to move in. In some cases where the husband and wife are from the same village, it is not assumed to be necessary to move into either's homes. The arrangement is quite fluid as the husband and wife may either choose to move to either's home or continue staying in their own respective parent's house, however the children are expected to be raised wherever the wife resides.

The skill related to cultivation is equally shared between the genders, however, it is mandatory for the males to learn carpentry and cultivation while weaving is a mandatory skill for the females.

Religion

The traditional religion followed by the community is Animistic in nature similar to the Karbi, however appear to have been more strongly influenced by Mahapurusism, which is a form of Hinduism preached by *Shankar Dev* in the 15^{th}-16^{th} century (Saikia, 1998). For example, the community does not eat beef due to the influence of the Hinduism in their culture however the interpretation of the reason is opposite of the reason in Hinduism. The cow is regarded as a holy animal according to Hinduism, however, the Dimasa regard the cow as unclean and hence do not eat beef. The community believe in sacrifice and rituals to remedy health problems and protection from harm.

Communication and Knowledge Sharing

The Dimasa did not have a formal script, hence any important messages were communicated verbally. Overtime, when the community learned to make their own guns (single barrel) they

used the gunshot as a signal to relay that someone in the village had died. This message was confirmed with details by going to the nearby villages within the traditional district regarding details of any funeral rites that may be conducted for the recently deceased.

The citizens speak in Dimasa, Assamese and Haflong Hindi which is the lingua Franca of the people living in and around Haflong. The education of the children was passed on through practice and oral traditions. The establishment of Haflong as a hill station and subdivision head quarter in 1853, introduced the system of formal education. The previous generation of the community were educated in Haflong including the retiree. A primary level school was established as a community initiative in 2010 to encourage the education of the children from a younger age. The children complete their education in Gunjung and Haflong while they stay in hostels or with relatives. Most of the older residents have education up to the 12th standard level while the younger generation have higher education degrees.

Electricity and Telecommunication

Electricity connection was established in 2007 and telecommunication service was established since 2008. Electricity has been more influential in the lifestyle of the community since the telecommunication connection is still very patchy and does not have complete and consist coverage across the village. The families used radios for entertainment which were replaced by television. Television has changed the daily routine for the community.

Water Supply and Plumbing

Due to their specific location of the village, which is at the bifurcation of a river, they collected water directly from the source since there was no plumbing before 1981. In 1981, with the help of the autonomous council, a plumbing and water supply system was established. They built a water tank in the village to receive the main water supply which is connected to taps in different locations across the village. They still collect water from the taps. This maintains the cultural practice of gathering at the water source to bathe and wash clothes for the community, while making it more accessible. Most of these taps are located near the road in the centre of the village, hence the activity of laundry and bathe is not as private.

Livelihood

The community relies on the Jhum cultivation for their rice which is practiced outside their forested zone within their village area. Vegetable gardens are maintained behind their house. Rice wine which is fermented in a way unique to the Dimasa community has earned it a Geotag. The smell of the wine is quite strong and can be smelled from every house after 4pm which is the earliest when the community returns from their cultivation fields. A bottle of the rice wine can be sold from $10 (AUD) to $300 (AUD) depending on the quality which can differ from season and village.

The residents used to go all the way to Haflong for selling their produce however over the past few years, the village has established a weekly market near the Shiv temple. Regular market in Haflong or Gunjung. Weekly market at the Shiv Mandir arranged by the community itself. Some of the citizens have alternate jobs as Auto-rickshaw (Indian Tuk-tuk) drivers, or teachers or lawyers depending on their education. This has been possible due to the location of the village with respect to Haflong, the accessibility from the State highway and the cooperation of the village with the autonomous district council.

Health Care

The healthcare of the community was driven by the traditional religion relying heavily on rituals and sacrifice accompanied with medicinal herbs. The traditional practice of praying for good health and protection is still maintained, which are occasionally accompanied by western medicine. There is no health care subcentre in the village, however, the ease of access through the road networks has allowed the community to access medical attention in Haflong or Maibang.

Projective Floor Plan - Traditional House

Figure 4-20, Figure 4-21 and Figure 4-22 are AutoCAD drawings that indicate the architectural information gathered from the projective floor plan exercise during the Focus group discussion. Image 4-22 is the closest resemblance to a Karbi traditional house. The description of the house has been documented below:

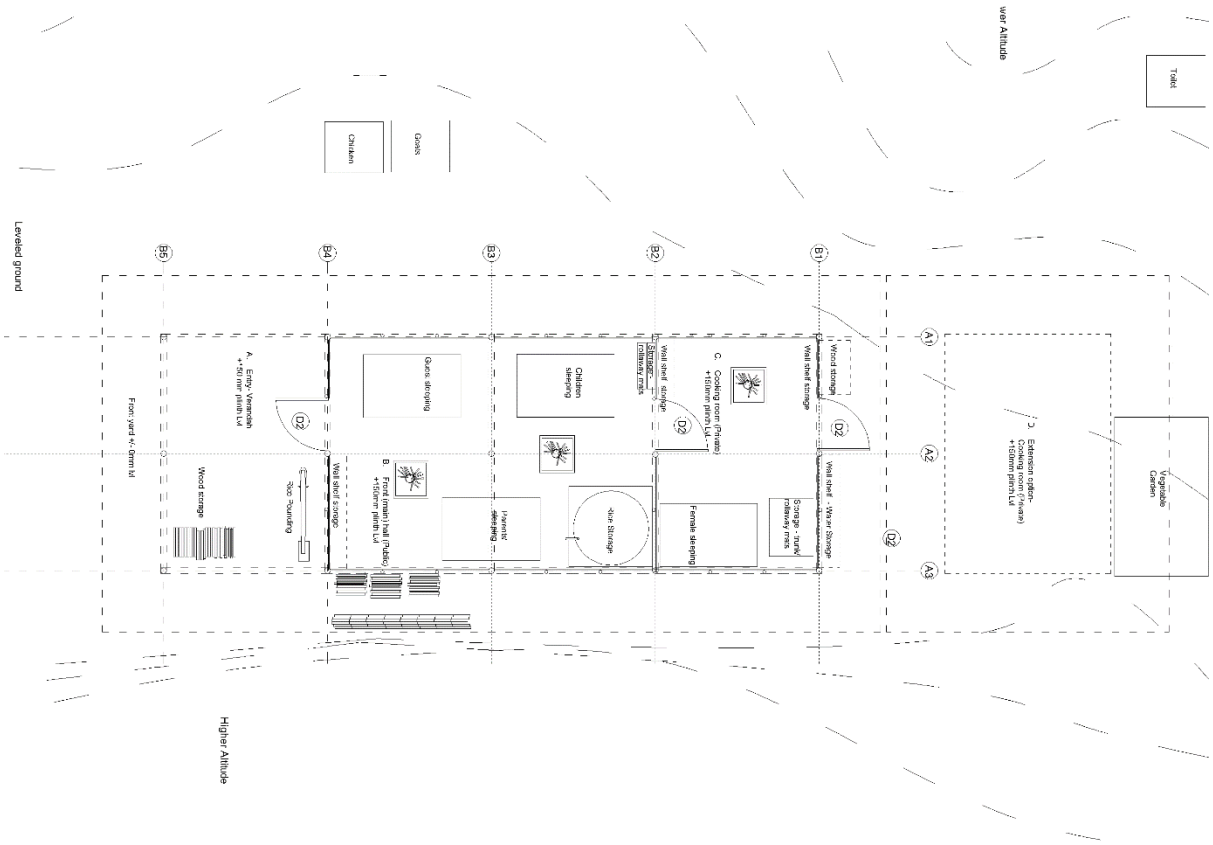


Figure 4-20 Dimasa traditional house plan

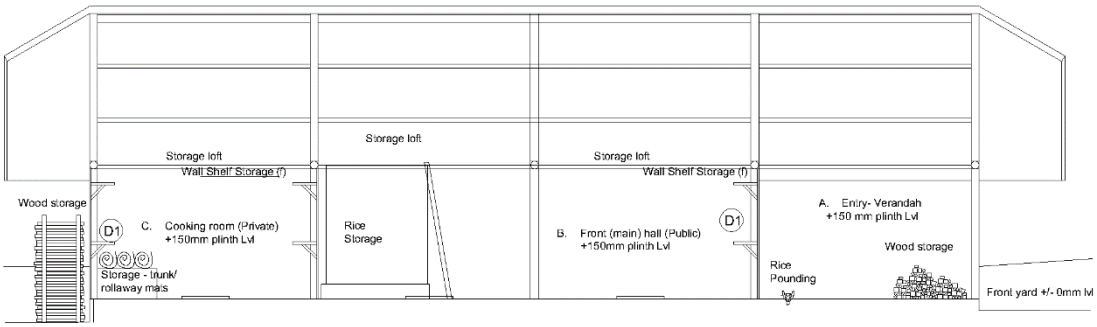


Figure 4-21 Dimasa traditional house section (Longitudinal)

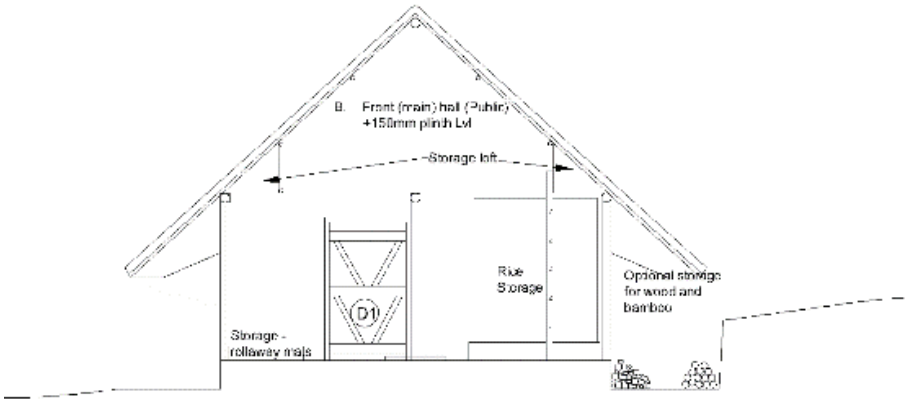


Figure 4-22 Dimasa traditional house section (Cross Section)

Image 4-31 Dimasa traditional house

The house is built directly on the ground as seen in Figure 4-23 (right). The ground is flattened for the plinth of the house. The earth gathered from grading the slope is used to create a raised earthen plinth. The house is oriented along the slope of the hill facing the street as seen in

Figure 4-23 (left). This is done since it is more convenient to grade less off the slope rather than reorient the house the other way and dig in the whole length of the house to obtain a levelled ground for the house. The grading of the slope around the house plinth is at least a metre or more away from the actual plinth area of the house. The graded earth is used to fill in under the house with a path around the house which is supported by bamboo stalks that are rammed into the slope to keep the earth in place. This creates a narrow path along the side of the house which allows a shaded access to the backyard around the house instead of through the house. The space in front of the house is maintained as a levelled ground creating a multipurpose space between the front door and the street, however sometimes due to extensions made to the house, the front wall is allowed to move forward closer to the street. The grading the of the slope around the house along with the raised earthen plinth, the rain flows around the house and the rainwater runoff from the sloped roof create a natural grouting around the house.

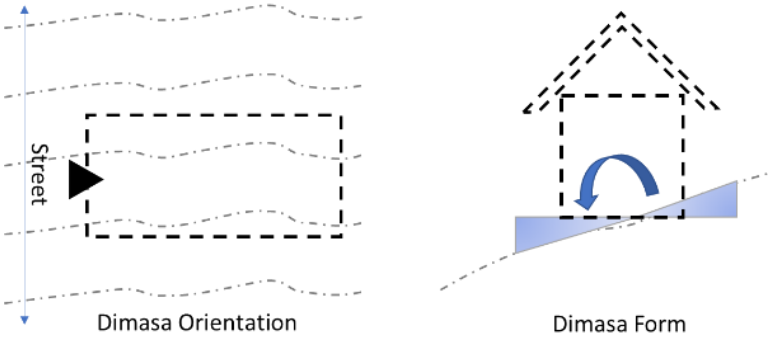


Figure 4-23 Dimasa traditional house: orientation and form

The entry to the house is from the door at the front which may or may not have a porch like veranda in front of the door. This space is used by the family for pounding rice to make it into powder with the aid of a seesaw like apparatus. A person may stand on one end of the seesaw with one foot on the end to push it down as far as possible and let it go to allow the free raised side of the log comes crashing down to pound the rice into powder. This apparatus can also be used for other grains and seeds such as maize and sesame seed. Wood storage. Also used for weaving, carpentry, and handloom. When the family sizer grows, the verandah is changed into a room by adding walls around.

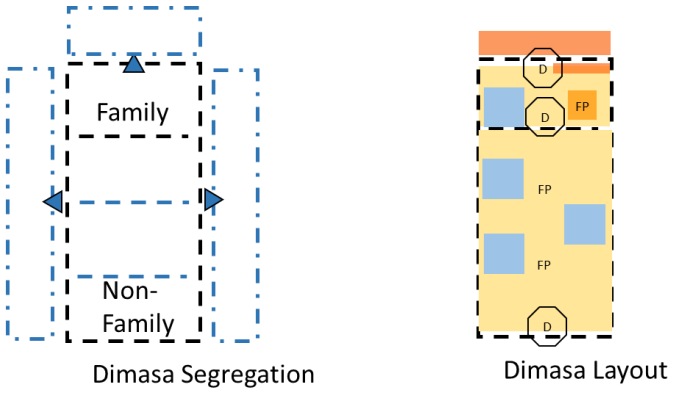


Figure 4-24 Dimasa traditional house: segregation and layout

The rest of the enclosed volume is separated into two rooms which are based on familiarity and gender. The rooms are placed one after another where the first room to be accessed is considered a public area where guests can be entertained and may sleep if staying overnight.

The room is double or triple the size of the second room. It is used as storeroom for rice and other goods. The community also practice sericulture and the mulberry branches full of silkworm larvae are placed in the first room. The size of the first room in the house allows a flexibility in the use of the space by both family and non-family members.

The second room is separated from the house because kitchen, which is only accessible to the family. No guests are allowed into the second room. In case of a small family with young children, the main room serves as the sleeping area, however, if the family has mature daughters, they sleep in the second room. The water for drinking and cooking is stored in bamboo tumblers on shelves built on the rear wall of the kitchen. Water meant for washing is placed in shelves in the overhung area outside the kitchen. Firewood is stored on the other side of the door in the same overhung area.

A vegetable garden is maintained behind the kitchen. The goats and chicken are kept in separate sheds either on the side of the house or on the front yard. The pigs are kept in the backyard beyond the vegetable garden and closer to the forest. The toilet is located far from the house towards the forest.

In response to the growing size of the family, there are three options that can be adopted. Firstly, partitions may be added across the first room to divide the spaces where the first room is still maintained as the public guest entertaining room and the following rooms become private spaces for the different family members. Secondly, the veranda may be turned into the first room for entertaining guest. And thirdly, another hut is built behind the house which is specifically used for cooking with exclusive access to the family.

The house is constructed using wood, bamboo, thatch, and mud. The floor is of mud which is sourced from the grading of earth to create the flattened ground for the house. Tree trunks are used as the main structural columns. As a general rule, twelve columns are used; four running through the centre of the house to support the ridge beam of the truss and four on either side of the house to support the structure of the roof. The rafter and purlins of the truss are made with bamboo. Four to five layers of thatch is laid on the roof to construct an insulated and waterproofed roof. To ensure water proofing, 3-5 long stalks of bamboo is cut in half and laid down over the ridge in a cascading order to ensure that water does not seep in through the gaps in the thatch at the ridge. The walls of the house are made with strips of bamboo woven into 3 x 3m panels that are tied to the column. Stalks of bamboo are used as intermediary columns that support the walls in case of a long façade.

The walls have no windows for extra light and ventilation in the rooms. The wall in the front and rear is built till the edge of the roof to reduce air circulation. However, the orientation of the doors allows the air to circulate through the house. The house remains cool all of the year, and in colder months, the fireplace is lit in the house to warm it up if needed.

The layout of the traditional Dimasa house indicates a linear transition of spaces from private to public. The exclusive entry to the kitchen is maintained as it is considered sacred. The doors of the house are located at the centre of the walls that cut through the house which adds the linear symmetry of the layout. It is a simple layout where the spaces are placed successively and due to the structure being built directly in the ground, there is a flexibility of circulation around the house without breaching the private or sacred spaces within the house. The simple bifurcation of spaces based on gender, familiarity and activity is clearly and successfully addressed in the layout.

NVivo qualitative software analysis- Dimasa

On conducting a text search query using textual data linked to the Dimasa case in NVivo, the result indicating the root word 'village' is shown in Figure 4-25. It is based on the generalised word input: Village OR Access Or Social Traditions OR Practices OR Communications Or Knowledge OR Community OR Infrastructure Or Livelihood OR Resources OR services OR Traditional OR House. Other supporting text search query results relevant to the discussion are recorded in the Appendix B.

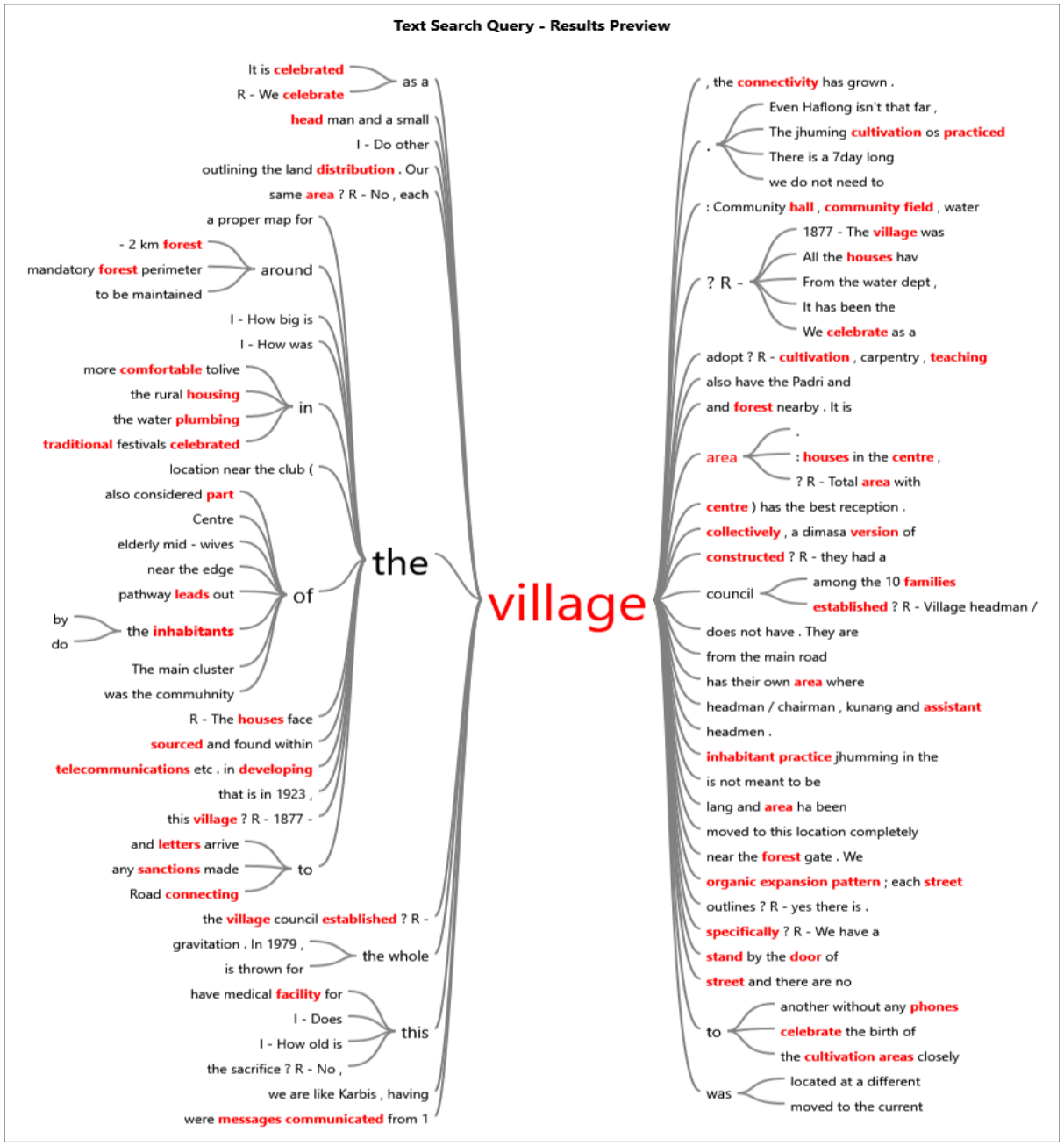


Figure 4-25 Text query, root term: Village

The result indicates links to improvement of community infrastructure with the presence of proper accessibility and connectivity to nearby towns such as Gunjung and Haflong. The access to the towns has allowed the village to improve the socioeconomics of the village through the presence of education, telecommunication, trade, and a traditional agricultural

practice. The forest cover surrounding the village is significant to the development of the village while maintaining a traditional outlook on cultural practices and livelihood through traditional festivals, traditional medicine, agriculture, and trade of local produce. The birth and death of a family member is a community event and continues to play a part in the traditions of the community. The presence of a primary school in the village allows graduates to teach in the school. The proximity to Haflong allows the people of the village employment opportunities aside from agriculture.

The social structure of the community is patriarchal and divided based on gender according to the skills each one offers to the community. The males learn carpentry and house building while the females learn weaving and cooking which also contributes to their livelihood. The presence of plumbing, electricity, telecommunication, a postal address, and opportunities to work in the nearby towns indicates government support and intervention which is made easier through ease in accessibility.

Figure 4-26 and Figure 4-27 are the text search query results around the root words ‘family’ and ‘house’ in the Dimasa case. It is based on the generalised word input of ‘House OR material OR space OR room OR construction’. It indicates links between the patriarchal structure of the community and the simply segregated layout of the house.

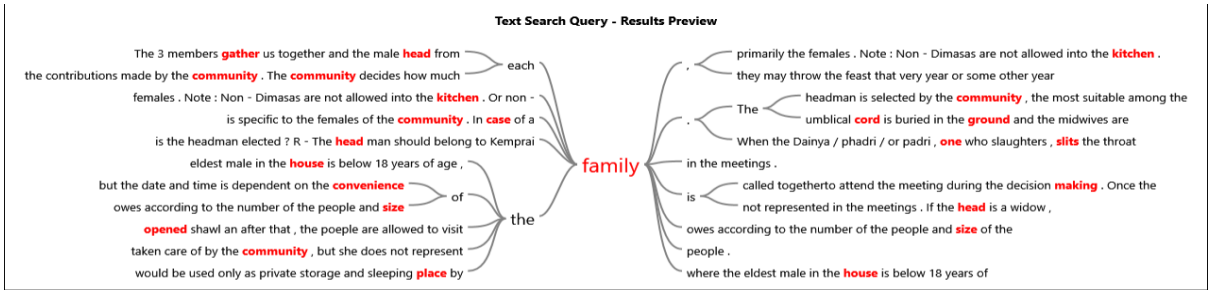


Figure 4-26 Text query, root term: Family

The results indicate links to social structure and the physical structure of a house, where the spaces are divided based on gender and social familiarity. The male of the family is considered important in representing the family in the community. The kitchen is the only space in the house that segregated from the rest of the house due to the exclusive nature of the space. It is accessible only to the family and sometimes used as a retreat for the females in the house. The discussion of the traditional layout of the house indicated equal attention given to the segregation of spaces as well as the construction method.

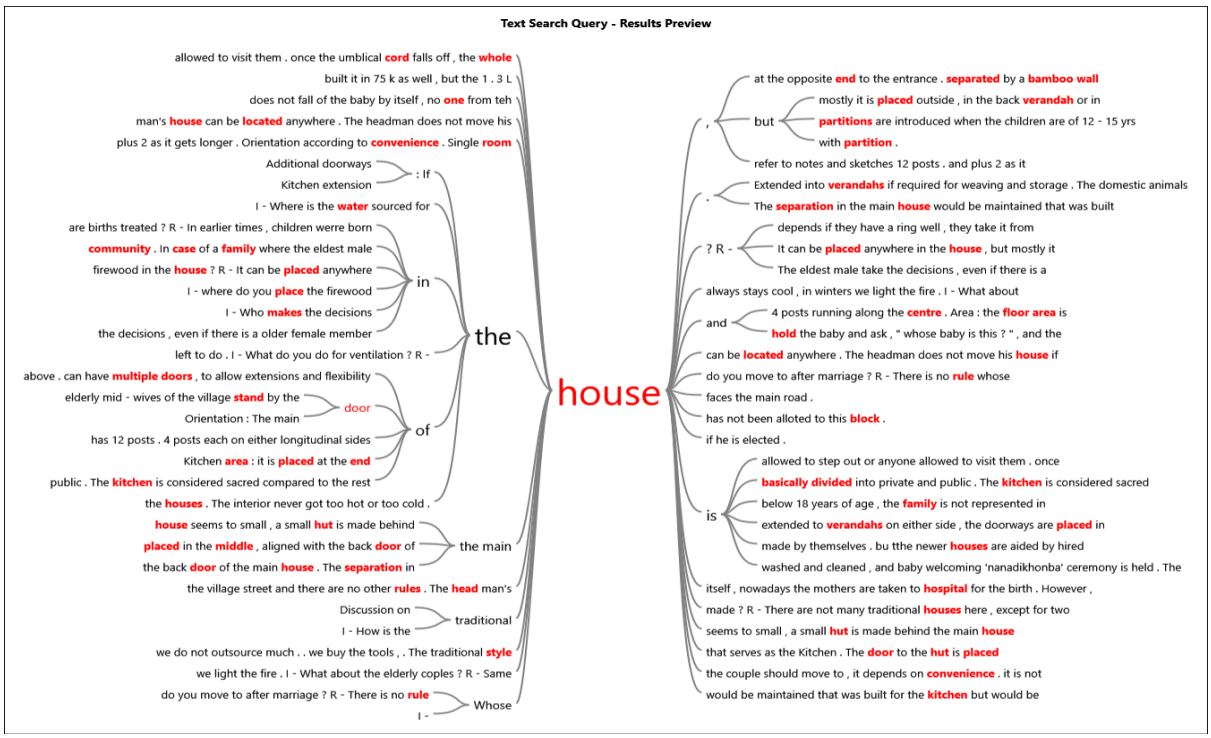


Figure 4-27 Text query, root term: House

In conclusion, the Dimasa village case is comparatively fortunate in its socioeconomic development due to the accessibility to the village, the transparency in governance and the degree of urbanisation present in Haflong. This case has indicated a blended culture of traditional practice along with urbanised facilities and services.

4.1.4. Case 4: Labang

It took a long time to finalise a village to study a community that was not socio-politically recognised as originally from Assam and a non-patriarchal society. There were many more villages that were either Khasi or Jaintia in the other districts, Dima Hasao and Karbi Anglong East. However, they were either too big in size (more than a 100 houses) or they were living in the plains which removed them completely from the uniform topographical context as compared to the other cases. We returned to West Karbi Anglong where the Labang village was chosen for the case study. The following sections presents the data collection.

Accessibility - Transect Walk

The village is in the Jaintia hill range, 22kms away from the Hamren Old Market. The village in accessed from the State Highway (SH) 18 is via a tarred road which was paved in 2014 by the community. It was done under the supervision of the Pastor from Jirikyndeng who was presiding the church in the village in 2000. Most of the road had already washed away due to the heavy rainfall in the region.

On the day of the first visit, we picked up a contact in Hamren who knew the way to the village and volunteered to serve as translator. It took nearly 2 hours to reach the village through the thick jungle folliage. It was towards the end of the Monsoon and had not rained for a couple of days. The road was rocky and shook the vehicle. The road twisted and turned, the terrain constatantly rise and fell until we came to a small clearing with a gate (E) as shown in Figure

4-28, framed by three rods of bamboo; two stood in the ground and the third rested horizontally on the curved ends.

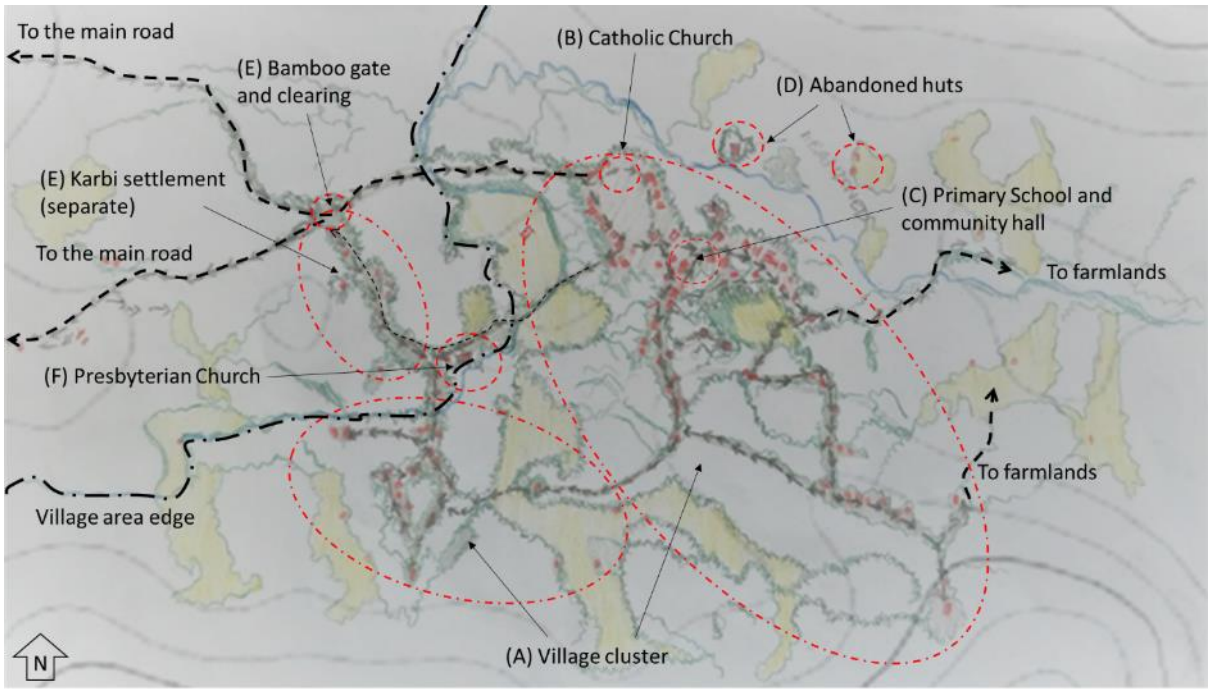


Figure 4-28 Transect map of the village, layered with a contour map obtained from google maps, Labang.

The volunteer informed us that that was not the way into the Labang village. The road access into the village continued to the left until we reached the last dip that had a bamboo bridge over a small stream flowing in the trough. We were later told that the stream indicated the edge of the Labang village community. The car slowly rose along with the terrain as the thick forest folliage gradually turned into tall trees of Betle Nut Palm and Banana plantation as we could spy into the village and see houses at a distance. The road opened out to of a rough rectangular field with huts along the sides which continued on up the hill to the southeast as seen in Figure 4-28.

We parked the car at the end of the field and met with the village elders with whom we discussed the data collection process. They informed me that they would be busy harvesting paddy but would return in the afternoon for the focus group discussion. The council decided to send a youth of the village to show us around to ease the process of mapping the village in the remaining time before they returned. We later found out during the Focus group discussion that he was the secretary of the village council.

Image 4-32 Field facing north, Labang.

Due to the scattered layout of the village across the hills , it took two days to fully conduct the transect walk. The village is scattered in two parts across the hills seperated by the *Menri* stream and the terraced paddy fields. A part of the village with upto 40- 45 houses is scattered across the hills on the east, while the rest of the houses are scattered on the hills to the west which is accesed through a bamboo bridge across the *Menri* stream flowing past the terraced paddy fields as indicated in Image 4-32. To cover as many houses as possible while walking through the village, the secretary suggested that we start from the stream called *Menri*, that marked the territory of the village beyond the beetle nut and palm plantation. It was explained that further north into the forest where *Menri* met another stream defining the edge of the village to flow into the Am-I river. We climbed back the muddy slopes to enter back int the village field as we passed the plantations. On the left is three houses and the catholic church (B) which had been built along with the road in 2014, shown in Image 4-32. From there, few huts are visible on the other side of the *Am-I* river, which have been abandoned (D).

Image 4-33 Part of the community-maintained vegetable garden, Labang.

We walked across the field and continued past where we had parked and climbed up the ascending hill that had a community-maintained vegetable garden as part of the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA),2005, as shown in Image 4-33. We continued along the path as the topography levels and come to a line of traditional houses along with a few that resembled an Assam type construction. At the end of the line of houses, the path comes to a T-junction. We go right as the left path goes to the cultivation areas. As we continue the path, it takes us across a small patch of cultivation field before it continues up a hill covered with pineapples with a house at the end of it as shown in Image 4-34 (left).

Image 4-34 Pineapple hill (left) and view of paddy field from Pineapple hill (right), Labang.

From the house, we see part of the village and its surroundings showing the houses on top of the hills as shown in Image 4-34 (right). Along the right side of the house is a path that slopes down to a small valley with a spring turned into a small pool using bamboo stalks and wooden logs, as shown in Image 4-35.

Image 4-35 Path along the right side of the house (left); the small valley with a bamboo bridge (top right); a natural spring turned into a pool (bottom right), Labang.

We cross over to the other hill using the bamboo and wooden logs before continuing up the path to the next house. The path continues around the house from the front to the left side of the house and continues up the slope of the hill. The hills have pineapple bushes on either side of the path as we trek up the slope. Wherever the ground reduces its slope, the space is used for drying the broom grass as shown in Image 4-36.

Image 4-36 Drying broom grass, Labang.

The path continues till we came to T-junction. The left side of the path have houses on stilts built in local materials, and the right-side lead to another part of the village through parts of the forest around the village. The left path continues in the same pattern of climbing through

plantations with intervals of house clusters with the front yard being used for drying broom grass. The path continues past the houses which led to Rongpangbong which is the closest settlement which is a Karbi village.

The left side of the T-junction returns us to the village through the forest. However, there is a path that departs into the forest from the edge of the house clusters leading to a lone house and the terrace cultivation area. There is a path across the terrace farm fields that leads to the second cluster of houses, however we return to the village to conclude the first cluster.

The density of the houses increases as we come closer towards the primary school and community centre building, unlike the dispersed layout higher up in the hills. We return to football field past the school and community centre and continued left passing more houses till we reached the terrace fields and *Menri* stream flowing along the edge of the fields. After meeting with the headman of the village and confirming our return to complete the remaining cluster of houses, we return to Hamren. It is decided that the focus group discussion is to be conducted in the afternoon of next day after completion of the transect walk.

The next day, we arrive take the road through the gate (E) that is on the way to eastern cluster of the Labang village. We drive through the gate and enter a Karbi settlement that is not part of the Labang village. There about nine to eleven houses which appear abandoned as the occupants are working in the field. At the end of the road, it turns left to a Presbyterian Church established by the Karbi villages around in the region. At the turn, there is an earthy footpath that leads down to a small hut which is said to serve as a health subcentre during the vaccination drives by the government of Health, while the road leads to the terraced paddy fields. We get off the car there and take the earthy footpath which leads the remaining cluster of the Labang village. There is a bamboo bridge constructed across the *Menri* stream, as seen in Image 4-37 which defines the edge of the Labang *Havar*, a Karbi word that is also used by the Labang, or *thaw-rep* that literally translates to ‘cultivation-area’ in Labang to refer to the extent of the Labang village context.

Image 4-37 Bamboo bridge over Menri stream, Labang

Image 4-38 Mud stairs up the hill, Labang

The path from the bamboo bridge gradually slopes up the hill slowly turning into a mud staircase leading up to the houses on the hill as seen in Image 4-38. Halfway up the mud-steps is a path on the right that appears to lead into the forest which we revisit later on our way back as shown in Image 4-39. The slopes of the hill are much steeper than the ones visited the previous day, so part of the hill has been graded to form a plain. These plain sections of the hill serve as a front yard of the houses that are built on stilts on the slope. Some of these sections are connected by gradually sloping footpaths while some are connected through a mug staircase.

Image 4-39 Path through the forest (left) and the steep hill (right), Labang.

The first house that we come is built on stilts with a part of it is extending over the slope of the hill while a part of it appears to be at the same level as the ground. There is an open area in front of the house with a shed on the other side. There are two paths that lead further into the cluster, one gradually slopes down the side of the hill and the other is a mud stair which is stabilised with bamboo as seen in Image 4-40.

Image 4-40 Shed and mud stairs, Labang.

We decide to take the path by the hut which leads to a similar graded plain with a house at the edge. As seen in. The path continues past the house along the side of the hill as it gradually slopes till, we come to two huts that are built on a graded plain at the side of the hill below the sloping footpath. At this point there is a mud-stair that is leading up the hill to the right, however we continue straight as we can see more houses perched on the hill ahead.

The slope downward gradually starts to flatten as we walk on the path to a cluster of three houses. The path continues till we reach a small pond that has been created by using rock to block the natural flow of water from the spring. There is a path on the left from the pond that leads downward through a small cluster of trees that open up to a Jhumming field. There is another manmade pond created using Bamboo and the nearby rocks on the left of the path that continues on to connect to a house that appears newly constructed on the ground without stilts as seen in Image 4-41.

Image 4-41 Jhumming field, house, and man-made pond, Labang

The path continues past the house and climbs 5-6m up the side of the hill to a barking puppy at the edge of the grade plain with a newly constructed house on it. Image 4-43 is the view that is seen from there showing the houses, footpath, parts of the forest and Jhumming along the hillside.

Image 4-42 Hillside view, Labang

We ascend the hillside as the puppy continues barking and trying to follow but is unable to climb down the steep slope covered with loose dirt. We return to the small cluster of 3 houses where we notice that just past the cluster is a path leading to the left through a slightly denser clump of trees. We follow the path which takes us a minute to walk through as it ascends and descends till opens to a clearing with vegetable gardens and a sunflower garden. There are more houses ahead as we continue. The clearing opens to a plain ground the size of a basketball court with houses around. Past the clearing, the path starts to narrow and slope downward along the side of the hill ending in a graded plain. There is a house and a path around the side of the house leading to a bigger area of graded plain with more houses and another mud- stair that leads to another graded plain with a house. We continue the descent and return to the first house that we had encountered at the beginning of the transect walk. We take descent down mud stair till we reach the path leading into the forest and take the detour to visit the last house in the whole village as seen in Image 4-44.

Image 4-43 Detour, Labang

At the end of the path, we reach the last house of the transect walk where the trees have been burned and cleared for jhum cultivation. The houses appear to be newly constructed evident from the colour and texture of the bamboo used for construction. Image 4-44 is the best and clear example of a house built on stilt with most of the structure extending out and hanging over the slope of the hill while maintaining an easy access to the house by having the entry level at the same level as the ground in front of the house. Some of the surrounding area is already being repurposed by planting broom grass and ginger on the slope.

Image 4-44 Last house, Labang

Having hiked for over three hours we decided to take a break and eat our packed lunch in the car. With all of the houses and landmarks mapped and documented through photography and a transect map, we headed back to the headman's house in the other cluster of houses. The path leads us back to the Presbyterian church, beyond it to the right and straight ahead through shrubbery as seen in Image 4-45 back to the Menri stream. There is a bamboo bridge constructed across the stream leading to a path past the terraced paddy fields as seen in Image 4-46.

Image 4-45 Presbyterian church, outside the Thaw-rep of Labang

Image 4-46 Bamboo bridge and terraced paddy fields, Labang

We made our way back to the headman's house where the other members of the village council and elders are gathered to participate in the focus group discussion. Table 4-4 is a list of the landmarks noted in the village during the transect walk.

Table 4-4 Elements observed vs. Description of elements.

LANDMARKS	
Built up	Houses School Church
Physical Landmarks	Bamboo gate, Terrace farming Streams Man-made ponds Bamboo bridges Broom grass Baptist church Presbyterian church Football field Am-I river
Landscape	Mud path/road Terrace farming Jhumming cultivation Vegetable gardens Fruit plantations Bamboo clusters Broom flower cultivation Forest Pineapple hills

Focus Group Discussion Outcomes

The focus group discussion was conducted with six participants, the current head mand, previous headman, the village council secretary, the headman's son who is also the assistant teacher in the primary school, and two other village members.

History and Background

According to the recollection of the group, the *thaw-rep,* which is the village context, has remained the same for over many centuries, however, the settlement within the thaw-rep has changed. Each resettlement is renamed as they move. The most recent re-settlement which is in the current location was in 1970. Before that, the community was settled in a location situated at a higher altitude and 4 kms away from the current settlement, called Rongpangdeng, for 17 years. Before that, the community was settled in a location that is 2km from the current location where they lived until 1957, called Madan-Jiri. The history of resettlement is unknown before that.

The population at Madan-Jiri (-1957) was 10 – 15 families and the community had moved due to the unusual number of deaths in the community. The superstition was that the place was not good, or the people would continue to die if they remained there. The population in Rongpangdeng (1957 -70) increased to about 150 people which is around 30 – 35 families. However, the community was already practicing agriculture in the current locations and it made better sense to move closer to the agricultural fields. The number of families in the current settlement is 69 families. In the many centuries that they have been living there, they have had no friction with other communities, in fact they have good relations with the Karbi people.

Administrative Construct

The village has a village council called *'Dorbar shnong'*, which is a literal translation of 'council' and 'village' respectively. It is composed of four members: *Rongba shnong* or the

headman (*Gaon Bura*, in Assamese means Village old man or village headman), who is responsible for administration; *Daloi* or the grand headman (*Bor Gaon Bura*, in Assamese means grand village old man or grand village headman), who is responsible for the land use and distribution; a member designated as the 'president' who leads the meeting and manages the agendas; and a member designated as the 'secretary' who is responsible for taking notes of the meeting, and the budget and expenses for the community. The president and secretary share the responsibility of relaying the decisions of the meeting to the public if mandated according to the issue. Traditionally, the members of the council were selected by the predecessors of the position which was sometimes treated as a hereditary position. However, the community collectively decided to conduct elections for each position in the council.

It was decided that the hereditary treatment of the council member position weakened the authority and capabilities of the council and their responsibilities to the community. The first election took place five years ago when the previous head man had died. The council members are voted on by the community for a term of five years and they can be re-elected if they have successfully attended to their duties. The elected candidate is presented with fermented rice wine to finalise him as a council member. The council member is chosen based on the proactiveness he demonstrates in his abilities, however, if he fails in his duties, another election is held for his position regardless of the term.

The *Rongba shnong* is elected based on his ability to enforce the decisions of the council and impartial role in the issues of the community. The *Daloi* is chosen based on his knowledge of the agricultural practices that will be best suited for the benefit of the community. His responsibility to the community extends into ensuring that each family has enough land on which they can cultivate crops and grow fruit trees depending on the personal livelihood choices of the community member. The president is chosen based on his relations with the community. The role is given to a youth who shows his abilities in cultivation and his ability to rally the youth to commit to community activities during harvest season, festivals, and other celebrations. The secretary is elected based on his understanding and management of the budget and expenses of the community. This position is difficult to fill as it is difficult to demonstrate the capabilities that are required for the position; however, the position is given to a youth who maintains good relations in the community to be able to source collections when required for festivals or celebrations.

No females are considered as eligible candidates for the position of council members, however, during the hunt for a case representing a matrilineal character, a village in Dima Hasao district belonging to the Jaintia community had a female head of the village. As the position in the village council in that village were based on heritage, the position was inherited by her from her father as her brother had chosen to move to Haflong thereby forfeiting the claim to headman-ship in the village.

Social Construct

The social structure of the Labang community is matrilineal where the children take the mother's name. For instance, when the marriage is between a Labang and Karbi, it depends on where the couple decide to settle. If the couple moves to a Karbi community, the children take the father's name and if the couple remain in the Labang community, the children take the mother's name. In cases where a Karbi woman marries a Labang man and they decide to settle in the Labang community, the Karbi surname is taken by the children because of which there

were quite a few families with Karbi surnames. However, the rest of the cultural practices and traditions were followed according to the Labang values.

The property is the direct responsibility of the female, specifically the youngest daughter, while the male remains the main authority in taking decisions and representing the family. The property can be inherited by all the children; however, the biggest portion is given to the youngest daughter. It is a common practice for the youngest daughter to take control of the property and the family house by the time she is married or 18 years old. The parents continue to stay in the house; however, her siblings are expected to move out of the family house when they come of age into huts of their own that is constructed within the compound. Upon marriage, the husband moves in with his wife in her house and he becomes the second patriarch of the family after the father. The sons-in-law from the marriage of the elder daughters do not receive the same attention and responsibility.

Cultivation is equally practiced by both however, at least one female stays behind in the house to do the household chores like collecting water, cleaning the house, and preparing for meals. Weaving is practiced by females; however, the presence of the practice was not evident during the transect walk and was not mentioned by the participants. Carpentry is a practice that is still actively practiced by the males of the village. The males have also learned how to build a contemporary house using cement, brick, and mortar.

Religion

The community followed the traditional religion called *Miam Chnong* which is animistic; however, in 1975 a few families were converted to Christianity and by 2012 the village was fully Christian. The traditional religion included specific sacrificial rituals for reasons such as Harvest, good health, baby after marriage, protection from death and epidemic illnesses, for peace and harmony in the community and the household. The community level rituals took place every few years depending on how the community is thriving. Ancestral worship is a three-day annual ritual that is part of the traditional religion where the family sacrificed pigs, goats, and chicken according to the number of ancestors being remembered.

In the Christian context, the traditional practices are still followed however they have been modified according to the context of the church. Meaning that, the sacrifice of pigs, goats ad chicken still take place as the village partake in feasts after harvest, marriage, someone's birth, funeral, Christmas, and New Year. The role of ancestral worship, praying for good health and protection from harm has diminished as the community congregates in church weekly where they can pray as a community for the same. The practice where the sacrifice of animals was the main focus of the ritualistic worship in *Miam Chnong* has changed as the worship and prayer takes place in the church and the partaking of meat follows as part of a community feast.

Communication and Knowledge Sharing

The Labang did not have a formal script, hence any important messages were communicated verbally, and knowledge was shared through oral traditions. Due to the inter-culture marriage the people can communicate in both Karbi and Labang, however the dialect spoken is different due to the blend of the languages where words from one language is used in the other language. The education of the children was passed on through practice and oral traditions. Since a female always stayed behind to take care of the house, the responsibility of taking care of the younger children is on her.

However, the concept of formal education was introduced by a pastor in 1972 along with the gospel. In the late 90s, the local political party provided a community hall and 10-12 houses, and the northeast council built the road that linked the Umcherra to Rongpangbong which are neighbouring villages that are closer to the State highway 18. Few years after, the community hall was turned into a school for lower primary classes up to standard 5. A local political leader helped by sending teachers and books for the students. The students continue their education in Hamren or Jowai, Meghalaya where they stayed with relatives or in hostels.

Electricity and Telecommunication

There is no connection to the power grid hence no electricity, however all houses have solar panels. Until 2007-08, the community relied on firewood and kerosene lamps for lighting up the rooms. It started with one family (secretary*)* who bought a panel to light up their house and other families followed suit. Some purchased the solar panels paying through made by from selling their farm's produce, while some used a government scheme to pay for the purchase.

The village has no telephone connection or postal service. The topographical location of the village does not allow any mobile network signals. Few people have mobile phones which they use when they walk a distance to the SH 18 or visit Hamren or Jowai. Few families own televisions which they do not use as often as there is no satellite connection, but they have DVDs and cassettes of films and songs.

Water Supply and Plumbing

There is no water plumbing service to the houses, they must collect water from the river, stream, or man-made ponds for the house. The Am-I river, *Menri* stream and the various man-made ponds across the hills provide the water for the community. These water source locations are also the place for the community to take bath and wash clothes which is a common social practice in the village.

Livelihood

The village has large areas of terrace farms of rice and maize and hillside pineapple gardens and broom grass along with jhum cultivation. They supply pork to Hamren in the weekly market along with the abundant pineapple, backyard vegetables and broom. Some of the community have learned construction methods that use cement and brick which provides them with an additional source of income, however agriculture is the primary source. There are few exceptional cases where the person is employed in Hamren or the towns in the district and they take the private busses that serves as public transport connecting the villages along the SH18, going to town in the morning and return in the evening.

Health Care

The community originally relied on sacrifices, rituals, and medicinal herbs, however in recent times, they go to Hamren, Diphu or Jowai for medical attention. There is no health care unit in the village, the closest hospital is in Hamren.

Projective Floor Plan - Traditional House

Figure 4-29, Figure 4-30 and Figure 4-31 are AutoCAD drawings that indicate the architectural information gathered from the projective floor plan exercise during the Focus group discussion. Image 4-47 is the closest resemblance to a Labang traditional house. The description of the house has been documented below:

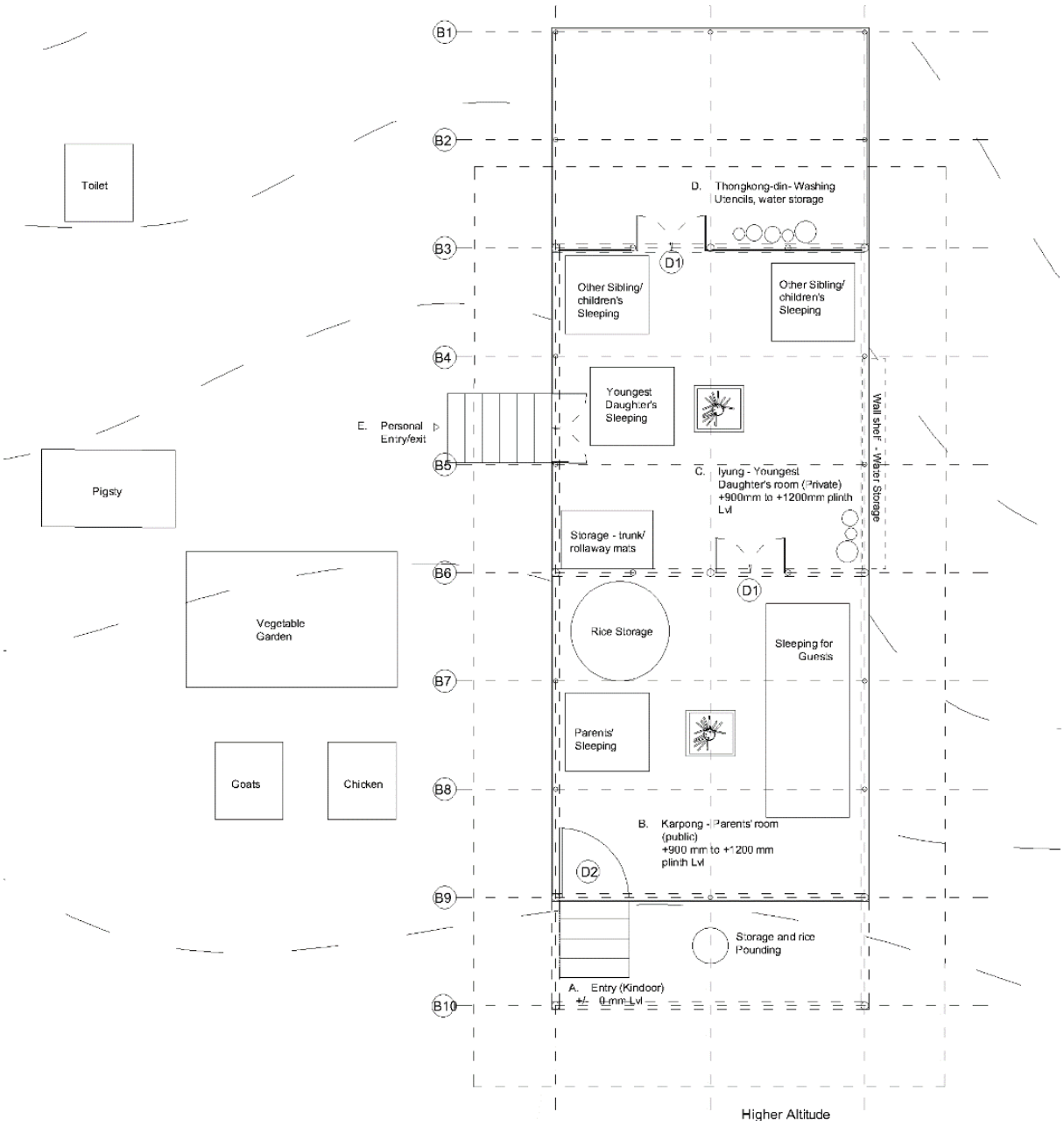


Figure 4-29 Labang traditional house plan

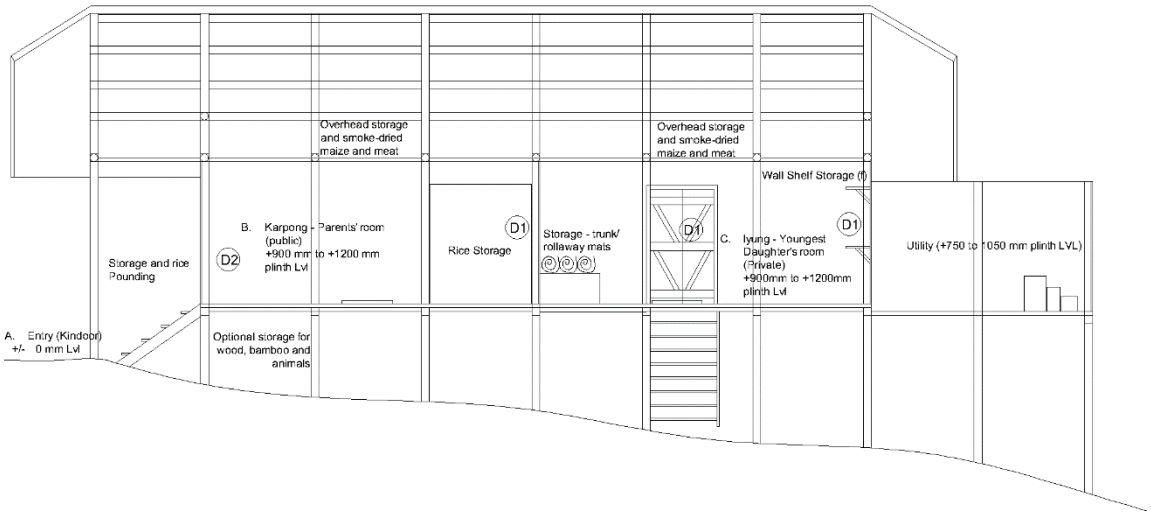


Figure 4-30 Labang traditional house section (longitudinal)

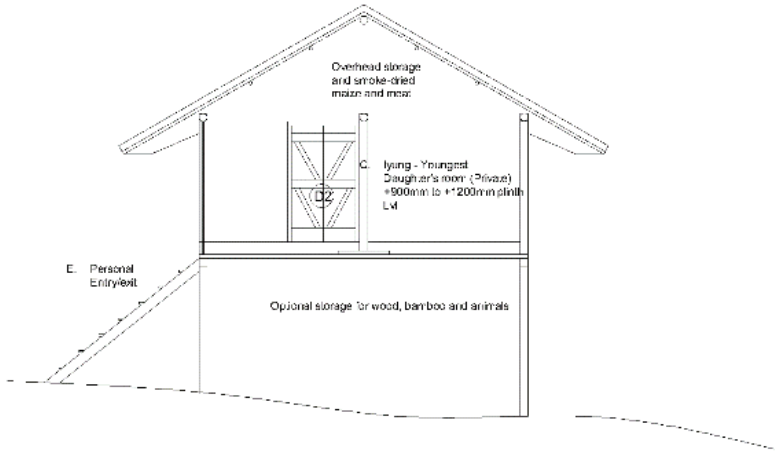


Figure 4-31 Labang traditional house section (cross section)

Image 4-47 Labang traditional house.

The traditional house is built on stilts that is supported on a graded topography as seen in Image 4-47. The slope is partially graded where the plain area as a front yard while the house continues to hang over the slope of the hill as noted in Image 4-44. The orientation of the house is against the slope of the hill with the entry from the narrow section that is closest to the ground and easiest to access as seen in Figure 4-32 (left). The entry door faces the street meaning that the street runs along the grade of the slope and at a perpendicular to the house orientation. This is done to provide an open space for drying clothes, carpentry, or other such activity. The elevation of the plinth is just high enough for a gap between the ground and the plinth that allows the rain-water run-off easily under the house. The house has sloping roofs due to the heavy rainfall as seen in Figure 4-32 (right). The space under the house is not used for much.

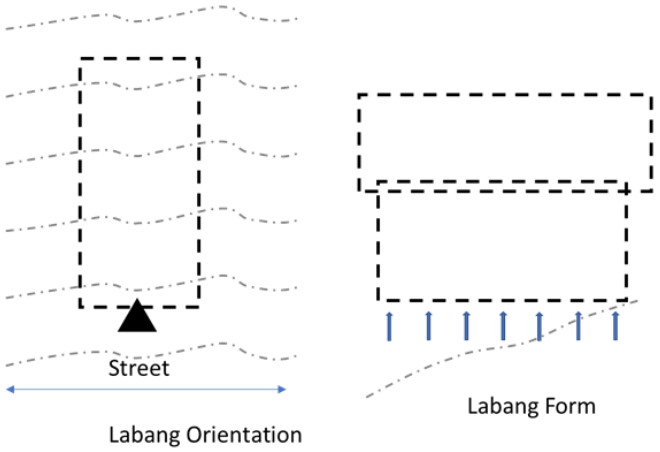


Figure 4-32 Labang traditional house: orientation and form.

The roof of the house extends to the front by about 1- 2 metres that is supported by columns in the front. This shaded space is used as a storage for firewood and bamboo and for pounding rice. The access to the house is from the plain ground with a bamboo ladder that leads straight up to the door of the house which is located at the edge of the wall as indicated in Figure 4-33 (right). The house is then split into two equally sized rooms located one after the other along with a cantilevering extension further back into the house. The segregation is based on familiarity to the household as indicated in Figure 4-33 (left).

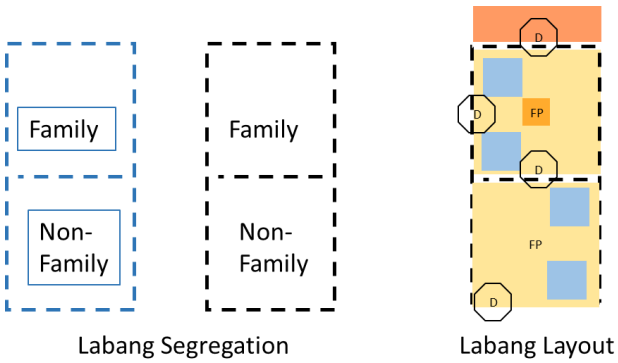


Figure 4-33 Labang traditional house: segregation and layout.

Both rooms can be used for similar activities such as storage, sleeping, cooking, weaving etc, however the rooms differ in the accessibility of persons into the rooms. The front room is meant for entertaining guests and is where the matriarch and patriarch sleep. Guests are not allowed into the back room and it is where the youngest daughter sleeps with her husband and children

if she is married. There is a door leading further back into the house which leads to a utility space which is partially covered by the roof overhang. The space is used for drying clothes, storage of water for cleaning and washing of dishes, and as a toilet in the night. There is a door that leads out to the side of the house from the back room. This allows the family members to exit the house to complete outdoor chores without being noticed by any guests that may have come over for a visit or a meeting in the front room. This door allows access to the vegetable garden, animal shed, and toilet located in the side of the house.

The materials used for the construction are wood, bamboo and thatch. There are 15 major columns that are used to form the structural frame of the house. The columns are placed in a grid of 3x5, where the first three columns support the overhanging roof of the *Kindoor*, with the central column as the main support for the ridge bam of the trussed roof. The next nine columns are the structural frame for the two rooms of the house, following the same pattern of placing a column in the middle to port the ridge beam of the roof. The last three columns are placed at the end to support the floor of the utility space at the end of the house. There are intermediary columns of smaller girth that support the bamboo woven walls of the rooms. There are no windows built into the walls to provide lighting however, a shelf is built into the wall in the Iung for storing water for drinking.

The roof is made with bamboo in a truss structure and three to four layers of thatch is laid on it to provide insulation and waterproofing from the rain. The space below the roof is used as a storage loft for drying rice, fish, meat, and maize. There is a shelf suspended from the roof that is meant for smoke drying meat, fish, and chillies.

As mentioned earlier in the focus group discussion of the case, a completely new house is constructed next to the first house, which is meant for the children above the age of 18 years other than the youngest daughter. No changes are made to the house by adding walls or extending roofs. The functionality of the layout is simplified by segregating the spaces based on gender, familiarity, and age. This automatically segregates the two rooms based on privacy. In some ways, it can be said that the back room is considered sacred as it is specifically reserved for the youngest daughter of the house who is culturally responsible for the household and the family home.

NVivo qualitative software analysis - Labang

On conducting a text search query using textual data linked to the Labang case in NVivo, the result indicating the root word ‘village’ is shown in Figure 4-34. It is based on the generalised word input: Village OR Access Or Social Traditions OR Practices OR Communications Or Knowledge OR Community OR Infrastructure Or Livelihood OR Resources OR services OR Traditional OR House. Other supporting text search query results relevant to the discussion are recorded in the Appendix B.

Figure 4-34 Text query, root term: Village

The result indicates its link to strong socio-cultural and agricultural practices, influence of geo-politics of the region on the community and the involvement of the church in improving the infrastructure through education. Despite the lack of telecommunications in the village and the proximity to state highway 18(SH18), the community is well connected due to the daily interstate bus passing by the village via the state highway. This indicates significance of the geopolitical nature of the location in encouraging education and improvement of social infrastructure. It has influenced agricultural, trade and livelihood practice which has included the plantation of tropical fruits like pineapples and bananas as part of the produce sold in the market.

The matrilineal nature of the community is a significant differentiating feature village environment and inheritance of property; however, the gender roles are still maintained like the other cases. The social structure of the families, though matrilineal in nature has maintained

a degree of patriarchy as the socio-cultural and traditional head of the community and the family unit is male. The originally hereditary position of the head man is now elected by voting based on the skills and merits the candidate presents as beneficial to the community.

Figure 4-35 and Figure 4-36 are the text search query results around the root words ‘family’ and ‘house’ in the Labang case. It is based on the generalised word input of ‘House OR material OR space OR room OR construction’. It indicates links among the physical environment, the matrilineal nature of the family social structure and building a house.

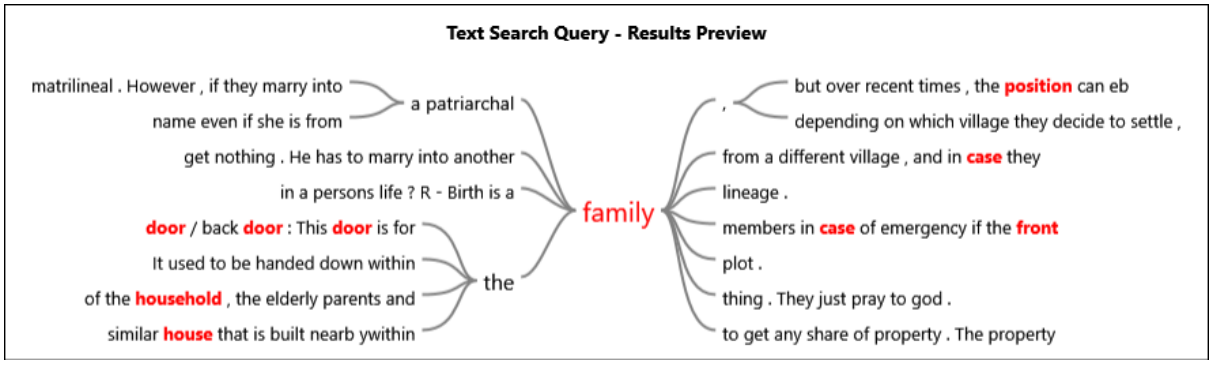


Figure 4-35 Text query, root term: Family

The geo-physical environment influences the material and skill used in building the houses in the village. Due to the connectivity to Jowai through SH18, the community can import materials and skill that are available in the towns despite the virtual disconnect. The segregation of space is based on gender, familiarity, and social hierarchy in the family. The community promotes self-resilience by the age of 15 or 18, where the bare minimum expected from the older children is to build a separate shelter for themselves.

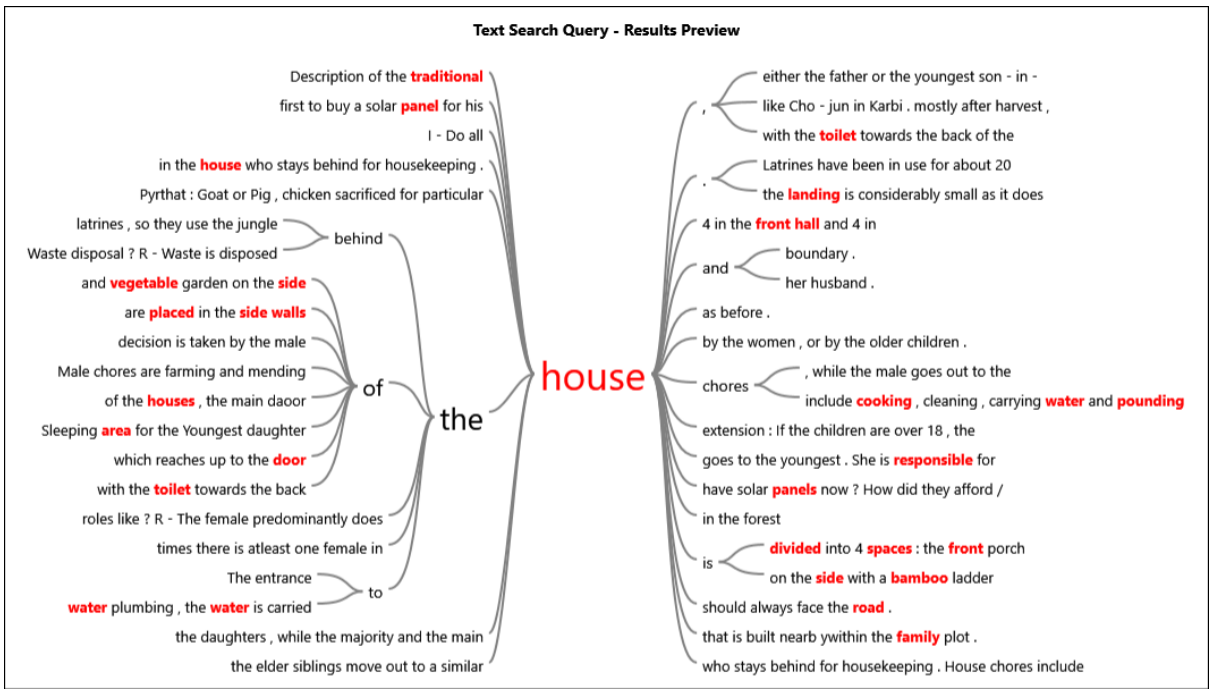


Figure 4-36 Text query, root term: House

In conclusion, the case analysis indicates that the telecommunication connectivity takes a back seat when the accessibility to globalisation is provided through a main arterial road, or in this case, a state highway. The accessibility and connectivity provided by the state highway has

been instrumental in improving the social infrastructure by enabling the purchase of solar panels for electricity, accessing a trade market, and easing commute to school or work on a regular basis.

4.2. Cross-case Analysis

The following section has repeated the same procedure of conducting a text query based on specific words like the content case analysis. However, the text query has been conducted across all the four cases which has resulted in references being linked to a root word that is mentioned in all the cases. The results of the cross-case text query analysis are discussed below:

4.2.1. Accessibility

From the content analysis of the cases, the accessibility to other communities, mode of livelihood, education, and trade, and to varying degrees of urbanisation, has indicated relevant to the growth and development of a community. Figure 4-37 is the text query result for road access with the root term is 'road'. It is based on the word input: Road OR roads OR Transport OR Vehicle OR Car OR Foot OR Way OR path OR street OR bicycle.

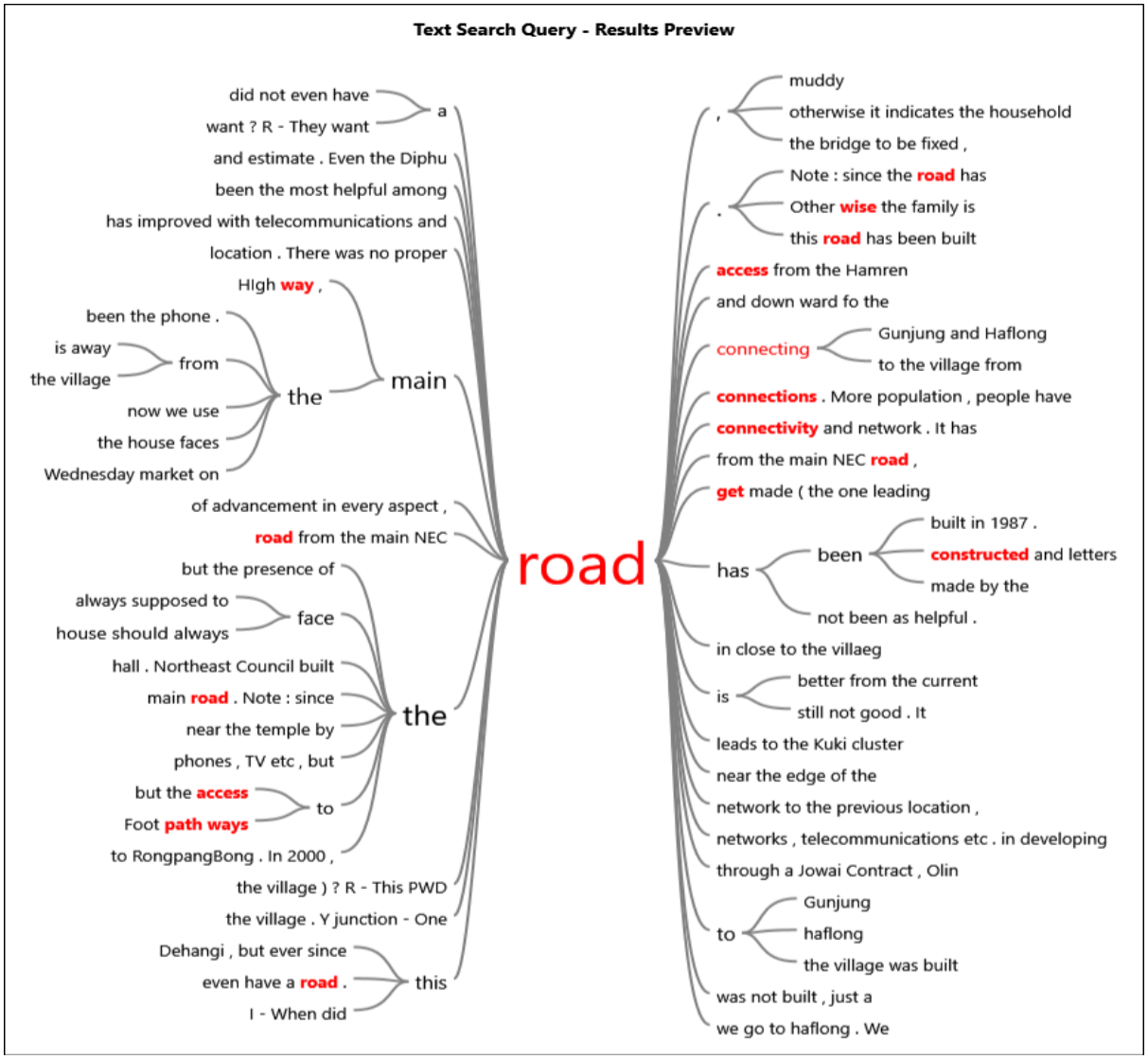


Figure 4-37 Text Query, Root Term: Road

The distance of the cases from an urbanized centre was at least 20 kms away. The cases were located off main roads without proper internal roads, except for Dimasa. Dimasa were not easily accessible due to the condition of the roads, hence the postal connectivity in Dimasa was better than the other cases. The cases, except Kuki, were surrounded by forests.

The road connectivity of the Kuki and Dimasa has encouraged the communities to hold weekly market that promotes the socio-economic status of the villages. However, in the Labang and Karbi cases, their disconnect from the town due to absence of road access in the Karbi case and the absence of telecommunication has affected the progress of the socio-economic status. The poor quality of roads or the lack of, has hindered improvement of community infrastructure.

4.2.2. History and Background

The brief discussion with the elders of the village or village council members introduced the history and background of each ethnic group and facilitated an understanding of the village as an individual case. It established a reference point for the study of each case to understand its current context better. The within case text query into the history and migration of the community was not relevantly revealing for the research, the cross analysis of the data around the root term ‘location’ had the greatest number of links to references across the cases and indicated the preferred context for settlement of a community in a region.

Word Input: Migration OR Moved

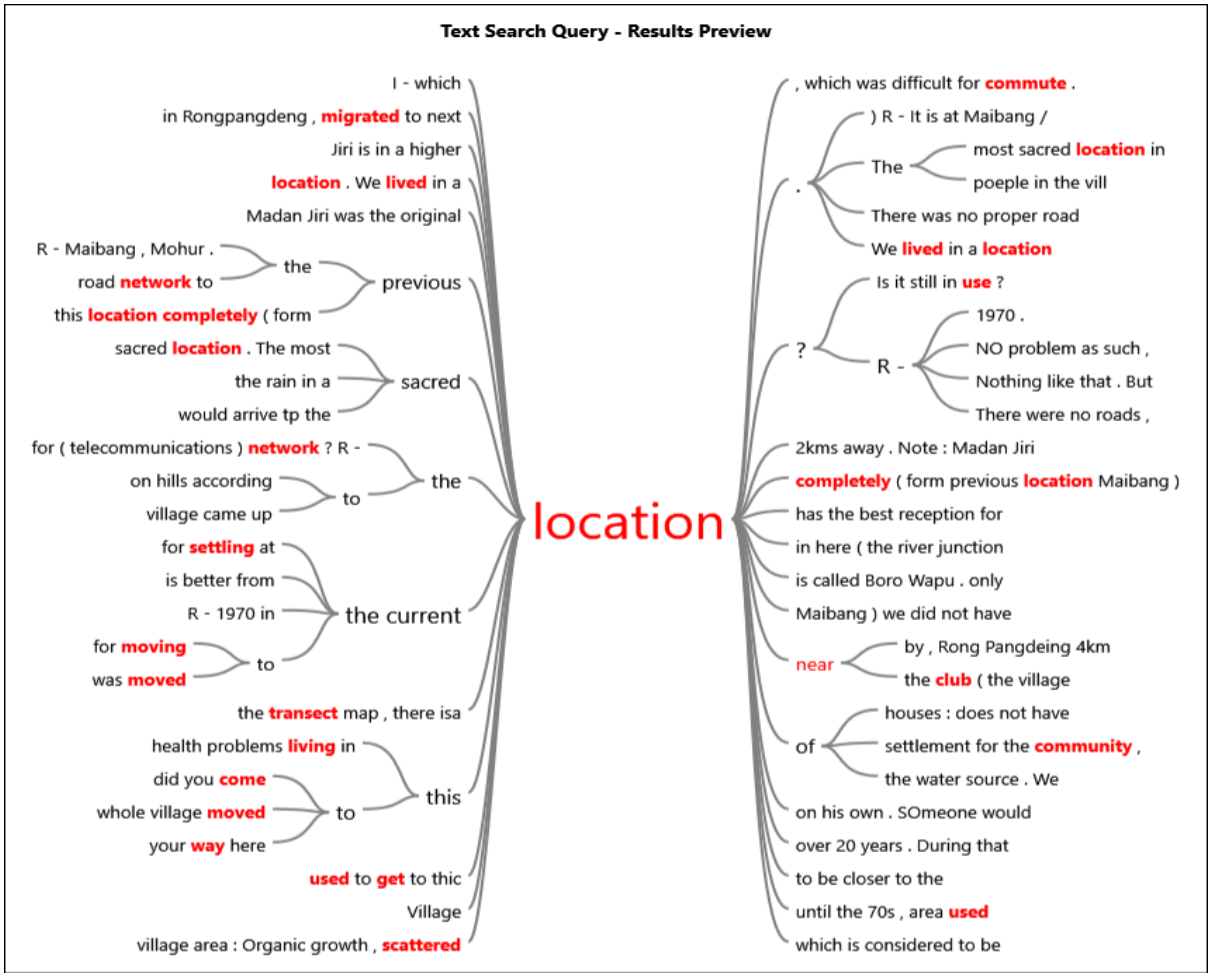


Figure 4-38 Text Query, Root term: Location

The Karbi and Labang cases were settled at least a few centuries ago that the history of the two cases were not as clear. In the case of Kuki and Dimasa, who are newer to the region, still recalled their history. The general reason for migration for the cases has been driven by agriculture, however, in the case of Kuki, the reason has been supported by Anglo-Kuki War of 1917. The location of their villages near a water source is very important which has been mentioned by all the communities. In the case of Labang, the village is located near the junction of two tributaries forming a river. The Dimasa and Karbi consider it sacred to the rituals that are part of the traditional religion which they still follow. This indicates that agriculture is very important to the social fabric of the cases.

4.2.3. Social Practice and Traditions

Each village demonstrated a form of governance that was involved in providing shelter, food, education, and an occupation along with the well-being of the citizens. Figure 4-39 shows the word tree result from the word input: Traditional OR Practice OR Culture OR Social OR Religion OR festival OR celebration. This has allowed attempts at generalisation of the social traditions and practices across village cases.

Figure 4-39 Text query, root term: Community

For instance, they organized working groups to help with farming or house construction for a family as a community. In the case of Kuki and Dimasa, the village councils managed to provide piped water and multiple points for their water source for the residences so that they would not have to spend more time making their way to the main water source and gathering around it. In the case of the Labang, the village council is appointed by conducting an election within the village who then manage the resources of the village by deciding where to farm and what to plant.

The traditional practice of bathing at the water source, has diminished in some houses. This reduces communication among peers whom they might meet up near the water while collecting water or washing clothes etc. A degree of gender equality was observed within the communities across the cases. It is because the way the community explained their socio-cultural practice with regards to gender, the each respected the others role in society and they each had a designated function according to their age and gender. However, over time this has changed. Though the house care is the primary function of the female, she may join in the agricultural practice. In the case of the male, he is the primary person to do cultivation, in the household context he may help out in activities that involve the outdoors rather than the cooking area. Though the cases demonstrated varied in forms of social construct, the functioning of society were based on gender. Jobs and chores, decision making, and execution of tasks are mostly gender based. In some cases, like the Labang, the ownership of land is strictly held by the females of the household. Since the females are the homebodies of the community, they are responsible for maintaining a socio – cultural practice that is reflective of the traditional community, and consequently maintaining the socio-cultural practices of the community, however, the religious responsibility of the community falls on the male, who generally maintains the religious and administrative traditions. however, in the case of the Labang, since the house belongs to the female, the religious inclinations can be controlled by the female in the household level, but in the community level the control remains with the male through the council.

Most of the villages followed a single religion collectively, however, the Karbi and Dimasa cases which majorly followed the traditional religion, had few families who were either Christian or Hindu. Despite the conversion to Christianity, the Labang and Kuki maintained few festivals that were celebrated around the harvest of food products. One thing noted in respect to worship was that they revered rice as a blessing or an item signifying sacredness. This indicated the significance of religion in strengthening the community by bringing them together more often during community events that were religiously inspired.

The socio-cultural centres of the communities differed across the four cases, the Kuki and Labang villages centred their religion and socio-cultural activities around the church, which was in both cases, facing a big ground, the football fields. Similar to having a town hall or town centre, or a piazza or plaza of a town, the village centre is similar. It is where the citizens gather for announcement of news, celebration of festivals etc. However, due to the nature of the context, the nature of the town centre has evolved. In the Karbi context, the centre has disappeared as it has split up into three parts of a community due to the three headmen. The socio-cultural context of the community in the regional level has influenced the way the village functions and hence the spaces within the village have been disintegrated.

The Dimasa village would conduct the administrative and council meetings in the headman’s house which could be anywhere in the village while the festivals and celebrations took place

in the centre of the village. they each had churches that acted as community halls which allowed the village to come together as a community. However, in the case of Dimasa who were dominantly traditional collected in the centre of the village which is the entrance of the village. Like the Kuki and Labang, the school in Dimasa is located close to the recognised centre which is also close to the entrance. In the Karbi village, the entrance of the village passes through another village that is further down the hill. It is odd how the Karbi village does not have a community centre, but from the observations made in the other three villages, the space that is clear for the school could be assumed as a village. One community activity observed in the village was that the people of the community had gathered to help with harvesting. The group harvesting is usually done towards the end of the season and helped in covering more area hence more productivity.

4.2.4. Communication and Knowledge Sharing

All four cases indicated having only oral communications along with a few specific forms of signalling across villages. In the case of Karbi, the higher officials in the administration of the Karbi Kingdom relied on "keys" that were made of strips of bamboo leaves knotted to mean specific instructions or messages addressed to the headman of the village. In the case of Kuki, messages regarding war or invasion were indicated through smoke signals or burning of chili. However, introduction of formal education by the American missionaries that came around the early 1800s facilitated in switching communication from oral traditions to messages written in the roman script.

Word input: Communicate OR Educate OR Message OR Knowledge OR Learning

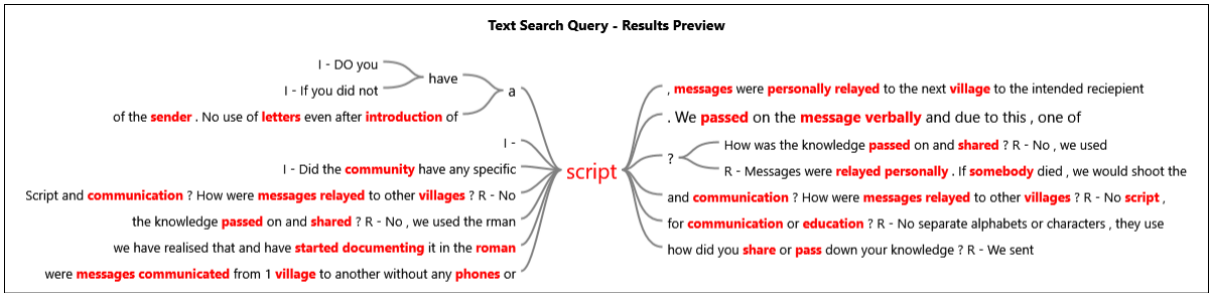


Figure 4-40 Text query, root term: Script

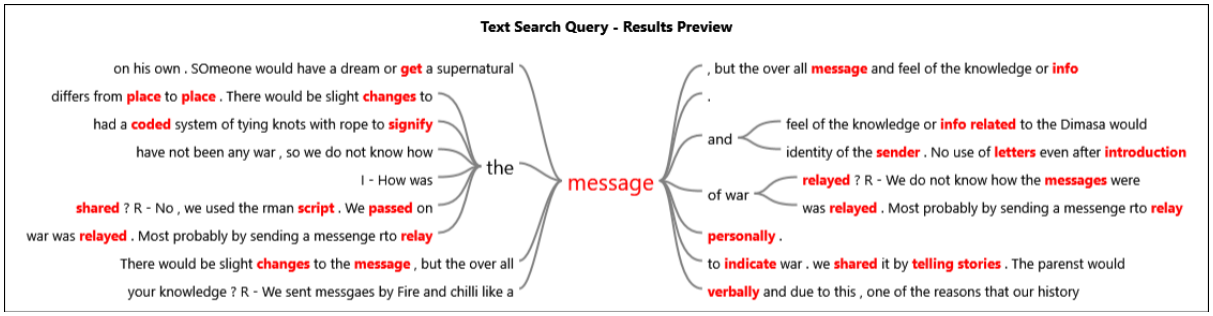


Figure 4-41 Text query, root term: Message

As indicated from the word tree in Figure 4-40 around the root term 'script', it highlights that, originally, the communities shared information and knowledge through oral traditions as they did not have a script. As indicated in Figure 4-41, messages were indicated through gunshots, burning chilli, smoke signals or personally conveying the messages.

Formal education was not a necessary part of the village infrastructure as the villages relied heavily on traditional occupation and customary practices to survive, however, in the case of Kuki and Labang, the conversion to Christianity and establishment of a church facilitated reading and writing as it enabled them to read the bible. With better opportunities being offered to the educated population, the children were sent to the closest primary school as the importance of education increased. Overtime, due to the initiative taken by the citizens, primary schools up to the 5th year were established for the children before they were sent to the nearest town for further education. In the case of Karbi, the primary school is a government initiative which has not been maintained and hence, the children would walk to school or move to Hamren to continue education. Figure 4-42 indicates the improvement of the life in the village due to education. Figure 4-43 indicates the relevance of connectivity and telecommunication in the village.

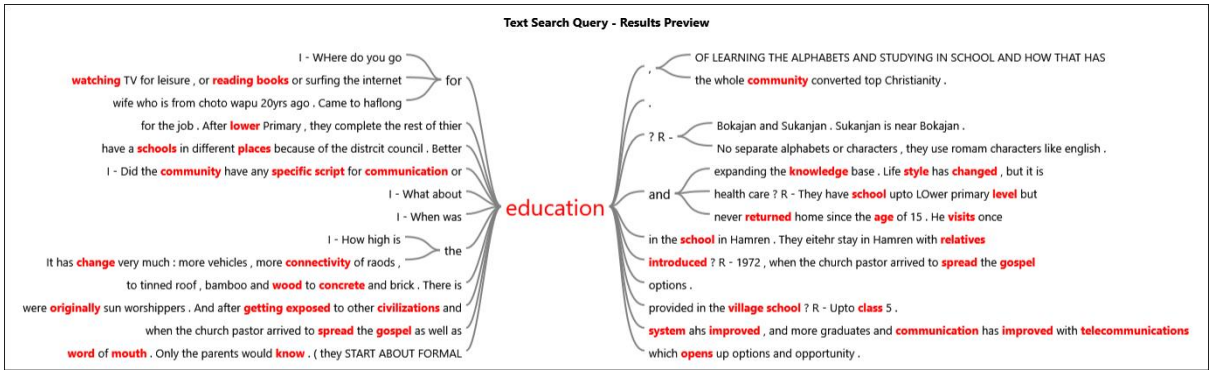


Figure 4-42 Text query, root term: Education

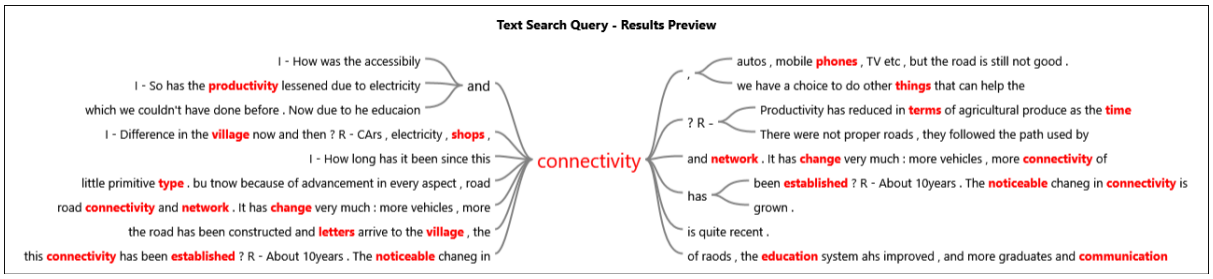


Figure 4-43 Text query, root term: Connectivity

Television can be considered a form of telecommunication which is one -way however, it is a luxury and not a service. Having a television has changed the way the social status of a family is valued; it has become a sign of higher income or higher buying power. This has led to owning a television being perceived as a necessity among the Karbi, Kuki and Dimasa, which has taken a central place among furniture owned by the family. Hence, placed in a room that is centrally located with respect to other rooms and spaces. Thereby being instrumental in aiding the economic situation of the family to change the way the house layout turns out.

4.2.5. Community Infrastructure

Each village has varyingly evolved over time since the settlement. The Kuki and Dimasa are most developed in terms of having infrastructure that promotes development, while Karbi and Labang seem to lack proper infrastructure for basic facilities such as Education and Healthcare. This was indicated to be linked to the ease of access to the cases. While Kuki and Dimasa have motorable roads leading to the village, the Labang has a motorable road which has been

deteriorated due to rain and the Karbi has a muddy path leading to the village despite being considered part of the town committee. Looking at the functioning of the Kuki and Dimasa village councils, they indicate that the village councils need to be directly linked to the district council to strengthen the governance in the village. This will encourage and promote better development based on the strengths and capabilities of the community and resources.

Word Input: Building OR School OR Church OR Market OR Healthcare

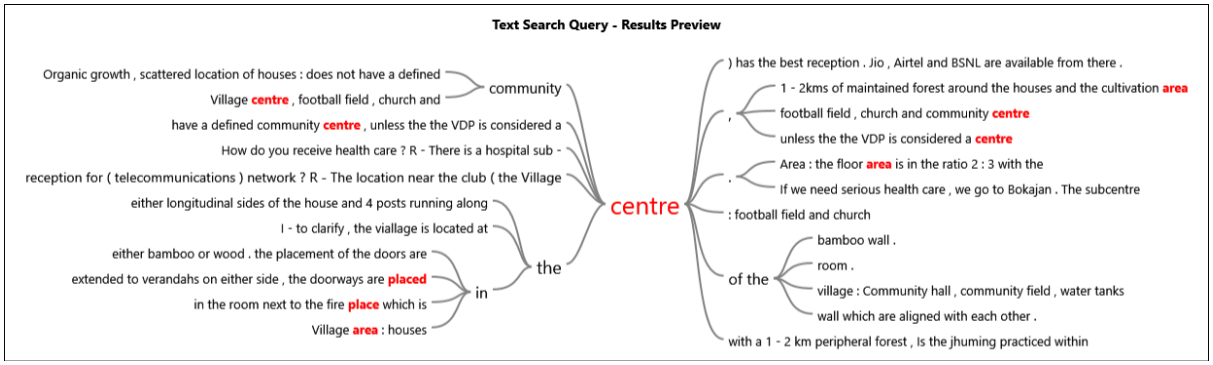


Figure 4-44Text query, root term: Centre

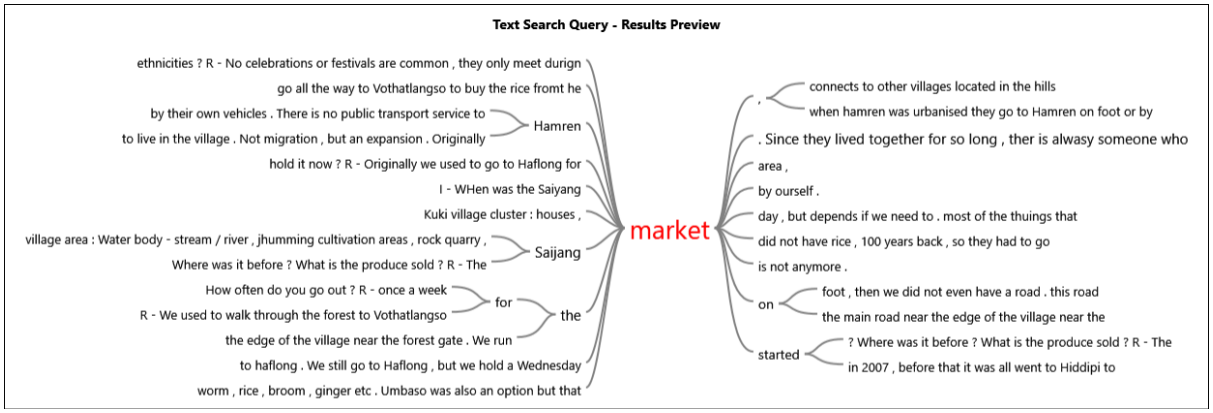


Figure 4-45 Text query, root term: Market

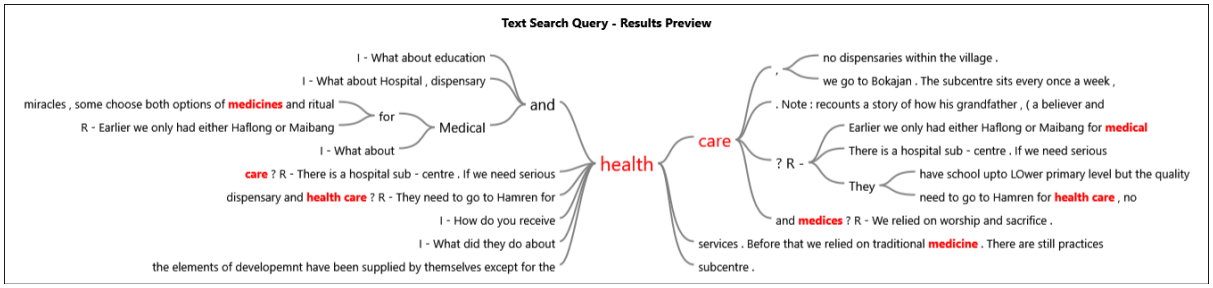


Figure 4-46 Text query, root term: Healthcare

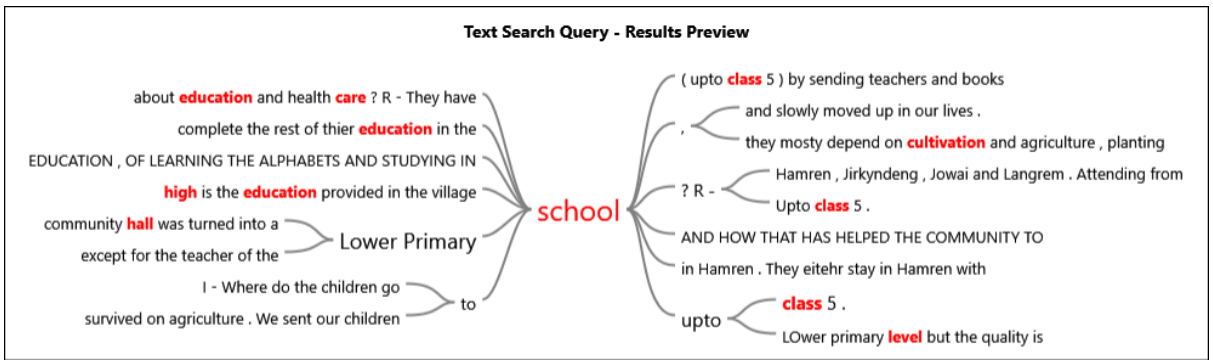


Figure 4-47 Text query, root term: School

Figure 4-44, Figure 4-45, Figure 4-46 and Figure 4-47 are the text query results around Community infrastructure. The Word trees are created around the root words ‘centre’, ‘market’, ‘healthcare’ and ‘school’. The perspective of health and sanitation has changed for all the cases. Originally the communities belonging to the four cases followed traditional forms and practices for health and medicinal care, which included ingesting or applying medicinal plants and worship and sacrifice to their traditional deity. However, with the education on health care and sanitation, the communities have gradually opted for non-traditional methods of health care. In the Kuki and Labang cases, they have been more receptive to western medicine while the Karbi and Dimasa cases continue to sacrifice animals as a remedy accompanying western medicine for a severe illness. The Kuki, Labang and Dimasa villages have indicated the need for a community hall in the centre of the village. In the Karbi context this necessity is difficult to address as there are three headmen.

Education and health care are among the most important facilities that is required by a community at any level or context, be it urban or rural. However, the need for establishing facilities that provide education and healthcare is greater in the rural areas due to the population distribution in India. Having education or having a larger portion of educated citizens has proven to change the perception of living. In the Kuki, Labang and Karbi cases, they had higher rate in educated numbers as the community had an active role in educating the younger population. The importance of education in the Karbi case appeared to be growing as stated by the respondents, however, since the village did not have a well-functioning school the children were being sent to the city. This has however caused a gap in the transfer of traditions.

Education influences community level causality by the fact that education in the region is taught in other languages. They need to learn either, English, Hindi, Assamese, or Bengali, this increases the connection between more people and makes cultural exchange easier. If looked at from an anthropological point of view, it can also lead to the deterioration of their own language and hence the value system as the value of words and meaning can be shifted over time. An example of this is the use of English words or Assamese words used to refer to the position of the council members in the community (President and secretary in Labang case, or Gaon Bura in Karbi and Kuki cases) instead of using the vernacular names. The similar observation was made in the traditional terms used to refer to a space within the traditional Karbi and Labang houses, while the Dimasa and Kuki houses did not have traditional names to refer to spaces. Instead, the terms they used were rooted from English, Assamese, Bengali, or Hindi.

Other ways of education changing the ecology is that they children need to go out of the village hence the traditional practice of joining and helping out their parents in cultivation for

livelihood changes as they either are not suited and trained in cultivation or they follow higher education or do other jobs. This can affect the agricultural productivity however, the option to do other jobs balances out the need for job, vocation, and livelihood in the village. In the case of Kuki, tea stalls and instructing children in the school, riding the autorickshaws in the Dimasa case are an effect of what education can do for the community. With education comes better opportunities in jobs which enables the citizens to visit different places and better learning ability, hence better transfer of ideas.

Another role of education in causing changes to the ecology is the communication of knowledge in relation to implementation of policy and rural development schemes. IAY is an example of an appropriate scheme with the intention of allowing the beneficiaries to build a house for themselves by themselves with government financial aid. However, the intention of maintaining the sensitivity to the socio-cultural practices and values of the rural stakeholders was lost in maintaining the socio-economic expectation of the beneficiaries.

Health care in the original traditional system was relied on religious ritual and growing of herbs, indicating their animistic alignment of life. In the case of Dimasa and Labang, they had relocated from their previous locations within their village area as a response to multiple deaths in the village. However, in current times, the perception of health care has n=moved away from traditional remedies to western medicine though it is still difficult to access. The need for health care is among the most important reasons for requiring better access to the villages. Health care is more of an indirect cause it is the need that is the cause while having it will be the effect. However, to maintain a health care facility, the villages would also need infrastructure such as having a dispensary or clinic where a doctor could work from. However, due to difficult accessibility which is caused by the topography and socio-political issues of the region, the health care system cannot be maintained, and the citizens need to go to the town and stay there. This affects them economically in terms of lesser productivity in cultivation, living expenses because of which they may choose to ignore the illness until it gets worse, which incurs even higher expenses or death.

Infrastructure such as banking, police station and postal services have become more important over the years due to the changing way of administration and maintaining societal harmony. Nowadays, having a bank account and a postal address and being verified by a police station is important as it is a right of any citizen in the country. And with reference to the recent Citizen amendment act of 1974, it has become more important as a duty of the citizens to inform the government and register themselves as a citizen. In the community level context, these infrastructure facilities are socio-economic factors that affect the regional and global contexts that in turn affect the access to other infrastructure such as health care and education and other physical infrastructure such as roads, schools, hospitals, and offices affecting job opportunities, hence affecting the growth and survival of the community. However, as a direct influence, the role of a bank is to provide the citizens with an option of financial security by allowing them to open bank accounts that do not charge any fees on a Nil balance, and also allow them to save money whenever they deposit or to allow them to access pensions or receive money orders from relatives working in the town or city. Having a police station is almost irrelevant as the law and order is maintained by the village council. It has to be kept in mind that the regional context of these villages is that they belong to Schedule Tribes (ST) according to the government of Assam and live within the Sixth Schedule areas of Assam which according to the constitution allows the customary laws to be followed over the federal or state laws.

However, in case a non-ST is involved in matters of law and order, then the state laws are followed in which case it becomes a multi-community level factor. Meaning it is higher than a community level factor, while not completely being a regional issue (though, the way media works, it becomes and regional issue).

Having a postal service, along with aiding in communicating across other communities and regions, it helps the community in maintaining bank accounts, paying electricity bills, and establishing their citizenship in the country.

4.2.6. Livelihood

Similarities in the cases in terms of cultivation were reflected in the strong dependence on Jhum cultivation as their main source of income. However, the cases differed in the secondary sources of income. The Kuki who have a portion of their village land in the plains, have adopted wet cultivation. The Labang had terrace cultivation due to the gradual sloping terrain, as well as hills covered with Pineapple gardens. The Dimasa and Karbi cases adopted growing fruits and vegetables as part of their secondary income. The Karbi and Labang grew Broom grass.

The location and accessibility of the case study villages has influenced their socio-economic status. In the case of Kuki and Dimasa, their location and easy accessibility has created better opportunities for economic growth, while the inaccessibility of Karbi and Labang have narrowed their opportunities. The options available for economic growth are inequal for the different cases.

Word input: Livelihood OR Jobs OR Employment OR Work

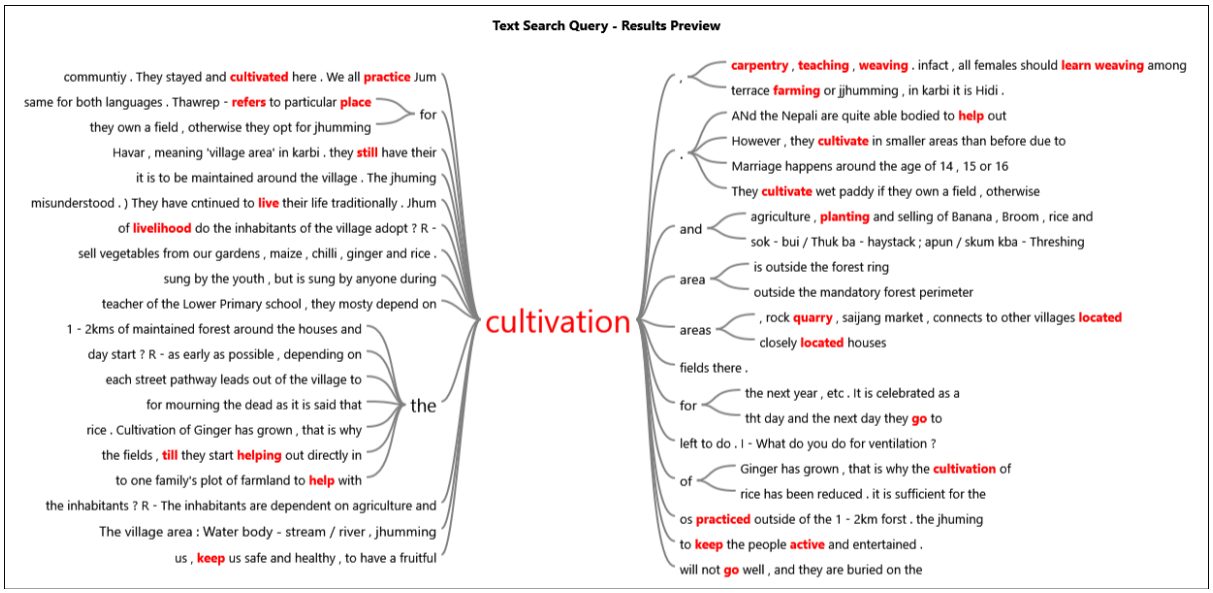


Figure 4-48 Text query, root term: Cultivation

Owning livestock has affected the household level because it determines the socio-economic status which equates to the socio-cultural status of the family as argued in the methodology for the data collection. Cows are mostly not accepted viable options as livestock since they are mostly helpful with wet cultivation in ploughing.

4.2.7. Resources and Services

Word input: Water OR Electricity OR Plumbing OR Telecommunication

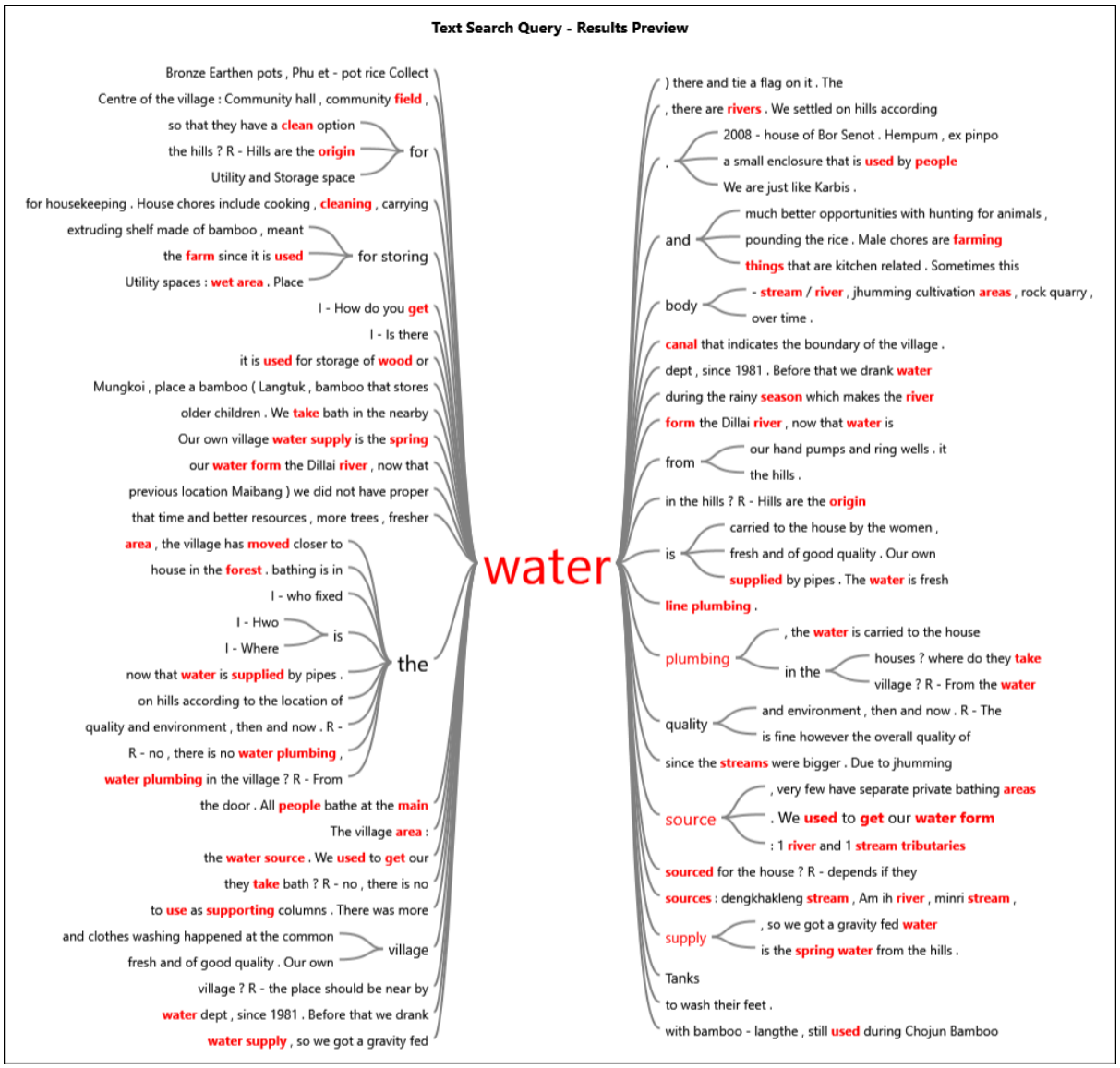


Figure 4-49 Text query, root term: Water

Before electricity, the routine of the village was the same as it had been since the establishment of the villages, however it changed once electricity was introduced. Electricity enabled the people to own a television which would take up a small section of the day affecting productivity; however, electricity allowed the people to continue working on other chores into the night, hence increasing productivity in other areas such as reading, studying, or learning a new trade through the computer. Electricity also allowed the use of power tools and the rice mill. Though telephones and telecommunication were invented a long time ago, telecommunication networks were only established in these villages last decade. This has aided in maintaining communication with people living away from the village or obtaining medical assistance when required.

Services such as water, electricity, telecommunication, and gas are variably relevant in the community context. In all the cases, water is not a service that is externally provided as the

settlement of the village is done with the availability of fresh water, however, while the approach to accessing it differs across the cases. In the Kuki case, the community has collectively taken the initiative to make the access to water easier by installing pipes that deliver water from the river to the main water tank in the centre of the village and from the water tank to selected points where taps are installed along the street. This way the distance to be covered to fetch water has been reduced to a few meters without any climb up or down a hill, reducing the amount of water lost in transportation. In the Dimasa case, wells were dug up along the main street connecting the houses, that way, the access to water was central for the houses. In the Karbi case, the water source is a spring, and no changes were made by adding pipes. The access to the water remained the same. In the Labang case, the water source is a river and there were a few changes by placing pipes for the newer houses by their owners. This was not a collective community decision.

In all the cases, electricity is a service that is expected will be provided by the government, especially in the case of the Karbi village since it is included in the town committee area, however, the Labang village is not supplied with electricity. It is not dependent on the government for the supply of electricity as all the houses in the community have solar powered electricity supply. Though the adoption of solar panels is common across all houses, it was actually not a collective community effort. It started with one house who bought the panel which one after another house was adopted across the community. This is a case where the adoption of solar powered electricity supply has become a socio-cultural practice. In the Kuki, Karbi and Dimasa, the electricity provided in the villages is by the government, however there are a few cases where the houses have opted to install solar panels to reduce the electricity bill of the house. Electricity affects the context of the community as it changes the socio-cultural practices by adding flexibility to the amount of time one could spend on doing work. Electricity removed the dependence on the sunrise and sunset of the days, this affects agriculture, as this allows the cultivators more time in the field after dark.

Telecommunications in the form of Postal mail, telephone connection or a mobile connection is a cause of changing the context and affecting the design of houses as this informs the citizens of other options of housing and design. It allows more interactions among different socio-cultural practices. Telecommunication has also been significant in aiding education; this has led to more exposure to other ways of living and housing.

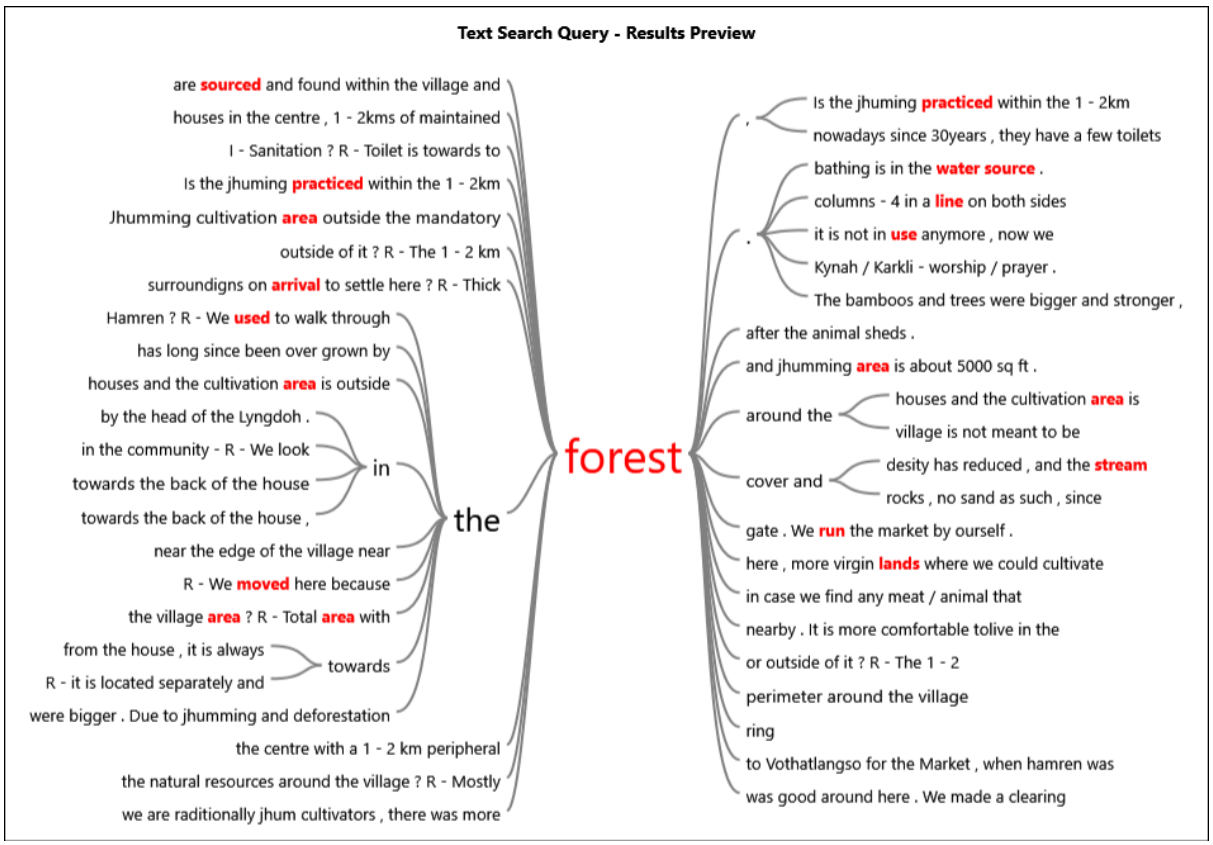


Figure 4-50 Text query, root term: Forest

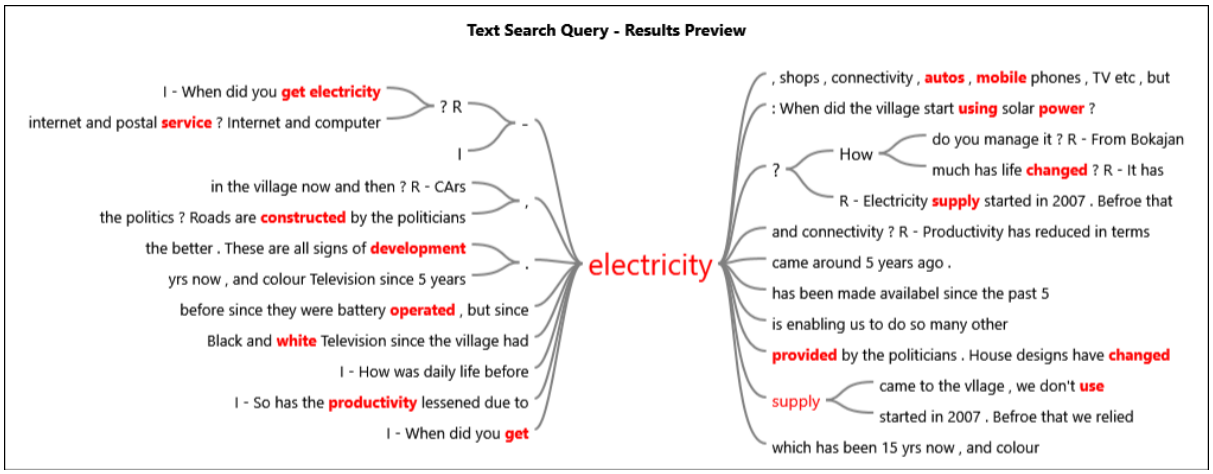


Figure 4-51 Text query, root term: Electricity

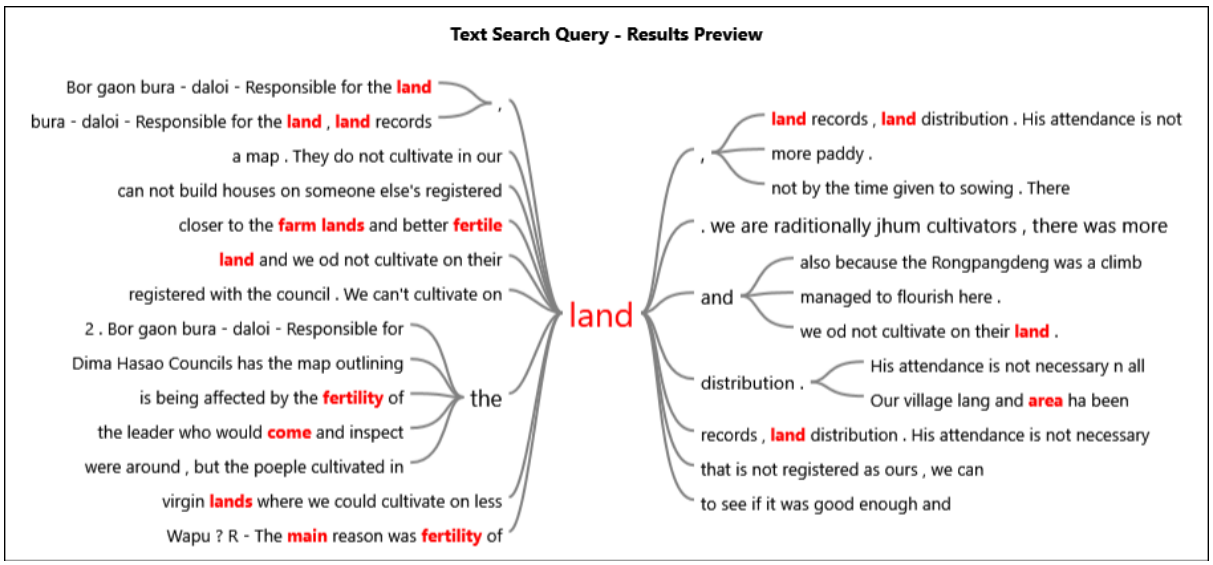


Figure 4-52 Text query, root term: Land

4.2.8. Traditional House

At the end of the focus group discussions in each case, the design of the traditional houses was described aided by sketches. Each case had a vernacular house which may appear similar due to its use of local construction materials such as bamboo, wood, and thatch, however, the difference in the houses stood out in the layout of the spaces and functions within. Figure 4-2, Figure 4-11, Figure 4-20 and Figure 4-29 show the diverse layouts of the four cases that were studied through the research methodology. Figure 4-53, Figure 4-54 and Figure 4-55 are the results of the cross-case analysis in NVivo. The text query results are around the words house, family and space indicating the relevance of the concepts to the design of a traditional house.

Word Input: House OR material OR space OR room OR construction

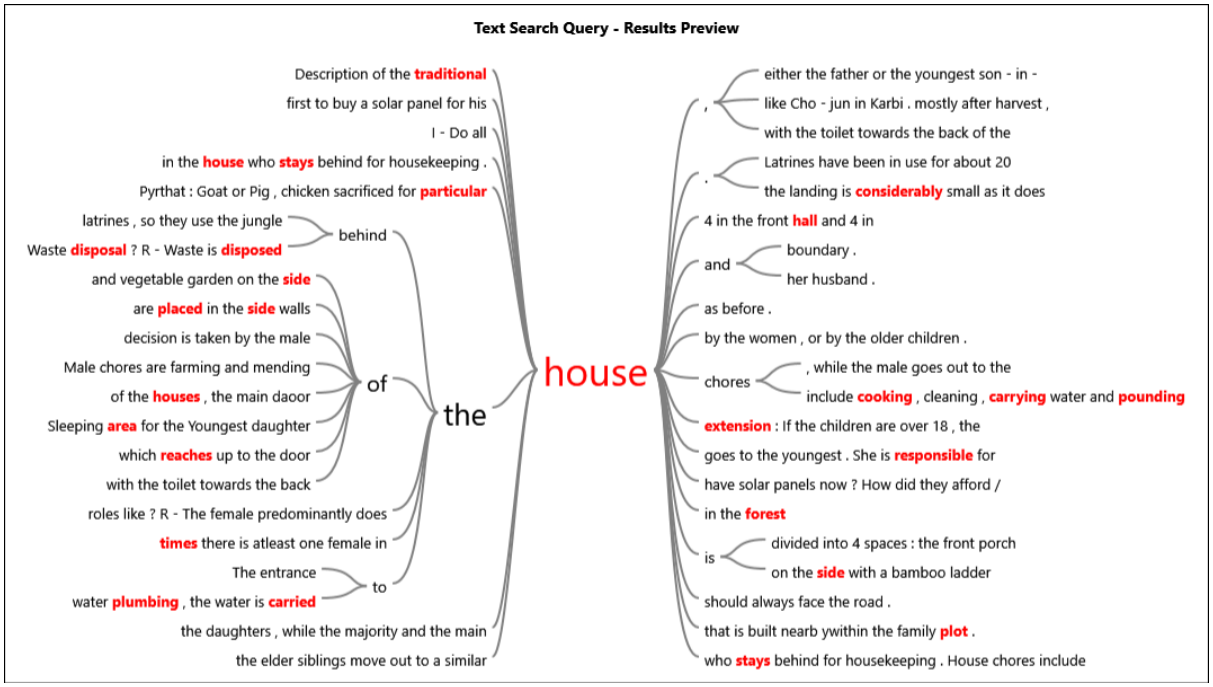


Figure 4-53Text query, root term: House

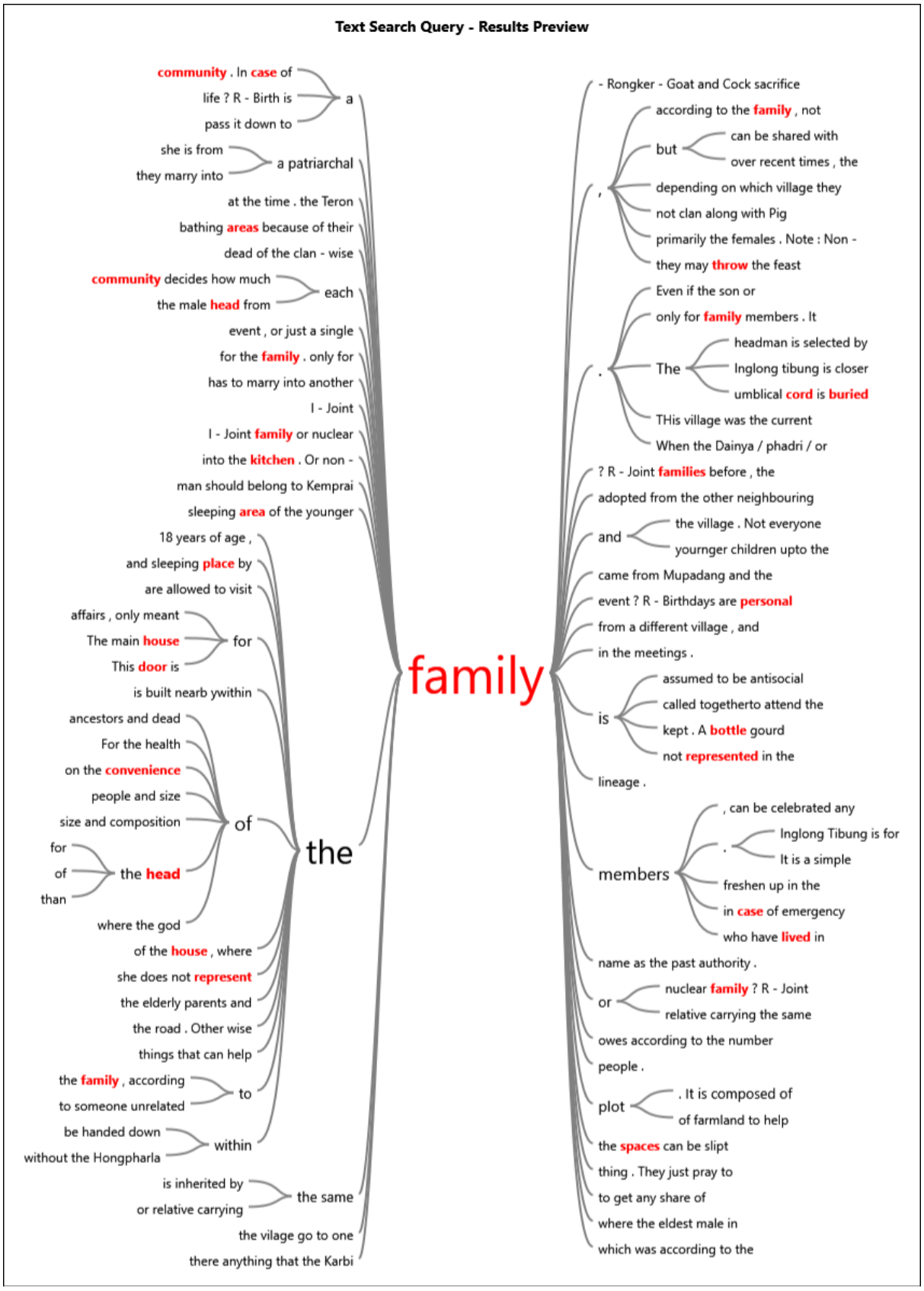


Figure 4-54 Text query, root term: Family

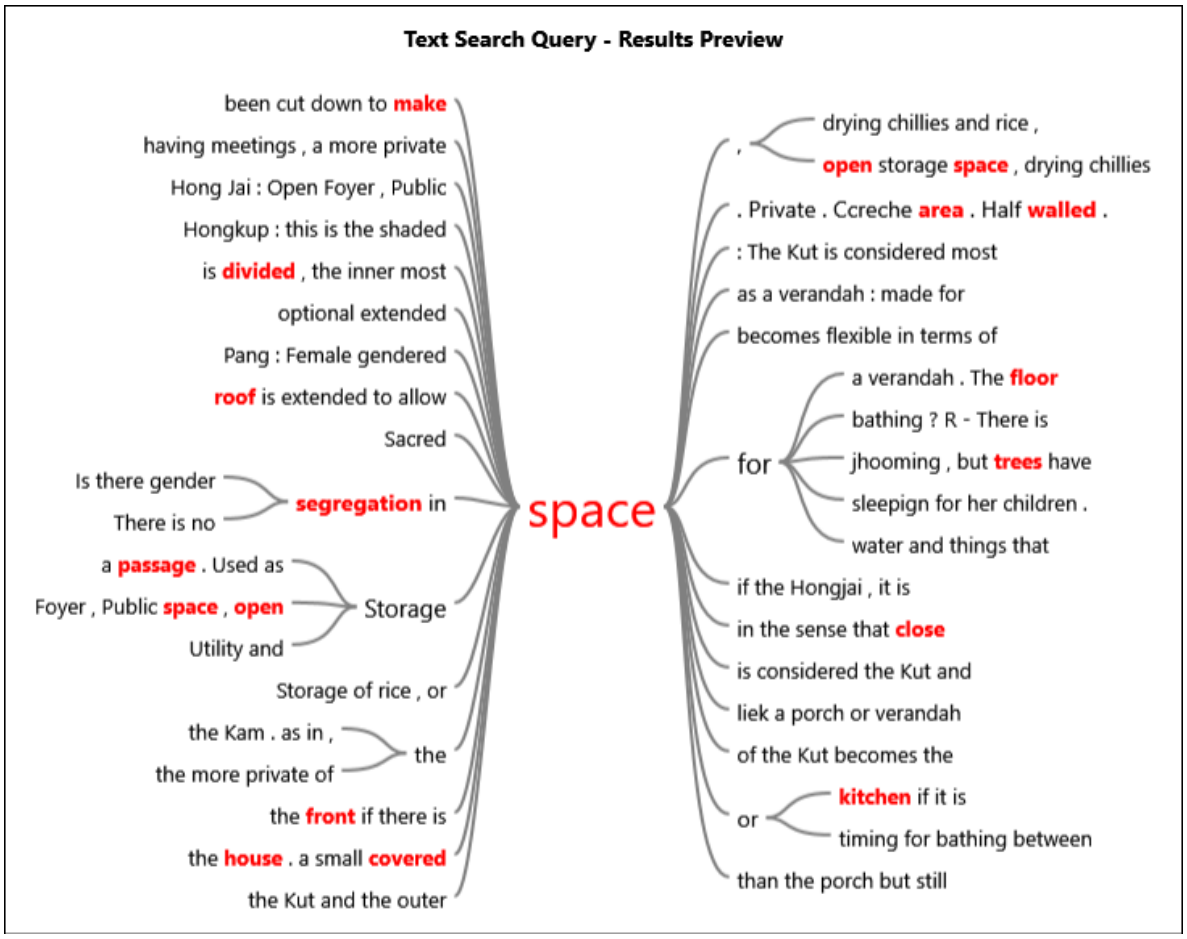


Figure 4-55 Text query, root term: Space

The houses are not squared or cuboidal in volume but oblong in shape. The houses are built in either a 2 x 4 or 3 x 4 ratio. The Kuki and Karbi case houses are oriented with the long side of the house facing the street while the Dimasa and Labang houses are oriented with the short side facing the street. Entrance to the houses were directly from the street in front of the house, meaning that the Kuki and Karbi house entrance was on the long side, while the Dimasa and Labang were on the short side. Figure 4-56 demonstrates the orientation of the house with regards to the street and the topography of the village.

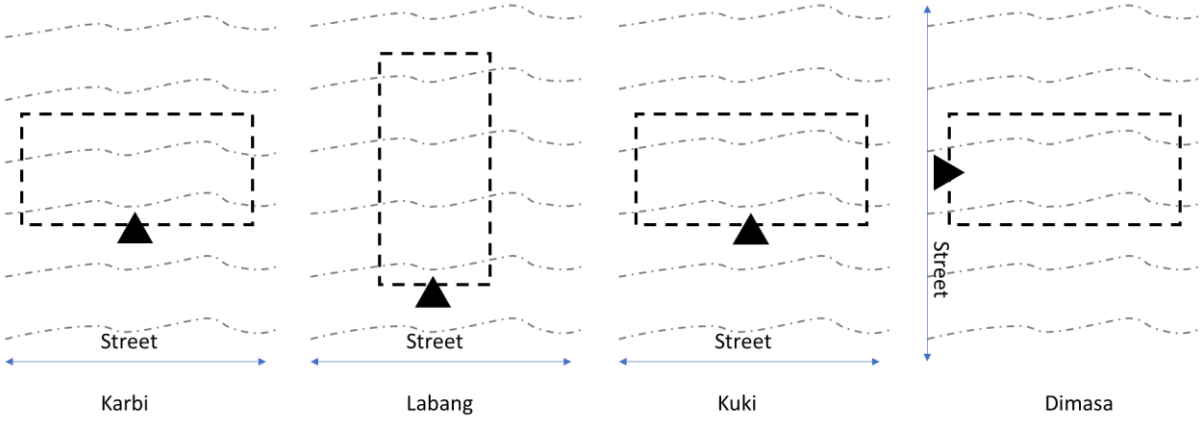


Figure 4-56 Orientation to street and contours

With regards to the topography, the orientation of the Karbi, Kuki and Labang houses are mostly from higher altitude to lower altitude, that is, the entrance to the house would be closer to the ground while the utility spaces which are often placed away from the entrance would be in a higher altitude from the ground. In other words, the house would be oriented so that the house is situated on a downward slope. However, in the case of the Dimasa house, the house was oriented along the topography of the hill. The slope would be levelled by infilling the lower slope to form a platform for building the house. The ground surrounding the house on the slope side is maintained lower than the plinth of the house so that the rain flowing down the slope continues around the plinth.

As shown in Figure 4-57, the Karbi, Kuki and Labang houses are often built elevated maintaining their plinth level at 1m to 1.5 m above ground on stilts while the Dimasa house is built directly on the ground. The plinth of the house is made of the earth which is raised from ground level by 150-200mm. However, the utility area of the Dimasa house may still be elevated from the ground. The local materials used in constructing the house is lesser in the case of the Dimasa house since it does not require wood or bamboo for flooring. All the houses maintained sloped roofs.

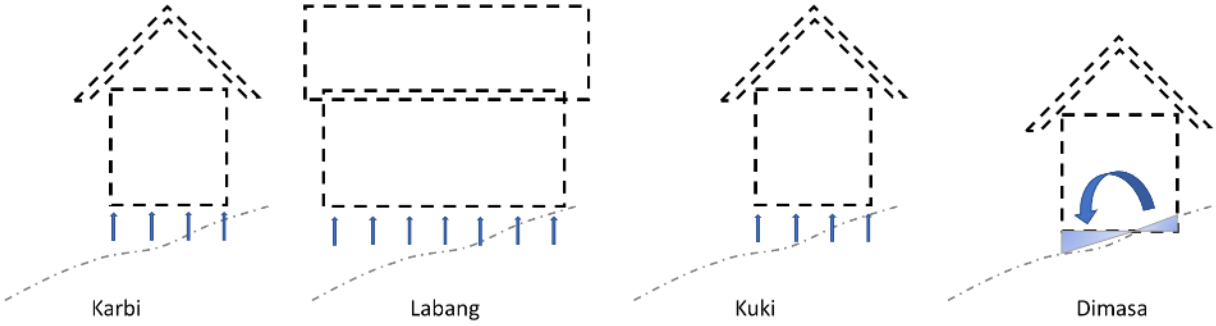


Figure 4-57 Roofing and plinth

Figure 4-58 demonstrates the segregation of spaces based on the accessibility of family and non-family members of the household. As shown, on entering the house would be split based on access of non-family members, so the Labang and Dimasa houses have a front room and a back room. The front room is meant for receiving guests, eating, sleeping or storage while the back room is meant for preparing food, eating, sleeping and storage. In the case of Kuki house, which has no partitions, the raised platforms indicate the spatial differences within the house. The Karbi house is divided into the openly accessible spaces that is meant for the non-family members, while the rest of the house is separated by a wall clearly indicating the boundary between family members and non-family members. While the Kuki, Dimasa and Labang houses have simplified the layout of their houses through segregation based on spatial and functional details, the Karbi house has developed a complexity in the layout by creating segregation based on age, gender, familiarity, and marital status.

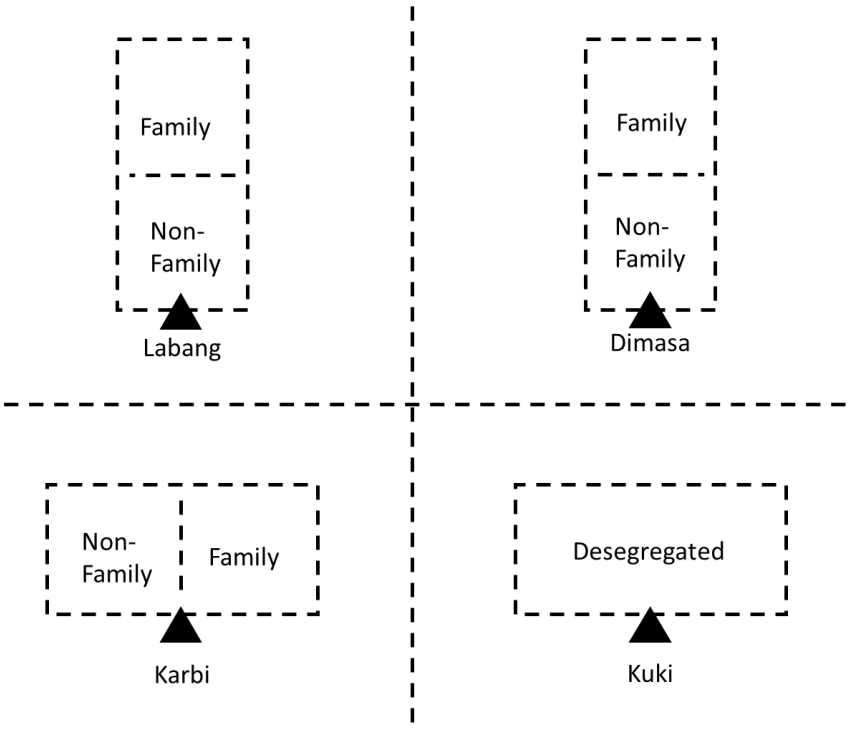


Figure 4-58 Segregation

As shown in Figure 4-59, with regards to the requirements of the house based on changing family dynamics, the Kuki, Karbi and Dimasa houses tend to go through changes within the same house by adding partition walls or by adding or enlarging rooms in the house while the Labang house does not change as much. The Kuki house can extend its volume in either adjacent sides or towards the front but is restricted from moving its walls back as it is believed that this brings bad luck. The Karbi and Dimasa house respond to changing family dynamics by adding wall partitions as the first solution before extending the house on either side. In the Karbi house, while extending towards the back is an option, it is only from the non-familiar side of the house. In the Dimasa house, if the spaces are not adequate despite the partitions, the kitchen is moved out of the house built at the back before any extensions are added into the house from either side. The adjacent extensions to the Dimasa house are for storage purposes or for maintaining a mill or workshop, the sleeping area is maintained within the original walls of the house.

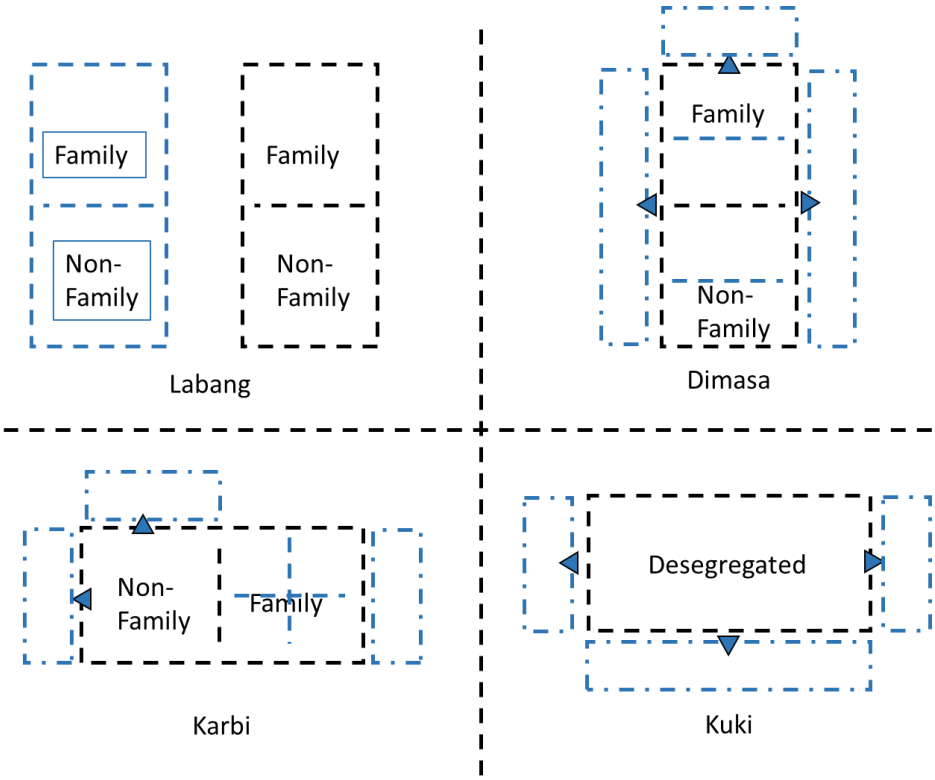


Figure 4-59 Reconstruction of house based on family dynamics.

In the case of the Labang house, a completely new house is constructed according to the traditional style of two rooms on stilts with a fireplace, utility area, storage area etc. It is due to the social practice of constructing a completely new house for their children once they are of 15 -16 years of age. It is more common among families with more than one daughter in the house, where the youngest one stays in the ancestral home while the older ones move to their own quarters within the family land and closely located. Unless the daughters are married and move to a different plot of land within the village or to another village, they would continue to function as one family by farming together, cooking together, eating together etc. The sons are also expected to move out to their siblings' quarter or their in-law's. This practice of constructing a completely new house for the elder daughters is almost akin to encouraging self-dependence in children by giving them their own room and possessions to manage their livelihood while giving them privacy in their life.

In the case of Dimasa and Labang, the houses have at least two doors; one that is meant for entry by the guests, and the other which is a back entry/exit from the kitchen. However, the Karbi and Kuki house have successfully maintained a single door for entry and exit of the house. In the case of Kuki, the community itself is a very transparent and close-knit community that is demonstrated by the open layout that it does not segregate between family and non-family member as shown in Figure 4-58 and Figure 4-59. In the case of Karbi, the entry to the house is from one door leads to an open space which is akin to a foyer which leads to either the family space or the non-family space.

While the Kuki house maintains an open and fluid circulation regardless of gender, age, or familiarity, the Labang, Karbi and Dimasa maintain a distinction among familiar and non-familiar by who is allowed into the kitchen which is generally in the inner part of the house hence maintaining a degree of privacy. Since the segregation in the Karbi is established by

function, age, gender and familiarity, the layout has more partitions and floor level changes as compared to the Labang and Dimasa. However, between the Labang and Dimasa, the Dimasa Kitchen is specifically off-limits to a non-Dimasa, while that was not expressed from the Labang. Meaning that, a non-familiar Dimasa may yet be invited into the kitchen but a non-Dimasa will not.

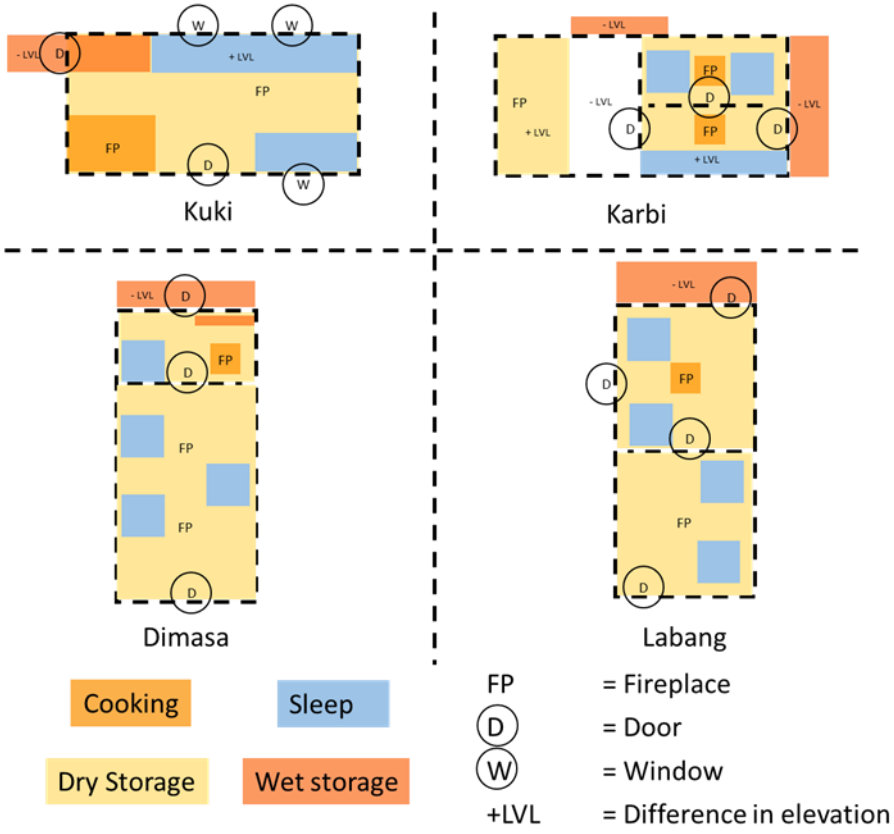


Figure 4-60 Layout comparison

The similarity in the layout of the houses was that each house is designed around the basic purposes of storage, cooking, and sleeping. Though the toilet and bathing are not part of the main house, the houses had designated locations for storing water that would be used for cooking, cleaning, and freshening up in the morning. As indicated, the space in the Kuki house is not segregated and un-partitioned, however, the house had elevated parts of the floors that served as seating or a bed. The cooking area would around a Fireplace that would shelf suspended from the ceiling for drying fish, chili, or rice grains. The rest of the layout was multipurpose having minimal furniture other than the presence of a cane/bamboo woven baskets or trunks for storing possessions which are usually placed on the loft space created by the gabled roofs. This is done to maintain as much free space as possible for the storage of the harvested goods or for sleeping if there were guests.

In the Kuki, Dimasa and Labang houses, the animals are housed separate from the house, while in the case of the Karbi house, the chicken and goats were housed within the house, as seen in Figure 4-60, excluding the pigs which were housed under it. The reason for doing so was explained as a preference. The Kuki, Dimasa and Labang preferred to provide sheds for the chicken and goats separate from the house and each other on the side of the house, while the pigs were housed towards the back of the house or within the forest area. The disposal of garbage and refuse are towards the back of the house which is in the direction of the forest.

Any outdoor activity such as threshing, or carpentry were done in the shaded verandah of the house. Traditional handloom which is still practiced by the women of communities is woven in the shaded multipurpose areas of the houses. The traditional apparatus which is made by using the walls to steady the apparatus to weave their clothes in the multipurpose areas of their houses. In the Kuki and Labang houses, the weaving was done indoors, while the Karbi and Dimasa did their weaving in the veranda.

The detail of the smaller components that make up the house contribute to reflecting the distinct vernacular practice of each community, such as the door, window, chimney, shelving and method of construction. Traditionally the houses had sliding doors, however, over time the doors have been attached to the door frame with hinges. In case of fenestrations, the Kuki house had large widows built along with the wall, however, the Karbi, Dimasa and Labang houses did not have windows.

From the discussion of the elements that contribute to create a self-dependent system in the village scale it becomes evident that there is the physical environment and the social environment that influences the vernacular architecture of the place. The differences in the vernacular practice are indicated through the socio-cultural differences among the cases, hence indicating that the cultural ecology in each case is different due to the socio-cultural practices and values of the community. This leads the research to re-affirm the fact that the socio-cultural context of the case is an important part of providing housing to a rural community.

However, this fact gives rise to the question of the kind of practice can be adopted for future policy regarding rural housing and development considering the diversity of the socio-cultural context of the case.

Table 4-5 Comparative analysis of the traditional houses

	KUKI	KARBI	DIMASA	LABANG
Topography	• Sloped	• Sloped	• Levelled ground	• Sloped
Orientation	• Street facing entrance. • Long side adjacent to the street	• Street facing entrance. • Long side adjacent to the street	• Street facing entrance. • Long side perpendicular to the street	• Street facing entrance. • Long side perpendicular to the street
Form	• Rectangular • Gabled roof or Dutch gabled roof	• Rectangular • Gabled roof or Dutch gabled roof	• Rectangular • Gabled roof	• Rectangular • Gabled roof
Plinth	• Raised on stilts	• Raised on stilts	• On levelled ground	• Raised on stilts
Layout	• Open • Single room • Free circulation	• Heavily segregated • Limited circulation • Branching movement	• Segregated into two spaces. • Limited circulation • Linear movement	• Segregated into two spaces. • Limited circulation • Linear movement
Space segregation	• Floor Material • Raised elevation. • based on function	• Heavily segregated • Floor Material • Raised elevation and partitions. • Based on function, gender, age, marital status, familiarity	• Mainly segregated into two spaces • Partitions • Based on gender and familiarity	• Mainly segregated into two spaces • Based on gender, familiarity, and position/role in the family
House changes	• Extensions to the front and sides • No partitions	• Partitions • Rooms added next to the open verandas	• Partitions • Kitchen is moved to a small structure behind the house	• New construction • No partitions, no extensions
Materials used	• Wood, bamboo, and thatch	• Wood, bamboo, and thatch	• Wood, bamboo, thatch, and mud (flooring/plinth)	• Wood, bamboo, and thatch
Design	• Hinged doors • Fenestrations present, in the Dutch-gabled roof and built in with the wall. • Shelving made of bamboo or wood, on the wall or hanging over the fire. • High roof, overhead space for a sleeping loft • Raised platform for sleeping or storage to maintain a clean area.	• Sliding doors • Fenestrations not present • Shelving made of bamboo or wood, on the wall or hanging over the fire. • Low roof, no sleeping loft	• Sliding doors • Fenestrations not present • Shelving made of bamboo or wood, on the wall or hanging over the fire. • High roof, no sleeping loft, storage only.	• Sliding doors • Fenestrations not present • Shelving made of bamboo or wood, on the wall or hanging over the fire. • Low roof, no storage or sleeping loft
Surrounding with respect to neighbours	• Closely located. Neighbouring houses are visible	• Scattered, neighbouring houses not easily visible.	• Closely located. Neighbouring houses are visible	• Scattered, neighbouring houses not easily visible.

With regards to construction, the technique used by the different houses differed slightly. In the Karbi, Kuki and Labang case, they used two wooden planks laid down on their side to form the outline of the rooms. The bamboo woven wall would be supported by the planks. Due to the presence of the planks, it reduced entry of dust from the floor on the exterior of the house. In the case of

4.3. Chapter Summary

This chapter firstly conducts an in-depth content analysis of the village based on the data collected on the field and come supporting data from the internet as in the case of the contour

maps. This analysis allows the context of the villages to be understood in terms of its history, social culture, and its surrounding environment. It allows the research to visualise the cultural ecology of the village in the community scale. The cross-case analysis of the data aided in understanding the regional context of the cases and the vernacular architectural practices of the communities. The vernacular architecture practice was different for each community based on their socio-cultural practice.

Firstly, what was the historic socio-economic context that originally existed that resulted in the traditional house? – For this question, each case was presented based on the environmental, social, and economic context along with historical references of the cultural practices that were followed and still maintained. A description of the traditional house aided in understanding the of the architectural manifestation of culture in each case. It is a cumulative result of the then environment, community, and interactions, which define the rural cultural ecology (Steward, 1972).

Secondly, what were the factors in the context influence the design of the traditional house? – From the content analysis, the factors such as road access, topography and availability of local material indicated to be the main fore-running causes of change in the cultural ecology. These factors affected other elements in the socio-cultural and socio-economic fabric, such as changing sources of livelihood, formal education and evolved methods of communication have been key in evolving the perception of the community culture and needs of the occupant. This led to adapting the house according to the livelihood, education and other exposures to multicultural ideas and concepts that have redefined the needs of the occupant from their house.

Thirdly, to what degree did the context influence the design of the traditional house? – The cross-case analysis of the results has aided in understanding the phenomenon of the cultural ecology of each case as a generalised phenomenon. Each unique context and traditional house of a case was understood in terms of design approaches based on the regional context. However, the evolution of these traditional houses is discussed through the results of the household level analysis in Chapter 5.

In the next chapter, which focuses on the household level data analysis starts by discussing the results of the questionnaire survey that help in selecting the household cases for the analysis. The few cases selected from the process are analysed based on the information given by the cases and the sketches obtained from the household interview. This will further contribute to understand the current trend in construction and vernacular design that is being practiced in the village contexts. It will also demonstrate the vernacular practices that have been maintained from the traditional household design.

Chapter 5. *Household Case Analysis: Evolution of Rural Housing Layouts*

This chapter starts with the discussion of the results of the household case selection in Section 5.1, based on the criteria discussed in Section 3.2.2. According to the results of the household case selection, each household case is described, analysed, and discussed according to the village in Sections 5.2, 5.3, 5.4 and 5.5. The results from the households in each village is summarised to produce a generalised set of observations pertaining to the changes in the layout of the household cases, which is discussed in Section 5.6.

5.1. House Selection

This section elaborates upon the household case selection process for each village case based on the criteria discussed in Section 3.2.2 . The data used below is the analysis of the data collected through the questionnaire survey conducted in each village. As described in chapters 3 and 4, the questionnaire had four parts, A, B and C were household specific, while D was individual specific. The consent given for the individual specific part of the questionnaire implied their consent for the participation in the second phase of the data collection which is the household interview.

5.1.1. House Type Score

Based on the score awarded to each item according to Table 3-5 in Section 3.4.1, the results were added up for each house to arrive at the following results for each village:

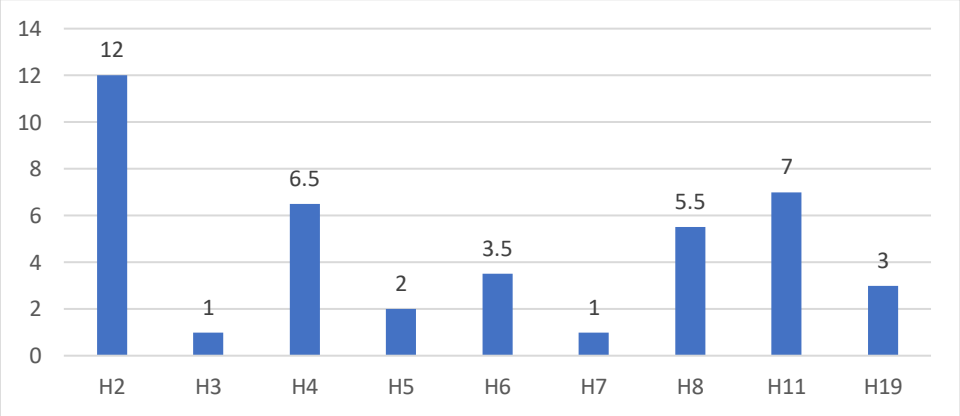


Figure 5-1 House type pattern for Kuki

Figure 5-1 is a graph that indicates H3 and H7 with the lowest score of '1' amongst all the households in the Kuki village case, which indicates that it is either a completely traditional house with two rooms, or with one room using one kind of non-local material. It is also possible that it is considered a mixed housing type with one room using only local materials. On the other hand, H2 has the highest score of 12 indicating that the house is closest to a contemporary house using non-local materials with more than four rooms at the least.

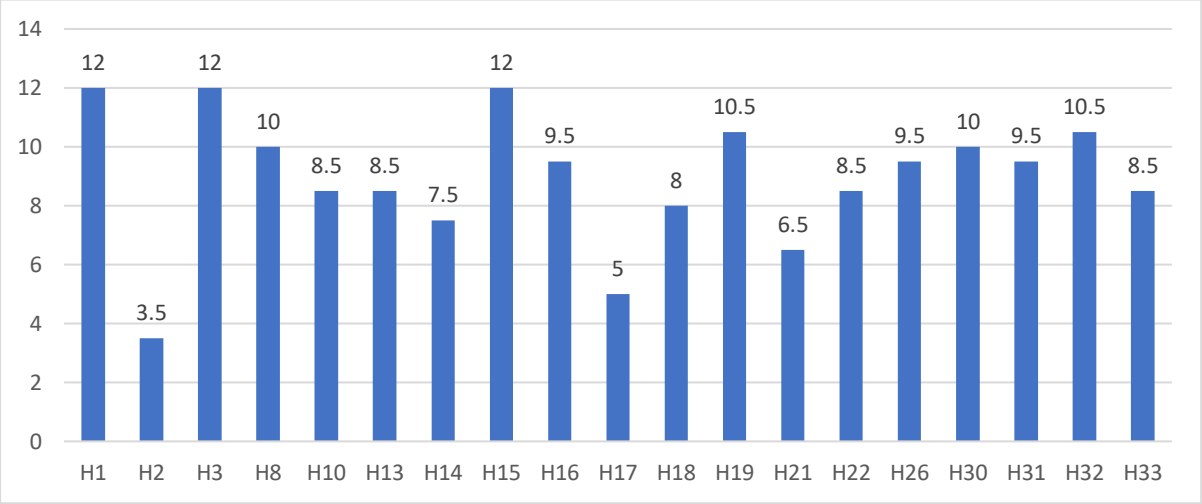


Figure 5-2 House type pattern for Karbi

Figure 5-2 is a graph indicating that H2 has the lowest score of '3.5' among the households in the Karbi village case. This indicates that it is probably the closest to a traditional house using mostly local materials present in the construction with only one or two rooms at the most. On the other hand, H1, H3 and H15 have the highest score of '12' meaning that the house is closest to a contemporary house using non-local materials with more than four rooms at the least.

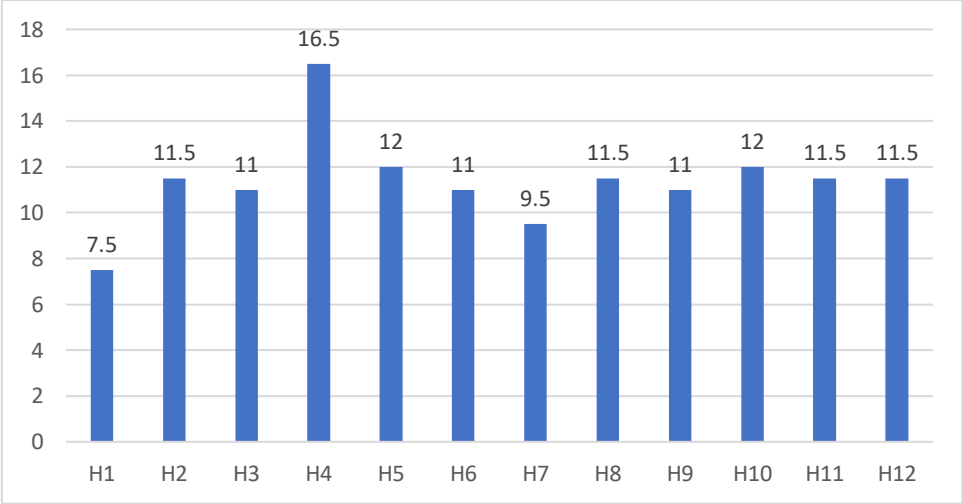


Figure 5-3 House type pattern for Dimasa

Figure 5-3 is a graph indicating that H1 has the lowest score of '7.5' which indicates that it is probably the closest to a traditional house however not as tradition in degree as compared to the Karbi. Other possibilities for this score may be the use of more non-local materials over local materials in the construction with more rooms. On the other hand, H4 has the highest score of '16.5' meaning that the house is closest to a contemporary house using non-local materials with many more than seven rooms at the least.

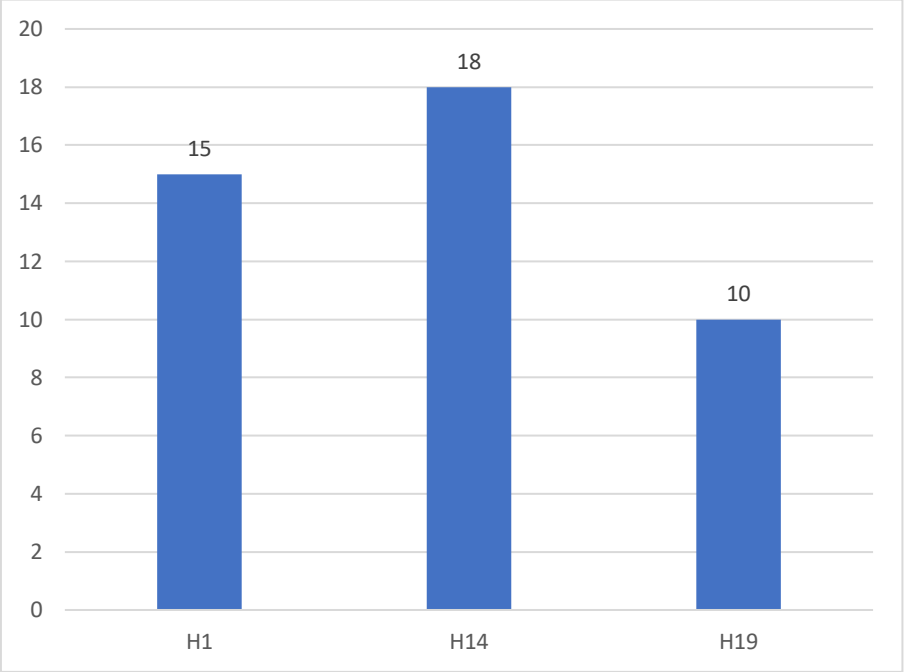


Figure 5-4 House type pattern for Labang

As seen in Figure 5-4 only three household consented to the household level data collection process. Therefore, the questionnaire data for Labang case was not used as a case selection tool.

5.1.2. Affluence Score

Based on the equation presented in , the following affluence scores for the households that consented to Part-D of the questionnaire/survey are calculated for the Kuki, Karbi, Dimasa and Labang village cases in Figure 5-5, Figure 5-6 Figure 5-7 and Figure 5-8 below:

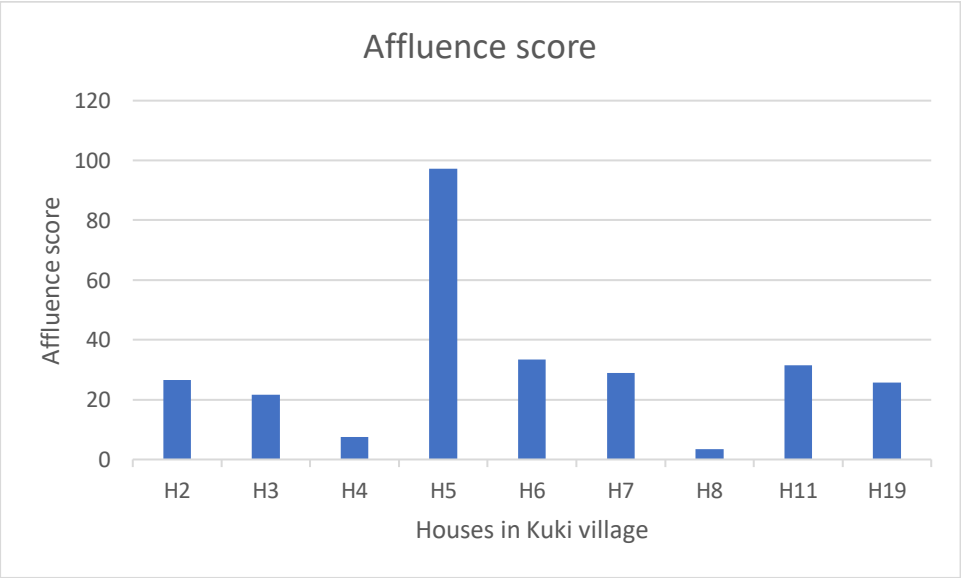


Figure 5-5 Affluence score for Kuki

Figure 5-5 shows another example of a huge economic gap within the houses in the village, between H5 and H8, while the average of remains below the value of 40 on the scale. This gap can be contributed to many factors, such as the number of people in the family, the annual

income, and the kind of possessions they own. In other words, these graphs aid in representing the affluence pattern of the households in the villages.

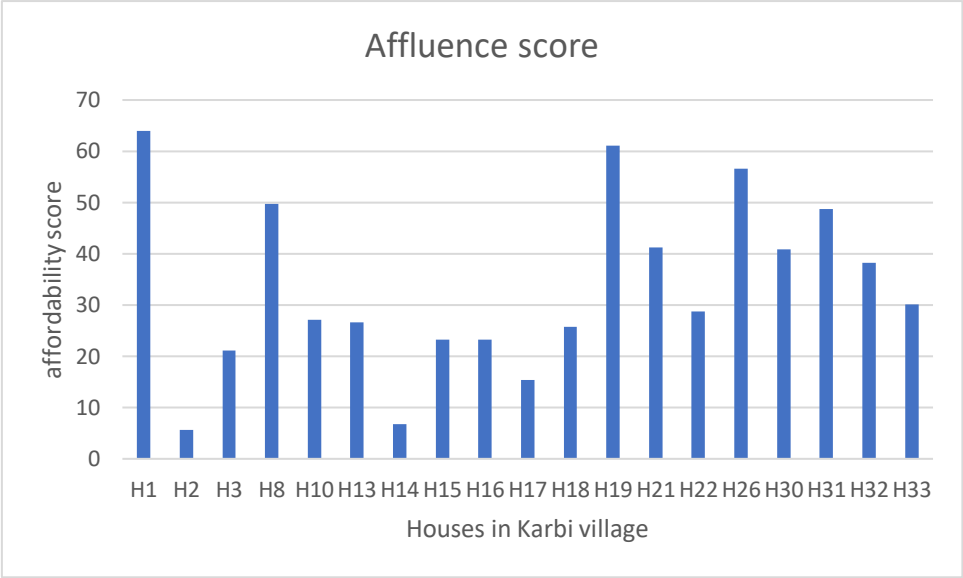


Figure 5-6 Affluence score for Karbi

Figure 5-6 shows that there is a huge economic gap within the houses of the Karbi village between H2 and H1, while most of them are within a certain range of 20 to 40 on the scale.

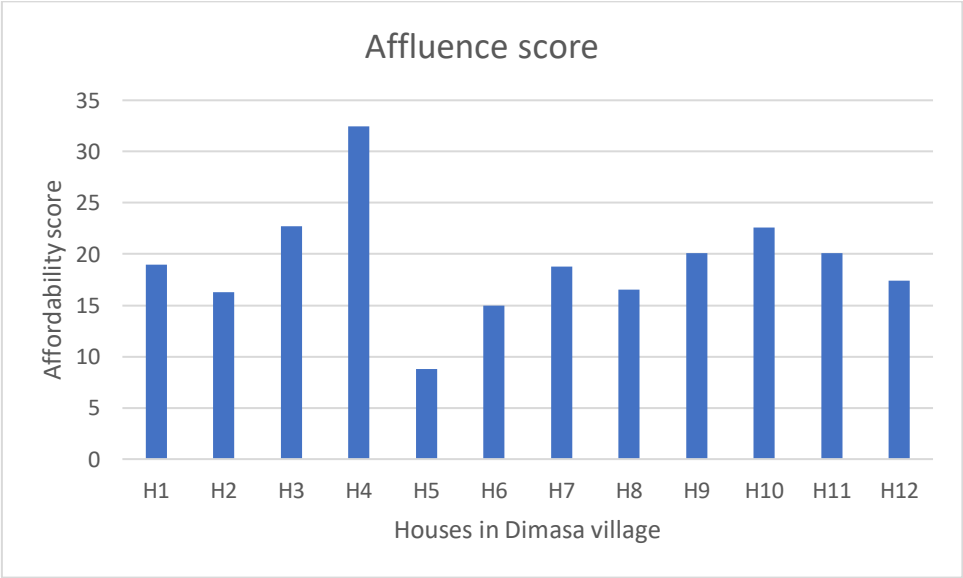


Figure 5-7 Affluence score for Dimasa

Figure 5-7 shows the affluence pattern of the households in the village, and it also shows that the gap between the least, H5 and the most, H4 is not as distinct as in the case of the Karbi houses in Figure 5-6

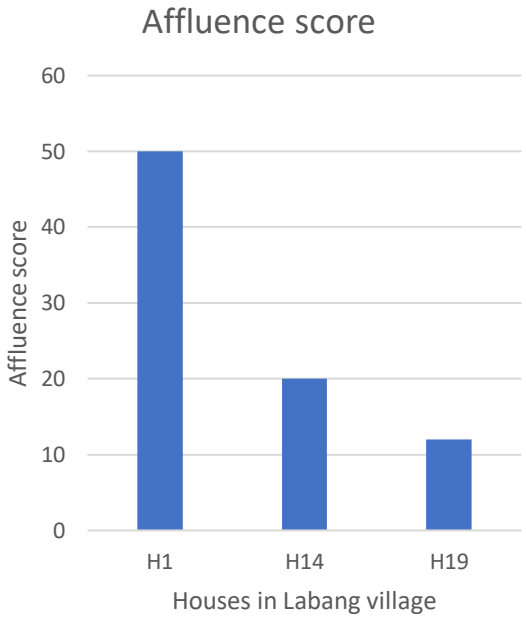


Figure 5-8 Affluence score for Labang

Figure 5-8 represents the affluence score of the household cases in the Labang village case. As mentioned, the data of the questionnaire survey were not used for a case selection process for the household interviews.

5.1.3. Conclusion: Scale of M versus H

By combining the results from the house type graph in Figure 5-1, Figure 5-2, Figure 5-3 and Figure 5-4, and the affluence graph in Figure 5-5, Figure 5-6, Figure 5-7 and Figure 5-8, the following scattered graphs are produced. The scattered graphs present the houses depending on their house type plotted along the x-axis, and affluence plotted along the y-axis. This way it became easier to visualise the information provided by the data and accordingly, choose the diverse cases for the next part of the research methodology, which is the household interviews.

According to the results of the case selection process, five households in Kuki, Karbi and Dimasa, while only three households in Labang due to the low consent numbers, were interviewed for the household level data collection. However only eight of the total 18 households interviewed are documented in the following sections, while data from the remaining 10 cases are presented in Appendix C. Each of the eight household cases, two from each village case, are discussed according to the village cases in four different sections. The discussion is addressed in the following format:

- *The current house* – the house that is currently being occupied. This section discusses the layout, construction, spatial use, and functionality and presents an AEIOU framework of the house.
- *Past house/s or future house* – this section discusses the previous layout and future-proposed layouts of the house based on the data provided by the participant. It discusses the layout, construction, spatial use, and functionality and presents an AEIOU framework of the layout to understand the house.

- *Changes observed* – this section compares the modifications, additions and reconstruction of the various layout that are discussed in the previous section and documents the significant changes in the layout, along with the discussion of the possible reasons for the changes.

After the observations and analysis of the household cases, the section is concluded with a section inference that generalises the changes according to the village case. This section highlights the major spaces that have been retained and changed, and the causes of the changes in the layout in a broader context of the household and socio-economic landscape within the village. It summarises the highlights of the household case analysis to simplify the inferences in terms of generalised observations. The generalised observations of each village will be further analysed across the village cases to produce an even more generalised set of results.

5.2. Kuki

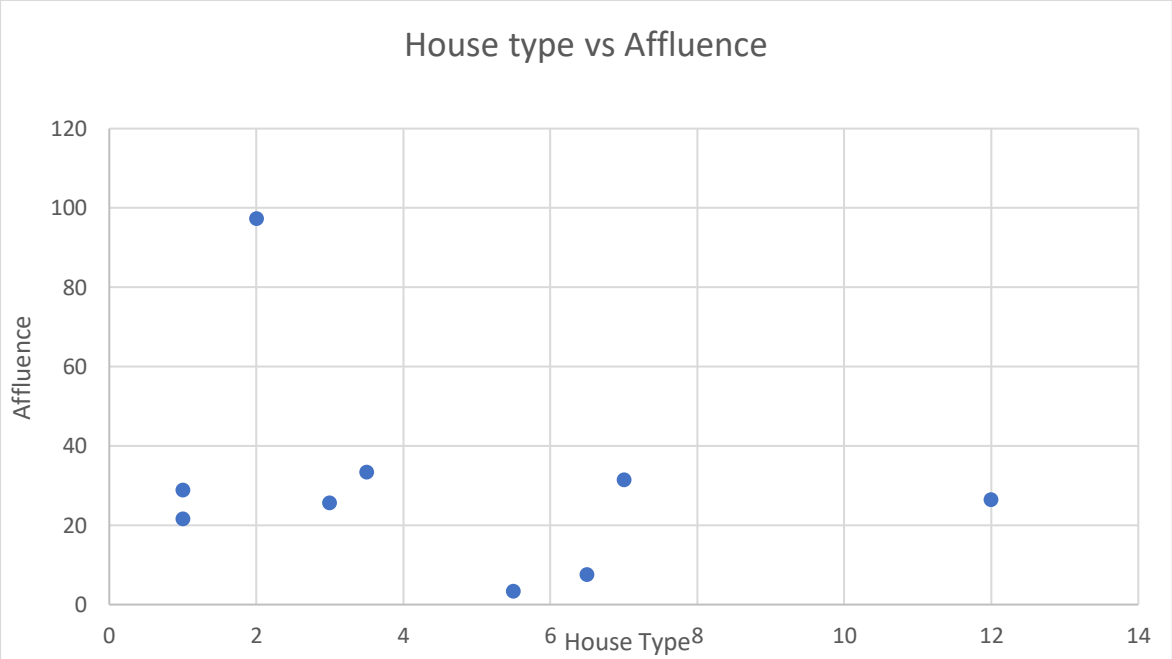


Figure 5-9 House type vs Affluence pattern for Kuki village

Figure 5-9 shows the trend of change in house type based on finance in the Kuki village case. It indicates that the houses did not change as much along with the increase in affluence. No household indicates having the means and choosing to live in a contemporary styled house at the same time. The cases that were selected for the household data collection are KuH02, KuH03, KuH08, KuH11 and KuH19. The contextual plans and house layouts of KuH03, KuH08 and KuH19 is recorded in Appendix C. The discussion of KuH02 and KuH11 and its subsequent generalised observation is followed at the end of the section.

5.2.1. Kuki House: KuH02

This house is located towards the eastern end of the village connected by the village path (3) as shown in Figure 5-10. The house (1.a) is traditionally built with wooden floors, bamboo walls with thatch roof which has gone through few modifications. There is a mixed contemporary house under construction (1.b) to the top left side of the current house (1.a). There is a clearing between the two structures which is meant for the proposed kitchen (1.c).

The vegetable garden (1.d), animal shed and pigsty (1.e), and Toilet (1.f) are located successively behind the current house (1.a) leading towards the forestry (2) behind the house. There is one neighbouring plot (4) on the left of KuH02 plot. Image 5-1 is a view of the house and its surroundings from the village path.

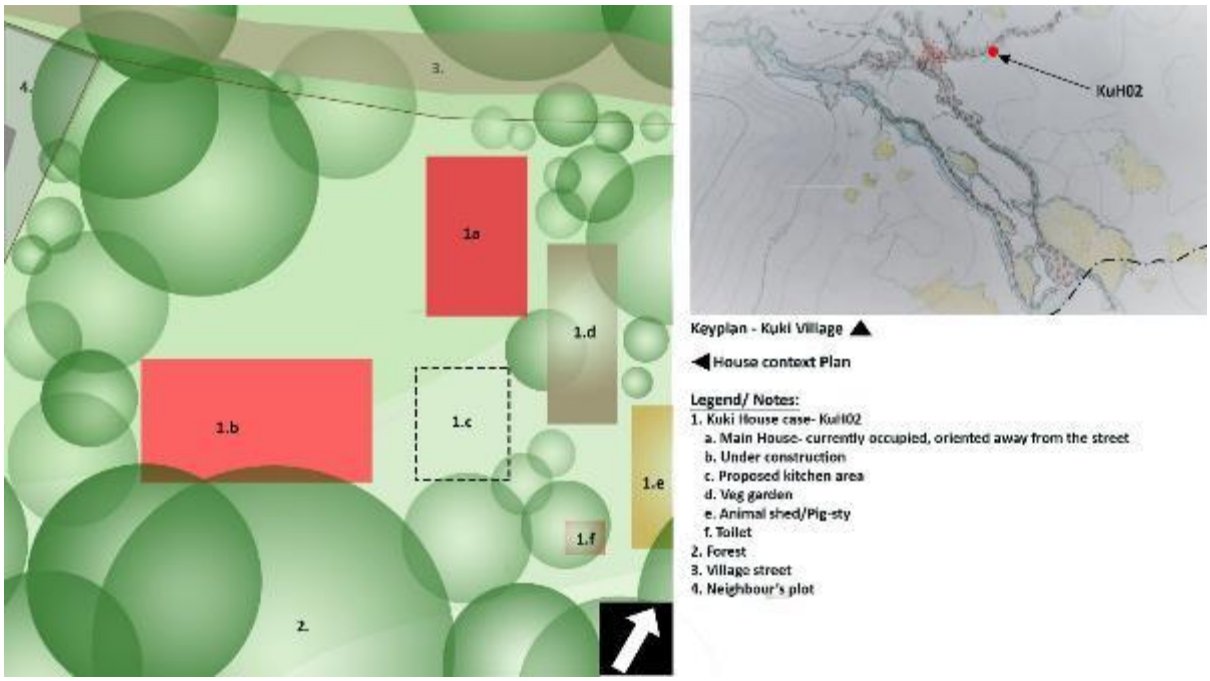


Figure 5-10 Kuki house: KuH02

Image 5-1 Kuki house: KuH02, view from village path.

Current House- Since 2007

Figure 5-11 is the layout of the current house. The entrance of the house is in through a *verandah* is approximately 6" above the ground which is not as high as traditional house. A

storage room is accessible from the *verandah* on the left while the right side is the protruded section of the kitchen like the traditional house. The first room entered in the house is similar to the traditional house with a raised platform and window above it; a typical kitchen with a firewood stove and a shelf hanging from the roof in the nook next the entrance door; water storage and pantry in the corner opposite to the kitchen; and the utility area of the house beyond the kitchen. However, the door to the utility area is placed closer to the kitchen area. On the left side of the house, the wall has a door leading to a room that is specifically meant for sleeping, as shown in figure 1- x. The room has two single beds on either side of the door. The room has no window however there is a perforated lattice screen made of bamboo strips that offers ventilation and light into the room.

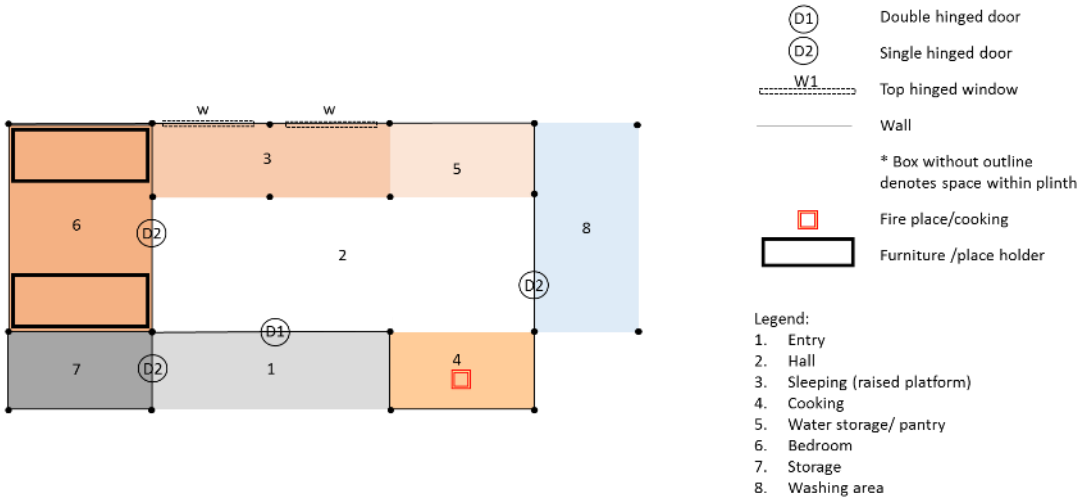


Figure 5-11 Layout of current house (1.a), KuH02

The current residents of the house who are an old couple in their sixties living here for the past ten years are not the original owners of the house. The house was originally built by another person who moved to a different village. The story behind the transfer of address is due to the cultural superstition that the owners of the house that is oriented away from the street tend to have misfortune befall them. The house was built at least twenty years ago when it was the last house in the village path. This resulted in the orientation of the house facing away from the street unlike the orientation of traditional houses.

It was during the time when there were many cases of Kuki youths joining the militant groups in the area and the previous owner would come under suspicion which led him to sell his house to the current residents before moving to a different village. On being asked whether the current residents had faced any similar consequences related to the orientation superstition, the couple said that there was nothing significantly indicative of the superstition being true for them as well. However, as to not test their fate, they decided to build a house that is oriented correctly to the street which is currently under construction as shown in Figure 5-10 in location 1.b.

Their vegetable garden, pigsty and toilet are located in succession as the ground slopes down behind the current house towards the forestry. The zoning of these areas is placed with the same logic as the traditional layout that the utility areas and pigsty should be far from the street and behind the house and preferred on a slope, allowing the sewage and waste to flow down and fertilise the land.

Most of the house is built using locally sourced material which is wood, bamboo and mud except for the tinned roof. The columns and beams are wooden logs that make up the structural frame of the house. The floor of the cooking area and the hall is made of mud as it is said to be much stronger than a bamboo floor and cheaper than a wooden floor. The floor in the pantry is made with wood as this section of the house is no longer resting on the ground. The raised platforms are made by using wood for the skirting and flattened bamboo as the platform. The walls are made of woven bamboo panels fitted between the columns. There are two windows above the raised platform fitted with wooden rods to serve as grills and shutters. The roof is a truss structure like the traditional house however, the thatch has been replaced with corrugated tin sheets. The couple have complained that it makes the room hot while the thatched roof was much more comfortable. They opted for corrugated tin sheets as it has a longer shelf life whereas the thatch must be replaced every 1-3 years depending on the damage due to rain.

Table 5-1 is the AEIOU framework that indicates the use and function of a space according to the data gathered based on Activity/function, Environment/space, objects/furniture, and each kind of User/ time for the current house layout. It indicates the quality of space, its accessibility and its functionality based on the User and time that they use it.

Table 5-1 AEIOU framework current house, KuH02

LEGEND	ACTIVITY/ FUNCTION	ENVIRONMENT/ SPACE	OBJECT/FURNITURE	USER/ FREQUENCY			
				Male occupant	Female occupant	Guests (Kuki)	Guests (non-Kuki)
1	Circulation, storage	Dry, wet, open, ventilated, exterior, public, wooden floor, bamboo walls	Tools, slippers, wood etc	Yes	Yes	Yes	Yes
2	Gathering, seating, weaving, sleeping, storage	Dry, flexible, interior, public, ventilated, mud floor, bamboo walls	Stools, sleeping mats, cabinets	Yes	Yes	Yes	Yes
3	Gathering, seating, weaving, sleeping, storage	Dry, flexible, interior, public, ventilated, raised bamboo platform, bamboo walls	Sleeping mats	Yes	Yes	Yes	Yes
4	Cooking, eating, storage	Enclosed, dry area, warm, semi-public, mud floor, bamboo walls	Fireplace, shelves, suspended shelf	Yes, occasionally, to keep warm.	Daily, all day	Yes, occasionally, to keep warm.	Yes, if familiar
5	Storage	Dry, corner, enclosed, semi-public wooden floors, bamboo walls	Cabinets	Yes	Yes	Yes	Yes
6	Sleeping, storage	Dry, enclosed, semi-public	Beds, cabinets	Yes	Yes	Yes	Yes
7	Storage	Dry, enclosed, private, mud floor, bamboo walls	Firewood, tools, produce	Yes	Yes	Yes	No
8	Washing, cleaning, storage	Semi-public, open, wet, well ventilated,	Water containers, clothesline	Daily in the morning and evening	Daily, occasionally throughout the day	Daily in the morning and evening	Daily in the morning and evening

Proposed House- Under Construction

The couple reconfirmed their preference of traditional style of living however, due to the differences in lifestyle between them and their children who are currently in Singapore and Chennai, they want to build a house that is comfortable for their children as well. Figure 5-12 is the layout of the proposed house under construction (1.b) and the proposed kitchen (1.c). The orientation of the house has been corrected to face the street unlike the current house which faces away. Like the Assam type house, the foundation, walls, and columns are made of concrete, brick and cement up to 2- 3 feet, with tinned roofing. The walls beyond the lower 2-3 feet, is made of bamboo woven into panels and fitted in between finished with mortar and paint. The proposed kitchen (1.c) will be built on the same level as the main house (1.b), but it will be supported on stilts as the location is on a slope, and the toilet will be built on the ground lower down the slope.

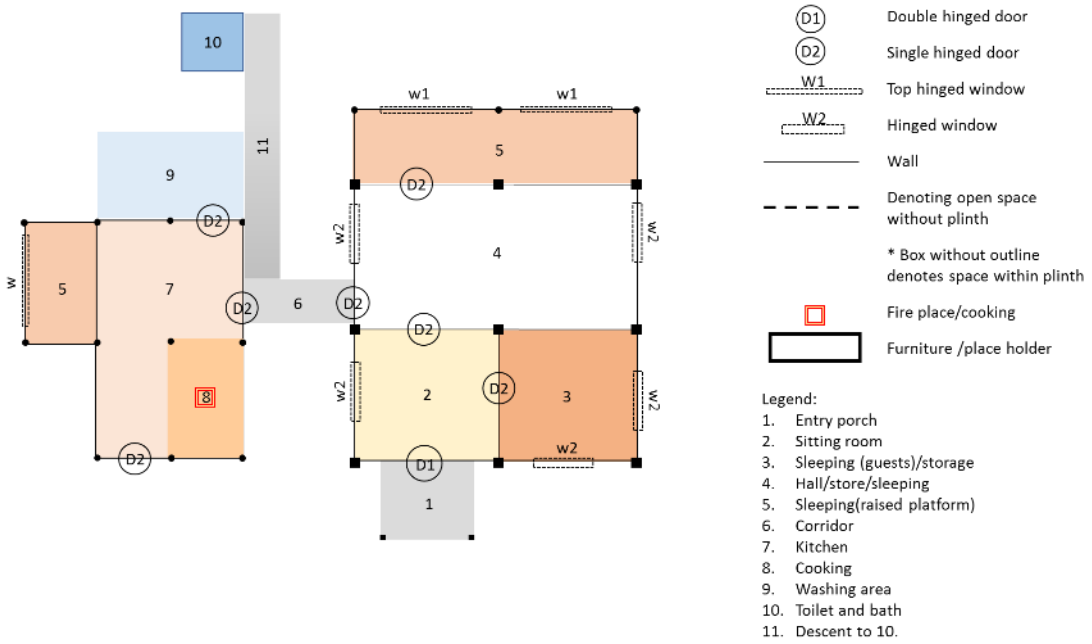


Figure 5-12 Layout of proposed house (1.b, right) with kitchen (1.c, left), KuH02.

Main house - The layout of the main house is accessed a porch which was noted as important to the entry into a Kuki house. Since it is a practice to leave footwear outside of the house, the porch area is used for this. The first room entered is the sitting room which is meant to be used for receiving guests formally. The door to the right leads to a room that can be used either as storeroom or guest room depending on the season. The door ahead leads to a hall that can be used as a room for having a prayer service. During the times when relatives visit such as Christmas, New year or Easters, the room can be split into half by adding a curtain to turn it into a bedroom. A door to the left exits the house to a shaded corridor connecting to the kitchen and the toilet. Continuing on, next is a long room that is built of wood and bamboo running the length of the wall in the style of the traditional raised platform used for sleeping. This space is meant for the people and guests who prefer the traditional style of sleeping.

Kitchen and toilet- The layout of the structure is proposed as a traditional house complete with a raised platform that can be used for sleeping. The structure will be half rested on the ground and the rest of it will be supported on stilts. There are three access doors, one that directly enters in from the front yard, a second that connects to the main house (1.c) and third that opens

out to the washing area as seen in Figure 5-12. Similar to the layout of a traditional house, the kitchen has a designated corner for cooking in the left from the corridor entry. The raised platform is diagonally located to create a longer space on the other half of the kitchen for people to sit around and eat meals. The utility space is open like the traditional washing area where utensils are cleaned and dried. The toilet is detached from both structure but connected by a path from the shaded corridor.

Table 5-2 is the AEIOU framework that indicates the use and function of a space according to the data gathered based on Activity/function, Environment/space, objects/furniture, and each kind of User/ time of the proposed layout of the house. It indicates the quality of space, its accessibility and functionality based on the User and time that they intent to use it.

Table 5-2 AEIOU framework proposed house, KuH02.

LEGEND	ACTIVITY/ FUNCTION	ENVIRONMENT/ SPACE	OBJECTS/FURNITURE	USER/ FREQUENCY			
				Male occupant	Female occupant	Guests (Kuki)	Guests (non-Kuki)
1	Circulation, storage	Public, open, dry, exterior, for placing footwear before entering the house, concrete floor	Slippers, farming tools etc	Yes, occasionally	Yes, occasionally	Yes, occasionally	Yes, occasionally
2	Gathering	Public, formal, interior, dry, enclosed, concrete and paint finish	Seating	Yes,	Yes,	Yes, occasionally,	Yes
3	Sleeping, occasionally storage	Private, enclosed, interior, dry, concrete and paint finish	Bed, cabinets	Yes, rarely to occasionally	Yes, rarely to occasionally	No	Yes
4	Gathering, sleeping, storage	Public, interior, open, flexible	Beds, cabinets, seating	Yes	Yes	Yes	Yes
5	Sleeping, storage	Semi-public, raised platform, interior, open, flexible, dry area, well ventilated,	Sleeping mats	Yes – Night or during day nap	Yes – Night or during day nap	Yes – Night or during day nap	No
6	Circulation	Open, public, wet/dry, ventilated,	Slippers, farming tools etc	Yes	Yes	Yes	Yes
7	Gathering, eating, sleeping	Interior, flexible, semi-public, well ventilated, dry area	Stools, mats, etc	Daily in the morning and evening for meals before farming	Yes, if staying at home	Yes, if staying at home	Yes, if familiar
8	Cooking, eating, storage	Enclosed, dry, interior area, warm, Semi-public	Fireplace, shelves, suspended shelf	Yes, occasionally, to keep warm.	Daily, all day	Yes, occasionally, to keep warm.	Yes, if familiar
9	Washing, cleaning, storage	Private, open, exterior, wet, well ventilated,	Water containers, clothesline	Daily in the morning and evening	Daily, occasionally through out the day	Daily in the morning and evening	Daily in the morning and evening
10	Washing, cleaning	Enclosed, wet, public, exterior, fixed,	Water, bucket	Yes	Yes	Yes	Yes
11	circulation	Open, semi- public, exterior, wet/dry, ventilated,	-	Yes	Yes	Yes	Yes

Changes Observed

The spaces have been separated between kitchen, utility, and bath on one side and storage, sleeping and a formal sitting room on the other side. The separate kitchen from the main house is reminiscent of a bungalow styled house that was built for British officials in India, some of which are still in use as government quarters. However, this layout results from the fact that the kitchen is intended to be in the traditional style while the main house is meant to be an upgrade according to the contemporary living standard in towns and cities. The house has an option of providing private sleeping quarters as well as the flexible hall that can accommodate more people. It is a mix of contemporary design using cement and brick as its construction materials along with traditionally inspired elements in wood and bamboo, while the kitchen is often traditionally built except for the roof which would be corrugated tin sheets since thatch is not easily available.

The AEIOU frameworks highlight the change in spaces from the current house to the proposed house. There are more rooms in the proposed house, and the variation between public, semi-public, and private have been modified. The exclusively private rooms in the two layouts are the storeroom in the current house and the bedroom in the proposed house. With the exception of the private guestroom, the spaces are intended to be open and flexible for different users and functions. The perception of privacy has increased for non-Kuki rather than for themselves. The kitchen retains its simple yet flexible and functional layout. The additional rooms that have been added as the proposed house do not have the central element of a house, which is the fireplace with the suspended shelf, that too has remained intact exclusively in the kitchen.

Construction – while the builder maintained the traditional style of housing, the roof has changed from thatch to tin due to its durability. The proposed house is mostly built on the ground because of the trend to not build on stilts and construction trend of using cement, brick, and mortar, however, the expense on those materials have led the builder to opt for bamboo and mud which is easily source-able, easy to build and after the finishing layer of paint it resembles a brick-and-mortar wall. The cemented floor instead of wood or bamboo is because it is more permanent while wood requires to be replaced every decade or so depending on the quality and bamboo needs to be replaced every 3-5 years. Cost of wood has also led to building on the ground instead of stilts.

Spaces- Spaces have changed because of the change in the perception of privacy and the sense of unfamiliarity with someone from another tribe or community. Due to this, a bathroom and a private room is specifically proposed as part of the house. However, due to the culture practice of having detached toilets, going a distance to take a bath and both being related to cleaning and getting rid of dirt, the bathroom has also been kept detached.

5.2.2. Kuki House: KuH11

The house (1.a) is located near the market on stretch of the village path between the market (2), other houses (3) and (4), and the community hall as shown in Figure 5-13. (1.b) is a shaded structure attached to the main house. Visible in Image 5-2, there is vegetable garden (1.c) behind the house in the backyard with a toilet (1.d) towards to back entrance (1.e) that connects to the village community water tank. The house was built by the respondent in 2007, who chose the location because it is very lively with tea stalls and shops. The house is contemporary in

design and construction unlike most of the vernacular architecture that is evident in the village. As seen in Figure 5-13, the house is oriented so that it faces the road as is the cultural practice.

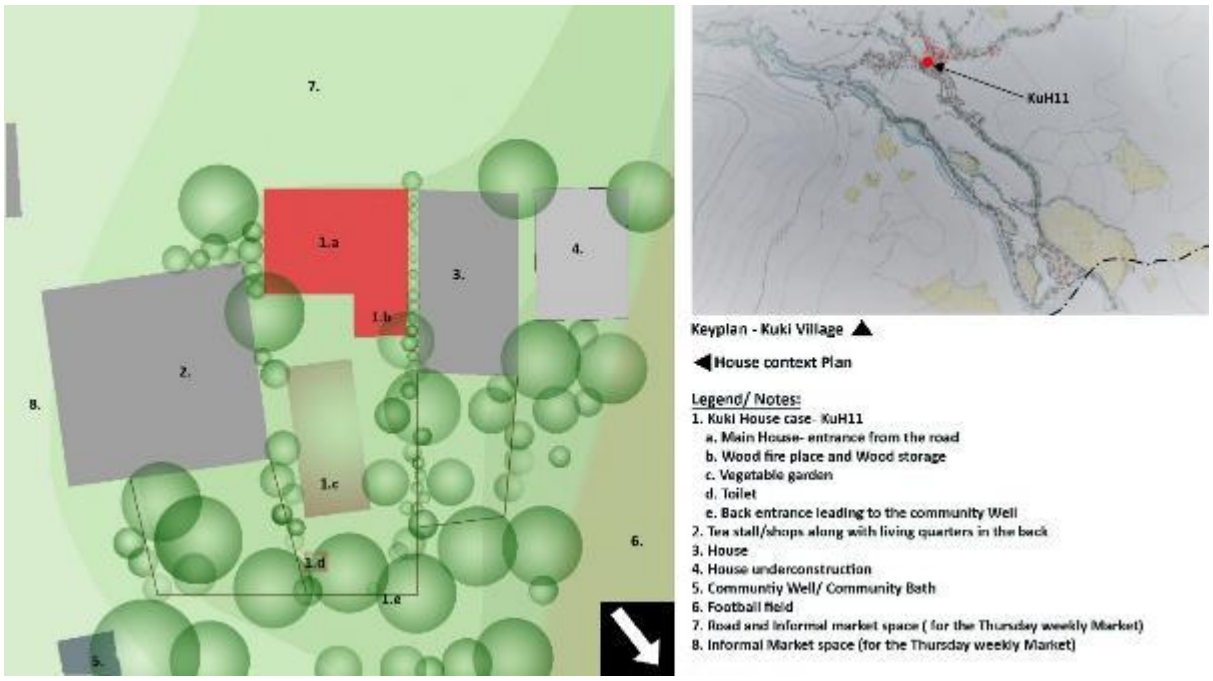


Figure 5-13 Kuki house: KuH11

Image 5-2 Kuki house: KuH11, view from the village path.

Current House – Since 2007

As seen in Figure 5-14, there is a long porch access along the front of the house. There are two doors into the house, one through the shop, which is open for most of the day and the other is through the sleeping area (5). In the room that is used as a shop, it is also used as a cooking area and a place where people can sit and hang out. There are two doors connecting to the

sleeping areas in the house. One of the doors, between the shop room and sleeping area (5) remains closed due to the placement of the furniture in the room.

There are three generations and a total of eight people living in the house. The respondent, his wife, his three children, his brother's son, and his parents. The other door leads to the sleeping room used by the respondent, his wife, and youngest children sleep, while his parents and other 2 children in another room and his nephew in the room with the cooking area. In case of more people in the house, the storeroom can also be used as a sleeping area.

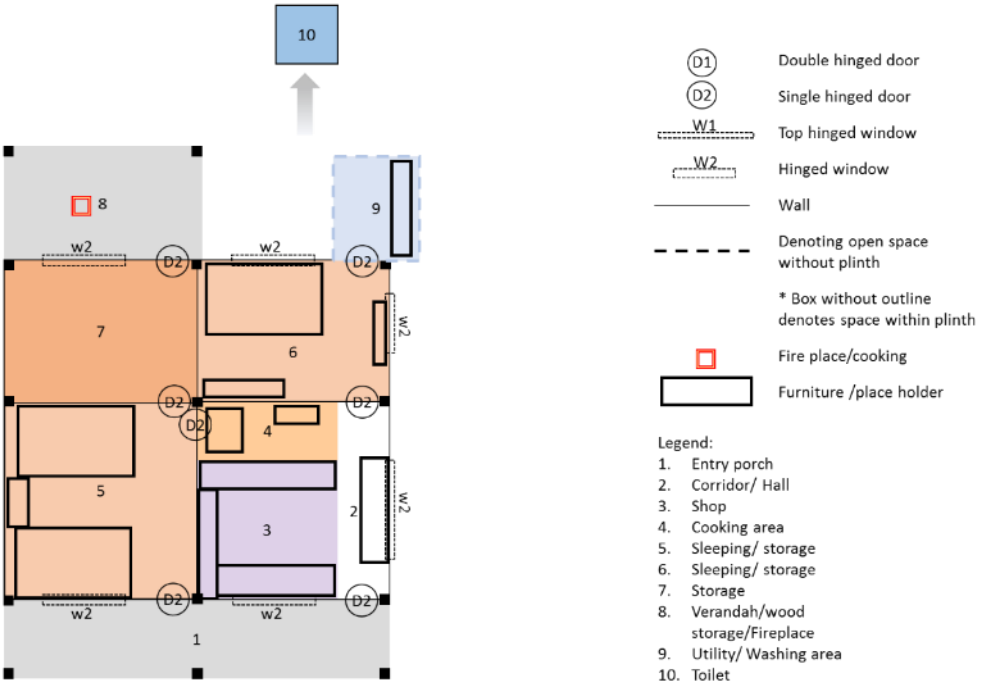


Figure 5-14 Layout of current house, KuH11.

There is a shaded veranda outside the storeroom, which is used for wood storage and for a fireplace with a suspended shelfing for drying meat, chilli, and rice. There is a backyard which is meant for vegetable garden and towards the end of the yard is a toilet made of wood and bamboo walls and tinned roof. There is a gate at the end of the fence which leads to the water source of the village. Meaning that they still practice bathing in the common community area. Table 5-3 is the AEIOU framework used to analyse the layout of the current house of KuH11.

Table 5-3 AEIOU framework current house, KuH11

LEGEND	ACTIVITY/ FUNCTION	ENVIRONMENT/ SPACE	OBJECTS/FURNITURE	USER/ FREQUENCY			
				Male occupant	Female occupant	Guests (Kuki)	Guests (non-Kuki)
1	Circulation, storage, gathering	Public, open, dry, exterior, concrete floor	Slippers, shop products, etc	Yes	Yes	Yes, occasionally	Yes, occasionally
2	Circulation, gathering	Public, open, dry, interior, concrete floor		Yes	Yes	Yes, occasionally	Yes, occasionally
3	Storage, selling, retail	Public, open, dry, interior, concrete floor	Table, shelves, chair, retail products	Yes	Yes	Yes	Yes
4	Cooking, storage	Dry, open, corner, concrete floor, semiprivate	Table, cooking stove, refrigerator, food	Yes	Yes	No	No
5	Sleeping, circulation, storage	Dry, closed, interior, concrete floor, private	Bed, cupboard	Yes	Yes	Yes occasionally	Yes occasionally
6	Sleeping, circulation, storage	Dry, closed, interior, concrete floor, semi public	Bed, cupboard	Yes	Yes	Yes	Yes
7	Storage, sleeping	Dry, closed, interior, concrete floor, private	Rice, shop retail products and other produce	Yes	Yes, occasionally	No	No
8	Storage, gathering	Dry, open, mud ground, exterior, semi public	Wood, fireplace	Yes	Yes	Yes	Yes
9	Washing, storage	Wet, open, exterior, brick laid ground, semi public	Wooden shelf, water	Yes	Yes	Yes	Yes
10	Washing, cleaning	Enclosed, wet, public, exterior, fixed, private	Water, bucket	Yes	Yes	Yes	Yes

According to the Table 5-3, it is evident that the house has changed in layout however the treatment of spaces as flexible and accessible is still maintained. The sleeping areas for the occupants of the house have been divided between the owner/ builder of the house and the dependents, which in this case are the respondent's parents and children. The respondent and his wife have the room that is used as thorough fare to access the utility areas and the back yard of the house.

Past House- Partially Abandoned

The past house is traditionally designed, similar to KuH02, as shown in Figure 5-15. This house was abandoned in 2007 when the new house was built closer to the market area. The house is currently used by the vendors and goods sellers from the other Kuki villages that come to stay overnight on Wednesday so that they can sell their goods early in the morning and leave by afternoon.

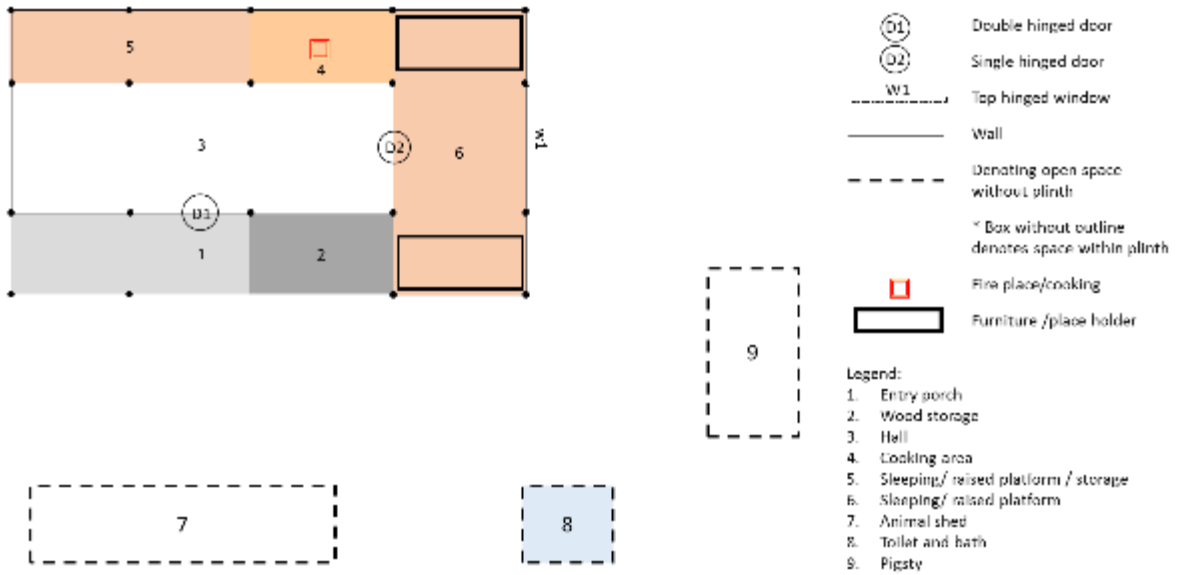


Figure 5-15 Layout of past house, KuH11

As observed from Figure 5-15, the house is facing an animal shed and there is a utility area and pigsty on the right, indicating that the house was oriented away from the access to the house from the football field. This orientation is said to be an anti-social indication; however, no anecdotes were shared to indicate that it rang true. It is noted that the current house is located in a very socially active place and oriented to face the street in front of it indicating a very conscious intent to maintain social relations with the community.

It was originally built for five people when the respondent was much younger, however, overtime, there were seven people in the house as the respondent had married and had a child, while his siblings were also grown up. As a primary solution an additional room was built which was built higher than the rest of the house, so that the whole room was completely designated for sleeping. Table 5-4 is the AEIOU framework used to analyse the layout of the past house of KuH11.

Table 5-4 AEIOU framework past house, KuH11

LEGEND	ACTIVITY/ FUNCTION	ENVIRONMENT/ SPACE	OBJECTS/FURNITURE	USER/ FREQUENCY			
				Male occupant	Female occupant	Guests (Kuki)	Guests (non-Kuki)
1	Entry, storage	Open, dry, wooden floor, exterior	-	Yes	Yes	Yes	Yes
2	Storage	Open, dry, wooden floor, exterior	Wood, tools,	Yes	Yes	No	No
3	Gathering, storage, sleeping	Enclosed, dry, wood floor	Stools, sleeping mat	Yes	Yes	Yes	Yes
4	Cooking, eating, storage	Enclosed, dry area, warm, semi-public, mud floor, bamboo walls	Fireplace, shelves, suspended shelf	Yes, occasionally, to keep warm.	Daily, all day	Yes, occasionally, to keep warm.	Yes, if familiar
5	Gathering, seating, weaving, sleeping, storage	Dry, flexible, interior, public, ventilated, raised bamboo platform, bamboo walls	Sleeping mats	Yes	Yes	Yes	Yes
6	Sleeping, storage	Dry, flexible, interior, public, ventilated, raised bamboo platform, bamboo walls	Sleeping mats	Yes	Yes	Yes	Yes
7	Storage	Open, dry, on ground		Yes	Yes	No	No
8	Washing, cleaning	Enclosed, wet, public, exterior, fixed,	Water, bucket	Yes	Yes	Yes	Yes
9	Storage	Open, dry, on ground	pigs	Yes	Yes	NO	No

As seen in Table 5-4, the layout and use of spaces were traditional and it is the additional room in the house that tends to introduce a sense of privacy-based segregation.

Changes Observed

The current house is almost unrecognisable as a Kuki vernacular house, however, upon conducting the AEIOU analysis, it was observed that the cultural practice of having the cooking area as an accessible space has been maintained. Since all the activity takes place at the front of the shop, the rest of the house is obsolete until night fall, similar to rolling up the sleeping mats and ignoring them until needed at night.

The traditional design is not reflective in the first glance however, it was noted that like the traditional house, the cooking area is the centre of the house, while the rest of the rooms are redundant. It is the urban perception of privacy and segregation that lends the idea into the house however, the actual treatment of the house is the same as a traditional house. In fact, due to the layout of the spaces and functions of the house, because of the placement of the shop area having the cooking area and the access to the toilet and utility areas form through the respondent's room, one half of the house feels like a thorough fare passage, while the other half does not feel like a thorough fare passage. Thereby indicating the lack of reservation of space and privacy for the respondent's room, but at the same time an attempt and offering privacy in the room based of familiarity of the person accessing the rooms.

5.2.3. Section Inference

The significant observation in the household case in this village was the houses maintained a layout that placed the cooking area in the centre of the house. Even if it is physically placed aside from the main house, it is not treated as an inaccessible space. The general approach to the space is that it is the main hang-out place for the family members as well as guests. The traditional fireplace with the suspended shelf is maintained in both houses, in KuH02, the fireplace is in the cooking area according to the vernacular including a raised platform, but in KuH11, the fireplace is placed outside the house and in the open, thereby providing a space for gathering around to socialise with other people albeit without the raised platform. In Kuki02, the proposed idea of the cooking area is intended to be in the traditional house design which would be mainly used as the cooking area with options of entertaining and sleeping if there are too many people in the house. However, in the KukiH11 the house is completely changed with no resemblance to the traditional house except for the maintenance of not having a bathroom or toilet joined to the main house since the practice of communal bathing is still followed in the family. This difference is attributed to the socio-economic background and the cultural exposure of the women of the household, in other words, the one responsible for cooking. In the KuH11, the daughter in-law is from Dimapur hence definitely not as familiar with the traditional design of the cooking area. Also, the construction materials and method influence the design of the spaces. Though the cooking area has been maintained as an open space which partly functions as a shop front, the elevated platform that was characteristic in the other houses was not present.

According to Kuki culture, the room that has a burning fireplace is where one would normally sit down with the guests, and more often than not, the kitchen is the most common place for entertaining guests. Since the couple is elderly and prefer traditional practices, the separate kitchen is designed exactly in the traditional layout. This case indicates that the welcoming nature has been maintained in the design and orientation of the house. In the proposed layout, the couple have managed to retain most of the significant elements of traditional design by opting for a traditional kitchen and incorporating a raised platform corridor. The newer additions have been the formal sitting room, the guestroom/storeroom and the hall which all serve an additional purpose rather than replace the traditional elements. While the house will accommodate more people to stay over, the perspective of the couple is that kitchen will remain the busiest space as that is where the fireplace and food is, and it is much easier to gather there than any of the other rooms or spaces. This indicates a sacred yet inclusive ambience to the kitchen while the sitting room, bedroom and other sleeping/storage spaces do not have much activity and do not reflect that same ambience.

Though the people living in the village still continue to use the community water tank near the market as the Bathing area. The families intend to build a bathroom behind their main living quarters. This suggestion has been indicated by the families who have family members who have lived outside of the village for a prolonged period of time, that is, the children in KuH02 who live in metropolitan cities in India and Singapore.

In conclusion, while the rooms are intended for flexible use, the house layout has been decided based on specific functional requirements for each room. The open layout of the traditional house design has become more distinct in its division of space and function. This has come about due to the influence of the urban perspective of standard living.

5.3. Karbi

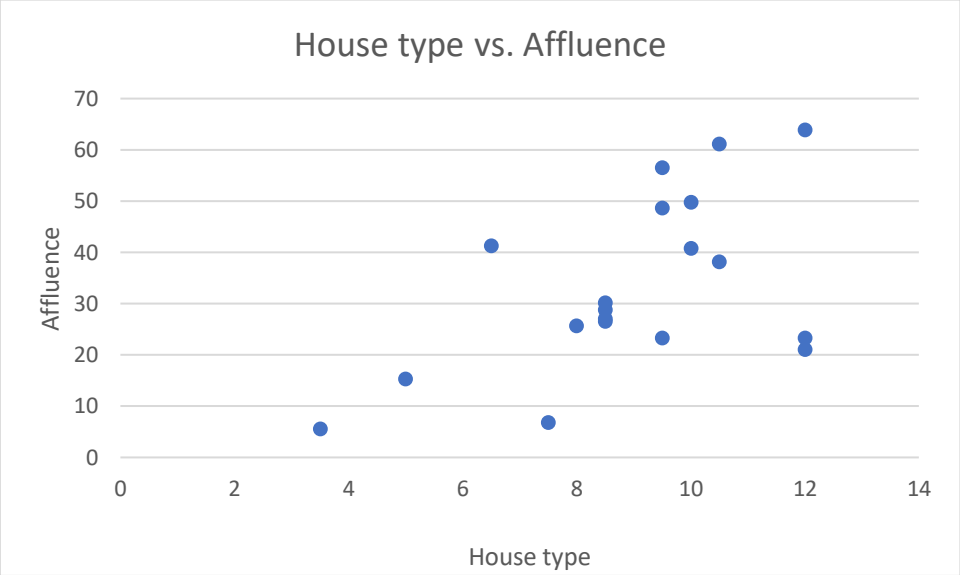


Figure 5-16 House type vs Affluence pattern for Karbi village

Figure 5-16 is a graph showing a gradual progression in changes that have taken place in the house from traditional to contemporary along with higher affluence of the households in the village. It indicates the varied degrees of affluence and different types of houses in the village. The cases that were selected for the household data collection are KaH01, KaH02, KaH19, KaH26 and KaH32. The contextual plans and house layouts of KaH01, KaH09 and KaH19 is recorded in Appendix C The discussion of KaH02 and KaH32and its subsequent generalised observation is followed at the end of the section.

5.3.1. Karbi House: KaH02

The current house of KaH02 is located in the middle of cultivation fields with Bamboo groves on one side and Broom flower plantation on the other side as seen in Figure 5-17. Access to the hut is quite difficult to navigate as the path connecting to it from the Lower primary school seems to be lost in the dense shrubbery of the forest. Image 5-3 is the view of the hut from the village path going past the hut to the farm fields ahead of it into the forest.

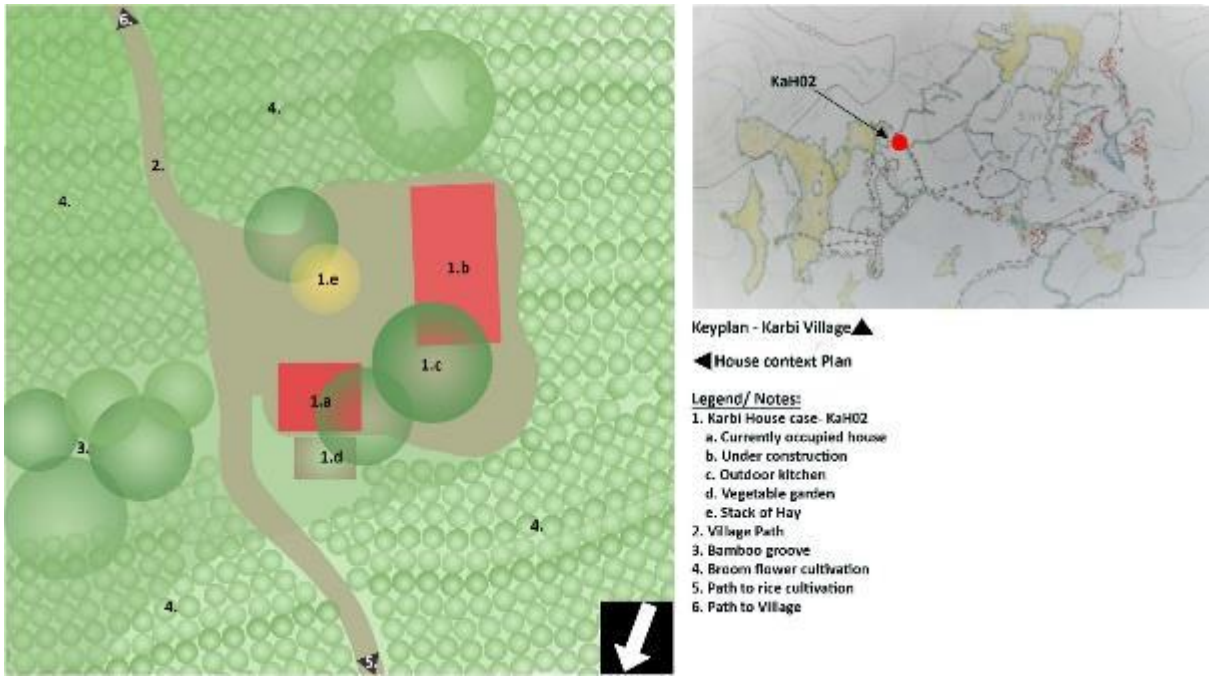


Figure 5-17 Karbi house: KaH02

Image 5-3 Karbi house: KaH02, view from the village path.

Current House- Since 2017

The layout of the house shown in Figure 5-18 is a basic hut built directly on the ground enclosed with bamboo walls and tinned roofing with a layer of thatch in the front. The layout has a small section of the roofed area as a veranda which is used as a storage area for wood, farming tools and sericulture. The only room in the hut has a corner for cooking and the rest of the house has a shelf built onto the bamboo wall for storing ingredients for cooking and a big 1.2m wide x 2m long x 0.6m high wooden platform which is used both as a bed as well as a storage space for articles that need to be placed above the ground.

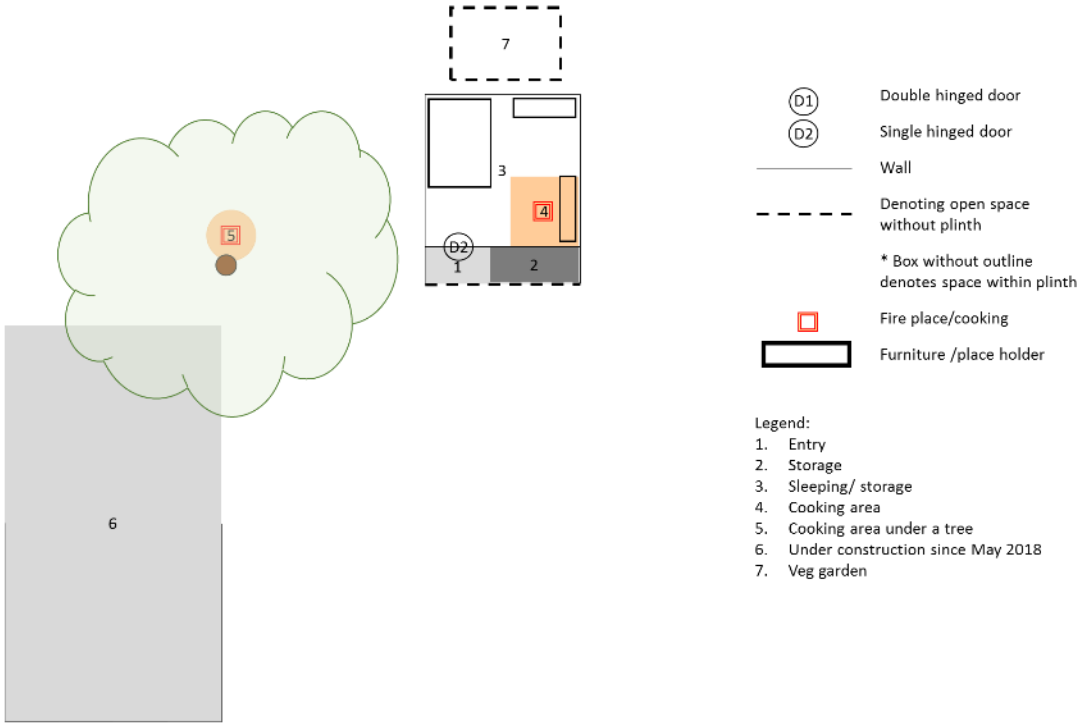


Figure 5-18 Current house, KaH02

There is a provision for a fireplace by a tree (5) next to the hut where she cooks sometimes while she works late into the night gathering and arranging the harvest. There is a partial construction of a plinth, wooden columns, bamboo walls and tinned roof, which was started in May 2018, by her (ex) husband, which is not used by her at all. The circumstances of this are explained in her story that aids in studying the layout of her past accommodations and there by understand the evolution of house layouts with respect to the respondent. There is a vegetable garden behind the hut hat is planted and maintained by the respondent.

This house is very much unlike a traditional house, in fact it is more of a farm hut, which is the case of the respondent. This is due to her circumstances where she alone has to cultivate across a large area of land to support the education and livelihood of her five children studying in Hamren, along with herself. There is more to her back story which is quite tragic for her situation which is relevant to the evolution of her living quarters explained along with the discussion of her past houses. Table 5-5 is the AEIOU framework used to analyse the layout of the current house of KaH02.

Table 5-5 AEIOU framework current house, KaH02

LEGEND	ACTIVITY/ FUNCTION	ENVIRONMENT/ SPACE	OBJECTS/FURNITURE	USER/ FREQUENCY		
				Female occupant	Guests (Karbi)	Guests (non-Karbi)
1	Entry	Dry, on ground, open, exterior, public	Farming tools	Yes	Yes	No
2	Storage	Dry, open, on ground, exterior, public	Silkworm, harvest produce, farming tools	Yes	No	No
3	Sleeping, eating, storage,	Dry, on ground, open, interior, private	Shelf, bottle gourd water containers, belongings, 1.2m X 2m X 0.6m wooden platform	Yes	No	No
4	Cooking, storage	Dry, open, on ground, interior, private	Fireplace, shelves, food	Yes	No	No
5	Cooking	Dry, on ground, open, exterior, public	fireplace	Yes	No	No
6	Storage, sitting	Dry, open, on ground, exterior, public	Construction material, wood, bamboo, corrugated iron sheets	Yes	Yes	Yes
7	Vegetable garden	Dry, on ground, open, exterior, public	plants	Yes	No	No

The table indicates the simplification of a house layout based on the need and the available resources to build a proper shelter. Due to the context of the household, there are not any segregations based on age, gender, or familiarity. The segregation is simply based on interior and exterior spaces, which are not exclusive as noted in the cooking area, which is present both inside and outside the hut. As noted, there is no utility area indicated in and around the hut as it is almost an irrelevant function in the lifestyle of the respondent. Since she spends most of her time in the cultivation field where she cooks her midday meals using a bamboo as the vessel, the requirement for a utility space becomes unnecessary.

Past Houses- 1973, 1988, 1993

Her family of her parents, four brothers and herself, originally moved to the village from Langso-mepi village in 1973 where the house was built in the traditional style with a *Hong-pharla* and *Hem-pi*. They originally built a hut of two rooms to live in which demolished by a storm within two weeks. As seen in Figure 5-19, the next house was built in the same year, with the help of the village community, which had two rooms; a kitchen in the front that served as sleeping area for her and her siblings while the inner room served as the room for her parents. In 1988, her father passed away and the eldest of the brothers who had married by then, built another house with two rooms side by side and a veranda which was also used as the cooking area. One room meant for her brother and his wife while the other was meant for her, her other three brothers and their mother. She stayed in that house until she married in 1993, to a widower from the village and moved to his home with two sleeping rooms, one sitting room and a designated cooking area all connected by a veranda.

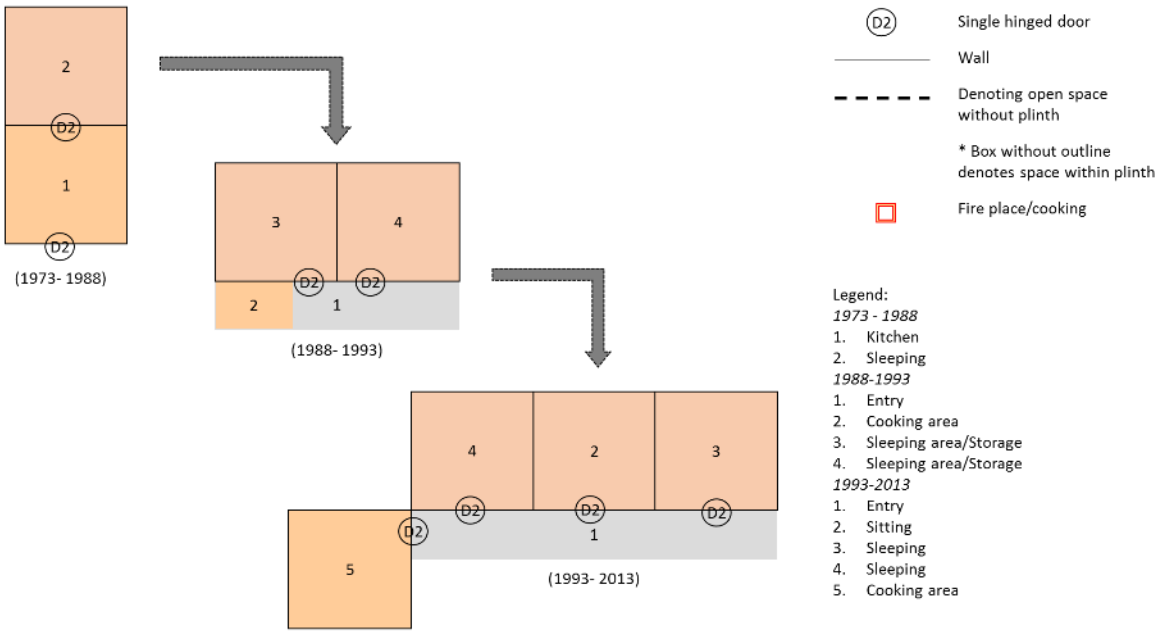


Figure 5-19 Past houses since 1973, KaH02

Her husband had two sons from his previous marriage, and they had two more sons and a daughter. They were quite well off at the time with almost 120 sacks of rice from a season. This led to more business ventures by the husband, such as owning trucks for transport and a rice mill to ground the rice. They were able to send the children to school in Hamren and have them live in a hostel. This fortune however, attracted attention of other women to the husband. Long story- short, this resulted in the respondent leaving the house in 2013 and pitching her own hut a little way out of the main cluster of houses, closer to the current house location.

She built a single roomed hut on a raised platform, called a Mandu, that was enough for herself in the middle of the field on the slope of a hill, that she cultivated all by herself. Her hard work to cultivate the field was not only for herself, but also for her five children who chose to move out with her, though they continue to stay in Hamren to continue their education. Even on holidays, they remain in Hamren with their uncle, the respondent's brother who had moved to Hamren once he married. The eldest two sons visit their mother during the end of harvest to help her in the field.

In 2017, she moved to the current location once her hut was damaged beyond repair and built another simple hut that was enough to accommodate her and her few belongings. Table 5-6 is the AEIOU framework used to analyse the layouts of the past house of KaH02.

Table 5-6 AEIOU framework past houses, KaH02

LEGEND	ACTIVITY/ FUNCTION	ENVIRONMENT/ SPACE	OBJECTS/FURNITURE	USER/ FREQUENCY			
				Male occupant	Female occupant	Guests (Karbi)	Guests (non-Karbi)
1 (1973-1988)	Cooking, eating, sleeping, storage	Dry, interior, open, flexible, semi-public	Fireplace, shelf, farming tools, sleeping mats	Yes	Yes	Yes	No
2 (1973-1988)	Sleeping, storage	Dry, interior, open, flexible, private	Belongings, sleeping mats	Yes	Yes	No	No
1 (1988-1993)	Circulation, gathering, storage	Dry, exterior, open, flexible, public	Farming tools	Yes	Yes	Yes	Yes
2 (1988-1993)	Cooking, eating,	Dry, exterior, open, flexible, semi-public	Fireplace, cooking ingredients	Yes	Yes	Yes	No
3 (1988-1993)	Sleeping, storage	Dry, interior, enclosed, flexible, private	Belongings, sleeping mats	Yes	Yes	No	No
4 (1988-1993)	Sleeping, storage	Dry, interior, enclosed, flexible, private	Belongings, sleeping mats	Yes	Yes	No	No
1 (1993-2013)	Circulation, storage	Dry, exterior, open, flexible, public	Farming tools	Yes	Yes	Yes	Yes
2 (1993-2013)	gathering, storage, sleeping	Dry, interior, enclosed, flexible, semi-public,	Sleeping mats, seating furniture,	Yes	Yes	Yes	Yes
3 (1993-2013)	Sleeping, storage	Dry, interior, enclosed, flexible, private	Sleeping mats, belongings, harvest produce	Yes	Yes	No	No
4 (1993-2013)	Sleeping, storage	Dry, interior, enclosed, flexible, private	Sleeping mats, belongings, harvest produce	Yes	Yes	No	No
5 (1993-2013)	Cooking, eating, storage	Dry, interior, enclosed, flexible, private	Fireplace, shelves, food, cooking ingredients, harvest produce	Yes	Yes	Yes	No

Changes Observed

The analysis of the layouts clearly indicates the role of socio-economic circumstances of the respondent. It is difficult to define the socio-cultural influences in the layout other than the fact the wooden table in the hut is an article that is built for placing objects that are not meant to be placed on the ground. In the case of her past house layouts, it is remains evident that the layout of the houses was primarily driven by the socio-economic reasons of the household. Due to the dire circumstances of the respondent, and the lifestyle in which she spends most of her time either in the field during cultivation or spends her day in Hamren as daily labourer for her livelihood, the importance of a house has been reduced to simply a place to return to sleep after spending all of the day out. The need for shelter in KaH02 is so basic that none of the distinguishing characters in a traditional Karbi house are present, despite her history of living in comparatively elaborate house layouts.

5.3.2. Karbi House: KaH32

The current house of KaH32 is located to the north of the main access road to the village with a muddy road connection to the location as shown in the key plan of Figure 5-20. It is located far from the main cluster of houses however, within the main cluster unlike the houses that are located to the west from the lower primary school. The house is on an elevation compared to the ground around it which slopes down behind the house and the path (3) connecting it to the last house of the village to the north is located about 200m away in a lower elevation. The landscape around the house is quite dense with tree and shrubs that extend from the forest

around it. Image 5-4 is the view of KaH32 from the village path passing from the front of the house.

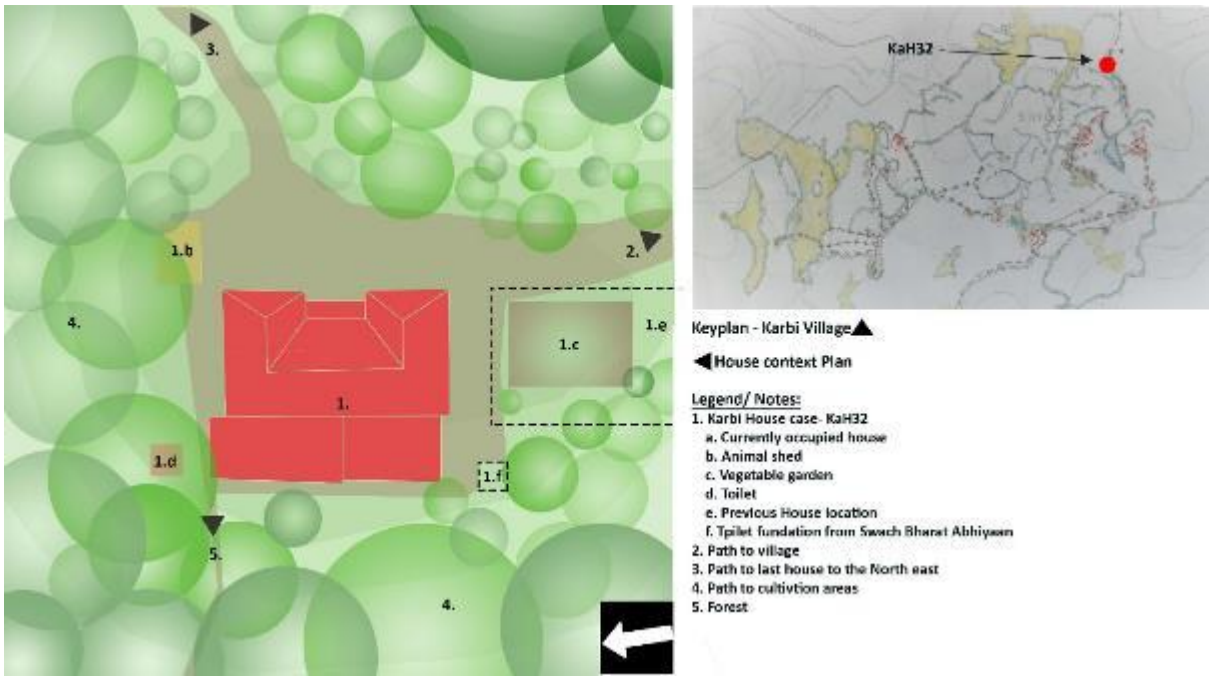


Figure 5-20 Karbi house: KaH32

Image 5-4 Karbi house: KaH32. view from front yard.

Current House

As seen in Image 5-4, the house is accessed by a ladder made of wooden planks as the ramp with wooden battens across it to create the steps. The house was built in 1990, when it had only three rooms, with two rooms added in 1995 and the rear section of the house added in 2017, as indicated in Figure 5-21. The different layouts will be discussed in the next section of past houses.

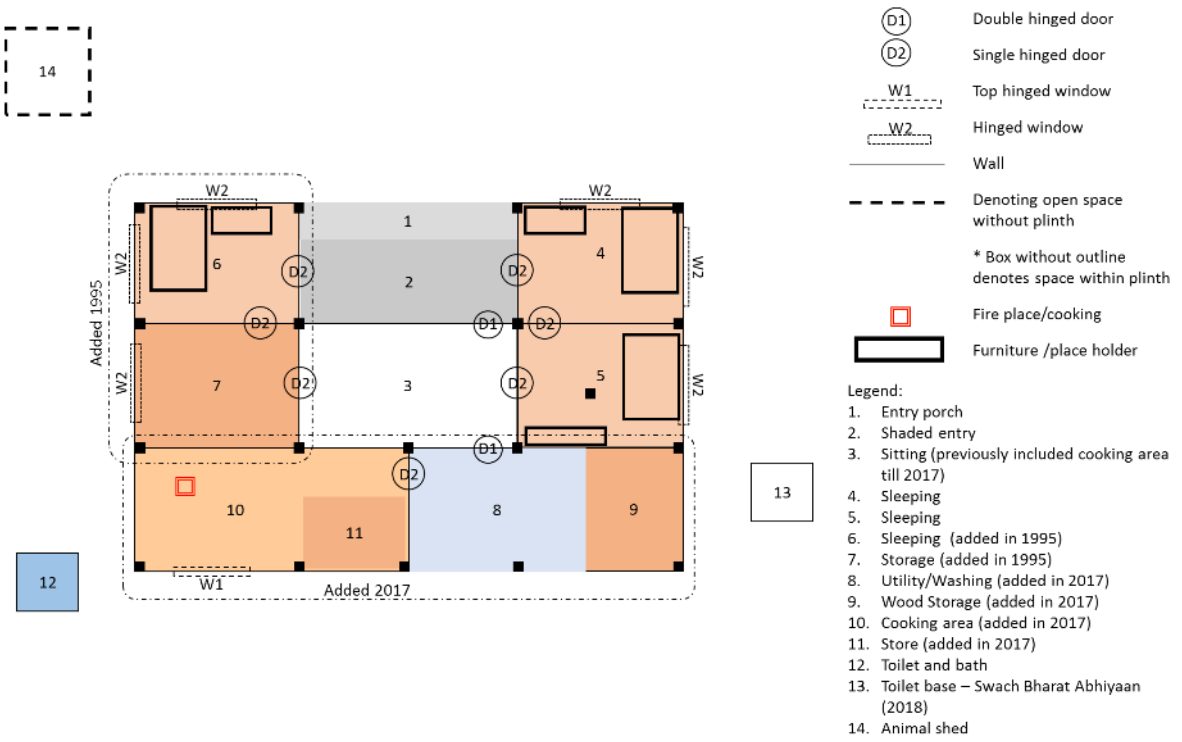


Figure 5-21 Layout of current house, KaH32

The house accommodates nine people, the patriarch of the house, his wife, his four sons, two daughter and one daughter-in-law. The respondent for this case was the eldest son and his wife since the father was inebriated and the mother in the cultivation field. The rest of the family, that is, the respondent's three brothers and two sisters were in Hamren for their schooling. In the current layout, the house has three sleeping areas, a specified formal sitting room, a designated storeroom, a cooking area that is accessed externally through the open utility area. Table 5-7 is the AEIOU framework used to analyse the layout of the current house of KaH32.

Table 5-7 AEIOU framework current house, KaH32

LEGEND	ACTIVITY/ FUNCTION	ENVIRONMENT/ SPACE	OBJECTS/FURNITURE	USER/ FREQUENCY			
				Male occupant	Female occupant	Guests (Karbi)	Guests (non-Karbi)
1	Entry, circulation	Open, exterior, enclosed with fencing, dry, wooden floor, public	Slippers,	Yes	Yes	Yes	Yes
2	Shaded entry, sitting, circulation	Shaded. Open, exterior, public,	Stools, farming tools	Yes	Yes	Yes	Yes
3	gathering, meeting, circulation	Interior, public,	seating	Yes	Yes	Yes	Yes
4	Sleeping, storage	Dry, interior, enclosed, fixed, private	Bed, cabinets, belongings	Yes	Yes	No	No
5	Sleeping, storage	Dry, interior, enclosed, fixed, private	Bed, cabinets, belongings	Yes	Yes	Maybe	Maybe
6	Sleeping, storage	Dry, interior, enclosed, fixed, private	Bed, cabinets, belongings	Yes	Yes	No	No
7	Storage	Dry, interior, enclosed, fixed, private	Rice grains, harvested produce.	Yes	Yes	No	No
8	washing, drying chilli, drying clothes, sitting	wet, exterior, open. Fixed, semi-public	Farming tools, water, utensils, vessels,	Yes	Yes	Yes	Yes
9	Storage	Dry, exterior, open. Fixed, semi-public	Firewood, farming tools, food produce	Yes occasionally,	Yes occasionally	No	No
10	Gathering, eating, storage	Dry, interior, semi-public, fixed	Shelves, rice grains, stools. water	Yes occasionally	Yes	Yes Occasionally	Yes occasionally
11	Cooking, storage	Dry, interior, enclosed semi-public, fixed,	Fireplace, shelves	Yes, occasionally	Yes	No	No
12	Washing, cleaning	Wet, enclosed, exterior, fixed, private,	Water, bucket	Yes	Yes	Yes	Yes
14	Storage	Dry, open, exterior, fixed public	Animals, firewood	Yes	Yes	No	No

The analyses of the spaces using the AEIOU framework indicates the inflexible nature of the houses. There are multiple rooms added, like rooms 4, 5 and 6, that serve the same purpose instead of having a single big room for the purpose. Indicating that the segregation due to age and gender. These rooms maintain a clear access without being a thorough fare to access another room, indicating the segregation due to familiarity. The layout has turn into a branched layout from a traditional spirally layout, however, the access and limits to a space are clearly noticed.

Past Houses – 1983, 1990, 1997

Figure 5-22 shows the various layouts of the past houses of KaH32 accommodated by the family since 1978. The family had built and lived in a traditional house when they first arrived in 1978. At that time, the current head of the house was a younger man, and his father was still

alive. In 1983, a different house is built to accommodate the growing family when the current head man and his brothers had married. The next house had two designated sleeping rooms placed on either side of a room that was meant for cooking, gathering to eat, socialise and receive guests. The rooms in the back were used as storerooms that could be interchangeably used as sleeping room. This house did not last long as it was built in the traditional materials and on the ground. A practice that was not popular at the time, houses on stilts were still preferred.

Figure 5-22 Layouts of past houses, KaH32

In 1990, a house with three rooms was built, where two rooms were used as the sleeping rooms and the third room currently used as the sitting area included the cooking area. In 1995, two more rooms were added to the house, one storeroom and another sleeping room while the cooking area was maintained in the sitting area. In 2017, the rear section of the house was completed, and a designated cooking area was built that is accessible through the utility space accessed through the sitting area. The utility area had the corner of it partially enclosed to create space for storing firewood and branches and stalks of edible plants. Table 5-8 is the AEIOU framework used to analyse the layout of the past houses of KaH32.

Table 5-8 AEIOU framework past houses, KaH32

LEGEND	ACTIVITY/ FUNCTION	ENVIRONMENT/ SPACE	OBJECTS/FURNITURE	USER/ FREQUENCY			
				Male occupant	Female occupant	Guests (Karbi)	Guests (non-Karbi)
1 (1983-1990)	Cooking, gathering, storage, sleeping for guests	Dry, enclosed, public, interior, flexible	Fireplace, shelves, stools, farming tools, sleeping mats	Yes	Yes	Yes	Yes
2 (1983-1990)	Sleeping, storage	Dry, interior, enclosed, fixed, private	Bed/ sleeping mats, belongings	Yes	Yes	Maybe	No
3 (1983-1990)	Sleeping, storage	Dry, interior, enclosed, fixed, private	Bed/ sleeping mats, belongings	Yes	Yes	Maybe	No
4 (1983-1990)	Sleeping, storage	Dry, interior, enclosed, fixed, private	Bed/ sleeping mats, belongings	Yes	Yes	No	No
5 (1983-1990)	Circulation, storage	Dry, exterior, open, fixed, public	Farming tools	Yes	Yes	Yes	Yes
6 (1983-1990)	Storage	Dry, interior, enclosed, fixed, private	Rice grains, other crops, harvest produce	Yes	Yes	No	No
7 (1983-1990)	Washing, cleaning	Wet, enclosed, exterior, fixed, private,	Water, bucket	Yes	Yes	Yes	Yes
1 (1990-1997)	Entry, circulation	Open, enclosed, exterior, public, dry, wooden floor	Slippers,	Yes	Yes	Yes	Yes
2 (1990-1997)	Shaded entry, sitting, circulation	Shaded. Open, exterior, public,	Stools, farming tools	Yes	Yes	Yes	Yes
3 (1990-1997)	gathering, storage, sleeping for guests	Dry, enclosed, public, interior, flexible	Seating stools, sleeping mats, farming tools,	Yes	Yes	Yes	Yes
4 (1990-1997)	Cooking, storage	Dry, enclosed, public, interior, flexible	Fireplace, shelves, food items	Yes	Yes	No	No
5 (1990-1997)	Sleeping, storage	Dry, interior, enclosed, fixed, private	Bed, cabinets, belongings	Yes	Yes	No	No
6 (1990-1997)	Sleeping, storage	Dry, interior, enclosed, fixed, private	Bed, cabinets, belongings	Yes	Yes	Maybe	Maybe
1 (1997-2017)	Sleeping, storage	Dry, interior, enclosed, fixed, private	Bed, cabinets, belongings	Yes	Yes	No	No
2 (1997-2017)	Storage	Dry, interior, enclosed, fixed, private	Rice grains, other crops, harvest produce	Yes	Yes	No	No

The analyses of the spaces using the AEIOU framework indicates the progression of the change in functionality of spaces and the layout. The 1983-1990 layout of the house is most unlike traditional houses in the sense that it is not concentrated and spiral in layout, rather, it is almost linear with reference to rooms 3, 4 and 5. It is built on the ground rather than stilts and the separate nonfamiliar component of the house is absent. The *Hong-pharla* or guest area of the traditional house is combined with the new layout in the area designated as the cooking area. In other words, it can be said that the cooking area of the house, which is the central in the

layout and also the first point of access, is flexibly used as minor storage of cooking related items, farming tools, seating stools, and sleeping mats for guests. However, the other rooms in the layout are designated as sleeping areas which may store the belongings of the family members.

The 1990-1997 is built of wooden stilts raised a metre above the ground. The layout is smaller compared to the previous version, however the rules for the layout is similar with a flexible sitting and cooking area that is semi-public while the sleeping rooms are private spaces. The 1990 addition to the house is provided a dedicated space for storing rice grans and other harvest produce, retaining the cooking area in the central semi-public room. This shows the growing value for privacy according to age of the occupants. In 2017, the cooking area was moved to the rear extension of the house as shown in

Proposed House

Despite the continuous reconstructions to the same house of KaH32 since 1997, the respondent expressed wanting to build a house made of permanent construction materials. Figure 5-23 is the outline of the proposed future house for KaH32.

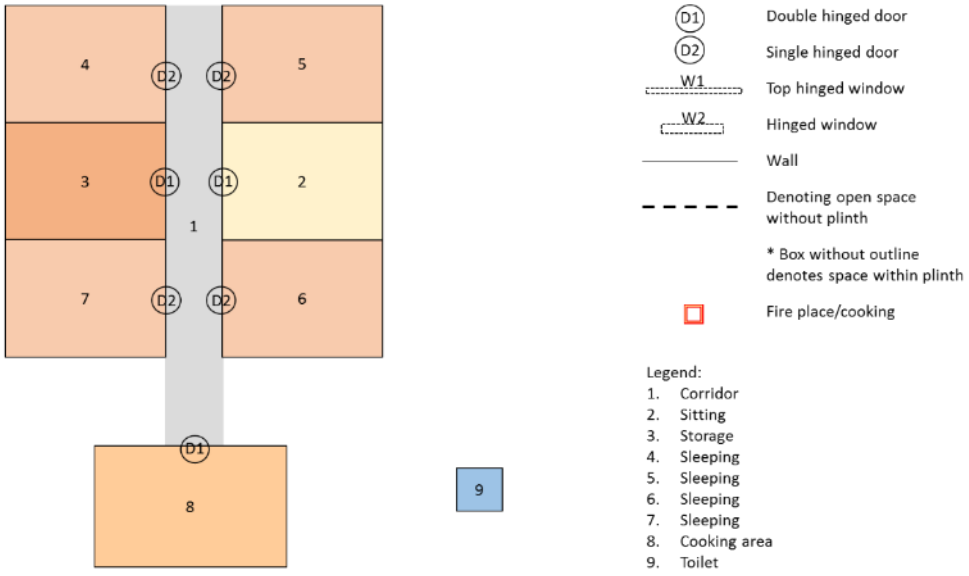


Figure 5-23 Layout of future house, KaH32

Similar to the current layout and the previous version, the future layout follows the trend of having separate designated rooms for sleeping, guests and storage. However, the linear layout of the house will remove the guest seating area as the transitional space as it was in the previous versions. Table 5-9 is the AEIOU framework used to analyse the layout of the proposed house of KaH32.

Table 5-9 AEIOU framework future houses, KaH32

LEGEND	ACTIVITY/ FUNCTION	ENVIRONMENT/ SPACE	OBJECTS/FURNITURE	USER/ FREQUENCY			
				Male occupant	Female occupant	Guests (Karbi)	Guests (non-Karbi)
1	Entry, circulation	Dry, concrete floor, public, interior, enclosed, fixed.	Footwear, farming tools	Yes	Yes	Yes	Yes
2	Gathering,	Dry, concrete floor, semi-public, interior, enclosed, fixed.	Seating stools,	Yes	Yes	Yes	Yes
3	Storage	Dry, concrete floor, private, interior, enclosed, fixed.	Rice grains, other crops, harvest produce	Yes	Yes	No	No
4	Sleeping	Dry, concrete floor, private, interior, enclosed, fixed.	Bed, cabinets, belongings	Yes	Yes	Maybe	Maybe
5	Sleeping	Dry, concrete floor, private, interior, enclosed, fixed.	Bed, cabinets, belongings	Yes	Yes	Maybe	Maybe
6	Sleeping	Dry, concrete floor, private, interior, enclosed, fixed.	Bed, cabinets, belongings	Yes	Yes	No	No
7	Sleeping	Dry, concrete floor, private, interior, enclosed, fixed.	Bed, cabinets, belongings	Yes	Yes	No	No
8	Cooking, eating, storage, dish washing	Interior, semi-public, enclosed, concrete floor,	Fireplace, shelves, food items	Yes	Yes	Yes	Yes
9	Washing, cleaning	Wet, Detached, exterior, enclosed, private, concrete floor	Water, bucket	Yes	Yes	Yes	Yes

Similar to the current layout the segregation in spaces in the proposed layout is even clearer based on privacy and familiarity. Compared to the current layout the circulation corridor running through the house clearly separates the public from the private spaces and removes the sitting area as the transitional space as it is currently used in the current layout. According to the socio-cultural tradition of having a detached toilet is practiced in the current layout and retained in the proposed layout.

Changes Observed

Though the layout has changed, the value system dictating the layout is intact. However, the value to personal space and privacy has been increased and the flexibility of the layout is lost. One notable change in the layout is that guest space or the *Hong-Pharla* of the traditional house has been completely absent and in fact it is treated as a corridor space to access other rooms and spaces in the house. The layouts maintain a detached toilet. The choice of materials is mostly local, however combined with contemporary style of construction,

5.3.3. Section Summary

In some ways the current layouts of KaH02 and KaH32 are not comparable to each other to indicate the trajectory of architectural evolution in the Karbi village context. However, analysing the previous versions of their accommodation, it indicates the major role of financial stability that allows increased segregation of spaces or otherwise. In the context of the Karbi village, it is observed that the socio-economic advantages of one household allows the construction of highly segregated layouts while the disadvantage enforces a very integrated and flexible functionality of a space within one single room. However, what the two layouts have indicated is that the socio- cultural context of the households are also important to the way houses are built as it dictates the classification of spaces based on familiarity, privacy, connectivity, and activities based on the environment.

In KaH32, the multiple rooms are introduced in the house due to the number of people in the house and the segregation of spaces based on marital status, age, and gender. The use of furniture in the rooms for sleeping, storage, studying, etc. instead of using a sleeping mat or other tools that can be stored away, has reduced the flexibility of the spaces. In the case of KaH02, the segregation is basic in terms of owner versus guest and shelter versus other activities that do not require an enclosure around them. This further indicates the composition of the family influences the degree of segregation of space in the layout.

The construction materials used and preferred are also influenced by the perception of urbanized standard of living. However, the financial constraints restrict the households from opting for permanent construction materials.

5.4. **Dimasa**

Figure 5-24 is a graph indicating that most of the houses have changed very much from the traditional style and the affluence of the households in general is better than the ones in the Karbi village. This graph like the previous, also indicates the tendency to change their surroundings along with the opportunity. The transect walk along indicated the same, that most of the houses had been constructed with more rooms using non-local construction materials. The cases that were selected for the household data collection were DiH01, DiH04, DiH05, DiH07 and DiH11.

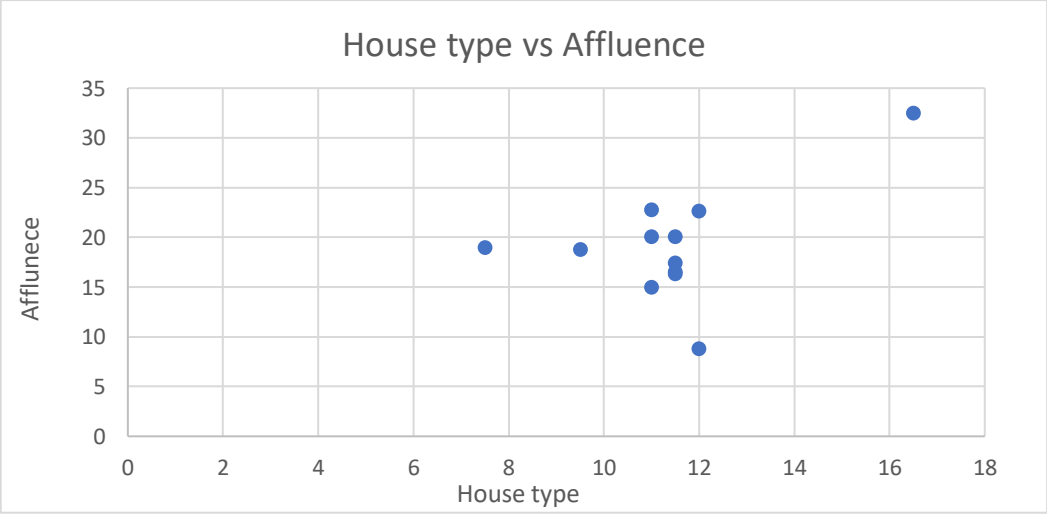


Figure 5-24 House type vs affluence pattern for Dimasa village

The contextual plans and house layouts of DiH01, DiH05 and DiH11 is recorded in Appendix C. The discussion of DiH04 and DiH07 and its subsequent generalised observation is according to the format stated in Section 5.1.3

5.4.1. Dimasa House: DiH04

The current house of DiH04 is located on the worn-out access road (2) extending eastward from the village centre as shown in the key plan of Figure 5-25. The compound is separated from the road by a fence. According to the traditional practice, the house is built directly on the ground. The house is divided into two units, main house (1.a) and the traditionally designed house (1.b) with a small animal shed (1.c) in the open space in between. There is a vegetable garden (1.d) behind the house, along with a toilet (1.e). The landscape behind the house is quite dense with tree and shrubs that extend from the 1-2km peripheral forest (6) around the village. Image 5-5 is the view of DiH04 from the entrance point from the village path.

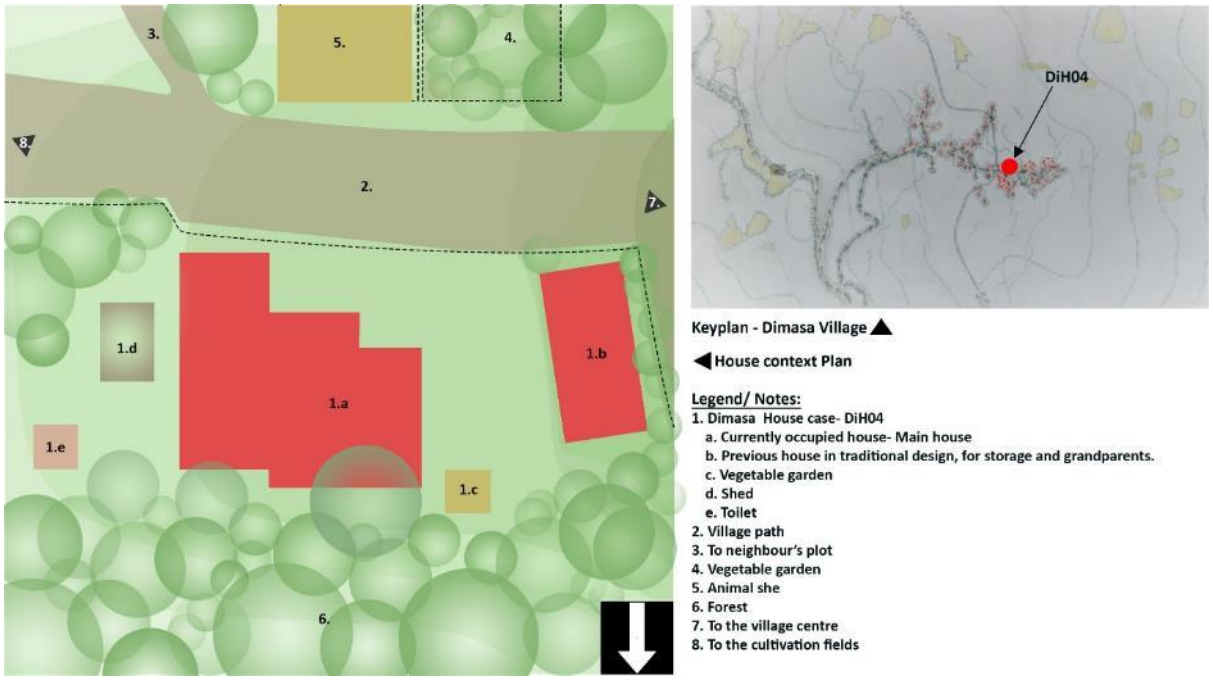


Figure 5-25 Dimasa house: DiH04

Image 5-5 Dimasa house: DiH04, view from the front yard.

Current House – Since 2000

The current layout of the house is distributed between two units, where the kitchen and storage are maintained in the traditionally built unit and the sleeping quarters along with the sitting area are maintained in the contemporarily built unit. According to the traditional construction style, the house is built without any plinth on a graded plain. There have been many changes to the layout over the years since the first house in 1982, which will be discussed in the next section on layouts of past houses. Figure 5-26 is the current layout of the DiH04.

Figure 5-26 Layout of current house, DiH04

The orientation of entry to the shelter units have been changed to face away from the road, however, the fence along the compound maintains a single entrance from the road the first space that is accessed in the compound is the courtyard (15) between the two shelter units. This removes the impression of the house units being faced away from the street. The two units of the house are built on different elevations on the ground. Table 5-10 is the AEIOU framework used to analyse the layout of the proposed house of DiH04.

Table 5-10 AEIOU framework current house, DiH04

LEGEND	ACTIVITY/ FUNCTION	ENVIRONMENT/ SPACE	OBJECTS/FURNITURE	USER/ FREQUENCY			
				Male occupant	Female occupant	Guests (Dimasa)	Guests (non-Dimasa)
1	Entry, circulation, sitting,	Dry, open, flexible, concrete floor, exterior, public	Bench, footwear, farming tools	Yes	Yes	Yes	Yes
2	Store, circulation	Dry, open, flexible, concrete floor, exterior, public	Farming tools, handloom, cycle,	Yes	Yes	Yes	Yes
3	Gathering	Dry, enclosed, fixed, concrete floor, interior, semi-public	Formal seating and cabinets	Yes	Yes	Yes	Yes
4	Sleeping, storage	Dry, enclosed, fixed, concrete floor, interior, private	Bed and cabinets	Yes	Yes	Maybe	Maybe
5	Sleeping, storage	Dry, enclosed, fixed, concrete floor, interior, private	Bed and cabinets	Yes	Yes	No	No
6	Sleeping, storage	Dry, enclosed, fixed, concrete floor, interior, private	Bed and cabinets	Yes	Yes	No	No
7	Sleeping, storage	Dry, enclosed, fixed, concrete floor, interior, private	Bed and cabinets	Yes	Yes	No	No
8	Circulation, storage, weaving	Dry, open, fixed, concrete floor, interior, semi-public	Handloom, farming tools, firewood	Yes	Yes	No	No
9	Storage	Dry, enclosed, fixed, concrete floor, interior, private	Rice grains, harvest produce	Yes	Yes	No	No
10	Eating, gathering, storage	Dry, enclosed, flexible, earthen floor, interior, private	Sitting stools, silkworm, Rice grains	Yes	Yes	Yes	No
11	Cooking, storage	Dry, enclosed, flexible, earthen floor, interior, private	Fireplace, shelves, food items	Yes	Yes	Yes	No
12	Storage	Dry, enclosed, fixed, earthen floor, interior, private	Rice grains and harvest produce	Yes	Yes	No	No
13	storage	Dry, enclosed, fixed, earthen floor, interior, private	Rice grains and harvest produce	Yes	Yes	No	No
14	Utility, washing, storage	Dry, open, flexible, earthen floor, exterior, public	Firewood, water, utensils	Yes	Yes	No	No
15	Gathering, drying clothes, drying chilli etc storage	Dry, open, flexible, earthen ground, exterior, public	Clothes lines,	Yes	Yes	Yes	Yes
16	Washing, cleaning	Wet, enclosed, Fixed, brick laid floor, exterior, private	Water, bucket	Yes	Yes	Yes	Yes
17	Garage, storage	Dry, open, flexible, earthen ground, exterior, semi-public	Car, carpentry tools	Yes	Yes	Yes	No

The layout of the current house indicates the increasing value being given to privacy to each individual. It also indicates that the families live together even after marriage, meaning that

they live in joint families. The living quarters of the house have a contemporary design, while the cooking area is maintained in the traditional way.

Past House and Extensions – 1982, 2000, 2003 and 2006

The family has been living in the village since the beginning of the settlement, and the first house in the village was a traditionally designed house. However, the respondent shared answers regarding the oldest house that they could remember, and in this case, it was the traditionally built house that was built in 1982. The family lived in three main rooms, the parents in the first room, the sons in the middle room and the daughters in the last room which also included a cooking area. As shown in Figure 5-27 the layout of the 1982 house was the same as a traditional layout with an added partition in between to have one more room that provided privacy.

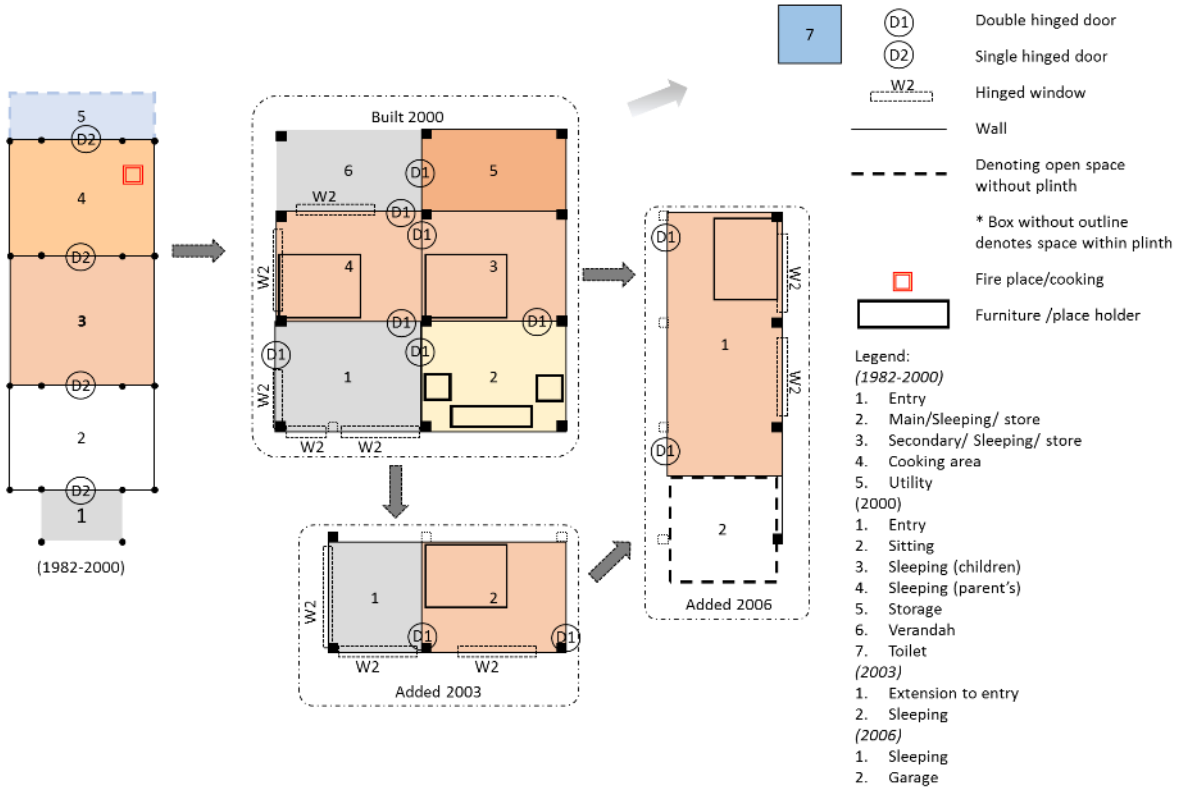


Figure 5-27 Layout of past houses, DiH04

In 2000, a house was constructed on the side of the 1982 house. It had a corridor access, a formal sitting room, two sleeping rooms for the parents and the sons, a veranda for placing the handloom, and a grain storeroom. The 1982 house was turned into a store house while maintaining the cooking area for the new layout as well. In 2003, the front corridor was extended, and another room was added to the layout for the elder sister and her husband. In 2006, another sleeping area was added to the house, along with a shaded space used as a garage for the three-wheeler that the brother-in- law used as a source of income. Table 5-11 is the AEIOU framework used to analyse the layout of the proposed house of DiH04.

Table 5-11 AEIOU framework past house, DiH04

LEGEND	ACTIVITY/ FUNCTION	ENVIRONMENT/ SPACE	OBJECTS/FURNITURE	USER/ FREQUENCY			
				Male occupant	Female occupant	Guests (Dimasa	Guests (non-Dimasa)
1 (1982-2000)	Entry, circulation, weaving	Dry, open, flexible, earthen floor, exterior, public	Footwear, farming tools	Yes	Yes	Yes	Yes
2 (1982-2000)	Gathering, guest sleeping, storage	Dry, enclosed, flexible, earthen floor, interior, semi-public	Sitting stools, sleeping mats, silkworm, Rice grains	Yes	Yes	Yes	Yes
3 (1982-2000)	Sleeping, storage	Dry, enclosed, flexible, earthen floor, interior, private	sleeping mats, silkworm, Rice grains	Yes	Yes	Yes	No
4 (1982-2000)	Cooking, eating, sleeping, storage	Dry, enclosed, flexible, earthen floor, interior, private	Fireplace, sleeping mats, shelves, food items	Yes	Yes	Yes	No
5 (1982-2000)	Utility, washing, storage	Wet, open, flexible, earthen floor, exterior, private	Firewood, water, utensils	Yes	Yes	No	No
1 (2000)	Entry, gathering, circulation, storage	Dry, open, flexible, concrete floor, interior, public	Bench, footwear, farming tools	Yes	Yes	Yes	Yes
2 (2000)	Gathering	Dry, enclosed, flexible, concrete floor, interior, semi-public	Formal seating				
3 (2000)	Sleeping, storage	Dry, enclosed, fixed, concrete floor, interior, private	Bed and cabinets	Yes	Yes	Maybe	Maybe
4 (2000)	Sleeping, storage	Dry, enclosed, fixed, concrete floor, interior, private	Bed and cabinets	Yes	Yes	No	No
5 (2000)	Storage, weaving, circulation	Dry, open, fixed, concrete floor, interior, semi-public	Handloom, farming tools, firewood	Yes	Yes	No	No
6 (2000)	Storage	Dry, enclosed, fixed, concrete floor, interior, private	Rice grains, harvest produce	Yes	Yes	No	No
7 (2000)	Washing, cleaning	Wet, enclosed, Fixed, brick laid floor, exterior, private	Water, bucket	Yes	Yes	Yes	Yes
1 (2003)	Entry, circulation, storage	Dry, open, flexible, concrete floor, interior, public	Bench, footwear, farming tools	Yes	Yes	Yes	Yes
2 (2003)	Sleeping, storage	Dry, enclosed, fixed, concrete floor, interior, private	Bed and cabinets	Yes	Yes	No	No
1 (2006)	Sleeping, storage	Dry, enclosed, fixed, concrete floor, interior, private	Bed and cabinets	Yes	Yes	No	No
2 (2006)	Garage, storage	Dry, open, flexible, earthen ground, exterior, semi-public	Car, carpentry tools	Yes	Yes	Yes	No

The table clearly indicates the progression of functionality of the spaces from flexible to fixed. The traditional house had lesser rooms and lesser fixed furniture to determine the use of spaces, however, the newer additions to the house indicated to inclination of the layouts towards specificity of functionality of space.

Changes Observed

The analysis of the layouts and the AEIOU frameworks indicate the influence of urbanised exposure on the way of life for the household while retaining the traditional cooking area. The value of space has remained intact, but the interpretation has changed. The flexibility of the spaces has turned into rigid spaces with specific functions.

5.4.2. Dimasa House: DiH07

The house (1.a) is located on one of the branching village paths from the access roads in the village as seen in the key plan Figure 5-28. There is bamboo fencing around the compound of the house along with trees that have been maintained according to the tradition of maintaining the bigger trees in the village. The is a front yard that has stacks of firewood (1.b), and the toilet (1.c) and vegetable garden (1.d) are behind the house. Image 5-6 is a view of the house and its surroundings from the village path.

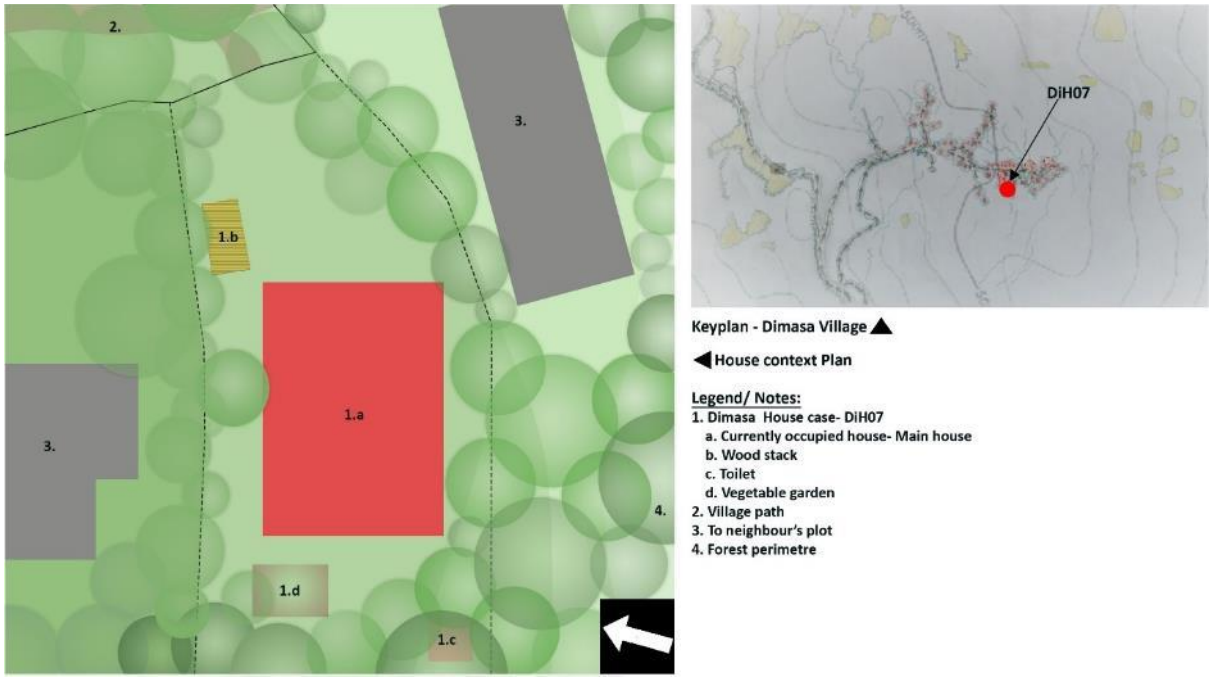


Figure 5-28 Dimasa house: DiH07

Image 5-6 Dimasa house: DiH07, view from front yard.

Current House- Since 2015

The house is built on the ground on a foundation that is a mixture of mud and cement as seen in Image 5-6. The house is accessed through an entry space that has a handloom upfront. There are two rooms into the house. One leads to a formal seating area that is also used a guest sleeping area when there are people overnight in the house. The other leads to the main sleeping area of the house which is private and meant for the household occupants. Ahead of the formal seating area is a big hall that has a cooking area on one corner while the side of the hall is completely used as a storage space.

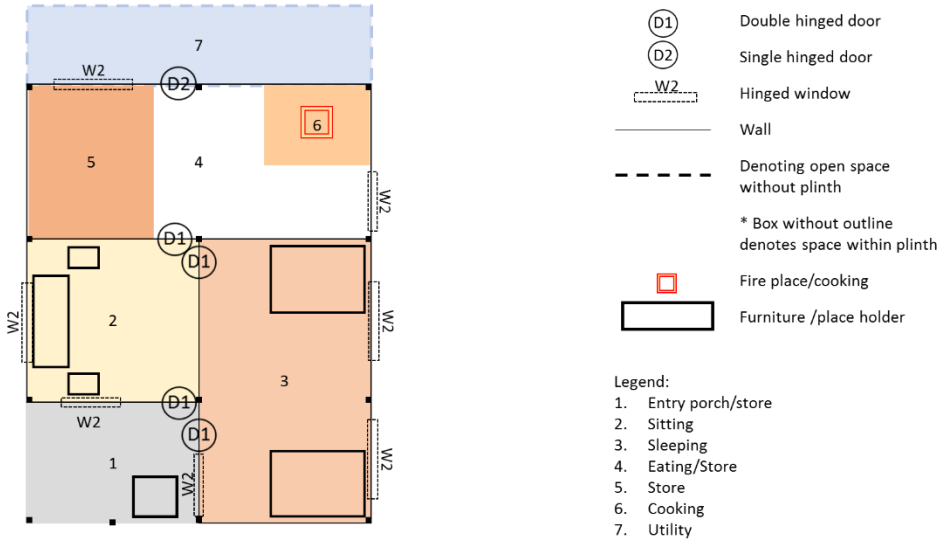


Figure 5-29 Layout of current house, DiH07

This house was built with the aid of the IAY housing scheme within a month or so. The bamboo was self-sourced from the forest, the tin and wood for the main structure, windows and windows was bought by the respondent. Most of the work, like clearing the ground and laying out the floor, laying the foundation for the wooden columns, weaving the bamboo for the walls,

and assembling the components along with the roof was executed by himself. The doors and windows were made by outsourced labour since the respondent admitted to not knowing how to do it. The cost of construction along with labour and material cost was approximately AU$1500 sourced from the IAY housing scheme to build a 60m^2 house. Table 5-12 is the AEIOU framework used to analyse the layout of the proposed house of DiH07.

Table 5-12 AEIOU framework current house, DiH07

LEGEND	ACTIVITY/ FUNCTION	ENVIRONMENT/ SPACE	OBJECTS/FURNITURE	USER/ FREQUENCY			
				Male occupant	Female occupant	Guests (Dimasa)	Guests (non-Dimasa)
1	Circulation, storage, carpentry, weaving	Dry, open, flexible, earthen floor, exterior, public	Footwear, farming tools, carpentry tools, handloom	Yes	Yes	Yes	Yes
2	Gathering, guests sleeping,	Dry, earthen floor, public, interior, enclosed, flexible.	Formal seating, sleeping mats and cabinets	Yes	Yes	Yes	Yes
3	Sleeping, storage	Dry, earthen floor, private, interior, enclosed, fixed.	bed, cabinets,	Yes	Yes	No	No
4	Eating, storage	Dry, earthen floor, semi-public, interior, enclosed, flexible.	Sitting stools, silkworm, Rice grains	Yes	Yes	Yes	No
5	Storage	Dry, earthen floor, private, interior, enclosed, fixed.	Rice grains, harvest produce	Yes	Yes	No	No
6	Cooking, gathering	Dry, earthen floor, semi-public, interior, enclosed, flexible.	Fireplace, sleeping mats, shelves, food items	Yes	Yes	Yes	No
7	Utility, washing, storage	Wet, open, flexible, earthen floor, exterior, private	Firewood, water, utensils	Yes	Yes	No	No

The layout indicates that accessibility has been split between private and public spaces, with one sleeping room that is specifically for the occupants, while the rest of the house is accessible to non-occupants based on the activity. Due to the linear layout of the compound, the spaces and functions in the house are laid out accordingly in a linear way. The spaces in the house are oriented around the usability of the spaces as a storage space. The layout has changed in the way that in allows a private section of the house for the occupants, however, maintains the flexibility of the rest of the house.

Past Houses – 1977, 1998, 2008

As seen in Figure 5-30, the first house as recalled by the respondent was a traditionally design house from 1977 to 1998. The next house is after marriage, where he moved to his wife's house and is given a room in one of the three rooms that functioned as sleeping rooms. The main living quarters of the house had four rooms, one entrance room that was meant as a make-shift storage space and three other sleeping quarters. Among the three sleeping quarters, one was a room meant for the parents (or in laws), the second for guests or extended family members and the third for the respondent and his wife.

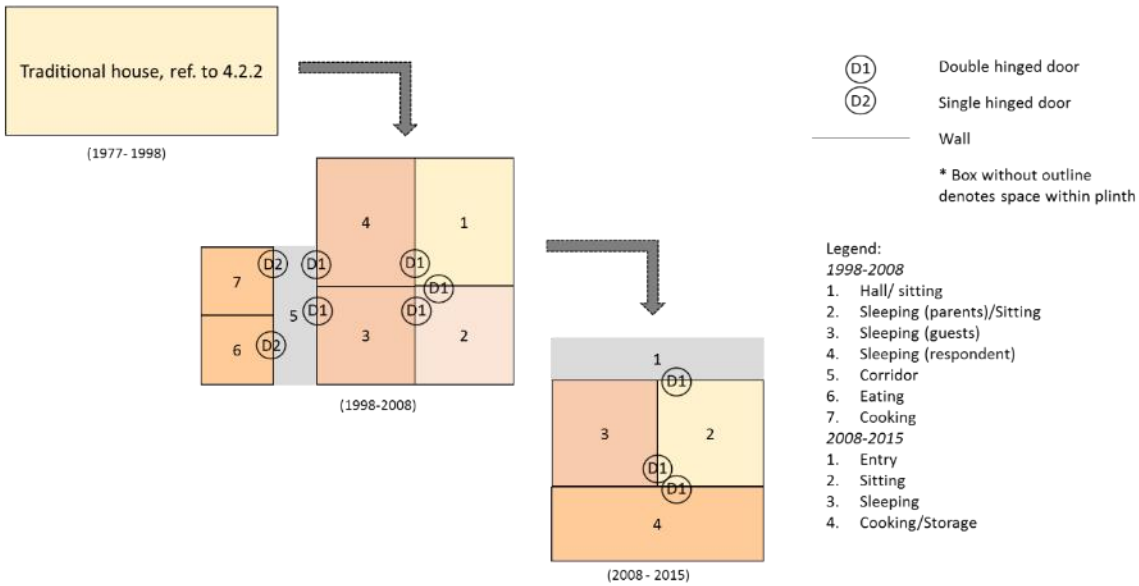


Figure 5-30 Layout of past houses, DiH07

In 2008, the respondent and his wife moved out to three-room house. The house was previously used as a store house for their rice mill and rice grains. It had a long veranda with a door that accessed the first room which was the guest sitting room which was also used for sleeping. The room had two doors, one that led to the occupants' private room and the other that led to a room for cooking, eating and storage. The two rooms were equally sized while the last room was the length of the other two rooms, but narrower. They lived there with three of their currently four children until 2015. Table 5-13 is the AEIOU framework used to analyse the layouts of the past house of DiH07.

Table 5-13 AEIOU framework past house, DiH07

LEGEND	ACTIVITY/ FUNCTION	ENVIRONMENT/ SPACE	OBJECTS/FURNITURE	USER/ FREQUENCY			
				Male occupant	Female occupant	Guests (Dimasa)	Guests (non-Dimasa)
1 (1988-2008)	Gathering, sleeping option, circulation, entry	Dry, partially open, flexible, concrete floor, public, interior,	Seating, farming tools, harvest produce, footwear	Yes	Yes	Yes	Yes
2 (1988-2008)	Sleeping, gathering, storage	Dry, Enclosed, flexible, concrete floor, semi-public, interior,	Seating, bed, cabinets,	Yes	Yes	Yes	Yes
3 (1988-2008)	Sleeping, circulation, storage	Dry, Enclosed, flexible, concrete floor, semi-public, interior,	bed, cabinets,	Yes	Yes	Yes	Yes
4 (1988-2008)	Sleeping, storage	Dry, Enclosed, flexible, concrete floor, private, interior,	bed, cabinets,	Yes	Yes	No	No
5 (1988-2008)	Circulation, washing	Dry and wet, open, flexible, concrete floor, semi-public, exterior,	Water, farming tools,	Yes	Yes	Yes	Yes
6 (1988-2008)	Eating, storage	Dry, enclosed, flexible, concrete floor, semi-public, interior,	Seating, food items	Yes	Yes	Yes	Yes
7 (1988-2008)	Cooking storage	Dry, enclosed, flexible, concrete floor, private, interior,	Fireplace, shelves, food items, rice grains	Yes	Yes	Yes	No
1 (2008-2015)	Gathering, circulation, entry, storage	Dry, enclosed, flexible, concrete floor, public, interior,	farming tools, footwear	Yes	Yes	Yes	Yes
2 (2008-2015)	Gathering, sleeping option, circulation	Semi-public, dry, interior, enclosed, flexible, concrete floor	Seating, bed, cabinets,	Yes	Yes	Yes	Yes
3 (2008-2015)	Sleeping, storage	Private, dry, interior, enclosed, flexible, concrete floor	bed, cabinets,	Yes	Yes	No	No
4 (2008-2015)	Cooking, eating, storage	Private, dry, flexible, concrete floor, interior, enclosed	Fireplace, shelves, food items, rice grains, harvest produce	Yes	Yes	Yes	No

The table indicates that most of the house is quite accessible and part of the circulation to get to the cooking area which is always placed at the rear of the house to maintain a direct connection to the utility areas of the house. The layout as well as the table indicate that the transition from traditional to a contemporary design is not recent. Like a contemporary designed house, there are multiple rooms for specified activities indicating the segregation of space based on the relation between occupants, however, the rooms that allow guest access, they are still treated flexibly.

Changes Observed

There are no clear indications of how the layout changed from the traditional to the 1998-2008 house as it may be due to the fact that the traditional house was the respondent's house and the house he moved to after marriage was his in-laws' house, indicating that he had no hand in constructing the house he lived in before moving out and building his own house. There is a connection in the layouts between the 1998-2008 house and the 2008-2015 house, however,

even this structure was built with the help of his in-laws. Therefore, it can be said that the respondent himself had no direct input into planning the layout, however he may have been part of the skilled labour to have it built, as it is noted that he had built the house that he currently accommodates. Also considering the size of the house that was built within the IAY budget, it demonstrates that the implementation of the IAY housing scheme fared much better in the Dimasa village case as compared to other cases.

5.4.3. Section Summary

From the above analyses of DiH04 and DIH07, it is evident that the traditional design of the houses has clearly been redesigned according to the privacy of the married occupants. Additions were made to DiH04 according to the time when the daughters of the house were married and moved to the house. DiH07 had the most private room in the 1998-2008 house before moving out as a nuclear family. According to the socio-cultural practice where people from other ethnic groups are not allowed into the cooking area, it place at the ends of the layout in DiH07, while DiH04 maintains it as a separate unit.

Occupants from both houses indicated the preference of local materials and traditional construction style, however, due to the growing influence of the urban way of living, they admit to making changes to accommodate the changes for the younger generation. The analysis also indicates the role of government support that has better visibility in the Dimasa village case.

5.5. **Labang**

In the case of the Labang household case selection, there were only three households that consented to participate in the exercise, therefore it was not required to produce a graph of their affluence score versus their household score. However, the three households that agreed to participate in the interview are LaH01, LaH14 and LaH19, however LaH14 and LaH19 are the two cases that are discussed below. the scattered graph for the households in Labang is shown below:

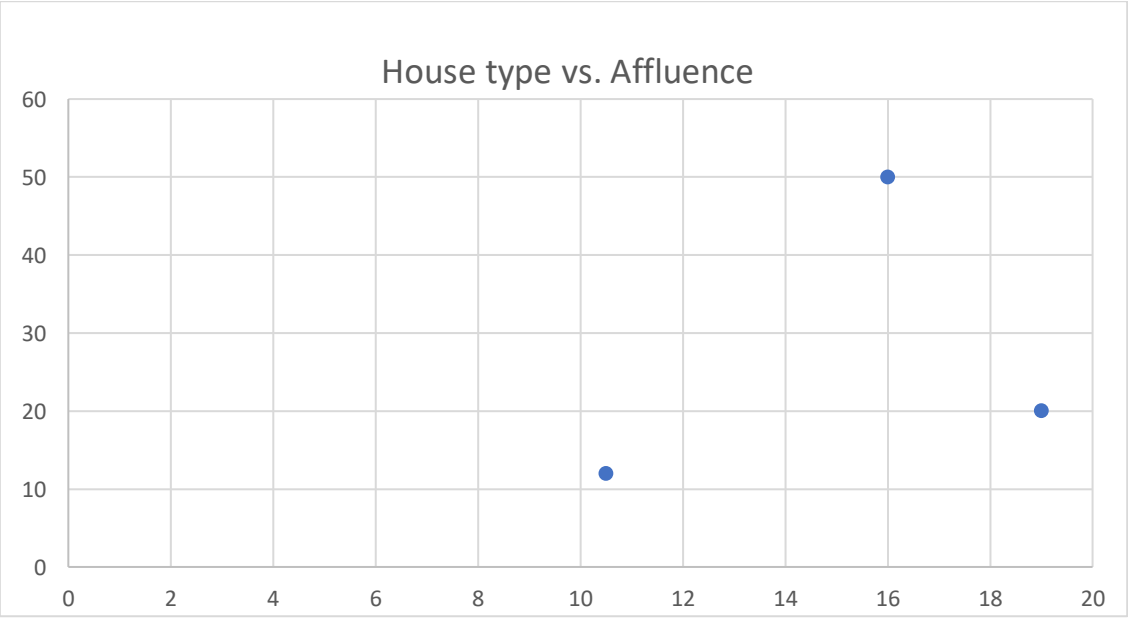


Figure 5-31 House type vs affluence pattern for Labang village

The discussion of LaH14 and LaH19 and their subsequent generalised observation is according to the format state in Section 5.1.3 The contextual plan and house layout for LaH01 is recorded in Appendix C.

5.5.1. Labang House: LaH14

The current house of LaH14 is located to the east of the village centre in the main cluster of the village connected through a muddy village path as shown in the key plan of Figure 5-32. There is traditional house It has direct access to the cultivation fields (6) east and southeast of the house behind a small stretch of trees (5) as seen in Image 5-7.

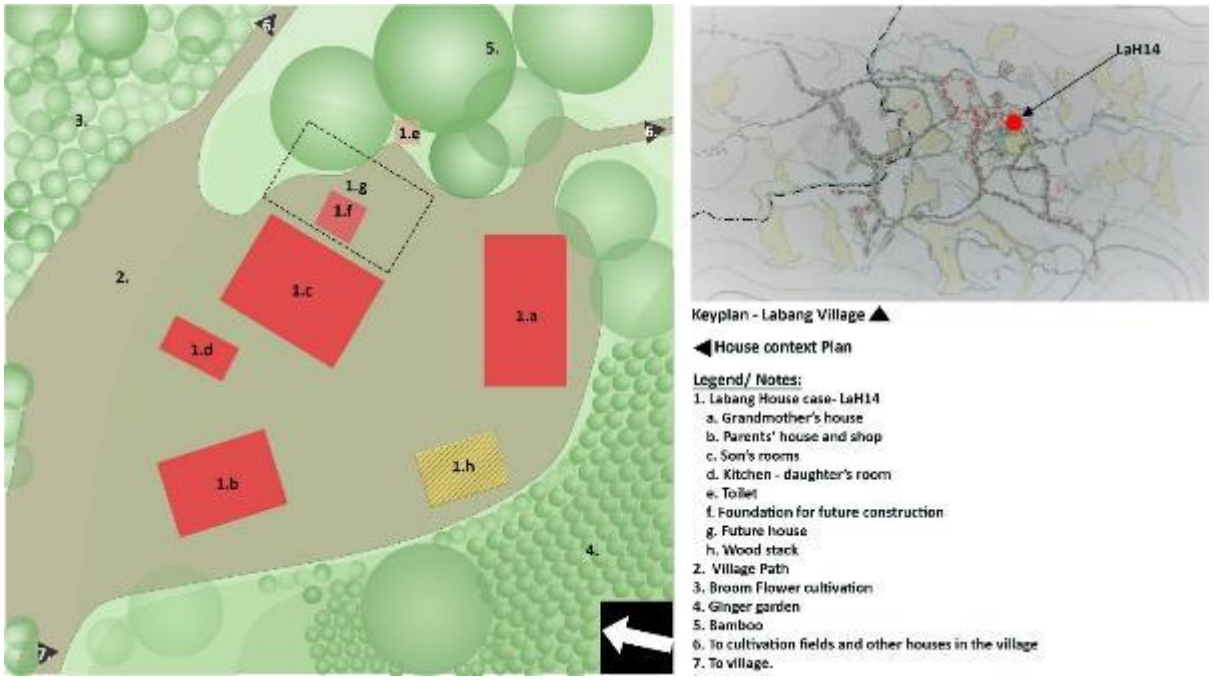


Figure 5-32 Labang house: LaH14

Image 5-7 Labang house: LaH14, view from village path.

Current House

Following the socio-cultural practice of adding shelter units to accommodate each generation of daughters, LaH14 has three shelter units and one more for the sons of the house. The older units are built on stilts while the more recent units are built on a plinth raised by about 15cm. Image 5-7 is the view of LaH14 from the village path leading to the cultivation areas. As shown in Figure 5-33, the layout of LaH14 is distributed across the different spatial and functional units of the house that is built according to the traditional practice of building multiple units for each daughter. In this case, there are three females in the house, one from each generation.

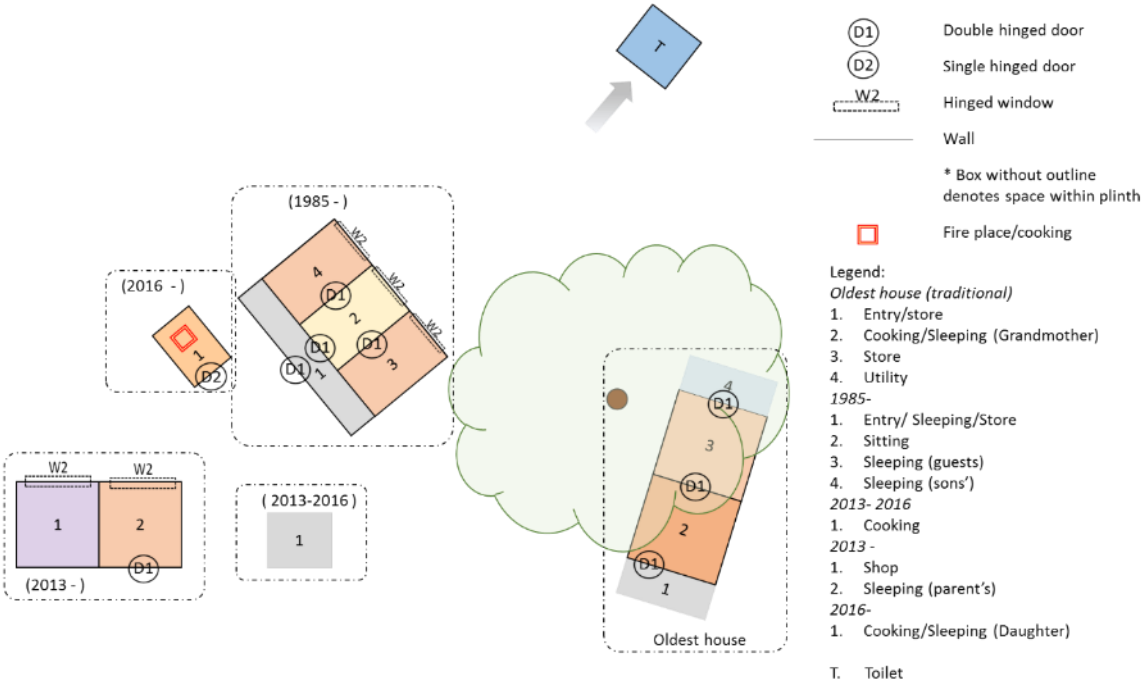


Figure 5-33 Layout of current house, LaH14

The oldest house is a traditionally built house which has been maintained as such, however, the internal functionality of the spaces has been switched since it a single person accommodation. This is also because according to socio-cultural traditions, the role and responsibility of the main representative of the household goes to the youngest daughter when she is 18 or married, so the value held by the traditional house has moved to the unit where the married couple live. However, since the daughter of the household who is almost 18, her sleeping quarters have been moved to the cooking hut which indicates the central and sacred role of the cooking area, or the main fireplace that is responsible for providing sustenance in the form of food and warmth. Table 5-14 shows the AEIOU framework used to analyse the spaces within the different units of LaH14.

Table 5-14 AEIOU framework current house, LaH14

LEGEND	ACTIVITY/ FUNCTION	ENVIRONMENT/ SPACE	OBJECTS/FURNITURE	USER/ FREQUENCY			
				Male occupant	Female occupant	Guests (Labang)	Guests (non-Labang)
1 (oldest house)	Entry, gathering	Dry, flexible, open, exterior, public, wooden floor,	Firewood, footwear	Yes	Yes	Yes	No
2 (oldest house)	Sleeping, cooking, storage	Dry, enclosed, interior, semi-public, fixed, wooden floor	Sleeping mat, belongings, foot items, fireplace, shelves	No	Yes	Maybe	No
3 (oldest house)	Storage	Dry, enclosed, interior, private, fixed, wooden floor	Rice grains, harvest produce	No	Yes	No	No
4 (oldest house)	Washing, storage	Wet, open, fixed, exterior, private, bamboo floor	Water, drying clothes, drying dishes	No	Yes	No	No
1 (1985)	Entry, storage, circulation	Dry, flexible, enclosed, exterior, public, concrete floor,	Rice grains, harvest produce, footwear,	Yes	Yes	Yes	Yes
2 (1985)	Gathering, storage, optional sleeping	Dry, flexible, open, interior, semi-public, concrete floor,	Formal seating, bed	Yes	Yes	Yes	Yes
3 (1985)	Sleeping	Dry, fixed, enclosed, interior, private, concrete floor,	Beds, cabinets, belongings	Yes	Yes	Maybe	Maybe
4 (1985)	Sleeping	Dry, fixed, enclosed, interior, private, concrete floor,	Beds, cabinets, belongings	Yes	Yes	No	No
1 (2013 – 2016)	Cooking, storage, sleeping, eating	Dry, enclosed, detached, private, flexible	Fireplace, shelves, sleeping mat	Yes	Yes	No	No
1 (2013)	Shop, storage	Dry, enclosed, private, flexible, interior	Shop products, rice grains, harvest products	Yes	Yes	No	No
2 (2013)	Sleeping, storage	Dry, enclosed, private, flexible, interior	Sleeping mat, belongings	Yes	Yes	No	No
1 (2016-)	Cooking, storage, sleeping, eating	Dry, enclosed, detached, private, flexible	Fireplace, shelves, sleeping mat	No	Yes	No	No
T	Washing, cleaning	Wet, enclosed, detached, private, fixed.	Water, bucket	Yes	Yes	Yes	Yes

The analyses of the spaces using the AEIOU framework indicates the progression of the change in functionality of spaces and the layout. The segregation of spaces or units is based on the traditional rules of segregation and expansion of the house within a household; however, the interpretation of the rule has changed with every successive unit added to the house cluster. Since the house opts to added shelter units to the house cluster rather than reconstruct a house to include all members, genders and generations, there is no discussion on past versions of the house since it is included in the current layout. It is observed that the construction materials have changed over time. The preference for permanent materials is evident, but due to necessity, they still use bamboo as the main construction material.

Future House

Since the children of LaH14 are very young, there are no current plans for extension or a new building, however, the respondents expressed a possibility of using the rural housing scheme to build a properly constructed house for the sons.

5.5.2. Labang House: LaH19

The current house of LaH19 is located to the south east of the main cluster of the village on the surrounding hills accessed through a muddy path connecting the houses in the village as shown in the key plan of Figure 5-34. It has direct access to the cultivation fields north and northeast of the house. The house is built on stilts raised to an elevation higher than ground facing the slope and the access path. It is the last house on the path connecting the small cluster of houses on the hill. The landscape around the house is quite dense with tree and shrubs that extend from the forest around it. Image 5-8 is the view of LaH189 from the village path leading to the cultivation areas and water source.

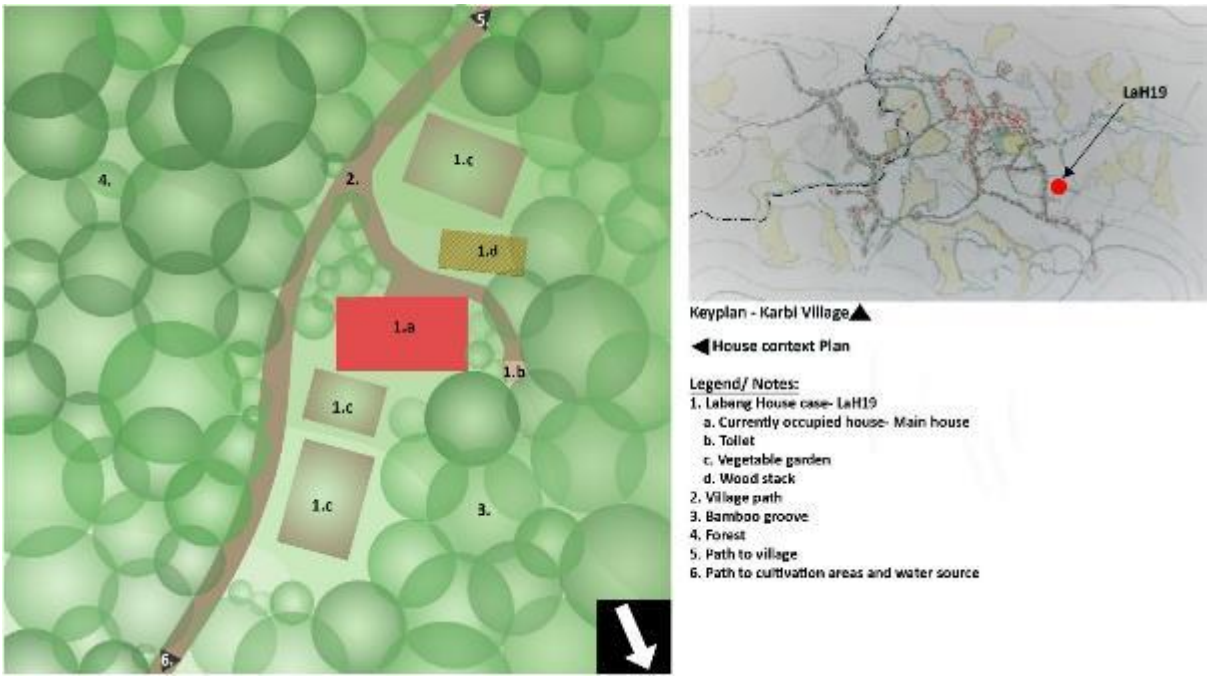


Figure 5-34 Labang House: LaH19

Image 5-8 Labang house: LaH19, view from village path.

Current House

This family moved to the village in 2016, after their marriage to be closer to the wife's sister who had also moved into the village after marriage few years earlier. The respondent in this case is the wife while the husband was away due to work. She confessed to having no clear idea of the traditional house design and that her house is designed according to the simplistic traditional layout of two internal room and an external utility space as shown in Figure 5-35.

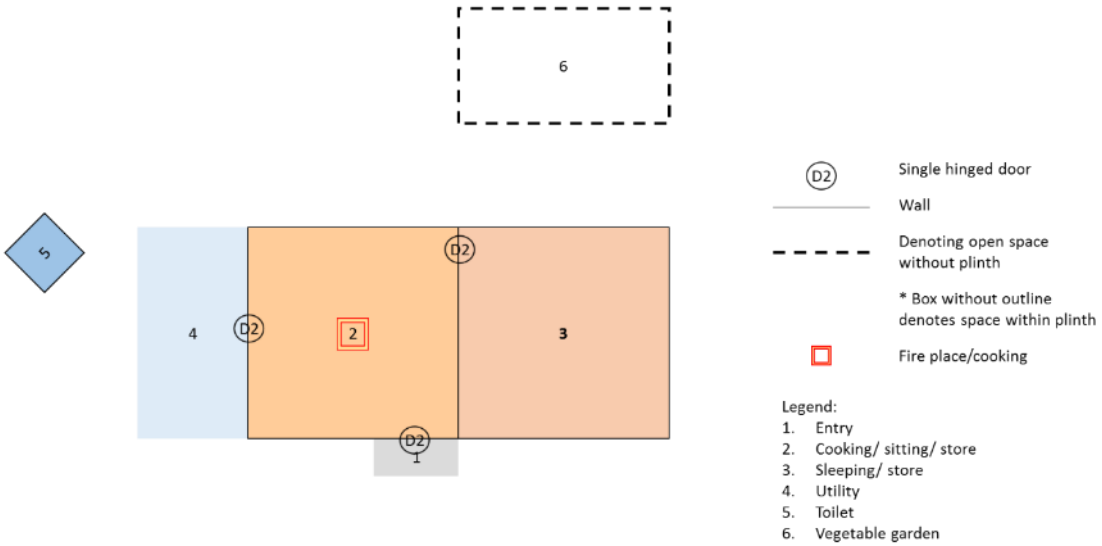


Figure 5-35 Current house, LaH19

This indicates how the immediate culture of house construction and design influences that single unit of households. However, the influence of her upbringing in Khandelier and Mohkaiaw where she lived in house built of concrete was reflected in the use of the spaces. The layout ensures exclusive privacy to the sleeping area which is also used a storeroom. The room meant for cooking is meant for sleeping or gathering with guests. It is connected to the utility space which is not exclusively treated because of its placement. The main hearth has been moved out of the inner room and placed in the outer room, which is unlike a traditional house. The respondent indicated that the sleeping room is most important and most used by the occupants. Hence concluding the very clear change in use of spaces influenced by the culture of the users while the construction and design is influenced by the village context. Table 5-15 is the AEIOU framework used to analyse the layout of the past houses of LaH19.

Table 5-15 AEIOU framework current house, LaH19

LEGEND	ACTIVITY/ FUNCTION	ENVIRONMENT/ SPACE	OBJECTS/FURNITURE	USER/ FREQUENCY			
				Man	Woman	Guests (Labang)	Guests (non-Labang)
1	Entry, circulation, sitting	Dry, open, exterior, bamboo landing, public	Footwear, farming tools	Yes	Yes	Yes	Yes
2	Cooking, gathering, sleeping for guests	Dry, interior, enclosed, flexible, bamboo floor, semi-public	Fireplace, seating stools, sleeping mat, shelves, food items, garden produce, farming tools, etc	Yes	Yes	Yes	Yes
3	Sleeping, storage	Dry, interior, enclosed, flexible, bamboo floor, private	sleeping mat, shelves, rice grains and harvest produce, belongings	Yes	Yes	No	No
4	Washing, storage	Wet, exterior, open, flexible, bamboo floor, semi-private	Water, utensils, drying clothes,	Yes	Yes	Yes	Yes
5	Washing, cleaning	Wet, exterior, enclosed, fixed, private	Water, bucket	Yes	Yes	Yes	Yes
6	Gardening	Open, earthy, flexible	Plants, herbs, etc	Yes	Yes	No	No

The analyses of the spaces using the AEIOU framework indicates that the layout of the spaces have been switched and are according to the values that have been instilled in the occupants during their life in towns and villages that are more urbanised and socio-culturally diverse. The construction of two rooms and a utility spaces places linearly using local materials indicate the influence of the architectural control followed in the village.

Future House

LaH19 is new to the village and still in the early stages of becoming financially stable, however, the respondent expressed the preference of living in a concrete house with three-four rooms. The cooking area, sitting area and the sleeping area should be in designated rooms with the dish washing as an interior function than an exterior one. This indicates that the occupants prefer permanent construction materials over local materials for building houses.

5.5.3. Section Summary

These houses indicate that the socio-cultural context of the village influences the image of the house, while the interiors are influenced by the context to which the occupants have been exposed. In the case of LaH14, the layout is disjointed from the various spaces in a house which resembles the traditional practice of having separate units, however, and the LaH19 the layout is oriented with the sleeping area treated as the more private space instead of the cooking area which is socio-culturally more sacred. The difference in this approach the layout is because of the background of the households, LaH14 generationally belongs to the village, while LaH19 moved to the village after marriage from a comparatively urbanised and culturally diverse town or village. This difference in the background further indicates the varying degrees of traditional values being retained in the house layout and how the exposure to other cultures redefines the spatial values in the house.

Additionally, the inclination to use local construction materials is influenced by the socio-economic context of the household. The young couple are in the process of saving up for a house that is built with non-local materials and in contemporary fashion. This indicates the

influence of the socio-cultural context of Khandelier and Moh-kaiaw that she was exposed to before moving to the village.

5.6. Chapter Summary

This chapter started with the results of the household case selection which gave the typical and diverse cases present in the village cases. This resulted in the selection of 18 household cases across the village cases. Eight of which are documented and discussed in this chapter while the contextual plans and house layouts of the remaining ten are recorded in Appendix C.

This chapter analysed the layout of the houses and investigated changes to the house that had taken place due to their socio-economic factors that is unique to each house in the household level as well as the village level. It helped in understanding the spaces, functions and how they were used that are important to the household. The AEIOU framework was used for presenting as well as analysing the data which aided in understanding the evolution of the house depending on the contextual influences on the household. Further cross analysis of the results from each village case section resulted in a generalised understanding of the evolution of housing in the rural context. The discussion of the results led to a conclusion of the major influences on the architecture of the household case layouts.

The next chapter focuses on the rural cultural ecology that is shaped by the results of the village case analysis and the household case analysis. It will discuss the highlights of the analysis with respect to the context of rural housing to aid in proposing a solution for building socially acceptable and liveable houses. The discussion of the results is approached with the intent to understand the major influences on rural housing and the causality, where the village context, socio-economic status of the household and the social practices of the household, in the family unit level as well as the community level, influences the architecture of the houses. This will aid to define the recommendations to develop a user-oriented bottom-up approach to rural housing as the outcome of the research.

Chapter 6. *Findings and Discussions*

This chapter contains the causal analysis and discussion of the results ending in a set of considerations to ensure an effective rural housing scheme. It discusses the findings of the research according to the research questions introduced in Chapter 1. Section 6.1 discusses the causal process that affects the housing design and construction in the rural context based on the analysis conducted in Chapters 4 and 5. Section 6.2 highlights the crucial elements within the rural cultural ecology that influences housing design and construction. Section 6.3 discusses considerations that need to be incorporated into the rural housing scheme to ensure its efficient use and implementation. Section 6.4 summarises the chapter.

6.1. Causality in the Rural Context

From the analysis conducted in Chapter 4 and 5, the research helps understand the process through which the different elements of the village influence the housing design and construction (Mohr, 1982). It responds to the first sub-question of the research:

RQ 1.How does the rural context of the house influence the housing design and construction practices? What is the causative context? What is the effect?

This question is answered by discussing the cause which influences and the resultant effects of the causal process with regards to housing design and construction in the cases studies based on the causal links defined by the data analysis of Chapter 4 and 5. The first part of the section discusses the causes within the rural ecology and the second part discusses the effect on housing design and construction practice. The rural ecology is referred to as the causative context which is inferred from the analysis of Chapter 4 while the effect of the causation on the housing design and construction practice is based on the analysis of Chapter 5.

6.1.1. Causative context: Contextualism, Cultural Ecology and Ethno-architectural Contextualism

It is evident from the research as well as the literature that the rural context is different from the urban context (Gregory and Urry, 1985; Halfacree, 1993; Harvey, 1973; Hoggart & Buller, 1987; Smith, 1981, 2008; Steward, 1972, 1986), hence the section discusses the major characteristics of the rural context that influence the trajectory and evolution of rural housing (Donovan & Gkartzios, 2014; Lu & Qian, 2020; Tzoni & Lefaivre, 1990). The following discussion will draw mostly from the village level analysis in Chapter 4 while generalised conclusions made in Chapter 5 is used to support the causal discussion. This section aids in answering the first part of the first sub-question, which is rephrased to: *How does the causative context cause a change to the housing design and construction practice in the rural context?*

As mentioned in Section 3.5.3., the intent of the section is to generalise the understanding of the rural cultural ecology through the analysis of the village case studies based on the highlighted similarities and differences observed in Chapters 4 and 5. Figure 6-1 is a conceptual sketch which aided in visualising the causality in the rural cultural context relevant to the data analysis of the research. The conceptual links presented in Figure 6-1 is digitised in Figure 6-2 which aided in shaping the causation within the rural cultural ecology discussed in response to the first sub-research question.

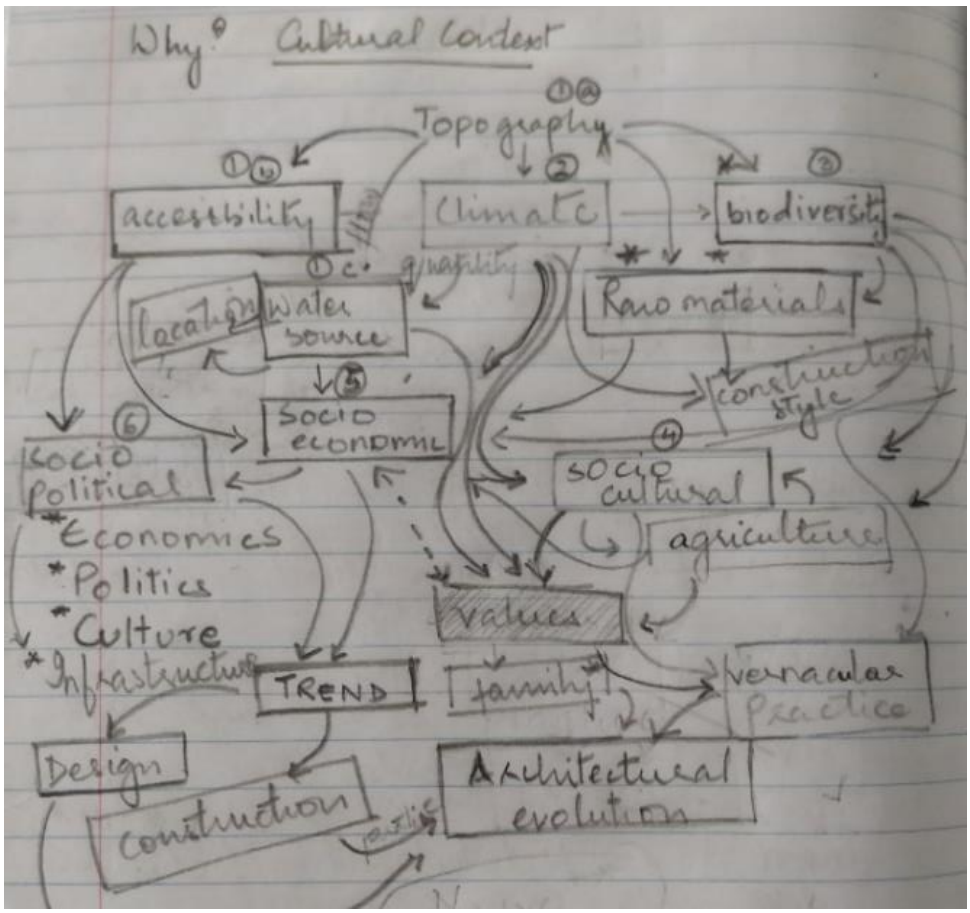


Figure 6-1 Rural cultural ecology

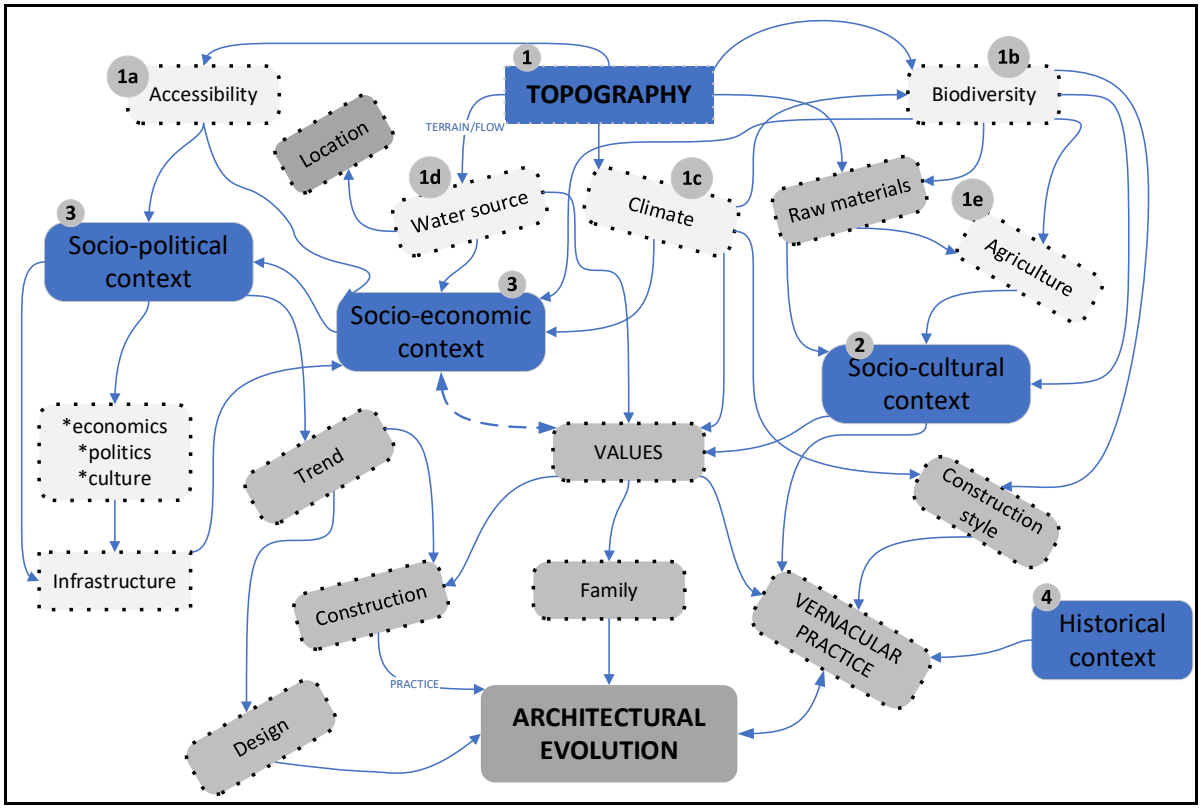


Figure 6-2 Digitised schematic representation of Figure 6-1

The figures demonstrate the inter-related contexts and sub-contexts that form a chain of influence that is primarily contextualised based on the topography of the place. This aids in explaining the rural cultural ecology (Steward, 1972) as an intersection of environment, community and interaction which reaffirms the contextualist theory (Annis, 1978) applied to the methodology in Chapter 3. The analysis of the village and its surrounding to address the effect on culture and its representation in housing proves the validity of the contextualist theory by Annis (1978). The theory of cultural ecology by Steward (1972) has helped develop the methodology to study the cases based on the characteristics of the village (environment), the unique identity of the people (community), and the socio-cultural and socio-economic practices (interaction). The contextualist approach used in the data analysis affirms that the elements in the cultural ecology are linked to each other and influence one another necessitating the observation of the community and environment and their influence on the practice of architecture. The outcomes of this analysis aids in developing a user-oriented bottom-up approach to rural housing that demonstrates the application of critical regionalism (Lefaivre & Tzonis, 1981), in the architectural aspect.

On revising the conceptual ideas that arise from observing the links in the causal analysis, it indicates that there are four contexts that need to be addressed to understand the rural cultural ecology. The contexts are topography and accessibility, socio-cultural practices and bio-climatic response, socio-economic and socio-political context, and historical context. The inferences based on literature and research is discussed below.

Topography and Accessibility

Topography of a region is the primary feature of the regional context that determines how a settlement thrives (Harper, 1923). Depending on the type of soil, vegetation and the physical shape of the earth, the topography of the region can control climate modifying the temperature and air pressures (Bennie et al., 2008; Das et al., 2015). This can affect the wind, the rain; for the latter it can impact its quality and quantity (Hutchinson, 1969; Poreh & Mechrez, 1984; Sharon et al., 1988). The weather and the topography can lead to influencing the biodiversity of the region (Coblentz & Riitters, 2004; Eisenlohr et al., 2013; Yamaura et al., 2011). Quantity of rainfall also affects the flow of water, which affects the soils (Cheuk et al., 2005; Dong et al., 2012; Fang et al., 2012). The density of soil or the type of soil influences that kind of foundations the house will have and the produce that can be cultivated there.

Jhumming cultivation is a socio-cultural practice that is a result of the topography as the rice grown in the hills relies on the rich quality of the soil (Fox et al., 2000; Tripathi & Barik, 2003). This is done as the sloped topography would not be able to accommodate troughs for the rice to grow for wet cultivation. As gathered from the focus group discussion of Kuki, Karbi, Dimasa and Labang in Chapter 4, after 5-7 years of cultivating in an area, the cultivation moves to another area with good quality soil. This repeats until the cultivation returns to the first location in about 15-20 years' time. In recent times, the rotation period has been affected by the lack of space, the weather and quality of soil indicating the role of global warming in the environment of the region.

At the community level, topography along with the water source defines the location of the settlement and the growth of the settlement over time. The topography also influences the accessibility to the village which significantly influences the degree of connectivity to an urbanised town and the resulting influence of the socio-political and socio-cultural aspects of

the regional context. Evident from the focus group discussions in all the cases, the presence of water body is a major reason for deciding the location of the village. While the Dimasa were specific about the location being near the confluence of two water bodies, the Karbi, Kuki and Labang indicated the importance of a water body as it provided water for irrigation as well as a communal space for health and sanitation and religious rituals.

Considering the contextualist approach to the research, the topography was defined by the physiographical characteristics based on forest cover, altitude, and rainfall. This was a similarity among the villages since they were from the same category as defined by the PMGAY as discussed in Section 2.2. However, upon deeper analysis of the landscape and topography, it was observed that each village had differing characteristics that led to differences in the formation of the village sprawl. The jhuming cultivation practiced by the communities contributed to the pattern of the sprawl formation based on houses being relocated to accommodate their agricultural practice. This led to house layouts that either overlooked a steep hillside or a gradual slope or plain ground. Based on the contour of the ground, the distance of the toilet, utility spaces and animal sheds from the house can vary. Since it is preferred that these spaces have proper drainage, the houses on grounds with lesser slope tend to have them further from the house.

The topography contributed to the difference in the plinth heights of the houses to ensure the proper drainage from the utility spaces. Some houses had lower plinth rise where there was a slope towards the back of the house, while some had higher plinth rise where the topography was almost horizontal which meant that the drainage would not be as good. In this case, the airflow and ventilation provided by the gap between the plinth and the near-plain ground becomes a significant reason for the house typology. This indicated that the reasoning for maintaining a higher plinth in a house was driven by the drainage and ventilation of the wet areas.

Topography plays a significant part in orientation of the house. By defining the orientation of the house, the village sprawl formation is affected as it defines the pathway of the village that avoids the toilet, utility areas and animals' sheds of a household. As seen in the analysis in Chapter 4 and Chapter 5, specifically the Kuki and Dimasa communities that build houses in close clusters, this factor aided in deciding the location for a new construction. It was based on the pathway direction, drainage pattern, soil type and condition, and the location of the toilet, utility areas and animal sheds.

Environment: Socio-cultural Practices and Bio-climatic Response

After the topography of the region, the environment is the next layer of the causative context that influences housing design and construction. The environment of the region around the settlement influences the socio-cultural practices that are linked to the seasons, agricultural practice, bio-diversity available and the micro-climate. It dictates the choices of the local deity that the community prays to for a good harvest, health, and shelter. The environment determines the festivals according to the seasons, and depending on the quality of soil, it also determines the agricultural practices of the community. It determines the medicinal practices based on the biodiversity (Laloo et al., 2006; Tag et al., 2012).

As the environment dictates many aspects including the food grown, and that in the case study areas rice is considered sacred and is the basis of socio-cultural practices. Fermenting rice wine is a socio-cultural practice among all the case communities which is made during the period

between each new cycle of cultivation; however, the process of fermentation and its final product is different among the tribes. The cultural new year celebration that normally takes place around the end of January or the beginning of February is the time when the community takes the time to celebrate festivals that are for praying for the community, the households and rain for the good harvest. The viability of rice cultivation, through Jhumming as well as wet cultivation indicates the significance of rice as an agricultural product but also as a central part of the culture as it represents wealth and security, as informed by the participants of the focus group discussions.

The analysis in Chapter 4 of the environmental context and its effect on socio practice and housing, indicated the importance of the natural resources. Worshipping of the local deity and having festivals around the rain and harvest of produce dictates the seasonal intervals social practices that bring the community together. The significance of their agricultural practice was architecturally presented by having flexible layouts that could easily be turned into a storeroom for the rice grains during harvest season. However, in the newly constructed houses, there are multiple rooms for guests, cooking, and sleeping, with an exclusive storeroom which also doubles as the guest room when there are many occupants in the house.

As noted in the cross-case analysis of the traditional houses in Section 4.2 and the literature by Rapoport (1969) and Ching (2007) , the environment further affects the design of a shelter based on the micro-climate and the construction materials available of the region. It influences the quality of shelter depending on the kind of space being designed, whether it is well ventilated or insulated. It provides the raw construction materials that add texture to the house and define the character of the spaces.

According to the climatic response in the traditional houses across the case in Section 4.2, the bamboo walls and wooden floors keep interiors cool during the summer and warm during the winter. The roof was made with thatch that provided water proofing and insulation from the rain and cold. In current practice however, the houses use tinned roofs which does not provide the same insulation as thatch roofs as noted in the household level case analyses. One of the reasons given according to the respondents in the village level as well as the household level, for the switch from thatch to tinned roofs, has been due to the change in agricultural practices that have led to lesser quantity of thatch available to replace the roof; additionally, it is considered an expensive effort to grow the specific grass used for roofing.

Though there is a similarity in the causal elements in the house defined by the topography, bio-climatic environment, available resources and socio-cultural perspective and practices, there is a difference in the interpretations of spaces and functionality. The difference has been indicated in the segregation of spaces and the progression of spaces based on privacy and accessibility of the occupants versus guests. Even the significance and centrality of the spaces and their function is dissimilar across the cases as shown in Kuki houses where the cooking area and kitchen are still easily accessible to non-familiar occupants, while the Karbi, Dimasa and Labang houses maintained a distance to access the kitchen. The current housing schemes and newly build homes show that there is an increased segregation in the newly constructed layouts which unlike the traditional houses, is uniformly indicated in the contemporary interpretations of their houses.

The increased segregation of spaces has led to a greater number of rooms, introduction of either long corridors to connect to each room, or a central room from where all other rooms are

accessed and a change in house layout. This long corridor or central room is treated as the guest room, guest entertaining room, TV room if they have one, etc. as it transitions from semi-private to a public space. On the other hand, the other rooms that are accessed from the central room are the private areas of the house, based on the age and gender of the person. Therefore, having a comparatively sprawled layout of a house in contrast to the traditional linear layout.

In this context, the micro-climate influenced the social practice of the community which in turn influenced the layout of spaces within the house. However, the difference in skill, material and construction method affected the degree of bioclimatic response in housing which has been dictated by the socio-economic and socio-political context.

Socio-economic and Socio-political Context

This research found through the data collection and analysis that the topography, accessibility, environment, and socio-cultural practices had a significant impact on the resources in the region; this in turn defined the socio-economic and the socio-political context. The context of accessibility, telecommunications, roads, etc. along with location, influences the availability of facilities such as health care and banking; and services such as electricity, and telecommunication. Socio-political context of the district or state can influence governance and access to facilities and services are not universally provided in the remote areas. However, the initiative to construct access roads can promote the development of the socio-economic context of the village. This can further influence the access to construction materials and implementation of rural development schemes. This affects the education and exposure to other cultures modifying the perception of housing and living standards that can accelerate the evolution of spaces. This phenomenon was observed among the cases in varying degrees.

The road accessibility to the village is a critical aspect of defining the socio-economic and socio-political context and agriculture is the most important part of the village that drives the livelihood of the people living in the village. Coupled with the socio-political context of the region, the source of livelihood for the communities can be diversified based on agricultural practices. The agricultural practices of the Kuki and Dimasa community support weekly markets, lending more visibility in the socio-economic context. This further adds to socio-political visibility as the weekly market creates a hub for people of different socio-economic backgrounds to gather and form a multicultural space. The presence of a multicultural space creates opportunities for government supported facilities and infrastructure such as hospitals, public transport, and schools.

Of the services that are part of the socio-economic system – water, roads, communications, and electricity; water is not a major issue. It is readily available and there is no scarcity, however, as seen in Chapter 4, the cases of Kuki and Dimasa had arranged for a water tank to be built in the centre of the village to ease the access. Electricity and telecommunications, however, have a significant impact on the technological advances that changed a typical day in the life in the village. Their presence influenced daily life, from agricultural practices to the socio-economic practices and livelihood. Due to the shift from oil lamps to electricity, the people in the household can stay awake longer to complete tasks that may have taken a day's work away from farming. In the case of Kuki, it increased opportunity for the children to read and study longer in the evenings. Telecommunications broadened the opportunities for education by allowing to alternative modes to access information. As noted in the household analysis in Chapter 5, the changes in socio-economic practices influenced the assumption of what

constituted an adequate shelter in the rural context. Meaning that the house size and form was changed to accommodate the activities of the family based on their education, employment, livelihood, and other support skills.

The socio-economic and socio-political contexts of the village cases have indicated the difference in the access to financial aid and infrastructure support for housing. In the Kuki and Dimasa cases, the accessibility to the village has provided better access to services and facilities, thereby having IAY and PMGAY houses built in the villages. However, due to difference in the socio-political communications between the village community and the government scheme provider, the results of using the rural housing schemes have clearly differed. According to the focus group discussion, the cases in Kuki are insufficient to the community as they were built in the design that is unlike their preferred open layout plans using non-local materials and skills. In contrast as demonstrated by DiH07, the Dimasa community have been able to use the schemes to the best of its advantages by being more proactive in implementing schemes that provide better infrastructure to the community.

In the case of Karbi and Labang cases, due to their inaccessibility to the village and lack of proper connectivity, financial and policy support from the government is hindered due to lack of visibility within the socio-economic and socio-political context. Specially in the case of Karbi, since the village lies within the town committee area, there is an ambiguity of the socio-political context of the village. In the case of Labang, the location of the village and absence of a notable resource or landmark like the quarry in the Kuki village, has not helped in increasing its socio-political visibility. There were not as many IAY and PMGAY housing examples in the Karbi and Labang village, and even if there were, they were incomplete like KaH19. The village level as well as the household level analysis of the Karbi case indicated that the application of the schemes was not effective as the decision-making and execution was handled by the external stakeholders.

Historical Context

The historical context of the village affects the community because the part of history that is remembered by the community is the part that informs their traditional practices (Steward, 1972). By what they remember or practice, the memory can indicate the values that the communities place on things, rituals, and practices. Consequently, the older the village is the more chances there are of the houses of the village to resemble the traditional house through appearance and/or spatial value. As noted in the Dimasa village, the 1-2 km boundary of untouched forestry around the house settlement area indicates their values in tradition towards animism and valuing the importance of the environment.

However, with specific reference to the house design and layout, the historical preference of the society and the individual building the house influences the outcome of the house. As observed in DiH07, the current house outcome indicated a preference in housing layout being conditioned through the previous layouts the individual had lived in. In KuH11, the current owner had spent the defining years of his life in urbanised places like Bokajan, Guwahati and Chennai, and therefore built a house that was most deviated from the traditional style while also maintaining a traditional wood fire area for cooking traditional food. This indicates that the history of the individuals can influence the decisions made during building a house.

To summarise the causative context of the causality, the factors that influence in housing outcomes are the topography; environment (socio-cultural practices and bio-climatic

response); socio-economic and socio-political context; and indirectly, history. Figure 6-3 revises the discussion of the causative context and illustrates the elements and their causal links leading to housing and construction practice.

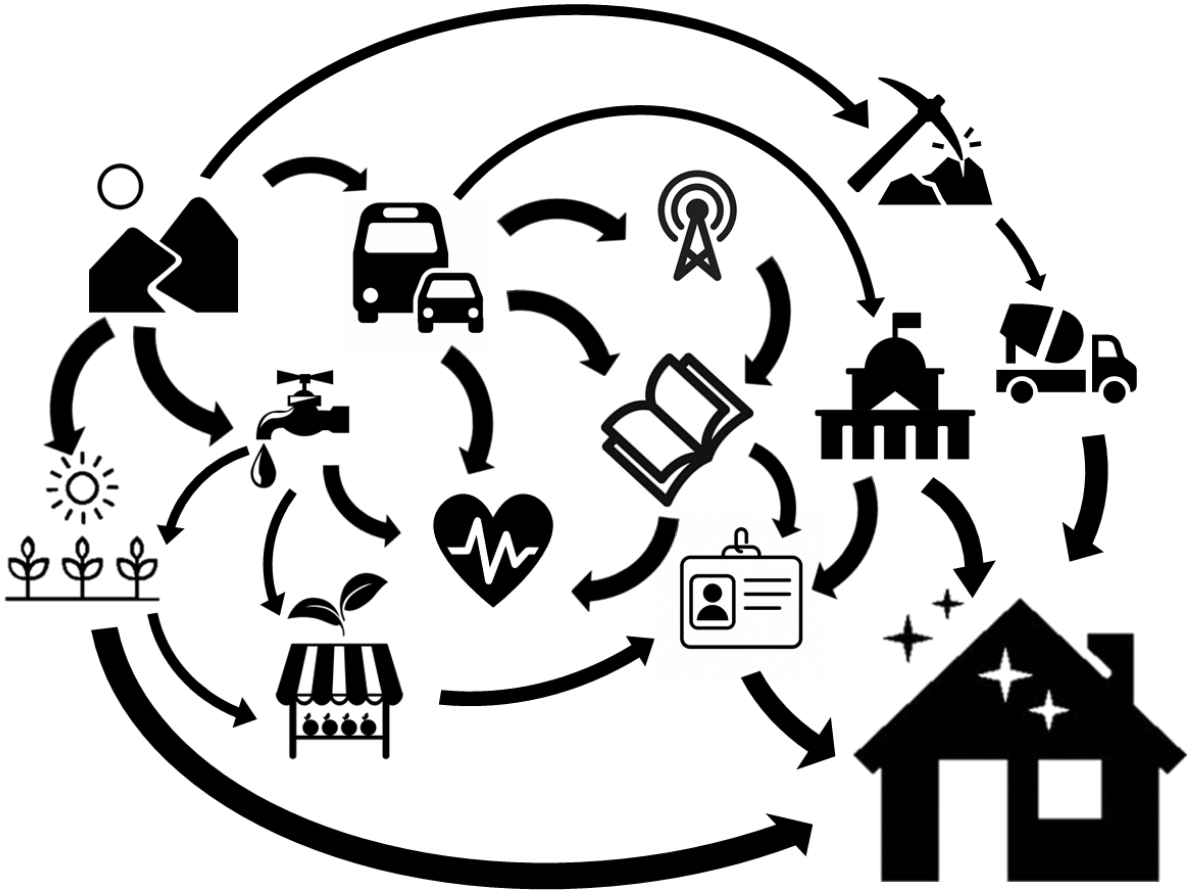


Figure 6-3 Causative context of rural housing

The topography of the region, other than the physical context determines the environment, biodiversity, and the micro-climate of the village. It determines the road access to other villages and towns, access to services and defines agricultural practice. Agricultural practices and road access determine the socio-economic opportunities of the community and modes of education, livelihood, and income. Facilities, services, and amenities such as, road access, healthcare and hospitals, education and schools, electricity, and telecommunication aid in developing a visible socio-economic context that is unique to the community of the village thereby enhancing the socio-political context. As time passes, the history indirectly affects the community through its influence on socio-cultural practices.

In conclusion, the natural resources provided by the environment determine the materials and skill to be used, the micro-climate of the region determines the bio-climatic design, the socio-cultural practices which informs functionality of the house, and the socio-economic context allows the diverse interpretation of housing and shelter, thereby collectively shaping the housing and construction practices of the community. The next section focusses on the effects of the causality on architecture, which answers the second part of the first sub-research question.

6.1.2. Resultant Effect: Departure from Traditional Architecture

This section is the discussion of the resultant housing design and construction currently practiced in the villages resulting from the causative context presented in the previous section. This section answers the second half of the first sub-question, which rephrased to: *How is the housing design and construction practice affected by the causative context?*

The focus of the section is to discuss the changes to housing design and construction in comparison to the traditional architecture in the respective communities. The section is divided into orientation, form, segregation, layout, and design based on function and use; the data for this section comes from the analysis of the architecture in Section 4.2.8. This section summarises the significant changes observed in the layouts across the villages to factors that influence these changes in the layout making occasional call backs to the discussion in section 6.1.1.

Orientation

The orientation of a house is part of developing housing design in vernacular practice as it is in response to the physical context and the environment of the region (Bodach et al., 2014; Indraganti, 2010). However, orientation is also determined by socio-cultural perspectives (Ching, 2007; Rapoport, 1969). As discussed in the cross analysis of Chapter 4, the orientation of houses is determined by topography and the street scape; and due to the expansion of the village the way the street was oriented could also change. The door to the house itself may face away from the usual orientation of facing the street, due more to the expansion of the rural sprawl than a conscious choice of the household. The orientation of the house is maintained such that the utility spaces of the household were away from the access road.

The Kuki houses consciously oriented the houses to face the street. The Karbi houses maintained the orientation so that the street that passed by the house did not pass by the utility area of the house at the back. In the case of KaH02, the village street extends onward passing behind the house. As shown in figure 5-21, it is the last house on the path surrounded by the farmlands, thereby maintaining a culturally social orientation of the house.

The Dimasa houses clearly maintained a street facing house with a slight exception in DiH04, where the entry to the house is on the side, however, due to the fencing around the house, the entry to the compound is from the street with the utility areas maintained away from the entrance area. It is to be noted that having a fence around the compound is not a practice in the other village cases, because of which the separation of entry from utility space is attained through orientation of the house itself.

In the Labang houses, it is confusing to establish the front and back of the house because of the multiple units that are part of the same house, however, it is observed that the units are facing the general direction of the centre of the village. Like KaH02, LaH14 is the last house on the street with the village path continuing by the side of the units to the farmlands and the utility area of the houses are maintained away from the village.

Form

Like orientation, form is determined by the physical environment and the climate in combination with socio-cultural perspectives (Ching, 2007). The material used and the construction method also contributes to shaping the form of the house (Rapoport, 1969). Due

to change in construction materials and the expenses attached to the new construction materials, the houses being constructed are not as big as they were in the past. The result is the reduction in the number of rooms and their size. Some houses have removed stilts from their construction to save cost of wood and thatched roof have been replaced by corrugated galvanized iron sheets. Tinned roofs are cheaper and a longer lasting option as thatch requires to be replaced every year. The grass for the thatch needs to be grown specifically for roofing which has not been followed due to the socio-economic changes. The case of KuH02, demonstrated that due to the change of the material used for roofing, the shape of the roof has remained sloped however it affected its aesthetic by diminishing with the soft yet cosy appearance of the house.

Both KuH02 and KuH11 have removed the stilts but KuH02 has maintained the wooden floor in the cooking area. KarbiH32 maintained a raised platform for the *Hong-Pharla*, while in KaH02, the house is built directly on the ground due to circumstance. Dimasa houses have always been built on the ground, hence the form or the house did not change with regards to the elevated forms of the other traditional houses, however, the spread of the rooms changed the layout. LaH19 maintained the stilts in the house, however, LaH14 indicated the progression of the layouts by going from two-room units on stilts to adding a three-room unit on the ground with a detached kitchen to the house cluster. This is further discussed in the next two sections on segregation and layout.

Segregation

Segregation is affected by the social perception in and around the community (Alitajer & Molavi Nojoumi, 2016; Ching, 2007; Dettlaff, 2014; Harris & Atalan, 2002; Mustafa et al., 2010; Rapoport, 1968; Sadoughianzadeh, 2013). This is an inward influence from the construction trends being followed in the region. Through the changes in the cultural ecology of the region, community and household, the architecture of the houses has maintained the principle of segregation based on gender, age, generations, space, and function, however the interpretation in the house has been redefined. The spaces that were originally multifunctional for sleeping, storing, or receiving guests have become segregated into specifically designated spaces. The houses have specifically designated bedrooms, cooking area and storeroom etc. The multifunctional use of the outdoors has been reduced over time.

In Kuki houses, spaces have been segregated according to age and familiarity however, despite segregation in spaces, the movement of the occupants are not hindered. The Karbi houses have two contrasting examples representing segregation of space based on age, gender, and familiarity in KaH32 and segregation based on activity KaH02. The reason for this difference is the financial contribution put into building the house and the number of people living in it. In similar fashion, the Dimasa layout indicates the segregation of space based on gender, age, and familiarity, and in case of more people, more the number of rooms. The segregation guest receiving spaces continued to be maintained separately from the cooking area which is regarded as sacred space. In the Labang cases, the rules for segregation of space were maintained, however, in LaH14, it is observed that the segregation is reinterpreted with regards to the allotted sleeping area for the daughter versus the sleeping area for the sons.

Layout

Due to the changes in the orientation, form, and segregation, it has led to consequently making changes to the layout (Ching, 2007; Mustafa et al., 2010; Rapoport, 1969). It has affected how spaces and functions are aligned or connected to one another. The free-flowing spaces have

become restricted and maze-like. The segregated layout of the houses has created spaces that are specifically designated to a function; however, the hierarchy of spaces have remained consistent in most of the houses with the exception of KuH11, which is most unlike a traditional layout and KaH02, which is a simple hut.

In KuH02, the single room open layout has been converted into two separated layouts based on accessibility determined by familiarity to the household. In case of the KaH32, the spiralling inward layout has become a branched layout maintaining the transition of spaces, however, the accommodation of the rooms based on the gender, age and familiarity has become flexible. In DiH07, where the spaces are placed successively, the layout has remained consistent of placing the cooking area towards the end, however, the sleeping quarters have been separated and placed on the sides that are accessible from the guest area. The linear layout has become branched. This branched layout is also observed in DiH04, however, despite the number of married couples in the house, the layout is divided between the cooking area and storage in the old traditional unit and the sitting and sleeping areas in the newly constructed unit.

In conclusion, the layout of the houses in terms of connectivity have become more flexible to adapt to the number of spaces and functions that need to be connected to one another, by relying on a central room or a public corridor. The spaces however have become less multifunctional in comparison to traditional spatial layouts.

Design: Space, Function and User

In the household context, as discussed in Section 3.2.3, the family size, gender, age, generations living in the house, occupation and vocation of the members, source of livelihood, material possessions owned etc contribute to the kind of house that the citizens chose to live in (Barker, 1968; Dittmar, 1994; Karabati & Cemalcilar, 2010; Rapoport, 1969; Salvendy, 2012; Wilson, 2000). From the size of the family influences requirement in terms of diversity of spaces and the various function to respond to according to the members. Across the communities, the response to individual diversity is varied. The Karbi family continued to maintain their separate rooms and partitions, which was adopted by the Dimasa houses as well, in the case of Labang, this segregation was created based on gender, since according to the marital status, the couples are expected to build a completely new house for themselves. The Dimasa, Kuki and Karbi would maintain more than two generations of the family within the same house, while in the Labang house the socio-cultural practice of building a completely new house was maintained.

The design of the spaces is changing as the segregation of spaces allows each space to be specifically designed. The doors and windows are made of wood instead of bamboo, they are more durable and stronger. The height and level of openings have changed. Some cooking areas have counters, the fireplace is diminished (climatic and material). Use of beds instead of roll-away bedding or the raised *chang* in the Kuki house. The multifunctional role of a space has been reduced; the spaces used for multifunctional purposes have been reduced. Instead, the new practice is the designate exclusive functions to a space and therefore have a rigid layout with many rooms.

In relation to family size, the requirements are different, it might be due to more children or due to more adults, or due to the generations living under one roof. The trend in the Dimasa, Karbi and Kuki houses has been to have as many rooms as there are people in the house. The Labang house has maintained differences among the generations as observed in LaH14. In fact, the house was divided into four parts, parents, grandmother, sons, and daughter. And as is the

cultural practice, the daughter slept in the cooking area since the role of the girl is most significant in maintaining the traditions of the community and it is recognised as the sacred space of the house. If possible, men are not allowed into the cooking area.

The fireplace was maintained in most houses, except for the KuH11 which had changed to gas stove. The Karbi, Dimasa and Labang houses maintained the fireplace on the ground and hence maintaining the overhead shelf for drying chilli, rice, fish, or meat. However, it is also to be noted that in case where the traditional design of the cooking area is maintained, the houses are more reliant on agriculture than others which have been modified. In the case of KuH02, the occupants of the house are an elderly couple who prefer traditional lifestyle hence maintaining the cooking area to suit. While the design of the guest areas and storerooms are simple cuboidal rooms that can be used in any manner. In LaH14, the cooking hut represents a central and sacred part of the house where the main fireplace is located that is responsible for providing sustenance in the form of food and warmth. In the LaH19, though the occupants are much younger and have been exposed to other cultures and other ways of living, the traditional house design has proved to be the simplest form of housing that meets the needs of the family given the low socio-economic background. With the changes in material, the reliance from bamboo used for binding and stabilising the structure, wood and nail has been used in some houses as the trend in construction practice has moved to more contemporary methods, also because bamboo structures look bad, ugly, poor, etc.

This perception of cooking area has been carried over to houses that have been built according to the presumed socially acceptable standard. In KuH02 the current house is traditionally built however, the proposed house places cooking area separately from the rest of the house because of the perception that it is no longer acceptable to receive guests in cooking area. However, at the same time, the respondents also expressed that due to their socio-cultural practice of sitting around the hearth, the kitchen would probably be the place to receive and entertain guests.

The utility area of the house has maintained its place next to the cooking area, hence placed away from the main house. However, the location of the toilet has been relocated from being placed far into the jungle or the backyard to being closer to the house, or sometimes even within the same structure with an outdoor access. In some cases, the respondents had expressed wanting to build the toilet with a bathing area and indoor access. The change in socio-cultural practices for some citizens due to exposure to urban cultures has introduced the idea of not using the communal bathing areas in the village, thereby affecting the change in layout by constructing wet spaces within the house.

Originally the houses did not have designated bedrooms as such, rather, there was enough space where one could unfold their bedding and sleep at night, while in the morning the bedding would be rolled up and kept in the loft or a corner. Even in the case of the Karbi house, the only clearly designated bedroom was the *Kut* area, which was only meant for the eldest couple, or homeowners. The rest of the family had designated corners or partitioned areas that they could use but the space would not be exclusive in the day.

Excluding the Karbi traditional house, the houses originally did not maintain a specific guest room or living room, however, the changes in the current practice is that they would have a room which would be specifically designated for guests to entertain them or letting them stay overnight. There is still a change in the segregation of non-familiar space in Karbi houses. The traditional house originally split the familiar and non-familiar from the entrance of the house,

however, the current trend in housing follows the Labang and Dimasa practice of placing the familiar space after the non-familiar space, hence making the non-familiar space a thorough fare.

The Evolution of Housing and Construction Practices

In conclusion, the discussion on the changes in the housing trend across the village cases answers the second half of the first sub-research question: *How is the housing design and construction practice affected by the causative context*?

It demonstrated that the houses have been adapting to the changing context that has been created by the evolution of the regional context and the village context. The discussion indicated that the communities valued the role of the cooking area and the value of a personal space for each individual member of the house increased in all cases. The value of having a designated storeroom was established. The value of a multifunctional space is maintained though redefined. The segregation of dry space versus wet space, storage versus functional has been maintained in deciding the layout however, it has been reinterpreted to suit the change in construction style and design trend.

Research in Chapter 5 indicated that the general perception of housing and shelter in the rural context has changed from generation to generation and it differs from household to household based on the financial status of the homeowner. The communication with urbanized population and the promotion and support by the governmental institutions have influenced the definition of living standards. The availability of construction materials coupled with skill and maintenance of the house has led to choices that have produced mixed typologies of housing.

Regarding bioclimatic conditions, social economic status, and functionality of the shelters, based on research in Chapter 5, the traditional house is posited to be better than the contemporary design that seem to be the inspiration of the households based on urbanization of the housing perception. However, a mixed version, or rather, an updated version that is clearly contextualised to the cultural ecology of the village is what would be suitable to the context. For this, the factors that influence the trend of rural housing needs to be clearly understood with respect to the socio-economic, socio-cultural, and environmental context.

This demonstrates the need to redefine the perception of housing and contextualise it to the rural context. The perception of “standard living” in the rural context needs to be clearly differentiated from the urban context. The communication of the benefits and implications of rural housing scheme by the government needs to be clarified. And finally, the role of the construction industry needs to be contextualised to the rural vernacular practices by encouraging the use of local materials and learning the skill required in using them for construction.

6.2. The Main Causes Within the Rural Cultural Ecology

The previous section discussed the causal analysis based on the causative context presented by the rural ecology and the causal effects based on the changes observed in the household cases in comparison to their respective traditional architecture of the community. This section expands further on the main causes that effect housing design and construction practice in the rural context. The discussion answers the second sub-research question:

RQ 2.What are the main causes that influence the evolution of architecture and the trend of construction in the rural context within the cultural ecology?

Based on the theory of analytic induction, the results of the causal analysis of the previous section are generalized to highlight the three main causal factors that influences rural housing practices through housing design and construction practice. The main factors to be discussed are multiculturism and cultural assimilation, government intervention, and the housing and construction industry itself.

6.2.1. Multiculturalism and Cultural Assimilation

As discussed in Chapter 2, multiculturism is a phenomenon where a new form of culture is produced when there are different cultures existing in a place (Steward, 1949, 1972, 1986). Depending on the level of social integration, an individual or family adapts to diverse context of those different cultures by incorporating newer practices or modifying a few of their own practices while maintaining others (Lozanovska, 2015). This phenomenon is noticed in the urbanized settlements where people from different communities live together. As a migrant from the rural areas, the individual or family that takes on practices from other communities goes through what is called a cultural assimilation (Steward, 1972). This intake of multicultural practices is then imported to the rural areas through the process of counter-urbanization that was addressed in the literature on the gap in rural housing approach in Chapter 2 (Gkartzios & Scott, 2010a, 2010b).

This brings out a difference in the perception of housing among the households depending on the exposure to urbanization. As observed from the analysis of the cases in Chapters 4 and 5, at both the village and household level, the perception of housing has changed in preference of non-traditional housing designs using concrete, brick, mortar, and cement that result in a permanent structure. However, the preferences vary across the cases.

The older generations were more conservative in their perception on home layout, while the younger generations were more flexible in determining the layout of their houses. The cases that had lived in urbanized towns and cities and support their livelihood through non-agricultural sources, were more inclined to build permanent structures. It was observed that the cases that spent more time in the village and support themselves through agricultural practice continued to build houses using local material as that is what the respondents were comfortable with. The agricultural practices of the village allowed the respondents to maintain the understanding and skill of using local materials for building huts and houses for sheltering people and storing the produce of the forest. However, the use of local materials includes maintenance and material replacements which happen yearly for the roof, every three years for the bamboo wall and every decade for the wooden floor. Having a permanent structure gives the impression that there will be lesser maintenance involved hence be less expensive in the long run, as shared by the respondents of KuH02, KaH02, LaH01 and LaH19. However, the ever-changing dimensions of a family is not considered in this decision making, which is one of the primary reasons for the evolving layouts in a household.

Another reason for the changing perception of housing is the concept of ‘standard’ as mentioned in the interview by KuH02, KuH11, KaH19 and LaH19. This perception is heavily defined by the section of the population who have been away and are habituated to urbanized way of living (Foley & Scott, 2014; Gkartzios & Scott, 2009, 2010a, 2010b). In KuH02, the children of the couple live in cities who occasionally visit during Christmas; KuH11’s respondent had lived in Chennai for a while before moving back to the village; KaH19’s children want to ‘modernize’ the house; and LaH19’s couple were raised in towns before

moving to the village. This introduces a negative perception to 'traditional', where it can be misinterpreted as 'old-fashioned, static in time', which is further misunderstood as 'un-suitable for the time and place', however this may not be true when it comes to rural housing. Similar to the multiculturism in urban settlements, multiculturism is practiced in rural areas, however the social integration and the cultural ecology of the context dictates the housing design and construction practice.

As gathered from the household interviews discussed in Chapter 5, it has been shown that these non-traditional permanent structures are associated with concepts of wealth, as the materials are more expensive and do not need as much maintenance. They are perceived as the modern standard. The consequences are that rural people opt for what is perceived as better. Yet this brings with its non-local materials, buildings laid out along urban ideals instead of the needs of the rural context. The consequence of this is the harming of both the environment and social-cultural landscape of the village (Foley & Scott, 2014). This is a clear indication of the influence on the perception on housing standards based on the exposure of the family or family members to urbanization in the towns and cities.

Amid this perception divide, families continue to maintain a mixed approach to housing to meet a balance between expressing wealth within their financial constraints and having a house that accommodates the household. Due to the financial implications and upkeep of the house, in which case they expressed a preference to the houses being built as permanent structure. This same perception divide has also led to change in layouts of the house by re-interpreting the rules of segregation based on privacy and gender, however as observed in the household cases, the value system based on the social hierarchy within a family is intact. The parents and married couples in the house are given an exclusive space, while the children share rooms.

A supporting reason for this perception of housing that "the city standard is better", is also due to the understanding and interpretation of the rural housing policies and schemes that do not clearly promote local materials as observed in the Kuki and Karbi case studies in Chapter 4. This misinterpretation has increased along with the promotion of non-traditional materials for housing through the gap in implementation of the housing policies as shared by the participants in the cultural mapping. This observation is discussed further in Section 6.2.2.

In summary, the subconscious assimilation of the multi-cultural nature of the place where the individuals are educated and employed affect the social culture of the villages. The multiculturism of a place is shaped by the various cultures being practiced in an urbanized centre which is an opportunity for learning and redefining the culture of the people living in the place. The multiculturism practiced in urbanized centres is imported into villages which naturally do not have a multicultural environment. Hence, multiculturism is insufficiently contextualized in the rural context leading to blind acceptance of non-local skills, materials and construction methods of houses or rejection of vernacular methods.

6.2.2. Government Intervention

As observed from the analysis and discussion of the Karbi and Kuki cases in Chapters 4 and 5, it is evident that the dissemination of information and implementation of the scheme is not uniform across the different districts. The context of its access, connectivity, education along with the governance of the autonomous district council are the causes of the different levels of implementation of rural housing schemes. The analysis of the household cases indicated the

degree of successful implementation of the Indira Awaas Yojna (IAY) Scheme which varied based on the region and community.

The IAY scheme proved to be more effective in the Dimasa case. DiH07 had followed the guidelines better than the other cases that had made use of the scheme to build a house. The distinct differences in implementation were the involvement of external contractors to build the house, communication and translation of the housing scheme and the role of the government in aiding with respect to the same. Using contractors in the building of the IAY houses is restricted however, the houses in the Karbi and Kuki villages allowed contractors to be involved in the building of the houses which resulted in incomplete or inadequate houses. It indicates that the guidelines of the IAY houses are not well understood by the beneficiaries in the Karbi Anglong district, which was confirmed by the responses of the participants, hence indicating the gap between governance of the autonomous council and the beneficiaries.

The beneficiaries in Dimasa took an active approach to building their houses with the IAY fund, while the beneficiaries in Karbi and Kuki relegated the responsibility of constructing the house to contractors who took advantage of the funds to produce brick and mortar house. In the Dimasa village, the houses were made of wood and bamboo according to the vernacular practice, with modifications to the doors, windows, and roofs. The doors and windows were made of wood, as is the current practice in construction and the roof was of tin since they last longer and do not have to be replaced every year unlike thatch.

From this it is concluded that the IAY guidelines are appropriate for rural housing however the understanding and implementation of the scheme is inefficient. Since the beneficiaries were uneducated in the Karbi case, and due to the misconception of appropriate housing through cultural assimilation in the Kuki case, the brick-and-mortar construction was accepted by the community over bamboo and wood construction. In the Labang case, the similar practice was observed, however, few households had opted for the scheme.

The autonomous councils in both the districts are different. The Dimasa were more involved in the functioning and administration of the autonomous state while in Karbi Anglong there is a communication gap between the people and their council members. This discussion highlights the necessity of establishing a communication between the government and the village communities to encourage the effective use of government support to aid the households to build their own houses that is suited to the needs of the occupants. Establishing a communication with the government body will also aid in providing services and facilities that enhance the standard of living in the rural context.

In summary a government intervention that promotes better communication with the users of the rural housing scheme is a necessity for better implementation. The difference in the behaviour of the district council in each of the cases indicated the potential of the rural housing schemes while also, indicating the implementation gap in the way the rural housing scheme was applied. This then continues to affect the housing and construction industry and its role in influencing current practice which is discussed in the next section.

6.2.3. Housing and Construction Industry

An objective of the thesis was to understand the design and use of spaces to arrive at a generalized understanding of the vernacular architecture of the region and to provide a medium to support the implementation of rural housing policies for Smart villages. In relation to this,

an underestimated factor identified in the analysis has been the role of construction. It was assumed as the effect rather than the cause; however, it is a dynamic element in the rural cultural ecology. It is the role of construction that has influenced the vernacular design through the influence of the materials used, skills applied, and the structural and architectural design adopted from comparatively urbanized counterparts.

It is an inter-dependent factor, as it relates to the construction skill of the house owner/builder and the materials that are available, environmentally sustainable, and suitable for the thermal comfort of the occupants. As outlined above, the perception of good and modern has been influenced by the urban experience of some people. Together with media, government, and education this perception of quality has led to a shift of house design to materials considered more permanent – concrete, brick, sheet metal, etc. This shift has increased the role of external construction providers providing of non-traditional trades. This has affected the final form and is impacting the cultural and social acceptability of the housing solutions.

The construction style adopted by the builder is determined by the architectural control being defined by the community, however, the availability of local materials, construction labour and skill and the finance to build a house influences the resulting architecture of the house. Therefore, the discussion here indicates the relevance of the housing and construction industry as it influences the trend of housing design and construction, the import of skill and use of non-local materials and multiculturism through cultural assimilation.

Therefore, to summarize, multiculturism and cultural assimilation, government intervention, and the housing and construction industry are the main causes that influence the evolution of architecture and the trend of construction in the rural context. The degree of multiculturalism in the regional context directly contributes to the degree of cultural assimilation within a community (Steward, 1972) and the involvement of the government can either catalyse or repress the effects on housing design and construction practice through the housing and construction industry. In conclusion, these three main factors need to be addressed in tandem to facilitate a better user-oriented approach to rural housing for Smart villages.

6.3. The Mandatory Considerations of the Framework

The research in Chapters 4 and 5, along with the discussions of Section 6.2.1, shows that traditional housing is the better option for the social and cultural wellbeing of a village as it responds to the unique local context which is supported by Singh et al. (2009). However, the changing rural cultural ecology has indicated the need to update the vernacular construction and design practices to ensure a socially and culturally liveable house which is also addressed by Arboleda (2020) and Singh et al. (2009). Having established the causal process in the rural cultural ecology in Section 6.1 and highlighting the main causes that influence housing design and construction practice in the rural context in Section 6.2, this section summarises the considerations for informing effective implementation of the rural housing scheme. It discusses the features of the information framework that will enable contextualised solution to rural housing design and construction practice for Smart villages. It answers the third sub-question, which is:

RQ 3. What are the considerations to be made to develop a housing scheme that promotes better communication and implementation of the rural housing scheme?

Based on the analysis and discussion of the Chapters 4 and 5 and the previous sections, the following points suggest the areas that need to be considered for constructing an information framework that ensures a self-built house that is both socially and cultural acceptable as well as a liveable housing option in the rural context.

a. Addressing the geography of the place: It must be noted whether the place is accessible or not. One of the ways that rural development can be achieved is accessibility. Though it is not a direct cause of architecture, it is indirectly related to the different non-local materials one might want to use in construction. Aside from accessibility there are other ways that topography influences design, orientation, and quality of foundation. Also addressing that it is an earthquake prone area, the construction must be light.
b. Addressing construction skill and materials: There should be a list of materials that should be used in response to the climate, topography, earthquake and availability and its long-term environmental effects. Following that, the guidelines should explain the ways in which they can effectively be built, with more focus in the construction details, roofing, flooring, wall etc.
c. Addressing the trend of design and construction practice: It is the materials and the construction style that modifies their simplistic requirements into complicated ambitions. In other words, replacing the local material with a material that is alien to the context affects the space due to its construction method that has to be modified, the texture of the material which affects the ambient environment etc. The policy needs to include a compendium of construction methodologies informing the builders who make the house regarding vernacular construction styles. Producing layouts restricts the beneficiary from exploring their own way of building a house that is suited to their own needs.
d. Addressing Socio-cultural and socio-economic requirements: The mode of livelihood practices adopted by the beneficiary and their family can modify the functions and dimensions of a space in a house. In the case of the research, since the primary mode of livelihood is agriculture, the houses need to be flexible to accommodate the storage of rice and other food products during harvest. Simultaneously, a local granary can be built for the community to store their grains. It needs to incorporate the size of the family as a factor for design houses. Due to the socio-cultural reasons, the size of the family changes and socio-economic reasons are why they end up in small places. Incorporating these reasons, the house material and construction needs to be flexible and resource able.
e. Addressing the responsibility and ownership of the house: The community should be enabled to take charge of the construction of their house. Rather than producing plans and layouts of the house for the people, it is better to give the information on how a house should be built. Meaning that the correct engineering information is more important to be shared with the public. Why I say this is because, each household will have their own expectation of what they want from their house; how they want to use it and how much space do they really require for their activities and storage within the house. Hence the decision-making and construction of the house should be left to the residents/users/beneficiaries. However, in the case of involving external stakeholders, the central and significant role of the beneficiary should be maintained to propose effective solutions according to the needs of the family.

f. Transparency and communication: It is to be noted that the beneficiary has the right to information regarding his or her house, therefore, the framework needs to incorporate a system for communication between the government representative and the beneficiary. It should be easy to avail and one that maintains direct communication with the rural housing department to avoid miscommunications due to middlemen and external contractors.

Hence the information framework must include the various roles and functions to ensure provision of effective housing solutions contextualised to the rural context of housing and construction industry. A detailed outlined structure of the information framework will ensure effective housing solutions to better develop Smart villages.

6.4. Chapter Summary

This chapter focussed on the analysis and findings of the causal process observed in the rural ecology, its influence on housing design and construction practice, highlighted the main causes affecting rural housing scheme implementation, and the considerations to be made to improve implementation of the rural housing scheme. In doing so, the chapter was able to answer the research questions that were posed in the introduction chapter.

The causal analysis of the causative context, which is the rural cultural ecology, and its influence, which is the evolution of architecture and construction trends in the village cases, re-established the significance of ethno-architectural contextualism, a dually aligned perspective of ethno-architecture (Toffin, 1994) and environment-behaviour studies (Rapoport, 2008). The discussion of the cause-and-effect process of the context and the house indicated the main causes that influenced housing design and construction practice. The major causes established through the discussion were multiculturism and cultural assimilation, government intervention, and the housing and construction industry.

The subsequent discussion of the respective findings allowed the research to propose an outline of considerations that needed to be made to inform effective implementation of the rural housing scheme. The effective implementation of the rural housing scheme would contribute towards empowering the rural community to self -build socially and culturally acceptable as well as liveable houses for the rural context.

The next chapter focusses on detailing out the implementation framework supported by the literature review, methodology and the data analysis of the research. It answers the final question of the research questions posed in the introduction. The implementation framework will be contextualised to the rural context with the express purpose of ensuring self-building the house to increase the sense of ownership of the house. The framework will be outlined based on the phases, stages, activities, and external stakeholders involved in executing a housing project in the rural context. This will aid in developing the housing in Smart villages as a user-oriented bottom-up approach.

Chapter 7. *The Implementation of the Framework*

The previous chapter discussed the findings of the research conducted by this PhD and in doing so, answered the three research sub-questions. The discussion led to the understanding of the considerations to be made to inform a housing project through the rural housing scheme. This chapter, building on the discussions of the previous chapter to develop a framework that enables a user-oriented bottom-up approach of the rural housing scheme, summarises the implications of the overall research being conducted in the thesis. Thus, the key question needing an answer is:

What are the recommendations to inform a user-oriented bottom-up approach for a rural housing scheme?

By aligning with the users' needs and aspirations of housing, it expands upon the specificity of practice-based roles and responsibilities for constructing a working framework that will enable the support of government policy and other stakeholders to build a house integrating all the context specific considerations. The resulting house built through the support of the Framework is expected to be responsive in social and cultural contexts and be acceptable to the beneficiary of the rural housing support as stated as the aim of the thesis. This effectively contributes towards enhancing housing policy in the context of the Smart villages development.

The implementation of the Framework is discussed in three sections. Section 7.1 discusses the considerations that were suggested in Section 6.3 within the context of a conceptualised Framework. The discussion draws from literature review and the methodology adopted for the research. Section 7.2 contextualises the considerations of the Framework within a project timeline for developing housing within the rural context. It broadly addresses scope of the Framework based on the significant stakeholders and their functions within the phases and stages of the projected timeline for practical implementations. As a result, a conceptual model of the overall framework is then proposed in Section 7.3. It details the structure of the Framework based on the suggestions of Section 6.3 and the literature-based discussions of Section 7.1. Section 7.4 reflects on the implications of the Framework on practice and academia indicating future scope and evolution of practice and research, with a chapter summary in Section 7.5.

7.1. Constructing the Framework

While developing a housing project, there is a natural progression from idea solicitation, need analysis to finalisation of planning and design. However, in relation to the implementation of rural housing schemes for a housing project, the progression slightly changes as it introduces stakeholders that are normally not present in a housing project proposed by a client in the urban context. Rather, it is treated as a public government building which is supervised and authorised by a government representative. As observed in the analyses in Chapters 4 and 5, this is an ineffective approach to providing housing for the beneficiary which is due to the lack of information on the part of the external stakeholders that is needed to effectively implement a user-oriented bottom-up approach to rural housing. As discussed in Section 6.3, an information framework must be put in place that supports an effective implementation process.

In the case of a construction life cycle, the generic phases are initiation, planning, implementation and execution, performance and monitoring, and closing (Mastropasqua,

2019). The stages are simplified, and the activities are designated to the professionals to execute their functions according to the requirement of the project and a management process is in place to ensure smooth production of the project.

Based on the research, there is a gap of perspective that affects the approach to rural housing and its implementation. As shown in Figure 7-1, this gap can be filled by introducing a framework that first, informs the beneficiary of the skills, materials, and services available to them thereby enabling them as the primary role in the rural housing project. Secondly, it informs the external stakeholders of the local expectations, along with the opportunities, threats, strengths, and weaknesses of implementing a rural housing scheme that ensures a socially and culturally acceptable housing solution, critically contextualised to the region, village, and the household.

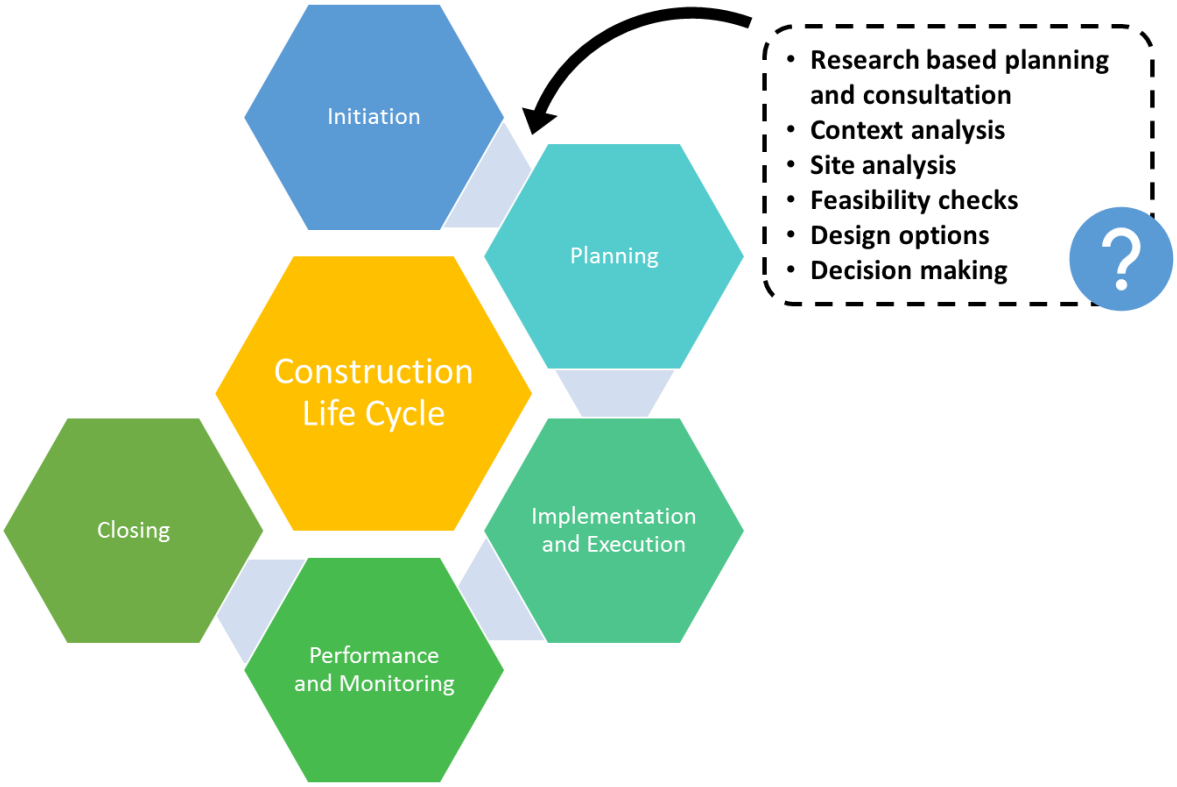


Figure 7-1 Missing information within the Construction Life Cycle in the rural context, adapted from Mastropasqua (2019)

As indicated, this framework is to be enacted after the initiation of the project to gather enough information to define an approach, and before the planning of the project to provide the information to plan the project. For a clarified understanding of the Framework, the literary and research evidence that guide the structure is succinctly revised in Figure 7-2. It shows a conceptual diagram that illustrates the support of the methodology, stakeholder involvement and their contributions, the possible activities within the Framework, the output in the form of design options and the outcome leading to an inclusive housing solution within the community.

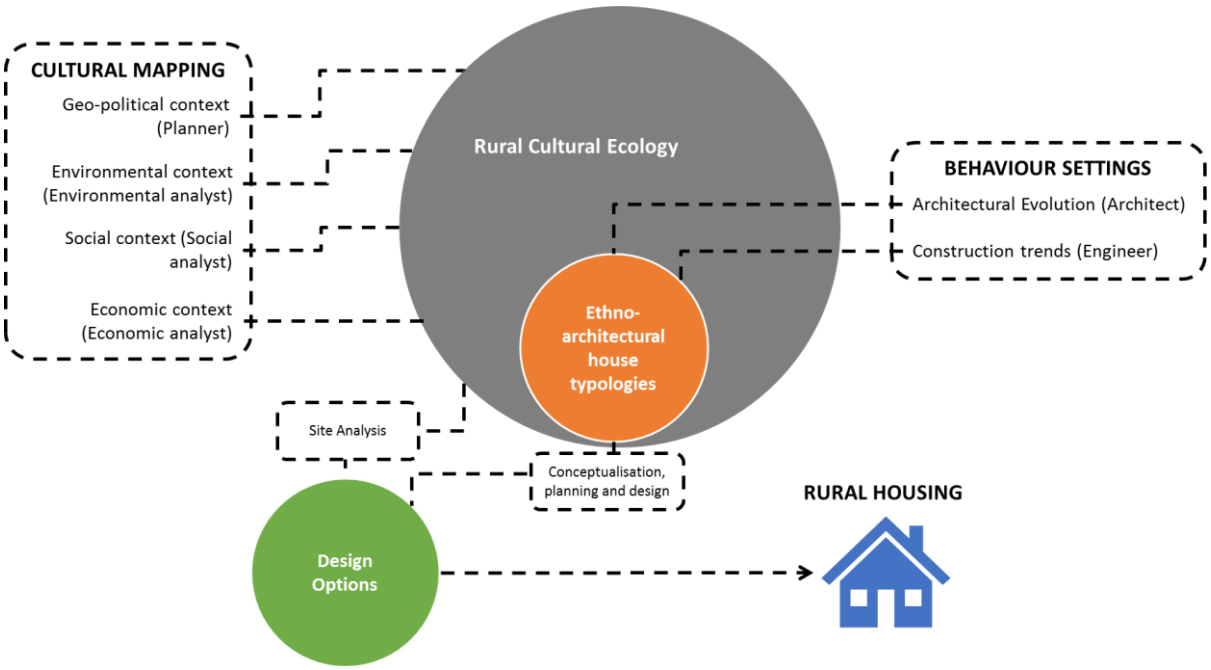


Figure 7-2 Concept diagram of developing the Framework.

Similar to the methodology discussed in Chapter 3, it shows a layered approach that identifies the context through cultural mapping (Field, 2010; Pillai, 2013) and identifies the housing trend and construction practice through behaviour settings (Barker, 1968; Schoggen, 1989). Based on the methodology adopted and the findings of the results, the process is supported by contextualism (Annis, 1978) and ethno-architectural contextualism, which is defined by the combined conceptual perspectives of ethno-architecture (Arboleda, 2020; Toffin, 1994) and environment-behaviour studies (Rapoport, 1990a, 2008). The theory of contextualism explains the need to understand the context of the house and its habitants to be able to design for the house (Annis, 1978). The combined theories of ethno-architecture (Arboleda, 2020; Toffin, 1994) and environment-behaviour studies (Rapoport, 1990a, 2008) recognise the causal link between culture of the community and the architectural space and structures created by it to represent it. Having recognised that the culture of the community is a crucial context to understanding the people and their needs (Hawkes, 2001; Pillai, 2013; Steward, 1972), these theories recognise the need to understand the regional and village level surroundings while maintaining that rural cultural ecology (Steward, 1972; Velázquez, 1978). Housing from a community perspective is a dynamic space which evolves based on external influence and cultural values and social settings of the community in specific contexts (Coolen & Ozaki, 2004; Ismail, 2012; Rapoport, 1969; Singh et al., 2009).

The functions of cultural mapping and behaviour settings are divided based on the type of information gathered from each area of investigation. Within the cultural ecology there are four contexts. These contexts are geopolitical contexts, environmental context, social context, and economic context. As far as the geopolitical context is concerned, the practice role of planning plays a significant role. A planner usually undertakes the relevant enquiries for ascertaining geopolitical aspects of a community before making any plan of improving the neighbourhood or settlement. The environmental context is provided by the practice role of an environmental analyst who undertakes the function of analysing the environmental aspects of the village and its surroundings. Social context is provided by the practice role of social analyst who undertakes the function of analysing the social aspects of the community. And finally, the

economic context is provided by the practice role of an economic analyst undertaking the function of analysing the economic aspects that influence the livelihood of the families.

Through behaviour settings, two aspects of architectural evolution and construction trends are addressed. The approach of ethno-architectural contextualism is used to understand the functionality of spaces within a house from an ethnographic perspective (Arboleda, 2020; Rapoport, 1990a, 1990b, 2008; Toffin, 1994). Architectural evolution of the houses is verified and documented by the practice role of an architect analysing the architectural typologies that are available in the village. Construction trends of the houses is verified and documented by the practice role of an engineer whose primary job is to analyse the construction methods and techniques being used including the usage of locally available materials and skills.

Similar to the data flow in the research methodology discussed in Section 3.4, the assessment of cultural ecology leads to site analysis, and the assessment of the ethno-architectural housing typologies leads to conceptualisation, planning, and design. The output of the respective assessments results in developing necessary design options for the beneficiary's needs. How this framework can be applied in practice depends on various practice roles involved in a project over the project development life cycle in the Section 7.2. The processes of practitioners being involved and underlying practice-based roles along with tools and techniques is elaborated as a composite framework presented in the Section 7.3. Since the proposed framework revolves round the gathering and dissemination of information needed to conceptualise, plan, design, and as a result, build a house through the implementation of the rural housing scheme, the Framework is here on referred to as the Information Framework.

The Information Framework intends to provide a systematic structure for planning consultants, environment consultants, socio-cultural consultants, socio-economic consultants, architectural consultants, and engineering consultants in order to perform relevant tasks on various components in relation to the implementation of rural housing scheme. Their expertise and knowledge in respective fields enables evaluation of feasible options taking into consideration the relevant rural cultural ecology and the target beneficiaries in the community. The access and liberty to choose among the recommendations, would enable the beneficiary, as the primary stakeholder to take a first-hand control in the implementation process. This will also aid in disseminating knowledge regarding new and modern design and construction methods that would encourage the evolution of the vernacular construction practices in the community.

Therefore, to ensure a user-oriented bottom-up approach of implementing the rural housing scheme, the research proposes that the traditional consultants' roles and functions do not prevail in rural housing context. Rather, consultants may provide valuable input by undertaking a peripheral role while maintaining the beneficiary as the central role in the decision-making process. For this, the role and functions of the consultants are limited based on the relevant contributions of their expertise and profession. The Information Framework must evaluate geography, skill and material for construction, design and construction trend, the socio-cultural and socio-economic requirements, and the ownership of the house, with all the while ensuring a transparent transaction of the benefits of the rural housing scheme. In summary, the Information Framework aims to support and enable a self-built house by the beneficiary of the rural housing scheme as shown in Figure 7-3.

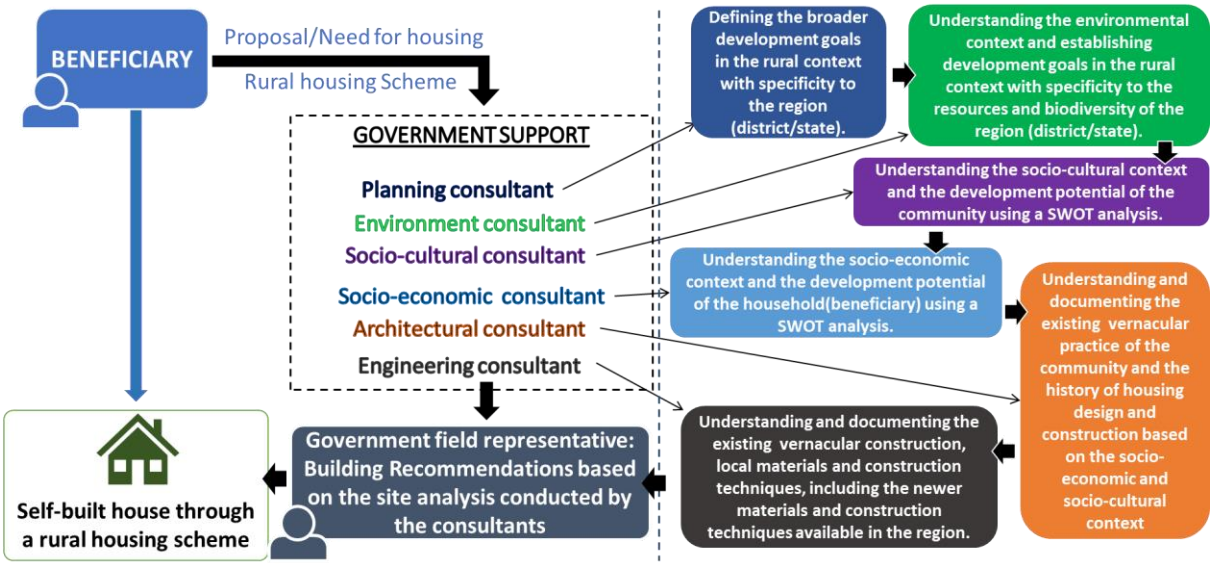


Figure 7-3 Conceptual components of the Information Framework to promote a self-built house.

Figure 7-3 indicates the components of the Information Framework illustrated on the right side of the dashed line. It is based on the support and resources provided by the secondary stakeholders through the government support to enable effective implementation of the rural housing scheme. On the left of the dashed line, the figure illustrates the functions and contributions of the Information Framework. It provides a set of professional recommendations based on understanding the regional and community level rural cultural ecology and its housing and construction trends.

The Information Framework needs to enable the access to the resource and support by the beneficiary, aiding their decisions regarding housing design and construction. Therefore, it provides the support and resources in the form of professional consultancy that the beneficiary may use to self-build a house which is elaborated in Section 7.3. The next section of the chapter contextualises the Information Framework within a project timeline that is developed for a self-build housing project aided by the rural housing scheme.

7.2. A User-oriented Bottom-up Approach to Rural Housing

Based on the difference in the nature of the housing projects facilitated through a rural housing scheme, the progression of the housing project along with the stakeholders relevant to the process must be outlined. The following sections address the project timeline to be followed in housing in the rural context and the roles of the stakeholders based on their contribution.

7.2.1. A Revised Construction Life Cycle for a Rural Housing Project

As demonstrated from the analysis of case DiH07 in Chapter 5, it is evident that a user-oriented bottom-up approach with a beneficiary oriented rural housing implementation is possible. According to the details, it showed that the role of the beneficiary was that of the main builder in the project. In contrast, case KaH19 was not beneficiary oriented, and hence, had a completely different outcome. It was an incomplete construction due to the use of non-local materials and construction methods that incurred more expenses. Therefore, borrowing from the procedure followed by case DiH07, the construction life cycle discussed in the previous section and the introduction of an information framework, a recontextualised project timeline is proposed, which is a concept for a user-oriented bottom-up approach for rural housing.

Incorporating the missing information into the processes of the construction time will re-orient the approach the rural housing scheme. The information given will enable the beneficiary to make decisions regarding their needs and their financial capacity and thereby provide the appropriate assistance to self-build their house. Therefore, based on the discussion of Section 7.1, an information framework needs to be incorporated into the rural housing project timeline that is demonstrated in Figure 7-4.

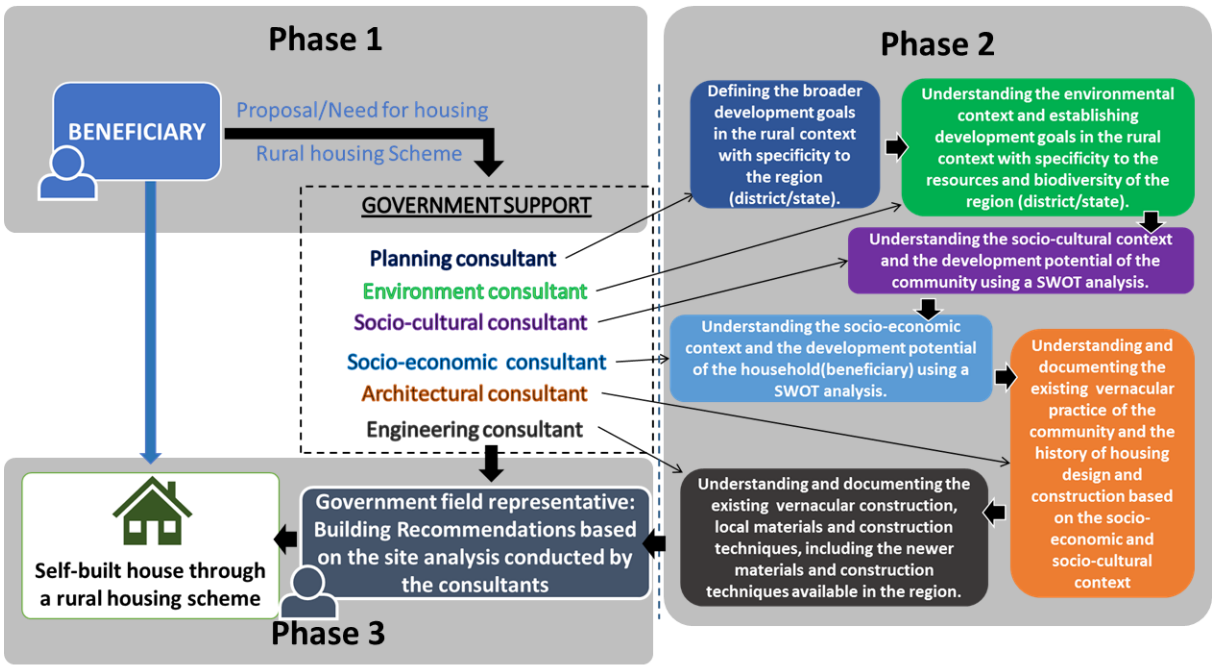


Figure 7-4 Introducing the Information Framework within a three-phase project timeline.

Figure 7-4 shows the project timeline divided into three phases according to the activities and the stakeholders involved. The first phase is oriented around the application process of the rural housing scheme, the second phase is oriented around gathering and providing the relevant information for the beneficiary to enable self-built houses, and the third phase is oriented around using the rural housing scheme to build the house. This concept is further reconstructed and explained below.

7.2.2. Stages, Roles, and Functions

Having segregated the construction process into three phases based on the nature of the activities and the roles involved, the phases are further broken down to stages based on the specific aim and scale of the activity and key roles. This presents an eight-stage process where the Information Framework takes up three of those stages. The planning stage of the construction life cycle (Mastropasqua, 2019) is included into the Information Framework as it reassigns the responsibility of gathering information about current housing and construction practices from the beneficiary to the architect and engineer. This ensures a better outcome of the design options that the beneficiary can choose from while allowing them to focus on their chosen mode of livelihood which may be farming, daily-wage labour, or any other employment that is available to them in the rural context.

KEY ROLES AND FUNCTIONS	PHASE 1		PHASE 2			PHASE 3		
	Initiation	Proposal	Support and Resources	Site analysis	Planning and Design	Decision making	Execution	Completion
Beneficiary	●	●				●	●	●
Case worker		●	●	●	●	●	●	●
Planner		●	●					
Environmental analyst			●	●				
Social analyst			●	●				
Economic analyst			●	●				
Architect			●		●			
Engineer			●		●			
Other skilled worker							●	●

Figure 7-5 Revised construction life cycle: Three phases, Eight-stage process, and Key roles.

Figure 7-5 is the project timeline broken down into an eight-stage process from the initiation to completion of the project that is divided among three phases based on the aim at the time of the project and the involvement of the beneficiary. This is done to maintain control of the decisions and changes by the beneficiary while the other roles involved in the project maintain a consultation role to reduce the influence of irrelevant urban influence, as suggested in Section 6.3.

As discussed, while the most important is the role of the beneficiary, the role of the case worker is significantly present in most of the stages for effective execution of the project. The other roles are restricted to one or two stages to reduce the urban influence and bias of the practice roles on the feasible options available and the decision made by the beneficiary. The last row for 'other stakeholders' is included in case the beneficiary chooses to procure and outsource services according to the skill and material required to build a house that is not fully locally possible. As such, the columns of execution and completion are the only stages in the housing process where any other external stakeholders are involved in the implementation of the rural housing scheme.

The stages: Initiation and Proposal are part of phase 1, Support and resources, Site analysis, and Planning and design are part of phase 2 and Decision making, Execution and Completion are part of phase 3 as shown in the Figure 7-5. The table marks the involvement of the key roles in each stage of the rural housing project timeline. The eight stages are broadly discussed below based on the roles and functions involved in the process.

Phase 1, Stage 1: Initiation

The initiation stage refers to the development of a brief defined by a need for a house construction, extension, or restoration. It is defined by the beneficiary based on the requirement that is either due to change in family dynamics or due to loss of shelter from a disaster, or a similar situation. At this stage, since it is still the beginning of the project, the beneficiary is the only person involved in the process. They have not approached any department or scheme to aid in the project and it is solely decided upon by the beneficiary and their family. It is included into the timeline representation of the rural housing process as it is crucial to the start of the project.

Phase 1, Stage 2: Proposal

At this stage, the beneficiary is expected to approach the department handling the rural housing schemes to propose their project according to the brief decided in the prior stage. This stage is crucial as it brings the beneficiary in contact with the case worker who would oversee and ensure the completion of their project based on the brief and the provisions of the government scheme, and other financial schemes.

Phase 2, Stage 1: Support and Resources

At this stage, the beneficiary is no longer in the picture since the information on the beneficiary and their brief has been shared with the case worker. This stage is as crucial as the previous as it is meant to relay the brief and information on the beneficiary to the other roles in the project. The most important roles in this stage are the case worker and the planner who will establish the degree of aid that can be provided to the beneficiary based on the regional plan and context of the beneficiary's location. Archival data and census data are used to establish and evaluate the proposal. The other roles need to be present in the stage to be fully aware of the trajectory of the project based on the data and proposal evaluation. This stage outlines the roles and functions of the external stakeholders based on existing context in terms of site and resources available for the construction. This stage allows the team to plan the type of data to be collected and how it should be collected. This is further discussed in Section 7.3.1.

Phase 2, Stage 2: Site Analysis

At this stage, the environmental analyst, social analyst, and economic analyst take part in a greater role as they are to go to the beneficiary's village and collect data on three dimensions of sustainability. This is done to establish the cultural ecology and have feasibility checks based on the data collected. A regional and community level data collection and analysis conducted to create a database for the village. This stage includes the case worker to ensure the proper documentation of the information gathered and analysed. This is further discussed in Section 7.3.2.

Phase 2, Stage 3: Planning and Design

At this stage, the case worker relays the preliminary site analysis to the architect and engineer team who return to the site to verify the data and personally understand the cultural ecology explained in the documentation and collect further data to understand the need of the proposal based on the community level and household level context. A household level analysis is conducted to create a list of options for the proposal that differ based on design of the construction, material used and the skill of the labour. The case worker continues to work with the team to ensure full understanding of the suggestions so that they may be able to relay it to the beneficiary in the next stage. This is further discussed in Section 7.3.3.

Phase 3, Stage 1: Decision Making

At this stage, the options that have been designed by the architect and engineer is presented to the beneficiary. The role of the case worker is crucial at this stage as it is necessary to ensure that the beneficiary is aware of the options available to them to execute and complete the project based on the environmental, social, and economic factors of the cultural ecology within the village as well as the house. Miscommunication and misunderstanding of the options at this stage can cause severe impacts to the government and bank funding system, the construction

industry and the beneficiary's socio-economic status as well and there by failing the rural housing scheme. The decision of among the available options is made by the beneficiary.

Phase 3, Stage 2: Execution

At this stage, the case worker may or may not have an increased role in the process. If the execution of the construction is done completely by the beneficiary, the responsibility of overseeing the construction by the case worker is reduced. The case worker's role is increased and may assist the beneficiary in procurement of the skills and materials that are not local to the village and its immediate surroundings, such as steel, brick and cement, and the skilled labour to construct the decided option.

Phase 3, Stage 3: Completion

At this final stage, the case worker conducts a final inspection and survey of the construction to ensure that the expectations from the proposal have been met. In case of a self-built house, the chances of a satisfied completion are much higher than in the case of an outsourced labour-built house. This stage concludes the successfully managed and built rural housing project that ensures not only a high degree of satisfaction of the households but also meets the culture and heritage of the community at large.

Having contextualised the Information Framework within the larger picture of the housing project timeline, the next section will elaborate on each of the stages within phase 2. The discussion focuses on the activities and contributions of the key roles in three stages that represent the three scales of data to be collected and analysed to arrive at a rural housing solution.

7.3. Details and Workings of the Information Framework

This section focusses on stages of the Information Framework and potential implications from the practice perspective. This section details out the roles involved in the project corresponding to the stages within Phase 2 of the housing process outlined in Figure 7-5. As demonstrated in the briefs of the corresponding stages, the following descriptions do not include the role of the beneficiary.

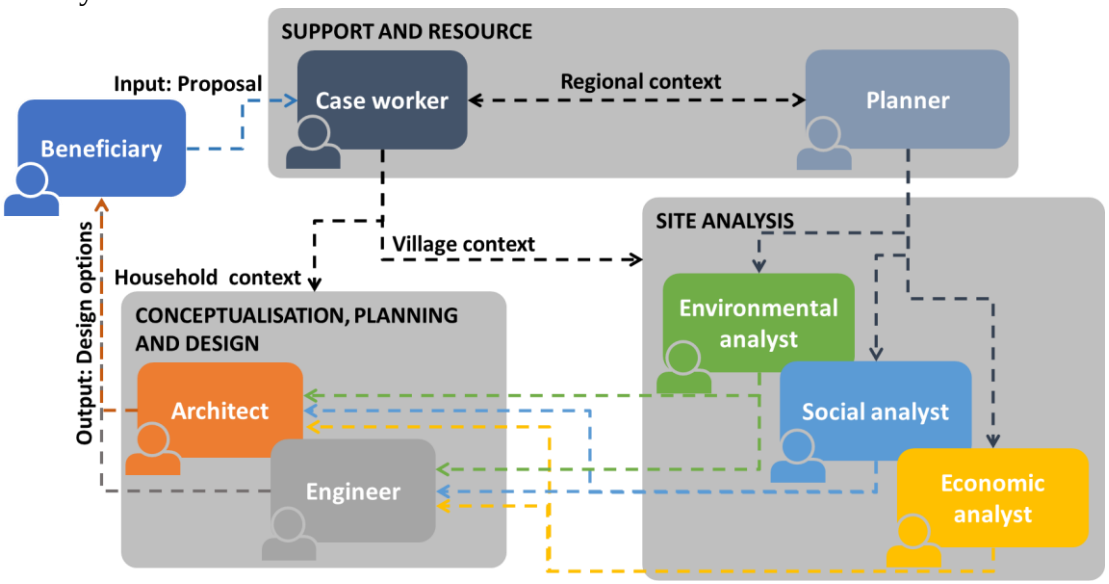


Figure 7-6 Information flow from input to output through the stages and key roles within the Information Framework.

Based on the outline of the stages in Section 7.2.2, Figure 7-6 schematically demonstrates the flow of information within the Information Framework based on the input proposal to the output of design options. As demonstrated in Figure 7-5 and Figure 7-6, the Information Framework represents a sequential process of gathering data from the regional context to the village context before moving on to the household context. Each stage is highlighted based on the scale (regional, village and household context) and the type of information required, and the key roles involved to execute the stage. The arrows from the case worker to the other key roles represents the communication between the caseworker and the stakeholder or team of stakeholders based on the scale of data required.

The 'regional context' arrow within the context of the 'support and resources' stage indicates the two-way communication the case worker needs to maintain with the planner since they are equally responsible for defining the objectives and methodology for the next stages of the Information Framework. The 'village context' and 'household context' arrows indicate the supervisory role of the case worker with the 'Site analysis' team and the 'conceptualisation, planning and design' team.

The case worker is present in the project for most of the processes from the proposal to the completion of the project. Their role is to maintain communication and smooth information flow and translation among the practice roles. The next sections will further elaborate each stage according to the functions and activities performed by the caseworker, analysts, and practice roles outlined in Section 7.2 and Figure 7-6.

7.3.1. Support and Resources

As mentioned in Section 7.2.2 and demonstrated in Figure 7-5, this is only stage when seven of the secondary stakeholders are involved. It is to ensure clear communication and interpretation of the proposal put forward by the beneficiary. This stage requires the participation of all the practice roles to ensure the complete understanding of the existing context the data available, data missing, and the data required to move forward in the project.

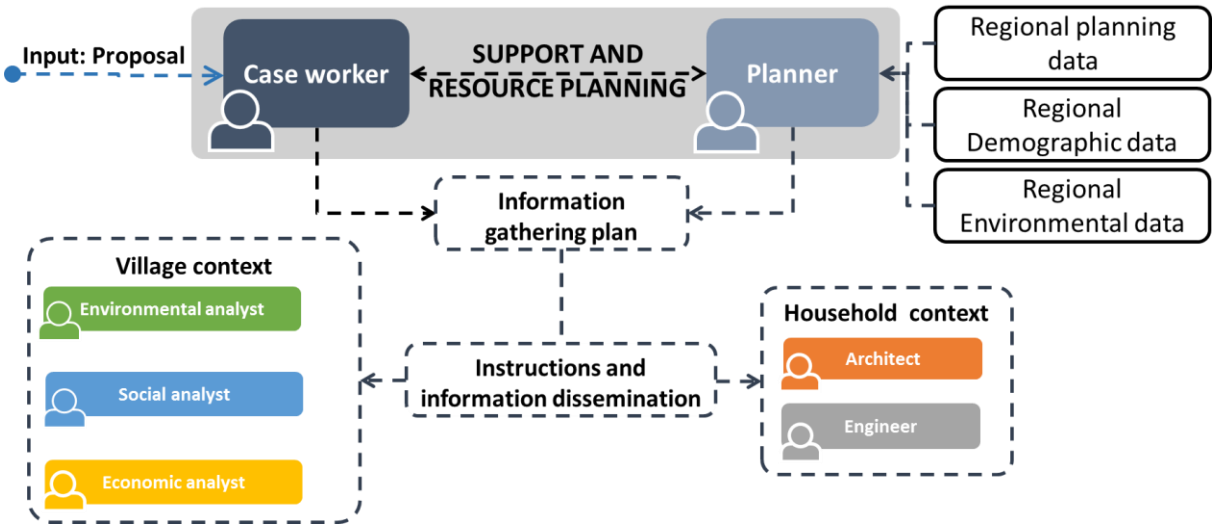


Figure 7-7 Regional information and activity dissemination of Phase 1, stage 1: Support and resources

Figure 7-7 represents the information flow in the first stage of Phase 2. It shows the roles of case worker as the input provider of the proposal discussed with the beneficiary from the previous stage (Phase 1, stage 2: Proposal) and the planner as the regional data analyst.

Tools and Techniques: Archival Data Research

Based on the information outlined in the 'proposal' stage, the case worker and the planner conduct a preliminary study based on archival and census data to establish the geopolitical context. A research plan is developed to collect data and establish the level of information needed to be gathered in the village and household scale for designing housing solutions. The analysis is conducted with respect to the region/district to which the beneficiary belongs.

In reference to the methodology explained in Chapter 3, there is a case selection process that is part of defining the scope of information to be gathered. The case selection process is explained in both scales, the village level as well as the household level in Section 3.2.2. For this research, the village level case selection process helped to choose the village cases to that were to be studied for the research. However, this selection process is not required to implement the information framework since the village to be studied in this case would be the beneficiary's village.

Data for Geopolitical Context

Information such as regional planning data, regional demographic data and regional environment data is relevant to develop a geopolitical context. The geopolitical context provides the context of the village in the regional level within the district and the state.

Regional Information and Research Plan

This level of data analysis allows the planner to gauge the access to non-local construction material and skill from nearby towns, there by indicating the different methods of construction available to the beneficiary. This process indicates the nature of the regional context of the village which depth to the site analysis to be conducted in the next stage.

The remaining five roles, the environmental analyst, social analyst, economic analyst, architect, and engineer are present in this stage to understand the extent of their participation and function of their role in the project. This stage establishes methodology and aids the practice roles in their approach towards the 'site analysis' stage and the 'conceptualisation, planning and design' stage of the project.

7.3.2. Site Analysis

Following the geopolitical analysis of the region, a site analysis is conducted to establish the village context based on the three layers of environmental, social, and economic contexts. As demonstrated in Section 7.2.2 and Figure 7-5, this stage involves the environmental analyst, social analyst, and economic analyst in prominent roles while the case worker assumes a reduced role as a supervisor of the team. Their aim is to establish the context of the village based on their analysis, in other words, realize the unique rural cultural ecology of the village based on the ethnic culture and practices of the community.

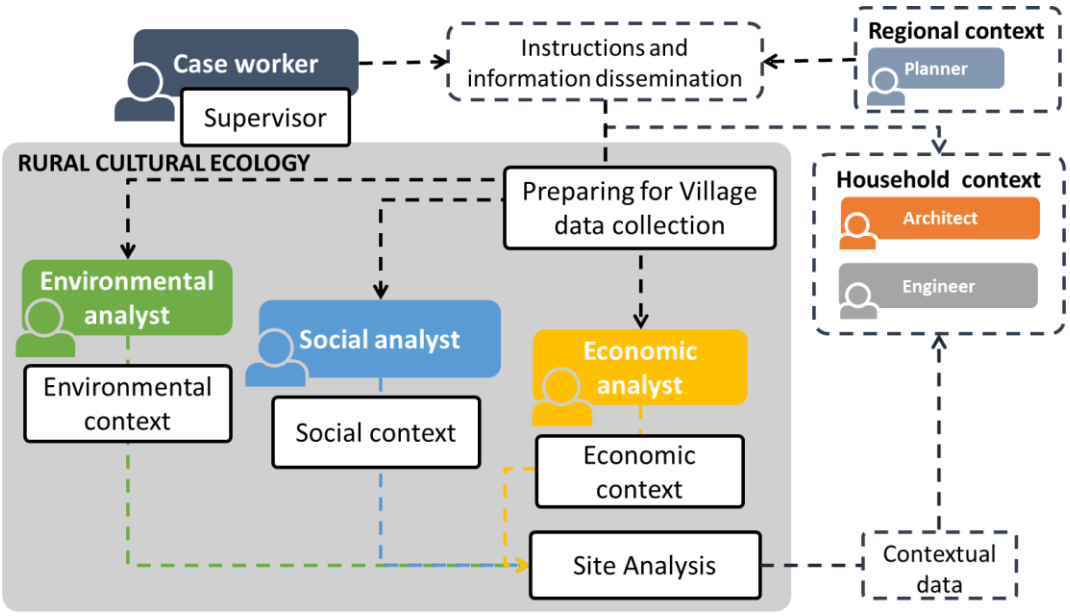


Figure 7-8 Rural cultural ecology, Phase 2, stage 2: Site analysis

Figure 7-8 represents the information flow in the second stage of Phase 2. As indicated, the case worker has a limited role and does not directly contribute to the activities and outcomes of the current stage. It shows the supervisory role of the case worker that overlooks the activities of the 'site analysis' team who are the environmental analyst, social analyst, and economic analyst. At this stage, the rural cultural ecology is defined by the environmental, social and the economic contexts presented by the 'site analysis' team.

Tools and Techniques: Transect Walk, Focus Group Discussion and Questionnaire/Survey

For this stage, the data can be collected in various ways that is suitable to the practice roles. However, based on research in Chapters 3 and 4, the suggestion is to conduct a transect walk to gather information regarding the physical context of the village. A focus group discussion allows the practice roles to gather information from the community itself to establish the socio-cultural and socio-economic context of the village. A questionnaire survey may aid in understanding the community in the form of statistics regarding house conditions and trends, family size and structure, and affluence and income range of the families which further aids in understanding the socio-cultural and socio-economic context of the community.

As explained in Section 3.2.2., the questionnaire survey data was instrumental in in selecting household cases for the research. However, the equation 5-1 in Chapter 5 was developed based on the data type gathered for the research based on the literature and methodology in Section 3.2.2. The same equation cannot be used to decide household case selection process for applying the information framework. In fact, it would be advised to develop a different equation that is more suited to the context of the data available and more inclusive of the meaning of the data gathered from the perspective of the environmental, social, and economic analysts. To aid the case selection process, a comprehensive criteria list should be developed based on expert opinions and vast knowledge provided by the environmental, social, and economic analysts and the contextual data collected by them in the 'site analysis' stage.

These three levels of data collection allow data to be collected visually, personally, and statistically. These varying degrees of interaction allows the analysts to gauge attitudes and perceptions better to establish the rural cultural ecology. Also, the questionnaire survey aids in

understanding the evolution of the architecture and design construction for the next stage of the framework which is conducted by the architect and engineer.

Data for Environmental Context

The environmental analyst establishes the environmental context based on the landmarks, natural resources, topography, physical landscape, flora and fauna, climate, temperature, and humidity etc. The size of the village, location of houses, fields, and forest are also documented as part of the data collected through a transect walk.

Data for Social Context

The social analyst establishes the social context based on the history, cultural and traditional practice, and system of values. The data for this context is collected through a focus group discussion based on questions regarding their religious practice, social practices, education, and knowledge sharing practices, festivals and cultural celebration regarding marriages, births and funerals, attitudes towards illness, health care and sanitation, attitudes towards gender roles and age hierarchy, attitudes to nature and attitudes to communities, etc.

Data for Economic Context

Economic analyst establishes the economic context based on the agricultural practice, potential of economic opportunities, quality and quantity of produce, access to trade, income, and employment opportunities that support the livelihood of the families. The type and quantity of material possessions along with the livestock owned by the family that contributes to livelihood and income also help to understand the economic context of the community as well as individual families.

Rural Cultural Ecology

Having analysed the data across the three contexts, the collective analysis aids in understanding the cultural ecology of the village. That is, the analysis assists in understanding the context to indicate the specific issues that directly affect the beneficiary and their brief for a construction. The analysis of the environmental, social, and economic factors needs to be considered before moving forward with planning and design of the project. At this stage, a SWOT (acronym for Strengths, Weaknesses, Opportunities and Threats) analysis is helpful in underlining the strengths, weaknesses, opportunities, and threats to the context with regards to proposing a new construction or a renovation for the project.

The result of the site analysis is used in the next stage as the site context and preliminary analysis by the architect and engineer to understand the architectural evolution and construction trend. It will guide the design and construction suggestions made by the architect and engineer. As indicated, the activities of the case worker contribute to managing the data collection process and documentation while ensuring smooth cooperation among the team members and the community.

7.3.3. Planning and Design

Following the site analysis, a smaller scale of analysis is conducted to establish the housing trend that is practiced in the village. As demonstrated in Section 7.2.2 and Figure 7-5, this stage involves an architect and an engineer in prominent active roles while the case worker maintains a reduced supervisory role. Their aim is to establish the evolution of architecture from the

traditional to the current practice of building houses with contemporary layouts and construction methods based on the changing cultural ecology around the village.

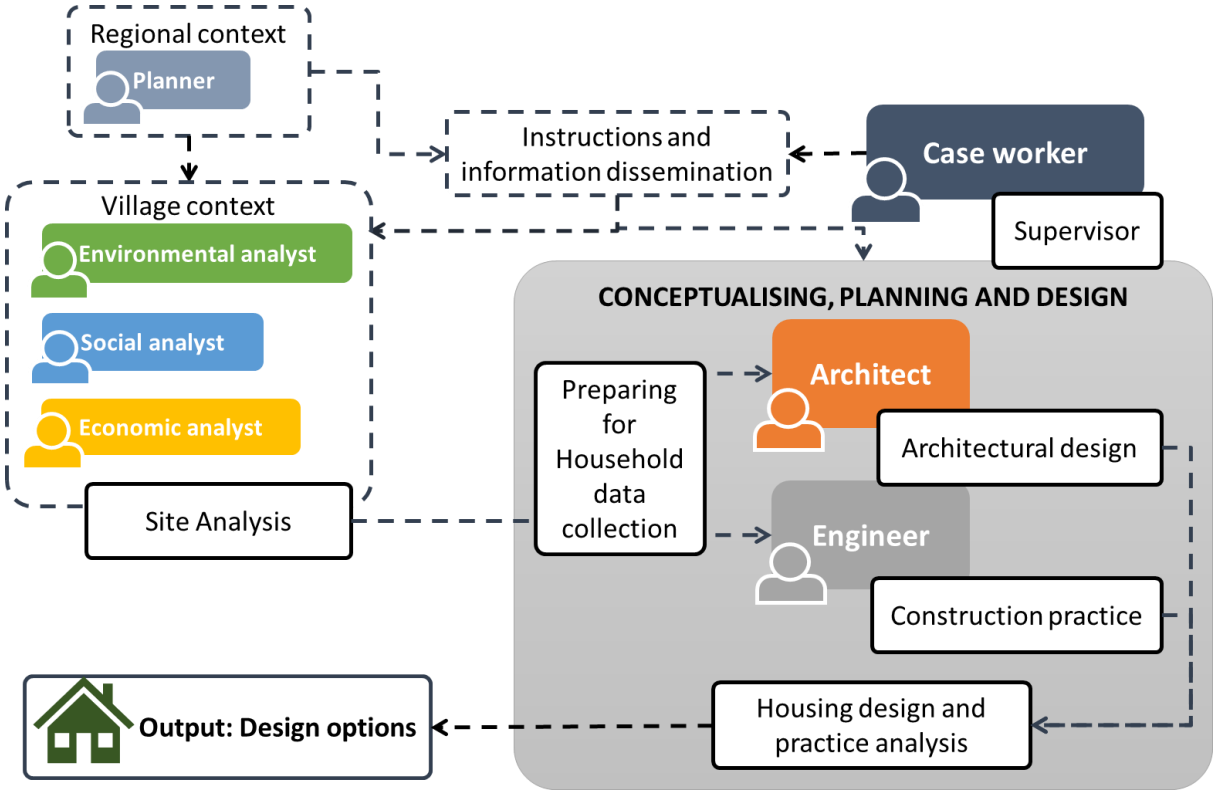


Figure 7-9 Housing typologies, Phase 2, stage 3: Conceptualising, planning and design.

Figure 7-9 is the description and explanation of the behaviour settings that is to be established by the activities of the practice roles in this stage. The rural cultural ecology is provided in the previous stage as part of establishing the contextualised site data that enables the architect and engineer to conduct their in-depth analysis of the behaviour settings in the village. At this stage, the housing trends is defined in the basis of the architectural evolution and the construction trends available in the village as well as the towns and urban centres in the region or district.

Tools and Techniques: Transect Walk and Household Interviews

At this stage, various other methods may be adopted including the selection of typical, yet diverse representative household cases as discussed in Section 3.2.2., to analyse and identify the elements in design and construction that have been changed or maintained. As explained in Section 7.3.2., the case selection criteria and process must be contextualised to the data gathered based on the requirement for the project proposal. Based on research in Chapters 3 and 5, household interviews and a projective technique can be used to understand the individual perception of housing and construction in relation to the past, present and future houses as described by the homeowner and their opinion as to what aids decision making for a new construction. A transect walk can be conducted by the architect and engineer to revise and physically familiarise the team with the analysis and results of the ‘site analysis’ stage.

Architectural Evolution

The architect’s expertise and training are required to conduct a spatial analysis of the houses that are selected through as the typical and diverse representative cases. It is the architect’s responsibility to address the architectural changes that have been the result of environmental,

social, and economic changes in the context. As demonstrated in the conclusion of Chapter 5, the design and layout of the house evolves over time due to social norms and practice, the climatic response and the materials and skills available.

Based on the environmental, social, and economic context provided by the site analysis, the change in architectural practice is to be analysed along the same factors existing on the community level as well as the family. As discussed in Chapter 6, differing family sizes and structure, socio-economic status, education, and employment qualifications are among the few factors that differentiate the house layout based on the personal needs of a family. The data analysis from the questionnaire survey along with the household interviews aid in understanding the setting due to which the 'environment' is uniquely designed to suit the family.

Construction Trends

The engineer's knowledge of structural sciences and construction methods and techniques with building a house aids to understand the feasibility of constructing a structure using local versus non-local materials. The questionnaire survey and the household interviews aid in defining the traditional methods of construction using local materials as well as the existing construction methods using a mixture of local and non-local materials, and whether skilled labour has to be hired for the specific construction.

Ironically as observed in discussion of Chapter 6, the analysis of the houses and the construction styles being followed in the village indicates the aesthetic and social aspiration. However, it was also noted that the construction skill in the village were below expectations. This kind of context allows the engineer to explore construction design based on the skills and materials available locally while lending the aesthetic of an urban-influenced construction.

Design and Construction Options

Based on the site analysis and their own personal data collection the architect needs to gauge the evolution of architecture and the trajectory of the evolution in the given context of the cultural ecology, while the engineer has to do the same but with construction methods, skills, and materials. Use of non-local skill and materials increases the cost of construction while decreasing the floor area and flexibility of the construction. As a result of their complete analysis, the duo can produce a list of design options according to the brief of the proposal, which differ in design, construction and thereby in cost.

The architect's analysis of the household and the architectural evolution outlines the possible architectural options, while the engineer's analysis of the construction trends aids in providing various options of construction with different materials employing different skills and costing accordingly. Their collaborative effort at designing for the proposal allows design options varying from vernacular to contemporary allowing a flexibility in choice and decision making by the beneficiary in the next stage. Environmental, social, and economic information can also be incorporated as factors to aid in decision-making for the beneficiary.

Similar to the household level analysis explain in Section 3.1.4., the site analysis of the existing context surrounding the households under observation aid in understanding the behaviour settings of the unique representative households. This further aids in understanding the physical and architectural expression of socio-cultural expression through the changes in the housing typology.

Design Translation and Aid

In this whole process, the case worker continues to maintain a reduced supervisory role who manages the data collection process and documentation while ensuring smooth cooperation among the team members and communication with the families. For this purpose, the role of the case worker needs to possess equal knowledge of architecture and engineering to aid in translating the design options to the beneficiary without partiality towards either approach to design.

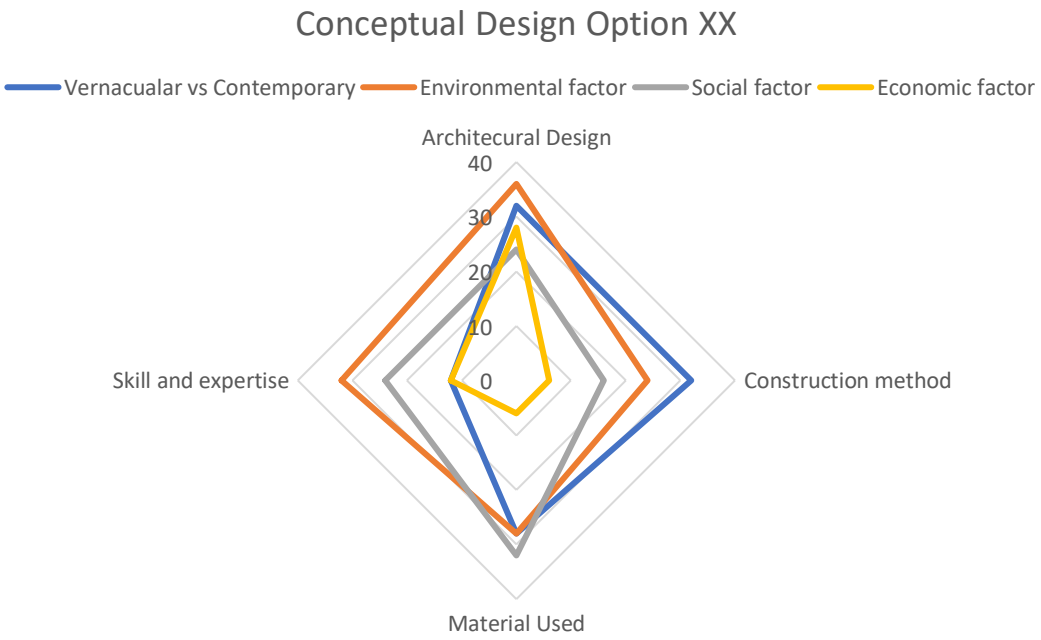


Figure 7-10 Radar chart representation of a conceptual design option XX

Figure 7-10 represents a conceptual design option that can be evaluated by the architect and engineer duo based on the housing typology, environmental friendliness, social acceptance, and economic viability. Though designs are evaluated based on the economic value (as seen in IAY and PMGAY outcomes in Section 2.2.2), research in Chapter 5 has shown that environmental and social factors also play a role in influencing decisions regarding future house changes. This degree of information provided for the beneficiary will ensure a housing project outcome that is truly a user-oriented bottom-up approach of rural housing in a Smart village.

If the options selected by the beneficiary is one that requires external procurement of skill and materials, the case worker may continue to work with the beneficiary to aid in completing the project. However, the activities and functions beyond the Information Framework falls within the third phase of the construction life cycle which is beyond the defined scope of the research. Hence, the stages beyond the Information Framework are not discussed here and similarly not represented in the expected timeline proposed in the next section.

7.3.4. Expected Timeline of Phase 2

All of phase 2 focusses on gathering as much information as possible to produce design options that include the choice of architectural layout, construction material, construction skill and construction method. This can range from vernacular to contemporary solutions which the

beneficiary is free to choose from based on their personal reasons (environmental, social, economic, or all three). A hypothetical outcome has been represented in figure 7-10 in Section 7.3.3. indicating the range of designs that can be produced and evaluated based on the typology, environmental friendliness, social acceptance, and economic viability. As explained in Section 7.2.2, there is no decision-making process in the Information framework as it is part of the third phase of the housing project.

Based on the five months of field research conducted between September 2018 and February 2019 across the four village cases in the sixth-schedule areas Assam, India, an expected timeline for execution of each stage within the Information Framework is suggested in Figure 7-11. Based on research in Chapters 3, 4 and 5, the discussions of Section 7.2.2 and illustrations of Figure 7-5, the timeline demonstrates a sequential process starting from outlining the proposal with the planner based on information given by the beneficiary, to the presentation and collation of the design options that are an outcome of the Information Framework. The expected timeline discussed below does not include the roles, activities and durations required to execute the completion of the housing project which are part of the third phase, since they are beyond the scope of the research. Therefore, the effect on the actual timeline of the complete construction life cycle is not discussed.

The black lines indicate minimum time required for the process completion which is the ideal timeline for executing the second phase of the construction life cycle. It considers the minimum duration required to complete a task as shown below. Based on research in Chapters 3, 4 and 5, it is the most ideal duration for executing the Information Framework presented in this chapter, which is around 3-4 weeks since the start of the process.

The blue lines indicate the extra time required to complete a task; it further indicates the possible time extension required to complete the second phase of the housing project. The actual time used for completing each task is based on the size of the village, size of community population, missing/provided data from the rural and regional departments, access to site and access to participants according to the time of the day/season. In some cases, the pre-existing information on the communities based on their history and culture contributes to the depth of information required for the social context of the site analysis, affecting the duration of the data collection period.

The red lines indicate the total time required for completing a task therefore indicating the maximum time required to execute the second phase of the housing project. A delay in any of the tasks within the information framework will lead to delay in the process, however, the red line takes into consideration the delays that can occur within the phase. These delays can happen due to lack of regional data being produced which affects the start date for the site analysis stage as well as affect the methodology to be followed in the second and third stage of the phase. The methodology may include more work to be done by the teams to fill in the missing information in the village context and household data.

Figure 7-11 Expected activity timeline of the Information Framework

The sequential process discussed in Sections 7.3.1., 7.3.2. and 7.3.3. is reflected in the process dependent activity timeline discussed and shown in Figure 7-11. Based on the discussions on the of the activities and the duration to complete the stages of the second phase of the revised construction life cycle, the functions of the key roles are summarised and tabulated in the next section.

7.3.5. Concept Model of the Information Framework

Until this point, the Information framework has been discussed according to the stages involved in Sections 7.3.1., 7.3.2. and 7.3.3., and the expected duration required for executing the stages in Section 7.3.4. However, this Section realigns the approach to explain the full expectations from the key roles involved in the Information Framework by incorporating the suggested tools and techniques mentioned previously in Sections 7.3.1., 7.3.2. and 7.3.3. Having discussed the activities and roles of the various practice roles within the stages of the second phase, and the expected timeline for executing the Information Framework in the previous Sections, a conceptual model of the Information Framework is compiled in Table 7-1.

Table 7-1 Concept model of the Information Framework

KEY ROLES	FUNCTIONS	EXPECTED DURATION	NOTES
CASE WORKER - using fact finding and semi participatory observation	Managing the brief and resources Managing the data collection process and data storage. Managing communications with the community on behalf of the analysts. Managing communications with the families on behalf of the architect and engineer. Relationship building	Full time *4- 10 weeks within the context of Phase 2	Prominent roles in the support and resources stage, reduced role in site analysis and planning and design stage
PLANNER - Archival data and GIS	Gathering the archival and census data Outlining the development plan of the region Defining scope and limitations of work for other practice roles	1 – 2.5 weeks	Prominent role in support and resources stage, inactive in others
ENVIRONMENTAL ANALYST – using Transect mapping, focus group discussion	Defining the physical landscape and topography Defining available local and indigenous resources Defining the changes in existing biodiversity and environment. Defining the change in lifestyle based on environment related issues such as irregular rainfall, extended drought, soil quality, irregular temperature, etc. Identifying issues (practices or activities) that are environmentally harmful. Environmental SWOT analysis Collective causal analysis of the data and results	1.5 - 4 weeks	Reduced role in support and resources stage Prominent role in site analysis stage Inactive in planning and design stage
SOCIAL ANALYST - Using transect mapping, focus group discussion and questionnaire survey	Defining the social engagement and continued practice of traditional social practices. Defining the degree of multi-culturism and urbanization Relation of traditional practice with history and the physical environment. Understanding the value system defined by gender, age, familiarity and talent, and social hierarchy. Social SWOT analysis Collective causal analysis of the data and results	1.5 - 4 weeks	Reduced role in support and resources stage Prominent role in site analysis stage Inactive in planning and design stage
ECONOMIC ANALYST - using focus group discussion and questionnaire survey	Defining the employment, income, and livelihood practices Agriculture and trade opportunities Socio-economic strengths of the community and families. Feasibility of using non-local over local materials and skills for housing labour, and vice versa. Suggest modes of income and financial support to fund the construction. Economic SWOT analysis Collective causal analysis of the data and results	1.5 - 4 weeks	Reduced role in support and resources stage Prominent role in site analysis stage Inactive in planning and design stage
ARCHITECT - using a transect walk, data from the site analysis and questionnaire survey, and a household interview	Familiarise with the data and site analysis through a transect walk. Observe different architectural elements of design being used. Spatial analysis of house layouts, house compound, zoning of spaces based on activity. Bio-climatic response through architectural design Response to multiculturism and urbanisation through architectural design Architectural analysis based on orientation, form, segregation, layout, and design based on space, function, and user. Changes to architecture through construction skill and material. Architectural SWOT analysis Design suggestion based on architectural evolution and SWOT analysis	2 -5.5 weeks *excluding the dormant period during the Site analysis.	Reduced role in support and resources stage Inactive in site analysis stage Prominent role in planning and design stage
ENGINEER - using a transect walk, data from the site analysis and questionnaire survey, and a household interview	Familiarise with the data and site analysis through a transect walk. Observe the materials and skill available. Identifying the vernacular methods and techniques of construction using local skill and materials Identifying the non-local and hired methods and techniques of construction using local and non-local skill and materials. Bioclimatic response through construction material Response to multi-culturism and urbanisation through construction material and skill. Construction SWOT analysis Construction suggestion based on available construction trends and SWOT analysis	2 -5.5 weeks *excluding the dormant period during the Site analysis	Reduced role in support and resources stage Inactive in site analysis stage Prominent role in planning and design stage

The first column lists the key roles in the Information Framework, along with the suggested tools and techniques for data collection that they could use to complete the functions assigned to them within the framework. The second column lists their respective functions within the Information Framework detailed according to the activities required by them. The third column depicts the expected duration of the activities being undertaken by various roles in the rural house construction process based on the expected activity timeline in Figure 7-11. The last column notes the varied degree of involvement in function and activity by the key roles.

The stages discussed as part of the project timeline that encompasses the framework do not involve the beneficiary directly. It focusses heavily on the knowledge and expertise of the external stakeholders involved in the three stages discussed. The framework intends to restrict the interaction between beneficiary and external stakeholders to minimize the influence of external pressure on the decision made by the beneficiary in the following stage of the project timeline. The activities and the significance of the practice roles is determined by the requirement of the project at the stage. While the other key roles have either one or two stages of activity, the caseworker is present in all three stages of the Information Framework.

Having clearly designated stages and functions for stakeholder contribution and involvement, reduces the friction that may be experienced in working alongside professions that appear distant from one another due to their focus of their professional practice. Having a caseworker that maintains the data analysis and the interpretations of the framework results ensures smooth interactions among the key roles. The caseworker aids in translating the technical jargon into much simpler language that is understood by the beneficiary for the decision making, execution and completion stages.

The processes of the Framework produce a data base of information regarding community specific nuances that are probable to repeat and be the same in another village of the same ethnic community, however, the physical context and economic context of the village influences the social context that can result in a different causal process in the rural cultural ecology of other villages. Similarly, the trajectory of architectural evolution and construction trends may contain resemblances across villages, however, the different causal processes in the rural cultural ecology can indicate differences in value of spaces and layout and construction methods. Conceptual similarities may be borrowed from previous applications of the Framework however the planning and design for each proposal will be different. Hence, despite the presence of a data base, the Framework must be repeated with each new beneficiary and brief to maintain the attention to detail in responding to a need established by the proposal. However, based on the information already available in the data base, the degree to which the Framework is repeated is determined during the stage of establishing support and resources for the proposal. This Framework will guarantee the beneficiary with access to information and the best viable suggestions that are suitable to be built according to their need.

In the case of a vernacular option using local material and skill, the constructability of the option is reliant on the time and opportunity of the beneficiary as vernacular construction practice is a community tradition and activity. However, in the case of a non-vernacular choice, many factors come into play that affect the constructability of the option chosen. Labour skill and costs, material availability, equipment availability, procurement, usability and cost, time constraints for the stages of construction involving non-local materials differ from vernacular construction. How to ensure that the option chosen is actually built? In this case, the role of the case worker increases as the beneficiary’s knowledge about constructability will not be

adequate to have the chosen option executed to completion. These are few of the considerations that need to be looked at when assisting in a non-vernacular construction.

7.4. Implications of the Information Framework

The implications of the Information Framework have been discussed in three different approaches: the methodology, its process, and its application. As demonstrated in Section 7.1, the structure of the Framework is based on the methodology designed by the research. As discussed in Chapter 3, the methodology is based on the overlapping and related areas in the field of culture and architecture. The understanding of culture through a cultural ecology as highlighted by Steward (1972) and architecture through critical regionalism as highlighted by Tzoni and Lefaivre (1990) signifies the niche concepts that incorporated within a multidisciplinary domain of environment-behaviour studies (Rapoport, 2008). The theory of cultural ecology and the behaviour settings by Barker (1968); Schoggen (1989) aided to further structure the activities and functions of the practice roles in the Framework. Adapting from the approach of the theoretical research framework, a conceptual framework was developed that established the significant roles of architecture and culture in a housing construction project in the rural context.

The revised construction life cycle provided the context of the framework according to the processes and various stages involved in initialising to completion of a project. As demonstrated in Section 7.2, the revised construction life cycle was segregated into three phases incorporating the Information Framework as the second phase. The three phases were further segregated into eight stages based on stakeholders involved, role and function, activities, and their potential contribution to the project completion. Based on the methods employed in the research design in Chapter 3, various stages relevant to the framework were divided into preparation, contextual study, and main study. These stages indicate the involvement of the key roles associated with the scope of work in site analysis. Equal emphasis is given in environmental, social and economic contexts for a clear understanding the rural cultural ecology (Steward, 1972). As asserted by Steward (1972), the planning and design in the context of rural culture associated with the site depicts the underlying vernacular architecture and methods, materials, and skills of construction processes in practice within the villages.

The process is clearly outlined to separate the interaction between the practice roles and the beneficiary to reduce the external stakeholder pressure that can arise from interacting with a person of a specialised perspective on the approach to housing and construction. Having applied the Framework, the implications can be viewed from a dual perspective. First, it enhances the involvement and practices of relevant stakeholders in the context of rural housing development; and second, it potentially streamlines the evolutionary process of rural housing over the lifecycle of the project.

The Framework works towards improving awareness of the factors that influence housing, including the key roles, functions, and the expertise that they contribute to a construction project. This application of the Information Framework ensures employment opportunities of different practices to contribute towards the development of housing in the rural context. It necessitates collaborative work among the practice roles which promotes the cooperation among the different fields and backgrounds in practice as well as education. Unlike the usual practice of having the responsibility of brainstorming a housing solution on an engineer which

can lead to neglect in the social and environmental values which translates to neglect of architectural space, this framework introduces a way to work around the imbalanced focus to construction choices made on the basis of finance and economy. This framework incorporates the value of social and environmental importance through architectural innovation and cooperative work among the practice roles.

This framework aids in strategizing the approach towards housing in the rural context. Without a structured framework contextualised to the construction process, the housing development is haphazard. This creates an opportunity to evolve the perspective of the construction industry as an accessible service, with standardised housing and construction guidelines. This aid to further recognise the differences in architecture and construction of rural housing through a contextualised lens, rather than follow a popular trend that is unsuitable to the socio-economic and socio-cultural context of the families. The framework clearly designates the scope of work to be executed and responsibilities of the practice roles that promotes a cooperative working strategy.

In combination of the twofold implication of the framework in the practicing field, the research encourages the education system and academia to evolve the body of knowledge regarding the literature that creates the foundation for such working strategies. This result calls back to the focus and aim of environment-behaviour studies by Rapoport (1969, 1990b) whose intention was to have a platform that brought practitioners, professionals and academics from different backgrounds having different body of knowledge working together to propose effective forms of shelter. Simultaneously, the framework utilises the strengths of ethno-architecture by Toffin (1994) to demonstrate the use of ethnographic methods to conduct architectural research for understanding housing typology and construction practice in rural context. This framework is an idealised conceptual model of applying the different bodies of knowledge across the spectrum of practice and academia contributing to housing and construction. In conclusion, it brings contrasting opinions on housing and construction together in a collaborative framework to produce housing solutions that are inspired by vernacular practice that is a natural and organic reaction to the available resources.

7.5. Chapter Summary

To summarise, this chapter answers the main research question of the thesis:

What are the recommendations to inform a user-oriented bottom-up approach for a rural housing scheme?

This chapter discussed the output of the research which is the result of analysing the results and discussions of the data analysis. This led to the suggestion of incorporating an information framework within a construction life cycle project contextualised to rural housing. The focus of this chapter was to define an information framework based on the research conducted in Chapters 3, 4, 5 and 6, to develop a user-oriented bottom-up approach to housing in the rural context.

Based on the causal analysis conducted in Chapter 6, an information gap was established between the initiation stage and planning stage of the construction life cycle illustrated by Mastropasqua (2019) in Section 7.1. The conclusions of the analysis indicated the components that were to be incorporated into the information gap. Based on the research in Chapters 3, 4

and 5, and the causal inferences in Chapter 6, conceptual structure of an information framework was developed.

This led to a revision of the construction life cycle that included the information framework as the phase between the initiation and the completion of the housing project in Section 7.2. Contextualised to the process of executing a rural housing scheme, the Information Framework developed based on the knowledge and expertise offered by key consultatory roles of planners, environmental analysts, social analysts, economic analysts, architects, and engineers. This led to a three-phase project timeline oriented around the proposal, defining the context, and executing the housing project. Further revision of the construction life cycle led to the development of an eight-stage process based on the activities of the key roles of the beneficiary, consultatory roles and the case worker who is also the supervisor of the project and the varying degree of their involvement in the process. The approach to housing was contextualised in the rural context which clearly designated the central position to the beneficiary while maintaining the remaining key roles as supporting consultants.

As discussed, the second phase of the housing project which defined the context of the housing project was detailed as the Information Framework discussed in Section 7.3. Each of the stages within the Information Framework were discussed based on the key roles and activities involved. Based on research, an expected timeline was proposed to complete the tasks and activities within the second phase of the revised construction life cycle. Following that, a conceptual model was developed which described the scope of functions and activities of each key role within the second phase.

The implications of the Framework are discussed in Section 7.4, based on improving awareness of the role and functions of the stakeholders in a housing and construction project, and the evolution of a user/beneficiary-oriented housing in the rural context. Overall, the discussion indicates the need and significance of encouraging collaborative approach to building effective forms of shelter in professional as well as education of the practice.

In conclusion, the chapter recommends the incorporation of an information phase that establishes the context of the housing project and informs the decisions of the user/beneficiary according to the options available to them. The Information Framework brings together the different key roles that are relevant to the user-oriented bottom-up approach of a rural housing scheme. The introduction of the Information Framework goes on to revise the housing project timeline and re-orient the role of the beneficiary within the rural housing context. The next chapter is the conclusion of the research and a summary of the thesis.

Chapter 8. *Conclusion: Thesis Summary*

This is the final chapter of the thesis summarising and concluding the research that has been conducted over the course of the past three and a half years. This thesis is the end result of a research that, briefly put, addressed the gap in the approach towards overall rural community development through rural housing within the context of the Smart Assam Project, discussed in Chapter 2. This rural-urban gap was defined as the difference between urban perception of housing versus rural expectation of housing. This research established that there are gaps in professional practice and policymaking in the approach towards improving housing and services in rural areas due to a gap in literature.

The following sections will review the chapters of the thesis while outlining the significance of each based on the structure presented in Section 1.6. In effort to bridge the gap, both in research and practice, Section 8.1. discusses the outline of the thesis based on aims and objectives that guided the thesis and research questions aligning the aim set out in focus in Chapter 1. Section 8.2. highlights the literature review and background of the research papers and academic books on Smart villages, housing, culture, architecture, and overlapping areas that was established to define the niche area for the research in Chapter 2. Section 8.3. summarises the research methodology paying close attention to the theoretical framework, site profile, case selection and the two-phase research design specifically developed for the research in Chapter 3.

As a result of the data collected based on the two-phase research design, the data analysis Chapters 4 and 5 are separately discussed in Sections 8.4. and 8.5. respectively. A collective discussion of the analyses and findings that was presented in Chapter 6 is summarised in Section 8.6. The Information Framework outlined in Chapter 7 which is one of the key tangible outcomes of the research is discussed in Section 8.7. Section 8.8. highlights the contributions to the existing body of knowledge in terms of redefining professional practice as well as academic education in the related fields. Section 8.9. concludes the chapter.

8.1. Introducing the Research

This thesis set out to aid in bridging the rural urban gap in development and infrastructure through rural housing for Smart villages, which is defined as the Smarter way of approaching rural development. In response, an information framework was developed to ensure a user-oriented bottom-up approach to effectively implement rural housing scheme. As such, the first chapter of the thesis included defining the aims and objectives, scope, and limitations along with the introduction to focus on the research and the research questions.

This clearly indicated that perception of the global standards of housing may be acceptable to the community in a social setting, but it may not be culturally acceptable. Alternatively, what is socially acceptable may not be economic or environmentally responsible. It is the personal experience and habit of a person in their life that defines the liveability of a house, and hence, it is crucial to understand the occupants' opinion and decision-making process to propose a user-oriented bottom-up approach to the existing procedure of providing rural housing.

The research aimed at understanding the rural perspective of rural housing design and construction practice based on the evolution of architecture and the construction trends in the communities. Therefore, the objectives of the research were defined based on the relationship between the community and the built-environment, and the relevance of culture.

Rather than take up an economic point of view which is the usual practice of housing schemes as noted in Chapter 2, the research stressed more on the socio-economic, socio-cultural, and environmental aspects of the cultural ecology of the community. The main research question of the thesis focussed on the developing a set of recommendations that enabled an effective user-oriented bottom-up approach to implement rural housing schemes. It was further broken down to three sub research questions to effectively contribute to the recommendations to be developed for the thesis.

The first of the sub research questions was to understand the causal process within a cultural ecology that influences housing design and construction practice. The sub question itself was approached from the perspective of the causative context as well as the resultant effect of the causation which was discussed in Section 6.1. The second sub-question asked regarding the main causes within the cultural context that were highlighted and discussed in Section 6.2. Based on the discussion of the main causes of housing design and construction practice, the third sub-question addressed that gaps in the implementation process of the rural housing scheme discussed in Section 6.3. The simplified set of research questions aided in visualising the research as a combination of different disciplines that required to be brought together to appropriately address the main research question.

Accordingly, the aim, objectives, and research questions defined the thesis structure that was discussed in Section 1.6. The thesis structure represented a research road map based on the formation of a research foundation, designing a research methodology, conducting the field research, analysing the data from the field research, and deducing the meaning and value of the research. Hence, moving forward, the research foundation was defined by the literature review of the concept of Smart villages that enhanced rural development, the relevance of re-orienting the approach to rural housing, and the creation of a theoretical approach guided by a design-oriented as well as a culture-oriented research. These sections of literature review were tackled in Chapter 2 which is discussed in the next section.

8.2. Scope of Research

In Chapter 2, the literature review started with the background research into the rural-urban gap in development. This required defining rural within the context of the research to address the appropriate approach needed to advance rural development (Cloke, 2006; Gregory and Urry, 1985; Halfacree, 1993; Harvey, 1973; Hoggart & Buller, 1987; Smith, 1981, 2008). A summary of the five-year plans of India highlighted the population, migration and infrastructure as the main factors that affect. This led to the introduction to the concept of Smart villages that improves the approach to rural development through Smart rural housing, which is an integral component, by re-orienting it from the user's perspective (Department of Urban Development, 2015). It borrowed from the ideology of a Gram Swaraj (Gandhi, 1963), the initiatives of rural development and housing (Department of Rural Development, 2013, 2015; Ministry of Rural Development, 2018) and the concept of Smart cities (Department of Urban Development, 2015; Griffinger et al., 2007; IEEE, 2017a; Vswanadham, 2013).

The literature review introduced the Smart Villages Lab (SVL) which is a research project based on the premise of generating new ideas and devising solutions required for empowering rural communities with a particular focus in the state of Assam in India. The research of this thesis was developed as nested research within the SVL project. Housing being one of the key areas in Smart Villages context, the scope of this PhD research is one of the components for providing insights into the rural housing (Doloi, 2016). Through the review of its development, it indicated the need and significance of encouraging a research into ways of providing housing through the contextualisation of construction management, to the rural setting and approach housing from the users' point of view(Memmott & Keys, 2016; Rapoport, 1975; Stevens & Starkey, 2007). The literature indicated that housing is among

one of the most integral components that make up a Smart village along with infrastructure, facilities, services, institutions, road access and telecommunication connectivity and creating a healthy village environment (Lu & Qian, 2020).

The context of rural development streamlined the research to explore rural housing schemes in India, its implementation, culture as a crucial factor for social acceptability and enhancing the knowledge the concepts and theories of architecture defining current practices in housing (Donovan & Gkartzios, 2014; Gkartzios & Ziebarth, 2016; Katharpi et al., 2016). However, the rural housing policy seemed to be lacking in implementation due to the social and cultural ambiguity (Foley & Scott, 2014; Katharpi & Doloi, 2017; Tatum et al., 2017) and isolated treatment of housing aside from rural development (Gkartzios & Scott, 2010b, 2014). The diversity of the communities in Assam further necessitated social and cultural acceptability of rural housing approach and solutions.

This led to the next section of the chapter, which described culture as an iceberg that shows only a small portion of what it really is, while most of the elements and nuances that constitute a major part of culture in a community is generally unseen or required in depth learning and assimilation (Penstone, 2011b). Macdonald (1962) posited in his essays that the physical representation of culture is different based on the people, their resources and the value and meaning given to the article of cultural representation. Steward (1972) defined understanding culture as a product of community, interaction, and environment, in other words, a product of a cultural ecology. This asserted that culture changes and morphs overtime according to the environment, however there are a set of values that determine the outcome as the socio-cultural practice and habit of a community such as language, dressing, food, festivals, social etiquette etc. along with vernacular housing.

Giedion (1964) demonstrated the similarities and differences of the cultural values of a community by comparing the Ziggurats built by the Sumerian's and the Pyramids built by the Egyptians. And as such the literature demonstrated that the vernacular housing practices of communities evolve with time based on the housing and construction trends that is influenced by people, resources, and the evolving meaning of their values (Rapoport, 1969, 1975). This led to addressing architecture as part of the literature review to understand the environment of family unit culture and the village unit culture creating the cultural ecology in a rural setting.

Rapoport (2008) introduced a design- oriented research approach to understand architecture supported by sociology, psychology, anthropology, and other social sciences called environment-behaviour studies which is similar to ethno-architecture promoted by Toffin (1994). They both encourage the use of ethnographic tools to study architectural artefact, however, they contrast each other in that the latter is culture oriented. In other research, the term ethno-architecture has also been referred to as an architectural outcome of the influence of multicultural influence in towns and places that have a potential of higher degree of social integration and cultural assimilation by Memmott and Go-Sam (1999); Memmott and Keys (2016). In more recent research, ethno-architecture has been used to navigate a methodology for designing shelters that is informed by active community participation as demonstrated by Arboleda (2020).

However, the combination of the two research approaches of environment-behaviour studies and ethno-architecture led to the proposed area of research, 'ethno-architectural contextualisation', which in this research tried to incorporate the dual perspective of culture and design influencing rural housing. This aided to define a research gap that reaffirmed the need for this research that incorporated the social and cultural aspects of housing for a community in a rural setting, thus leading to the next chapter to design the methodology for the research.

8.3. Research Methodology and Data Collection

Based on the research gap defined in Chapter 2, a theoretical framework was developed that helped design the research methodology that incorporated ethnographic and architectural concepts in Section 3.1. This section revisits the theoretical framework that guided the approach to data collection and analysis through a multi-case study research; discusses the rationalisation of the case selection criteria; briefly reviews the instruments and templates used for preparing and executing the data collection process and summarises the process in which the methods and tools were used.

8.3.1. A Multi-case Study Research

To fill the research gap, the research methodology was defined on a pragmatic-contextualist approach that incorporated ethnographic ways to understand the causative context of housing design and construction practice (Annis, 1978; Creswell, 2009; Merriam, 2009b). The theory and application of the research methodology is expansively discussed in Chapter 3. The contextualist approach (Annis, 1978) applied for this research stated the significance of studying the cases in two scales: the village/community scale and the household/family unit scale. Hence, this encouraged the field research to be divided into two phases to study the context, which is the village/ community, to understand the focus, which is the household/family. The purpose of this research design structure was to establish the causative context of the village and the resultant effect of the house within the rural cultural ecology which was discussed in Chapter 6 and is later reviewed in Section 8.6.

The strategic approach of the methodology was defined by acknowledging the importance of understanding the cultural ecology, which indicated the need for a contextualist theory (Annis, 1978). It emphasizes the importance of the context around the focus area as the main topic itself. Similarly, the intention of developing a solution to the problem explained by the need and significance of the research required a pragmatic approach (Creswell, 2009; Merriam, 2009b). In keeping with the aim of the research, the theoretical framework formed a research design which intended towards a practical approach and outcome. The pragmatist approach of the research aided in recognising the scope and limitations of the topic while pushing towards a theory of how the cultural ecology functioned to further inform the user-oriented bottom-up approach of rural housing.

This led to selecting a Multi-case study research design as it enabled the research to look into the phenomenon of the evolution of housing within the cultural ecology of a rural setting (Gerring, 2004; Merriam, 2009b; Stake, 1995b; Yin, 1984, 1993, 2003, 2013, 2014). It served as the best approach for conducting a research to understand the family unit and village unit cultural ecologies of the four ethnically diverse tribes (Kuki, Karbi, Dimasa and Labang) studied in the thesis.

Due to the dual focus on the village unit as well as the family unit, the research methods required to be separated based on the scale of the foci. Meaning that the data collection process was broken into two phases to maintain a clear focus of research in each phase. The research design addressed the context before studying the core, thereby establishing a sequence of collecting data. The methodological approach of the multi-case study created a space for incorporating qualitative social research methods to collect data while keeping the architectural perspective for the analysis of the household cases. The methods of data collection were designed based on the scale and the type of data required for the research. The cultural mapping of the village cases aided in visualising, mapping and understanding the rural cultural ecology(Pillai, 2013), while behaviour settings aided in understanding the evolution of housing (Barker, 1968; Schoggen, 1989).

8.3.2. Case Selection and Criteria

Due to the ethnic diversity of the communities in Assam and the need of the research to develop a replicable research design, the cases were selected to represent both diverse case as well as typical cases (Gerring, 2009). This meant choosing different ethnic communities that represented a greater number of the total population living in the state. This led to selection of the Karbi community within the Karbi Anglong Autonomous State and a Dimasa community from the Dima Hasao autonomous district council that represented the majority in their respective autonomous region. The Kuki community was selected based on the next highest population representation that is common in both autonomous regions. The Labang community was selected to introduce further diversity as a representative of a matrilineal community while the previous cases were patriarchal. Limiting the village size, age of the settlement and selecting from a similar topography within Assam aided in narrowing the number of cases selected among all the villages belonging to each ethnic community.

The similar approach of selecting a representative case for the household interview was adopted through the use of a questionnaire survey data incorporated into the research design to aid in selecting the households for the second phase of data collection. The case selection was made based on the diversity of the kind of materials used and the typology of the house and the socio-economic status of the household. The typology of the house was scored based on points given to the sourcing and availability of the materials and the degree of modernity or vernacularity in design. The socio-economic status was decided based on the affluence indicated by the data collected. The affluence of each household was calculated based on the gross income along with livestock, working tools and other possessions that can potentially contribute to a higher income in the household.

The case selection criteria aimed at identifying at least five representative cases that indicated different degrees of affluence along with different housing typologies. As depicted by Figure 3-7, the plotting of the scores of each household was based on affluence versus house typology. The typicality of the household cases was maintained by the fact that the cases represented the similar typology of houses and socio-economic affluence across each village case. The diversity of the household cases was introduced by selecting the cases based on the housing design, materials use selections, number of rooms etc versus the affluence and income of the families in the rural context. However, due to the diversity in the rural cultural ecology of the village cases, there was more diversity incorporated into the household cases.

8.3.3. Data Collection Instruments and Execution

The research design was detailed extensively to aid in collecting data for analysis. A Human ethics application for social research was submitted to ensure protection of the participants and thinking through the process of how to elicit the answers needed in a way that was appropriate and considerate of the data collection process. The cultural mapping process included a transect walk to create a cartographic sketch of the village with attention to the physical landscape, landmarks, and resources to understand the physical and spatial context of the village (Pillai, 2013). Cartographic sketches are highly significant to understand the formation and growth of the village sprawl according to the physical elements and the topography recorded on the maps. It was an effective medium of visualising the village in a two-dimensional format to indicate causal process related to house location and orientation. It expanded the understanding of the context created around the individual houses based on the direction the sprawl grows and its location and orientation based on the pathways, agricultural lands, forests and plantations, and the water source.

It was followed by a focus group discussion that informed the research of the historical, socio-cultural, socio-political and socio-economic aspects of the village and the community furnished with the architectural details into the traditional house of the community (Gaver et al., 1999; Patton, 2002). It aided in understanding the relevant factors that influenced the perception and expectation of housing in the village. A questionnaire survey was conducted across the village case to inform the socio-economic status and housing conditions of the existing demography of the village (Gray, 2009).

The data collected from this exercise aided in selecting household cases for the behaviour settings (Barker, 1968). This helped to better understand the architectural concepts behind the development of their vernacular housing practices in the four different villages of Kuki, Karbi, Dimasa and Labang community living within the similar geophysical context in Assam. The mode of inquiry was through a list of semi-structured questions that explained the history of the family, the house, the factors that influenced their decisions while making changes to their living conditions. The interview also included questions on the daily routine of the occupants to gauge the value and functionality of the spaces within the house based on the spatial relationship analysis technique using the AEIOU framework (EthnoHub, 1997; Robinson, 2015).

In order to analyse the varied types and scales of data collected through cultural mapping and behaviour settings, NVivo was used to classify the data and conduct a content analysis followed by a cross-case analysis across the village cases. Figure 3-20 in Chapter 3 shows the schematic representation of the analytic framework. The AEIOU framework was used to collect data as well as conduct an analysis of the house layouts obtained from the projective inquiry process. The AEIOU was proven effective due to its capacity to arrange the information of each room or space in the house based on the functions, activities, objects use, quality of environment, accessibility to persons and the duration and frequency of use. The importance of certain spaces and function over others and their relevance due to their value and meaning in the house according to community-wise culture, were indicated through the comparative analysis of present house layouts with their past and future versions. This method aided in defining the evolution of spaces and functionality with each progressive layout along with the indication of the factors that caused the changes in each household.

This process of the data collection and analysis aided to visualise the evolution of housing as a phenomenon that was a result of the surrounding context. The data collection and analysis of the household cases aided to identify factors that influenced decision making and approach to housing in varying degrees according to the socio-cultural and socio-economic context.

It was in the initial stages where the causality within the cultural context of the village were intuitively indicated or in some cases, plainly stated in the household interview. Analytic induction was used to qualitatively analyse and validate the analysis through simultaneous causal explanations of the phenomenon of the evolution of housing due to its specific context (Vidich & Lyman, 2000; Znaniecki & Bierstedt, 1969). Figure 3-25 in Chapter 3 shows the schematic process of conducting analytic induction based on the NVivo data analysis. According to the foci of the two data collection phases, the village level data analysis was discussed in Chapter 4 and the household level data analysis was discussed in Chapter 5. A generalised discussion of the data analysis from the respective chapters were presented in Chapter 6.

8.4. Establishing Context: Village Scale Data Analysis

Due to the contextualist approach of the methodology it was necessary to understand the village in depth to establish the context of rural housing. According to the first phase of the research design of the methodology, the fourth chapter of the thesis focused on the village level data analyses from the

cultural mapping. As per the preparations made for the field work, four cases belonging to different ethnic communities (Kuki, Karbi, Dimasa and Labang) were selected for the multi-case study. The cases were analysed based on socio-economic, socio-cultural, environmental, and physical contexts of the village. The design and layout of the traditional house of each case was also included to understand the historical and cultural context of housing.

Each case was presented and analysed individually based on the content of the data. With the aid of NVivo, a preliminary analysis of the data was conducted based on the cartographic sketch obtained from the transect walk. The analysis of the focus group discussion transcript indicated the varying attention given to different socio-cultural and socio-economic factors based on the participants' responses. The analysis of the traditional house layouts indicated the factors that defined the vernacular practice of housing and construction in the past. This gave an indication of the possible contextual factors that influenced the growth of the settlement and the evolution of the cultural ecology of the case since the establishment. NVivo qualitative software analysis was used to visualise the various elements in the village and their inter-linked relations and to affirm the intuitive indications of the data analysis through the text search query results. A cross-case analysis of the data in NVivo informed the significant element and their links that were common across the cases and the highlighted the issues that were crucial to the cultural ecology of the cases. Appendix B lists the various figures showing the text search query results that were obtained from NVivo that aided in affirming the significance of an element and the interconnected links that factored in forming the rural cultural ecology and influencing the evolution of architecture.

The process of content presentation of the cases, content analysis and cross case analysis aided in developing an understanding of the cultural ecology that defined cultural and social acceptability. The analyses formed the context that defined and influenced of perception and feasibility of global standards of housing, thereby coming closer to answering the first, second and third sub research questions of the thesis. The next chapter followed a similar process of data analysis however with a different focus which is the evolution of architecture.

8.5. Evolution of Housing: Household Scale Data Analysis

According to the second phase of the research methodology, Chapter 5 of the thesis focussed on the evolution of housing and construction in the rural cultural context addressed in Chapter 4. This entailed tracking the changes to the houses in design, construction, and structure from the traditional typology to the currently occupied typology or the future aspirational house typology. The cases were analysed based on the data collected through the projective inquiry technique along with the AEIOU framework.

The chapter started with household case selection results of the questionnaire survey conducted between the first and second phase of data collection. The initial plan was to select five households based on the consent and the typicality and diversity of the household units. The data was collected from eighteen households; five each from Kuki, Karbi and Dimasa, while only three cases consented to the data collection in Labang. However, due to the brevity of the thesis only eight, that is, two from each village case, were presented and discussed for the analysis while the other cases have been recorded in the appendix C. The cases were selected based on the extreme quality of content being represented relevant to housing typology and evolution. As a result, KuH02, KuH11, KaH02, KaH32, DiH04, DiH07, LaH14 and LaH19 were discussed and analysed.

Content analysis of each case was conducted by presenting a narrative of the information gathered from the household level interview and contextual data based on the immediate surroundings of the house and its layout with respect to the village sprawl and formation gathered from the village level

data analysis. The analysis of the household context, and the layouts of the houses that the household had lived in, indicated the trajectory of the housing evolution and the reasons for their housing choices. This was done by analysing the content of the textual data of the household interviews and the house layouts using the AEIOU framework as shown in Table 5-4 to Table 5-18 in Chapter 5. The house layout of each case was analysed using the framework informing the architectural design based on activity, environment, accessibility, level of interaction, objects and furniture required in the room and the users. This aided in understanding the architecture of the house based on the space created, function and purpose of the space and the persons involved. The comparisons of the present layouts to the past and future layouts aided in understanding the changes to the spaces and their functions by noting the changes in the layout overtime. This indicated the value system within the vernacular house design that had been preserved from the traditional layout to the modified layouts based on spaces and functions that resembled the traditional layout of houses.

It was asserted that the changes in the layouts of the houses and the usage and maintenance of the traditional elements within the houses were being caused by the factors outside of the household, reaffirming the validity of using a contextualist theory for the research. The conclusions of the chapter were based on the cross-case analytic discussion of the changes in the layouts of the house and how much of the traditional elements were being maintained. This discussion also highlighted the socio-cultural, socio-economic, and environmental factors in the context of the village and household that influenced the housing evolution, thereby, aiding to converge on the answers to the fourth sub-research question while refining the analyses assumptions of Chapter 4.

The household level analysis indicated the links between the cultural ecology, the existing influences of perception and feasibility and refined the analyses to high light the factors such as government involvement and role of construction. These factors were mentioned in the village level analysis; however, the importance of these factors was highlighted in the household analyses of KaH02 and DiH07, discussed in Section 5.3.1 and Section 5.4.2 of Chapter 5, respectively. The two cases highlighted the need for better communication and resources to be provided by the government support schemes, thus redefining their approach to housing and development of the village. The importance of the role of construction was identified by the fact that both houses were built by the beneficiary themselves and this allowed them more flexibility and responsibility to decide as per their needs. These highlighted factors were discussed in Chapter 6 which responded to the sub research questions posed in Chapter 1.

8.6. Research Findings and Contributions to the Body of Knowledge

This section answered the sub-questions of the research. Following the content analysis and cross case analysis of the data collected from the village level and the household level, Chapter 6 focused on refining the results of the analysis conducted in the previous two chapters. The chapter was presented according to the answers to the sub-research questions asked in Section 1.5.

8.6.1. Contextualism, Cultural Ecology and Ethno-architectural Contextualism

The result of the reiterative process of analysis focussing on the causality within the regional, community and household contexts depicted that the nature of the rural cultural ecology is responsible for the phenomenon of the evolution of housing, which answered the first sub-research question. The causality focussed on the first part of the first sub-research question by discussing ‘the causative context’ which is the rural cultural ecology, and on the second first part of the first sub-research

question by discussing ‘resultant effect’ as the departure from traditional architecture and therefore, the evolution of housing.

The research showed that the rural cultural ecology is highly significant as it presents the context. True to the theory of contextualism (Annis, 1978), cultural ecology (Steward, 1972), environment-behaviour studies (Rapoport, 1968, 1969) and ethno-architecture (Toffin, 1994), the research indicated the levels of context and factors within the cultural ecology that are interlinked and responsible for changes in housing in the rural context. Within the rural cultural context, there were four levels of influence that factored as the cause for evolution of housing as discussed in Chapter 6.

First, the topography of the place established the formation of the village sprawl and the drainage pattern, and thereby, defining the location selection and orientation of the houses. The topography also affects the accessibility to village hence affecting the materials, skills and multiculturism effects that influence housing. Second, the biodiversity of the place determines the important resources for the livelihood of the community, and hence, draws attention to some elements of the biodiversity more than others. The topography of the place allows a specific kind of biodiversity to thrive within the region creating a unique environment. Along with the biodiversity of the place, the topography affects the microclimate which in turn affects the bioclimatic considerations and its response in housing regarding creating a comfortable accommodation. This leads to development of agricultural practice, festivals, economic practices, religion etc, which in turn define the value system of the socio-cultural practices of the community. This results in developing a specific form and layout which responds to the value and meaning given to a space and functionality of the space. Third, the rural cultural ecology affects the socio-economic and the socio-political aspects of the community based on its multiculturism prospects. The multiculturism prospects, affected by the accessibility and connectivity of the community with the outside world determined by topography, influence the socio-economic opportunities for better education, employment, and trade while the socio-political opportunities affect the access to basic amenities, facilities, and services such as banking, health care, schools and universities, electricity, telecommunication, and other forms of infrastructure. These opportunities and possibilities to improve living conditions in the rural context affect the perception of global housing standards and the effectiveness of importing the urbanized way of living. Fourth, the historical context of the community is a part of the rural cultural ecology which hold the origins of the value system and the significance of the socio-cultural practices and traditions.

In conclusion, along with the discussion of the four levels of influence, the rural cultural ecology is responsible for defining the trajectory and degree of evolution of housing. The accessibility and connectivity to the village determine the opportunities and possibilities to improve living conditions in the rural context which affect the perception of global housing standards and the effectiveness of importing the urbanised way of living. The socio-cultural practices shaped by the environment results in developing a specific form and layout which responds to the value and meaning given to a space and functionality of the space. The socio-economic and socio-political context affects the materials and skills locally available to the community to build resilient houses that suit their needs according to their socio-cultural practices in agriculture, religion, and family structure. The historical context ensures to maintain spaces and functions within a house that are relevant to the socio-culturally identified housing.

8.6.2. The Main Causes Influencing Evolutions of Architecture and Construction Trends in the Rural Context

Through the discussion on causality within the rural cultural ecology, the main causes that influenced the evolution of housing was revealed which corresponded to the second sub-research question. The main causes were identified as 'multiculturalism and cultural assimilation', 'government intervention' and 'housing and construction industry'. They were highlighted as the significant factors that played a major role in defining the current trend of rural housing.

Multiculturalism and Cultural Assimilation

The general perspective on housing and exposure to urbanization addressed the degree of multiculturism and cultural assimilation of a community that is a result of the social integration of the communities with one another (Steward, 1958, 1972, 1986). They play a significant role in shaping the decisions that define the shelter and accommodation preferences of a person based on their degree of socio-cultural integration. That is, the influence other cultures and their perception regarding value and meaning given to space and functionality played a role in the evolution of housing. The degree of socio-cultural integration experienced by a community, a family or individual affected their perspectives on their own practiced culture. This was mostly seen in cases where a person having lived in a comparably urbanized community such as in a town or a city imports the industrial and postmodern concepts of architecture to the rural setting. The promoted outlook that 'urbanization is better' further persuaded the vernacular traditions of housing and construction to be incorporated with non-local methods, skills and designs that were found to be unsuitable to the context by the residents of KuH02.

Government Intervention

There was a clear link defined between government intervention and the influence of the evolution of housing. Since it is the aim of government initiatives to work towards development of both urban and rural settlements alike, the approach to fulfilling the aim can be erroneously perceived through the same lens. This perception error can lead to treating rural issues the same way as urban issues despite being very different cultural ecologies. This causal process further indicated the contribution of the government intervention to the gap between the urban perception versus rural expectation of housing. However, with reference to the cases KaH02 and DiH07, the discussion asserted the crucial role of government intervention in the form of rural housing schemes and financial support.

Housing and Construction Industry

The housing and construction industry were found to be an important part of shaping the evolution of housing based on the materials, skills and designs being promoted by the designers, equipment manufacturers, material procurers, and skilled craftsmen and labourers. The decisions for promoting a certain material, skill or design have been economically driven however, it has failed to incorporate environmental and social drivers to promote local alternatives of the same. A vernacular house that is normally self-built by the owner, has become a commercial product reducing the involvement and onus of the owner of the house. Hence, the role of the construction of the house was determined as another crucial factor in the evolution of housing in the rural context.

8.6.3. The Guidelines for Approaching Rural Housing

The causal discussion of the rural cultural ecology, societal influence, government intervention and housing and construction practice reaffirmed the significance of the user-based decision-making role

in the rural housing schemes. The user-based approach to rural development observed in the 'Barefoot College' in Tilonia (Roy, 1997) and the story behind the house built by DiH07 in Section 5.4.2 in Chapter 5 imply the possibility of having a user-oriented approach to rural housing projects.

Referring to the mainstream literature, the required guidelines for supporting the practice and encompassing the user-centric input parameters were not widely found, however, the need to reposition the role of the user is strongly advocated. Empirically validating the suggestion "let the users decide", the mandatory considerations for the beneficiary-oriented framework was listed which corresponded to the third sub-research question. However, the beneficiaries being the users of the houses require multi-dimensional inputs provided by various stakeholders to produce the context specific houses.

The answer to the third sub-research question broadly addressed the role of the beneficiary, the role of the stakeholders, and the significant attention to be given to the environmental, the social and the economic contexts, and transparent communication with the government and external stakeholders. With guidelines that promote higher degree of involvement by the government in understanding the need of the beneficiary and allowing the beneficiary to take command of the construction of their own house, it is proposed to the progress in culturally and socially contextualised liveable shelters that would contribute to greater rural development to a higher degree.

In conclusion, the causal analysis of the research in Chapter 6 presented the causal process within the rural context, defining the cause' and 'effect' which in turn revealed the main causal factors in the rural cultural ecology. This finally resulted in a list of recommendations for a user-oriented bottom-up approach of rural housing for smart villages. Further developing these conclusions of Chapter 6 led to answering the main research question of the thesis, which is summarised in the next section.

8.7. The Summary of the Framework

Considering the pragmatic approach of the research, the thesis was incomplete without a tangible form of outcome. Based on the brief guidelines outlined in the previous chapter an information framework was proposed. It incorporated the roles and functions of diverse professional and educational backgrounds to promote engagement and communication in the process of providing housing in rural areas.

Considering the recommendations suggested in Section 6.3, a review of the typical construction life cycle (Mastropasqua, 2019) indicated an information gap when contextualised to rural housing project. Research indicated the need to revise the construction life cycle to incorporate an information framework which re-oriented the key roles and their functions based on the information needed for developing housing project contextualised to the rural context. As shown in Figure 7-2, the information framework was developed based on the theoretical framework (see Figure 3-2) developed in Chapter 3 and the data collection and analysis process followed during the field research. It is supported by the theories of contextualism (Annis, 1978) bringing together cultural mapping (Pillai, 2013) for understanding the rural cultural ecology (Steward, 1972) and behaviour settings (Barker, 1968; Schoggen, 1989) for understanding the ethno-architectural evolution of housing (Rapoport, 1969, 2008; Toffin, 1994).

Based on the research conducted by the thesis, the revised construction life cycle was split into three phases where the second phase provided the structure for the information framework as shown in Figure 7-4. The proposed framework outlined the phases, functions and stakeholders involved in the building of a housing project in the rural context with the role of the house owner at the centre. In other words, the housing project is to be executed 'for' the beneficiary and 'by' the beneficiary of the rural

housing scheme employing the Framework with the aid of expert consultants. An expected timeline was presented to suggest the duration of the activities by key roles in the implementation of the Framework, as shown in Figure 7-11.

Aside from providing a housing solution for the rural community, the Framework serves two-other clearly outlined purposes that provide opportunities for analysts and practitioners to produce a research-based housing design and construction options for the house owner to choose from. Firstly, it provides a platform for multidisciplinary research and cooperative work among the consulting stakeholders improving awareness of the factors that influence rural housing. Secondly, it revises the project timeline and contextualises the housing project management to promote vernacular practice of architecture and construction.

The necessity to centralize and empower the users' role required reduction of external influence on perception of housing standards and its potential influence on decision making. This informed the Framework to be compartmentalized. The framework was split into three parts that reduced interactions between the beneficiary and the consultants; first: initialisation and proposal by the beneficiary, second: the conceptualisation, planning and design by the practice roles, and third: the decision making, execution and completion by the beneficiary. Delegating the responsibility of the execution and completion to the beneficiary designates them as a central and main stakeholder of the project while it allows the practice roles to execute their activities and functions of providing support as consultants.

According to the methodology developed by the research, the knowledge and expertise of the environmental, social, and economic analysts identify the cultural ecology of the village and thereby the context. Similarly, the knowledge and expertise of an architect and an engineer are assigned to identify the architectural evolution of houses and the construction trend in the village respectively, with the context in mind. The role of the planner and case worker is also assigned to ensure a contextualised approach to the on-site work of the practice roles. As such, the role of the beneficiary was simplified by reducing the initiation duties while increasing the responsibility of having the housing project built so that the onus and ownership of the house is clearly credited to the beneficiary. The collaborative roles and functions among the practice roles promoted and encouraged redefining the system of professional practice and education.

8.8. Contributions, Limitations, and Future Recommendations.

In closing, this thesis aimed to contribute to bridge the rural-urban developmental gap. It contributes to the existing body of knowledge and practice towards bridging the rural-urban gap discussed in Section 8.8.1. Along the journey of this PhD there were many limitations discussed in Section 8.8.2, which were circumvented in some cases, while in others, they point towards opportunities for future research discussed in Section 8.8.3.

8.8.1. Contributions

The contributions offered by this thesis are both academic-oriented and practice-oriented. They contribute to the redefinition of interdisciplinary and multidisciplinary research and development by proposing a dually aligned perspective of ethno-architectural contextualization. They were developed based on the theories of environment behaviour studies by Rapoport (2008) and ethno-architecture by Toffin (1994) that encourage the use of ethnographic tools for studying architectural artefacts. Notably the contributions of the thesis have been captured under four broad categories. The categories are

cultural evolution and development, architectural heritage and conservation, rural housing, and vernacular construction practices. The following section will discuss the details of the categories.

The theoretical framework and methodology developed by the thesis offers an option for theoretical replication that can support data collection in different rural contexts across the world. Unlike the methodology used in the top-down approach of Pahal (IIT Delhi et al., 2016), this research encourages a user-oriented bottom-up approach to produce socially and culturally acceptable rural housing solutions. The theoretical framework developed by the research is a contribution towards re-orienting the approach to rural housing and development research in socio-cultural foundational roots of the concept of environment-behaviour studies by Rapoport (2008) and ethno-architecture by Toffin (1994), which is developed based on the literature review on rural housing schemes, understanding culture through a cultural ecology and the contextualizing of architecture through critical regionalism (Lefaivre & Tzonis, 1981). As a research founded on the concepts of environment-behaviour studies and ethno-architecture, it provides empirical evidence encouraging the development of a theory that can be used to research and understand other cases and instances that fall within the subset of housing, cultural integration and contextualism. Furthermore, the resultant framework for enabling effective user-oriented housing solutions contributes towards revising policies that enable rural housing through development and infrastructure.

This research is a contribution to the fields of ethnographic and architectural research such as environment- behaviour studies by Rapoport (2008) and ethno-architecture by Toffin (1994). The concept of environment-behaviour studies was originally touted as a limitation due to its multidisciplinary roots however, the theories of contextualism (Annis, 1978), cultural ecology (Steward, 1972), critical regionalism (Lefaivre & Tzonis, 1981) and ethno-architecture (Toffin, 1994) aided in skirting the shortcomings of the conceptual perspective. Due to the specificity of the research itself, the definition of the theory of environment-behaviour studies is far from complete and inclusive of all other disciplines that it can cater to. In this regard the similar yet contrasting culture-oriented research of ethno-architecture aids in strengthening its interdisciplinary foundations. The position of the research between social sciences and architecture enables redefinition of the approach to rural housing for Smart villages, thereby contributing to the strategy and approach that can be adopted to refine literature and practical application in rural housing.

This PhD has been an opportunity to conduct an ethno-architectural multi-case study research on four ethnic groups. A study where the data is collected through ethnographical methods and analysed from the architectural perspective in four different socio-cultural contexts. It contributes towards the existing knowledge of each respective ethnic group from the perspective of vernacular architectural practice. There are few books written by colonial officers and missionaries (Edward, 1905; Endle, 1911; Stack & Lyall, 1908) on the studied ethnic groups as well as research by local historians and anthropologists (Haokip, 2013; Potowary, 2015; Teron, 2011, 2012), where the architectural documentation of traditional houses is found, however the existing vernacular practices of housing are not architecturally detailed. This research serves as additional documentation of the vernacular architecture that was traditionally practiced and how it has changed over time. It contributes to the history and knowledge recorded on the ethnic groups studied through this research.

This research draws obvious links between the socio-cultural contexts of the community and the success of rural housing schemes in Assam (Davidson et al., 2007; Gao, 2016; Khosla, 1983; McDuie-Ra et al., 2013; Tatum et al., 2017). It has reviewed the current practice and top-down approach of government interventions in rural development by taking the example of rural housing schemes ‘Indira Awaas Yojna (IAY)’ and ‘Pradhan Mantri Gramin Awaas Yojna (PMGAY)’ in India. In doing so, the

research has proposed a user-oriented bottom-up contextualist pragmatic approach. It stresses the importance of approaching the problem-solving endeavour from the user's perspective. Guided by the literature review and proven through the data analyses, the research endorses the importance of considering the socio-cultural practices and cultural values defined by the community in rural housing and development. The realignment of approach to rural housing policy contributes to promote the diversity practiced by the indigenous tribes of Assam as well as the rest of India. It adds to the recognition of the diverse tribes and their socio-cultural practices through vernacular architecture and construction.

The broad guidelines discussed in Chapter 6 and the framework outlined in Chapter 7 contribute to the redefinition of professional practice that is supported by research and analysis conducted by environmental anthropologists, social anthropologists, and economists. The framework marries the diversity of knowledge and expertise regarding the conceptualization, designing and planning of a house in the rural context. This adds to the need for developing a professional platform for multidisciplinary research and interdisciplinary development projects in the public as well as the private sector. It contributes towards research and policy development that enables multidisciplinary education for professionals interested in rural housing and development.

In contrast to the way rural housing and development is undertaken, as demonstrated in the Karbi and Kuki cases, the influence of the rural cultural ecology on the urban sector through the rural immigration can bring out other areas of research that contributes towards bridging the rural-urban gap.

8.8.2. Limitations

Ideally, a study of this nature may expand across many communities and houses for a holistic understanding of the multiculturalism and cultural assimilation of rural communities over time. The study location Assam is a place of over 115 officially recognized tribes where diverse culture is visible within varying degrees of socio-cultural integration. Before implementing an idealized framework proposed by the research, much work is needed to incorporate the environmental, socio-cultural, socio-economic, and socio-political variabilities across all these communities. However, the structure of the PhD is such that the time and resources provided did not allow inclusion of any more than the four village case studies investigated in the research. The geographical diversity provided by the topography, climate, people, and their socio-cultural practices across the region offers the opportunity for continued research into the understanding of the evolution of architecture in the region.

One of the possible outcomes of the research could have been to produce an output in the form of a creative work. The discussion on the departure from traditional architecture in Chapter 5 broadly outlines the principles that guide vernacular architecture which, along with the broad set of guidelines in Section 6.2, can aid in producing a generalized conceptual design layout for rural housing of the region. However, there are problems in undertaking that outcome. Firstly, the house, as mentioned will be a generalized outcome produced form the analysis of the four village cases, meaning it excludes at least 13 other tribes recognized living in the region. Secondly, the generalized output would have negated the aim to 'provide effective user-based' housing solutions. Pragmatically, each family's needs, expectations and interpretations of housing are not the same and hence the generalized design layout will fail. Thirdly, producing a generalized conceptual design layout is the approach taken by Pahal (IIT Delhi et al., 2016) which was argued to be unsuitable and ineffective solution, hence would be a counter-productive outcome of the research.

The ethical rules of the human research ethics of the university can be perceived as a limitation that restricted the level of participation in data collection, however, the restriction served as an opportunity to employ the technique of projective inquiry as a mode of data collection. This reduced the technical data of house in terms of actual dimensions of the house and its surroundings and the time needed to conduct a measured drawing exercise. The exercise allowed the participant to share data according to what they felt was significant in building a house. The template of interview questions aided in forming an idea of the functionality of the spaces within and outside of the house.

The inability to undertake a complete social ethnological approach was assumed to be short coming that hindered full indulgences into understanding the socio-cultural aspects of the research, however due to the position of the research as a subset of both social studies and architecture, it was easier to navigate through the shortcomings of the research and turn it into an advantage by focusing on the effects on architecture rather than the causes of change to architecture.

Along similar lines, the methodological approach undertaken in this research, the analysis leaned more towards the qualitative despite having conducted a questionnaire/ survey of the socioeconomics of the households and their houses in the villages. The quantitative data could have been used for statistical analysis, however, due to my epistemic belief along with my lack in knowledge of statistical analysis, I was apprehensive of learning something completely new on top of conducting a PhD research. Other reasons that persuaded me to conduct a qualitative-leaning analysis was the fact that the focus of the research involved culture and cultural perception which is not the most effectively explained through statistics.

8.8.3. Future Recommendations

Further study into evolution of housing by adopting and replicating this research is recommended to refine the body of knowledge. The methodology is quite detailed and inclusive of multiple contexts and issues due to the contextualist- pragmatic epistemic approach. This research can be used to study the rest of the 13 recognised ethnic communities across the sixth schedule areas of Assam to incorporate more criticality and nuanced understanding of the housing typology and evolution specific to its geophysical and socio-political context. Similarly, the research can be adopted to study evolution of housing in rural cultural ecologies in the different geophysical zones as carved out by the department of housing (see Figure 2-11) and arrive at generalised results that are indicative of the housing typology of the place.

As a next step the research can be refined by applying a different method of analysing the data, such as using experimental analysis to test the validity of the Framework. Alternatively, the broadly discussed guidelines that are the result of the analytic induction in Chapter 6 can be refined to experiment on the design of a vernacular inspired house that is contextualised and responsive to the current socio-cultural, socio-economic, and environmental contexts. The validity of the creative outcome would then be tested by the community to evaluate the shortcomings and depth of the guidelines in translating the value systems that dictate the architecture of vernacularly built houses. The significance of this approach is that it will test whether an architect or engineer can truly understand the socio-cultural aspects of housing and architecture and be true to the needs and expectations of the community over their own personal artistic intent.

The final conclusion of this thesis is that well designed projects that incorporate the strengths of environmentalists, socialists, economists, planners, architects, and engineers along with the aid of the government will produce a better response to the needs of the rural community. Each profession has

their own insights that contribute towards rural development. Environmentalists are able to bring in the strengths and opportunities of biodiversity while ensuring a healthy ecological system; socialists are needed to understand the differing perspective of housing, shelter and accommodation between providers and users; economists are able to calculate profits and financial opportunities through trade and commerce; planners can help to incorporate the strengths and opportunities of the community into planned projects; architects are needed to translate that need to spatial understanding of shelter; engineers are needed to construct a house that is appropriate to the need of the user; and the government support is required to make this possible in a democratic socialist country like India. However, it is most important to realise that the user of the house is the best judge of their needs, therefore, though these roles are necessary to provide an appropriate housing solution, it is just as necessary to step back in our enthusiasm to provide urban-inspired housing as this is the opposite of what is required in a rural setting. Therefore, the six key roles in rural housing need to be brought together to identify and frame a housing policy that is socially and culturally acceptable without compromising the values of the user. A suggestion that could be incorporated as a finding of the thesis is that the professions that are responsible for providing housing need to be trained to understand the rural context. The ethnographic approach that was incorporated into the research methodology was most helpful in understanding the rural cultural ecology and the evolution of housing. The gap between rural and urban perspectives on standard of living need to be distinguished and redefined according to the rural context. This action needs to be put in place through policy making and creating education curricula that informs people of the differences and promotes the advantages of socially and culturally contextualised rural housing.

8.9. Chapter Summary

To summarise, the entirety of the thesis has been revised by discussing the crux of each of the previous chapter in eight corresponding sections. This thesis is the documented proof of the research conducted in relation to the importance of cultural representation in rural housing through architecture for Smart villages. This thesis started with the aim to bridge the rural-urban development gap through better communication and implementation of rural housing. As a result, the thesis has produced a framework that does just that by providing a platform for better communication among stakeholders and a beneficiary-oriented information gathering and dissemination process.

The chapter has outlined the research questions that has propelled the research forward in Section 8.1. The review of the existing literature on related research and current practice has provided the foundation for the research to be built on in Section 8.2. The theoretical framework has shaped the research methodology outlining the procedure and considerations involved in field research for the thesis in Section 8.3. The two-level case analyses based on scale of the cases discusses the causative context in Section 8.4 and resultant effect in Section 8.5, with its causal presentation in Section 8.6 defining the main causes of changing architectural and construction practice. Section 8.7 summarises the output in the form of a framework supported by literary and analysed evidence within a revised construction life cycle in the rural context. It is presented based on the involvement of key roles in the process, their specific activities, and the estimated duration for each activity for implementing the Framework. Section 8.8 deliberates over the contributions, limitations and future recommendations of the thesis and research.

In conclusion, this chapter revises the genesis, development, and outcome of the research over the course of the thesis. In doing so, it enhances the existing body of knowledge through the research conducted and contributes to the literary evidence available to support theories such as environment-behaviour studies and ethno-architecture. Though the research has been conducted across a small

sample of cases, it establishes a precedent for further research in the significance of architecture and cultural representation in housing for Smart villages, across the diverse villages of Assam as well as all of India.

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Appendix A. Data Collection Templates with Ethics Approval

Ethics Approval Letter from the HESC, University of Melbourne

1 June 2018

Dr H.K. Doloi
Architecture, Building and Planning
The University of Melbourne

Dear Dr Doloi

I am pleased to advise that the Humanities Law & Social Sciences Human Ethics Sub-Committee approved the following Project:

Project title: **Impact of Architectural Design of Rural Housing in Assamese Smart Villages**
Researchers: **Dr D Hes, Dr H K Doloi, V Katharpi**
Ethics ID: **1750099.1**

The Project has been approved for the period: **01-Jun-2018 to 31-Dec-2018**

It is your responsibility to ensure that all people associated with the Project are made aware of what has actually been approved.

Research projects are normally approved to 31 December of the year of approval. Projects may be renewed yearly for up to a total of five years upon receipt of a satisfactory annual report. If a project is to continue beyond five years a new application will normally need to be submitted.

Please note that the following conditions apply to your approval. Failure to abide by these conditions may result in suspension or discontinuation of approval and/or disciplinary action.

(a) **Limit of Approval:** Approval is limited strictly to the research as submitted in your Project application.

(b) **Variation to Project:** Any subsequent variations or modifications you might wish to make to the Project must be notified formally to the Human Ethics Sub-Committee for further consideration and approval. If the Sub-Committee considers that the proposed changes are significant, you may be required to submit a new application for approval of the revised Project.

(c) **Incidents or adverse effects:** Researchers must report immediately to the Sub-Committee anything which might affect the ethical acceptance of the protocol including adverse effects on participants or unforeseen events that might affect continued ethical acceptability of the Project. Failure to do so may result in suspension or cancellation of approval.

(d) **Monitoring:** All projects are subject to monitoring at any time by the Human Research Ethics Committee.

(e) **Annual Report:** Please be aware that the Human Research Ethics Committee requires that researchers submit an annual report on each of their projects at the end of the year, or at the conclusion of a project if it continues for less than this time. Failure to submit an annual report will mean that ethics approval will lapse.

(f) **Auditing:** All projects may be subject to audit by members of the Sub-Committee.

If you have any queries on these matters, or require additional information, please contact me using the details below.

Please quote the ethics registration number and the title of the Project in any future correspondence.

On behalf of the Sub-Committee I wish you well in your research.

Yours sincerely

Ms Belinda Kelly – Secretary
Humanities Law & Social Sciences HESC
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Template 1

Guiding Questions for Focus Group Discussion (List of Focus Group Questions)

Faculty of Architecture, Building and Planning

Project Title: Significance of Culture in Architectural Design of Housing in Assamese Smart Villages

Name of researchers: Dr Hemanta Doloi (Responsible Researcher) and Velyne Ingti Katharpi (Student Researcher)

To under the existing cultural context of the village, the environmental, social, and economic factors as well as historical factors are to be revealed through this exercise with the Headman and the Village elders who would give their perspective on the village as the oldest recorders of history and events that have taken place in and around the village. The purpose of this Focus Group discussion is to involve their participation in mapping the village with information about the village as recognised and acknowledged by the inhabitants. The discussion would be discursive in nature to allow the respondents to express any notable information that the questions below many have not included. Questions would arise from their previous answers that would be used as probes to investigate deeper into their perspective of the village.

By participating in the Focus Group Discussion, the participants are providing your consent to use your responses for the purposes of research, with assurance that your personal identification will never be revealed anywhere in the project. You may choose to answer or not answer questions as you may see fit.

1) **Background**: To establish the point of reference in history.

Use of a Satellite map, a notebook and a recorder will be used to record the responses of the discussion. The satellite map of the village would facilitate in stimulating their responses regarding the following questions. A4 blank papers would be given to the participants to allow them to scribble any of their answers and descriptions as they like.

Age	- Reference to any kingdom or era - Reference to any natural disaster
Origin	- If known
Population	- No. of people - No. of families- - Demographic- age wise; designation wise in the community (Ref. to pilot study: in Karbi villages, 10 people are part of the village council, so min of 10 people in a village.);
Social construct	- absence/presence of religious and political members in a typical village
Reason for migration (if known)-	- Fleeing: from war, disease, any life threat, etc. - Sprawling due to expansion of original village/ town - Migrating for better opportunities - Migration wave, originally a nomadic tribe - Establishing outpost of territory as defensive measure

Describe surrounding as recalled/ assumed on establishment-	- Abundant forests - Fresh water - Abundant food and land for cultivation - Open grounds - Scenic beauty

2) Factors that influence the village

Accessibility and Connectivity	- Roads, trains, airplanes, helicopter - Telephones, internet, and computers (Postal services)
Environment	- Forest cover - Water quality - Natural resources - Health of people, animals, and plants - Natural disasters: Earthquakes, tremors, and landslides - Overall climate - Agriculture
Facilities and amenities	- Education - Healthcare - Electricity - Markets and trade - Livelihood and employment - Postal services (telephones, internet, and computers) - Radio and television - Arts and entertainment
Socio-cultural	- Spirituality and religion - Birth, maturity, marriage, and funerals - Social construct (relations to one another) - Social construct: worshippers, warriors, goods providers, etc. (casteism or classism) - Cultural integration and assimilation - Festivals (religious and seasonal)
Socio-political	- British rule - Indian independence, 1947 - Sixth Schedule of the constitution - Separate statehood, 1960-72 (Nagaland, Arunachal Pradesh, Mizoram, and Meghalaya) - Renaming and Separation of districts under the sixth schedule: (Mikir Hills and N.C. Hills to Karbi Anglong, Karbi Anglong West and Dima Hasao) - Change in governance: Congress to Bharatiya Janata Party - Implementation of rural development schemes
Socio-economic	- Agriculture - Livelihood and employment - Markets and trade - Implementation of rural development schemes - Rural-urban migration
Overall changes	- Connectivity and accessibility - Education and employment - Health and sanitation - Water, electricity, and other resources - Rural and urban migration

- What are the specific or notable changes that have taken place around the village that have changed the culture of the village irreversibly? What are the reasons for those changes? - What do they miss or want to bring back as part of the village environment? (Why?)

3) Traditional House

To identify the traditional house of the ethnic community that previously existed or still exists in the village. (A separate A4 blank paper would be supplied to the participants to sketch the traditional house of the community as they recall) This part of the discussion is important as the results and responses from this Section is used in the household interview.

Design- space and function	- Layout - Size - Construction method	- shaded/open/ enclosed area. - number of rooms - minimum and maximum accommodation - gender-based, age-based or based on social status. - room for modification- Extensions, renovation, and demolition - segregation of spaces
Accessibility	- House members, guests, delivery persons, service, etc. - indication in design	- Relation based. - gender-based or age-based or - social status - Religious - Convenience
Orientation	- Room facing a certain direction. - Location of room - Location of open spaces	- Is it considered auspicious or such? - Religious specification or socially determined. - Specific to general master plan of the village
Services	- Pump room or main water supply inlet - Electric room or the main switch - Drainage - Waste disposal - Gas in-let pipes (if applicable) - Work-shed/Garage - Air-circulation - Ventilation	- Function based. - Space based. - Convenience based. - Religious - Social
Connectivity (Placement of one room or function next to another)	- Socializing: with family or with guests - Cooking - Praying - Washing and cleaning - Sleeping - Storage	- Gender-based and age based. - Relation to family. - Relation to function - Convenience based. - Religious - Social
Functionality	- Overlap of functions in one room/space. - Multiple rooms used for activity. - Multiple functions in a room:	- time-based - person specific - Convenience based. - Religious - Social
Construction material	- wood - thatch	- source - workmanship

	- brick and mortar - concrete - bamboo - stone - mud - steel - other	- technique - measurement - cutting and joining - stability - preferred quality - maintenance - durability - cost effective
- What was the reason for building it that way? - Are these design decisions dictated by convenience or by social and religious norms? - How important is it to reflect the religious and social culture of the community in a traditional house? - How much has the house changed from the traditional design?		

4) **The village within a larger context and conclusion**

To identify any unique identifiers of the village. This Section would be relevant to locate landmarks within the precinct of the village and its viability for tourism from the community's point of view. This will also facilitate in understanding the role and relation of the village to other villages and towns, and its position in the global context.

Tourism	- Unique characteristics - Perception - Favourability	- Viability to support tourism. - welcoming of tourists - Perceived economic advantage. - possible change to the village life - possible disadvantages: economic, social, and environmental - will it urbanize the village or not?
- Is there anything that you would like to share that has not been talked about but deserves to be mentioned to contribute towards the understanding of the village and its cultural essence?		

Template 2

Demographic Survey Form (Questionnaire/Survey Instrument/s)

Faculty of Architecture, Building and Planning

Project Title: Significance of Culture in Architectural Design of Housing in Assamese Smart Villages

Name of researchers: Dr Hemanta Doloi (Responsible Researcher) and Velyne Ingti Katharpi (Student Researcher)

The socio-economic status of the community influences each household within the village. The demographic of each household facilitates in understanding the socio-economic status of the household as well as the community. The number of people in the family of a certain size and affluence affects the use of the spaces within and without the house by the family. The purpose of this survey is to gather basic demographic data along with a few details about the occupation and skills of the community within the village. This demographic data will facilitate to visualise the households as elements that influence the growth and evolution of the community with respect to affluence and feasibility of the lifestyle of a family within the community.

By participating in the questionnaire, you are providing your consent to use your responses for the purposes of research, with assurance that your personal identification will never be revealed anywhere.

Section A, B and C are meant to be filled by the representative individual of the household with respect to the head of the household. He/ she may or may not be the head of the household. The information collected in the Sections A is regarding the type of house, Section B is regarding the household demographic and Section C is regarding the materials possessed by the members of the household.

Section D is specific to individual member of the household. Participant may choose to answer or not answer questions as you may see fit. However, answering the questions on Section D facilitates the selection of the households for the Phase 2 of the Fieldwork which the household level study regarding the way occupants design is and use the house. It would be most helpful to the research for their participation in Section D of the Survey.

Section A: General Information about the House.			
Village name:			
House Number (as per map developed in initial stages of Phase 1):			
Name of participant:	☐ Family head	☐ Family member	
1	Direction of the front-side		
☐ North ☐ East	☐ West ☐ South	☐ North-East ☐ North-West	☐ South-East ☐ South-West
2	Plot Topography:		
	☐ Plain	☐ Uneven Slope	☐ Gradual Slope
3	Soil type		
	☐ Gravel	☐ Sandy	☐ Loam	☐ Clay
4	House type		
	☐ Traditional	☐ Contemporary	☐ Mixed

5	What kind of construction material is used?			
	☐ Wood ☐ bamboo	☐ mud ☐ Thatch	☐ Brick and mortar ☐ tinned roofs	☐ Steel ☐ Concrete
	Other (specify):			
6	What kind of house type do you prefer?			
	☐ Traditional	☐ Contemporary	☐ Mixed	
7	What construction materials would you prefer to use?			
	☐ Wood ☐ bamboo	☐ Mud ☐ Thatch	☐ Brick and mortar ☐ Tinned roofs	☐ Steel ☐ Concrete
	Other (specify):			
8	How many rooms does the house have?			
	☐ Living room: ☐ Dining room: ☐ Kitchen:	☐ Bathroom: ☐ Bedroom:	☐ Storeroom: ☐ Guest room:	☐ Study/Library: ☐ Worship room:
	☐ Other (specify):			
Section B: General Information about the household, regarding no. of occupants and their household profile				
9	No. of Occupants:			
10	Relation to Head and number			
	☐ Father ☐ Daughter-in-law ☐ Niece ☐ Mother ☐ Granddaughter	☐ Maid ☐ Spouse ☐ Grandson ☐ Driver ☐ Daughter	☐ Uncle ☐ Son ☐ Aunty ☐ Son-in-law ☐ Cousin Brother	☐ Brother ☐ Cousin Sister ☐ Sister ☐ Nephew
	Sketch family tree:			
11	Approximate Gross Annual Household Income (INR):			
	☐ Below 75,000 ☐ 75,001- 150,000	☐ 150,001- 300,000 ☐ 300,001- 500,000	☐ 500,001- 750,000 ☐ More than 750,000	
12	The family has been residing at the current address since			
	☐ 0- 5yrs ☐ 6- 10yrs ☐ 11-15yrs ☐ 16-20yrs	☐ 21-30yrs ☐ 31-40yrs ☐ 41- 50yrs ☐ 51-75yrs	☐ 76- 100yrs ☐ 101-150yrs ☐ 151-200yrs ☐ 201-300yrs	☐ 301-400yrs ☐ 401-500yrs ☐ More than 500yrs

Original habitat (if known):				
13	Religion			
	☐ Hinduism ☐ Christianity	☐ Islam ☐ Buddhism	☐ Traditional ☐ Other	☐ Prefer not to answer
14	Category			
	☐ General ☐ SC	☐ ST ☐ OBC	☐ Another Minority ☐ Prefer not to answer	
Section C: General Information about the possessions and materials owned by the Household. Participant is free to specify number of the items being enquired below				
15	Material possessions (please tick and specify approximate number)			
	☐ Vehicles ☐ Refrigerator ☐ Washing Machine	☐ Landline Telephone ☐ Radio ☐ Television	☐ Mobile ☐ Computer	☐ Generator/Inverter ☐ Water Pump
	☐ Farming Tools (specify)			
	☐ Traditional tools (specify)			
	☐ Electrically Powered Tools (specify)			
	☐ Others (Specify)			
16	Domestic Animals (please tick and specify approximate number):			
	☐ Dogs ☐ Cats	☐ Pigs ☐ Cows	☐ Buffalo ☐ Goats	☐ Poultry ☐ None
	☐ Other(specify):			
17	Outhouse or rooms detached from the main house:		☐ Yes	☐ No
If yes, (please tick and specify approximate number):				
	☐ Bathroom ☐ Kitchen ☐ Guest room	☐ Garage ☐ Workshop ☐ Animal Shed	☐ Storage ☐ Other (please Specify):	
18	Open Spaces			
	☐ Flower Garden ☐ Vegetable Garden	☐ Plantations ☐ Soft paved (earth)	☐ Hard Paved (concrete) ☐ Others	
Please specify the types of plants, herbs, or trees in the open spaces within the household boundary:				
19	Would you like to participate in the Household study of the research? This would require you and each of your family members to fill the Section D of the Survey individually.			
	☐ Yes	☐ No		

Template 3

Guiding Questions for the Semi-structured Interview and Projective (Floor Plan) Technique. (List of Interview Questions and Themes)

Faculty of Architecture, Building and Planning

Project Title: Significance of Culture in Architectural Design of Housing in Assamese Smart Villages

Name of researchers: Dr Hemanta Doloi (Responsible Researcher) and Velyne Ingti Katharpi (Student Researcher)

The design of a house is influenced by the culture of the household. Spaces are used and regarded differently according to value system dictating the interaction of people within a space. The understanding of how one uses a space indicates the value systems that are part of the culture of the household and community. Socio-economic and socio-cultural factors also influence the design and use of spaces within a house. The purpose of this method of inquiry is to extract as much insight as possible on the house from the perspective of the occupants, and therefore, investigate the architectural design of the house that is resultant of the culture of the household, community, and its other contextual factors.

By participating in this active participatory Interview, you are providing your consent to use your responses for the purposes of research, with assurance that your personal identification will never be revealed anywhere in the project. You may choose to answer or not answer questions as you may see fit.

Part 1. History

Determining history and nature of residency.

<table>
<tr><td colspan="3">- Is this the first house that the family has resided in? (If yes, go to Part 2. If no, continue below).</td></tr>
<tr><td>First house in the village (If known)</td><td colspan="2">- Is this the first house that the family has resided in?
- How many houses have you moved before residing here?
- Where was the location of the first/ previous house?
- Reason for choosing said location for first/previous house.
- Age</td></tr>
<tr><td>Population</td><td colspan="2">- No. of people
- relation to each other in the occupancy</td></tr>
<tr><td rowspan="2">Reason for moving houses (if known)-</td><td>- from a different village</td><td>- Fleeing: from war, disease, any life threat, etc
- Sprawling due to expansion of original village/ town
- Migrating for better opportunities
- Migration wave, originally a nomadic tribe
- Establishing outpost of territory as defensive measure</td></tr>
<tr><td>- within the same village</td><td>- better foundation
- Rotting house
- Expanding household
- Marriage
- To modernize
- Better view</td></tr>
<tr><td>Describe surrounding as recalled/ assumed on establishment-</td><td colspan="2">- Abundant forests
- Fresh water
- Abundant food and land for cultivation</td></tr>
</table>

	- Open grounds - Scenic beauty

To identify the design of the first/ previous house

History	Age Original boundary	-
Design- space and function	- Layout - Size - Construction method	- shaded/open/ enclosed area. - number of rooms - minimum and maximum accommodation - gender-based, age-based or based on social status. - room for modification- Extensions, renovation, and demolition - segregation of spaces
- What is the reason for segregation of spaces? Is Gender or relation to the household a factor?		
Accessibility	- House members, guests, delivery persons, service, etc. - indication in design	- Relation based. - gender-based or age-based or - social status - Religious - Convenience
Orientation	- Room facing a certain direction. - Location of room - Location of open spaces	- Is it considered auspicious or such? - Religious specification or socially determined. - Specific to general master plan of the village
Services	- Pump room or main water supply inlet - Electric room or the main switch - Drainage - Waste disposal - Gas in-let pipes (if applicable) - Work-shed/Garage - Air-circulation - Ventilation	- Function based. - Space based. - Convenience based. - Religious - Social
Connectivity (Placement of one room or function next to another)	- Socializing: with family or with guests - Cooking - Praying - Washing and cleaning - Sleeping - Storage	- Gender-based and age based. - Relation to family - Relation to function - Convenience based. - Religious - Social
Functionality	- Overlap of functions in one room/space. - Multiple rooms used for activity. - Multiple functions in a room:	- time-based - person specific - Convenience based. - Religious - Social
- Are there any spaces that tend to have too much traffic? When does that occur (certain season, festival, occasion, time of the day? - Would you like to rearrange the spaces or allocate different functions to the rooms to change the circulation and connectivity pattern of the house? Why?		
Construction material	- wood	- source

	- thatch - brick and mortar - concrete - bamboo - stone - mud - steel - other	- workmanship - technique - measurement - cutting and joining - stability - preferred quality - maintenance - durability - cost effective
- What was the reason for building it that way? - Are these design decisions dictated by convenience or by social and religious norms? - How have you been able to reflect the religious and social culture of the community in the house? How important is it? - How much has the house changed from the first construction?		

Part 2. The house, as built and used by the household/family.

(Show Satellite map of the Village and the house and use an A4 sheet to sketch an outline of the house footprint. The interviewee would be asked to participate in sketching their house as understood from their perspective, while answering the following questions)

(Repeat this Section for the current house after the questions for the previous House, if there is or was one.)

a) To Identify the current conditions of the house.

History	Age Original boundary Original environment	-
Design- space and function	- Layout	- shaded/open/ enclosed area. - number of rooms - minimum and maximum accommodation - gender-based, age-based or based on social status. - room for modification- Extensions, renovation, and demolition - segregation of spaces
	- Size	
	- Construction method	
Accessibility	- House members, guests, delivery persons, service, etc. - indication in design	- Relation based. - gender-based or age-based or - social status - Religious - Convenience
Orientation	- Room facing a certain direction. - Location of room - Location of open spaces	- Is it considered auspicious or such? - Religious specification or socially determined. - Specific to general master plan of the village
Services	- Pump room or main water supply inlet - Electric room or the main switch - Drainage - Waste disposal - Gas in-let pipes (if applicable) - Work-shed/Garage - Air-circulation	- Function based. - Space based. - Convenience based. - Religious - Social

	- Ventilation	
Connectivity (Placement of one room or function next to another)	- Socializing: with family or with guests - Cooking - Praying - Washing and cleaning - Sleeping - Storage	- Gender-based and age based. - Relation to family - Relation to function - Convenience based. - Religious - Social
Functionality	- Overlap of functions in one room/space. - Multiple rooms used for activity. - Multiple functions in a room:	- time-based - person specific - Convenience based. - Religious - Social
Construction material	- wood - thatch - brick and mortar - concrete - bamboo - stone - mud - steel - other	- source - workmanship - technique - measurement - cutting and joining - stability - preferred quality - maintenance - durability - cost effective

- What was the reason for building it that way?
- Are these design decisions dictated by convenience or by social and religious norms?
- Was the house built in several stages or in one stage of construction?
- What was the style of construction? Is that style of construction still prevalent?
  o If yes, is there an example of the construction?
  o If no, why was the construction style discarded?		

Part 3. Have any changes been made to the house? (If yes, continue below. If no, go to 'Part 4'.)

Changes made to the house.	- Renovations - Extensions - Demolition	- Accommodation - Maintenance - Affluence - Modernisation (any reference or inspiration)
construction materials	- wood - thatch - brick and mortar - concrete - bamboo - stone - mud - steel - other	- source - workmanship - technique - measurement - cutting and joining - stability - preferred quality - maintenance - durability - cost effective

- Which room was changed or added? Why?
- The changes made to the room or space; does it follow the traditional style?
  o If yes, why was the traditional style maintained and how?
  o If no, why was the traditional style discarded? What were the compromises made because of this decision? Was it worth the change?
- What were the inspiration or reference for the new renovations/extensions?		

- Has the change in the spaces brought about any noticeable changes in related areas of your life? (example: more rooms provide each family member with their own personal space and privacy. Or, smaller or lesser rooms reduces the cost of electricity, or lesser time spent keeping the house clean)	
Economic context	- Average percentage of gross income spent. - Financing - Government schemes - Cost effective. - Satisfaction

Part 4. Usage pattern

Time	Room	Function	User	Other interactions, objects and elements that influence the use of space
- Which is the first room to be used in a day? Which is the last room to be used in the day? - Which room has the most/least number of activities? - Which rooms are considered most important for the family? Or which rooms could you do without?				

Part 5. Contemporary house in comparison to traditional house

(To establish the difference and change in perception towards traditional and contemporary rural houses, the traditional house as described in the Focus Group Discussion will be showed and explained according to layout and function of the rooms and spaces.)

a) To identify the opinions and perceptions towards their house
   - Is the house comfortable for the current size of family?
   - Which room/s would they extend or change next? Why?

b) To identify their perception of Traditional houses compared to the house currently reside.
   - Are you familiar with this kind (ref. to traditional house from FGD exercise) of layout of house?
   - What is your opinion on having such layout for your family?

(Disclose that it is a traditional house if they already do not know it.)

   - What is your opinion of the layout as a traditional house?
   - How do you relate to this house? Is it suitable to your needs?
   - Is this house feasible today?
   - What are the problems with this house? What are the good points about the house?
   - In your next renovation/extension, which ideas would you like to incorporate into your existing house?

Is there anything that you would like to share that has not been talked about but deserves to be mentioned to contribute towards the understanding of the house and what it means to you?

Appendix B. NVivo Text Search Query Outputs

Appendix B is a list of the text search query results that were obtained from NVivo.

Kuki

The following figures correspond to the results obtained from the focus group discussion transcript for Kuki village case. The combined discussion of the text search query results is presented in Section 4.1.1.

Access

Word Input: Road OR roads OR Transport OR Vehicle OR Car OR Foot OR Way OR path OR street OR bicycle

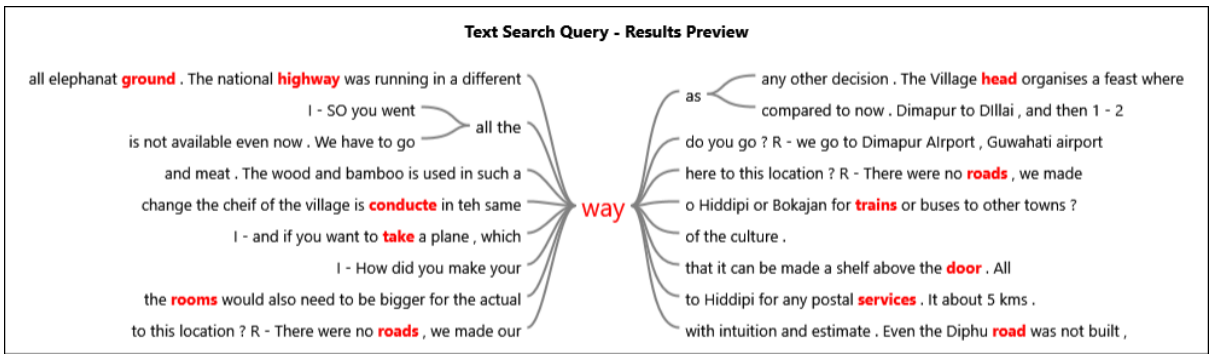

Figure B- 1 Text query, root term: Way

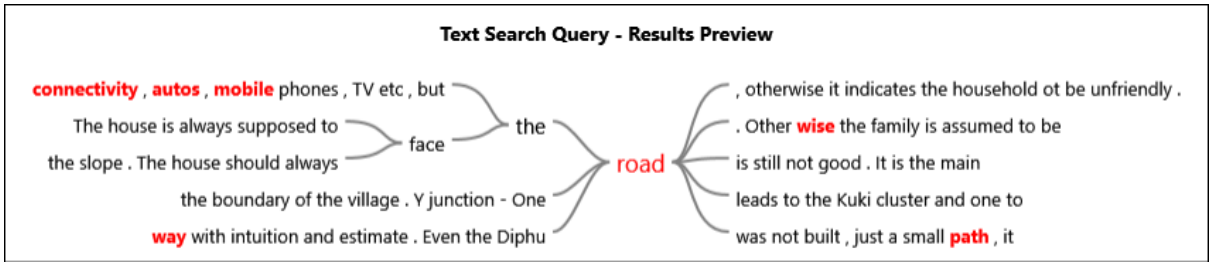

Figure B- 2 Text query, root term: Road

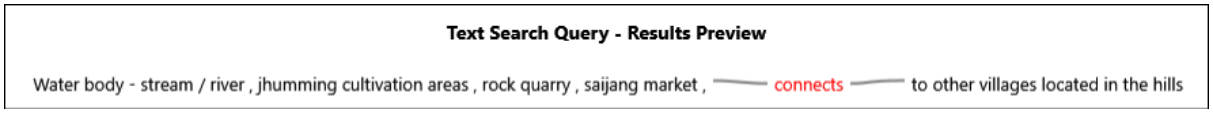

Figure B- 3 Text query, root term: Connects.

Figure B- 1, Figure B- 2 and Figure B- 3 are results around accessibility in Kuki. The results are word trees around the root terms ‘way’, ‘Road’ and “connects’.

Social Traditions and Practices

Word Input: Traditional OR Practice OR Culture OR Social OR Religion OR festival OR celebration

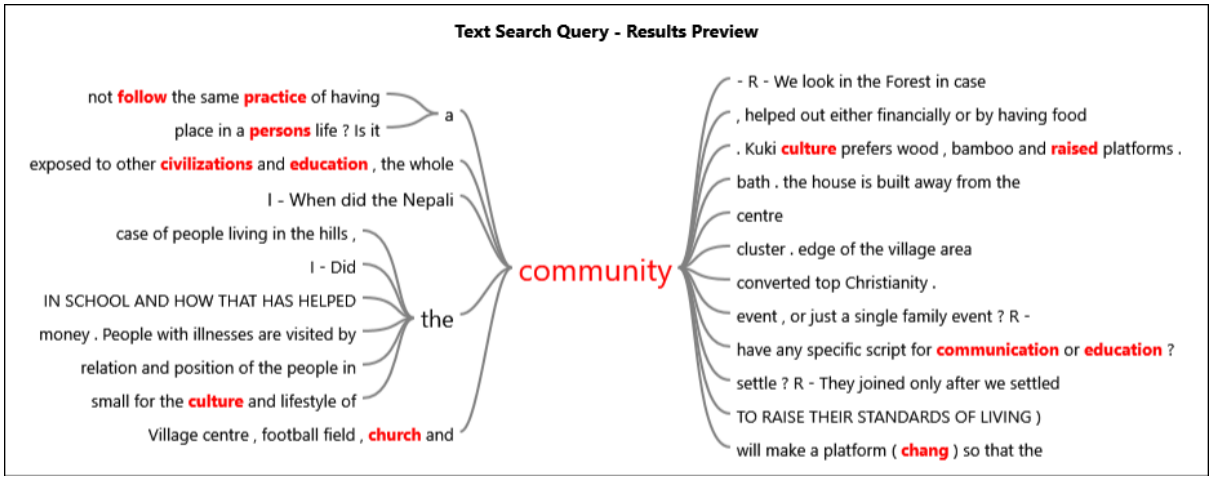

Figure B- 4 Text query, root term: Community

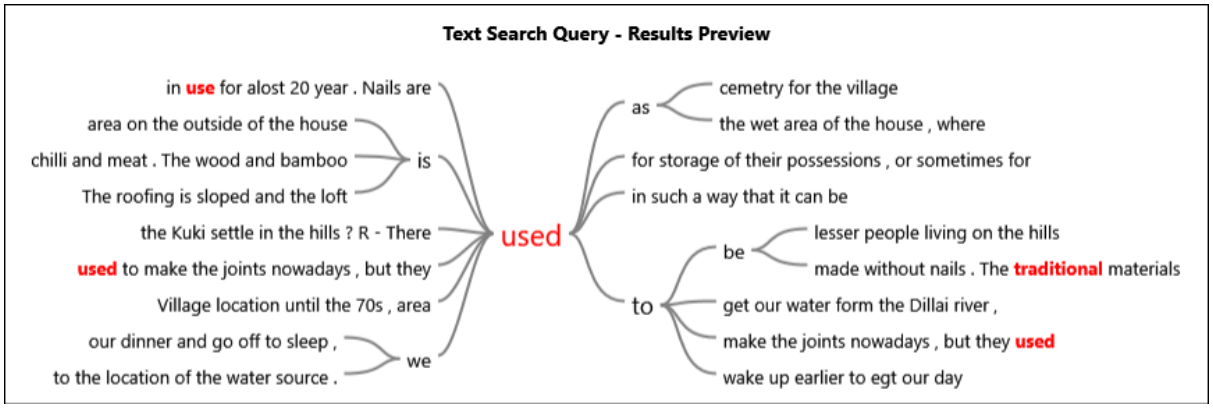

Figure B- 5 Text query, root term: Used

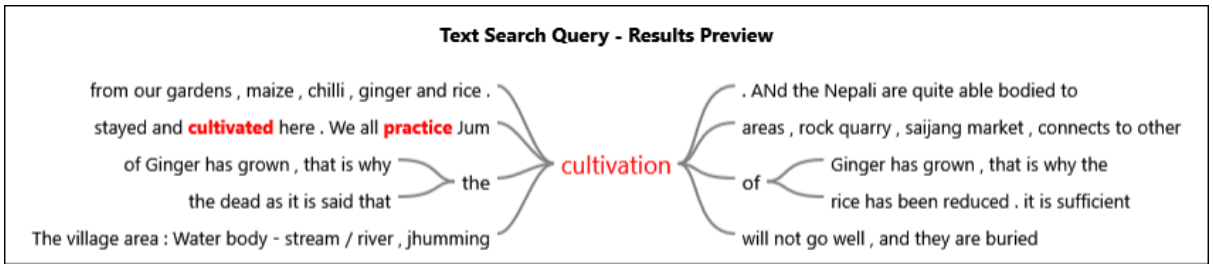

Figure B- 6 Text query, root term: Cultivation

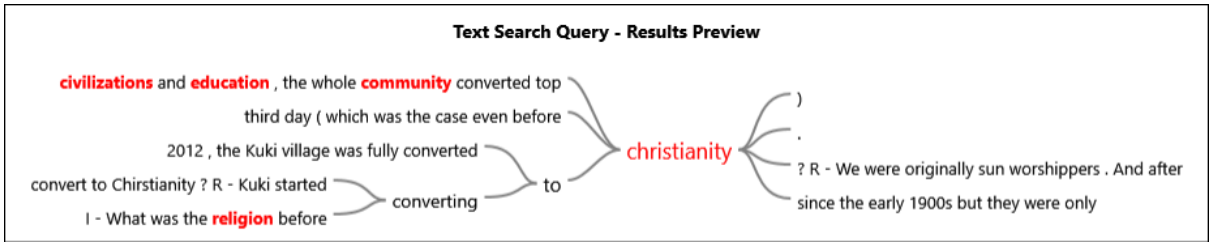

Figure B- 7 Text query, root term: Christianity

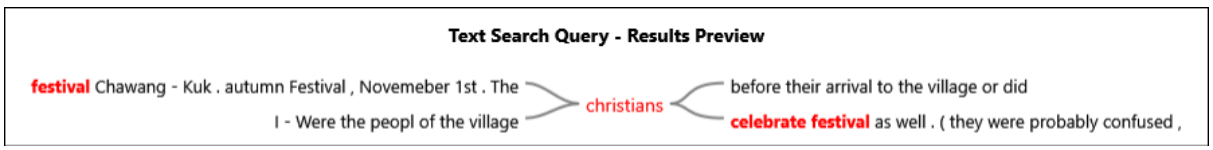

Figure B- 8 Text query, root term: Christians

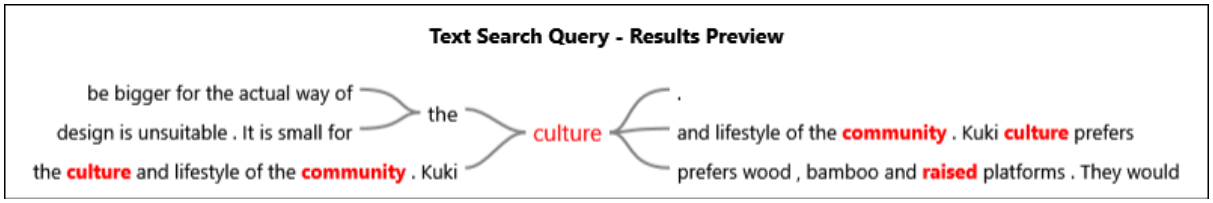

Figure B- 9 Text query, root term: Culture

Figure B- 4, Figure B- 5, Figure B- 6, Figure B- 7, Figure B- 8 and Figure B- 9 are results around social traditions and practices. The results are word trees around the root terms 'community', 'used', 'cultivation', 'Christianity', 'Christians' and 'culture'.

Communication and Knowledge Sharing

Word input: Communicate OR Educate OR Message OR Knowledge OR Learning

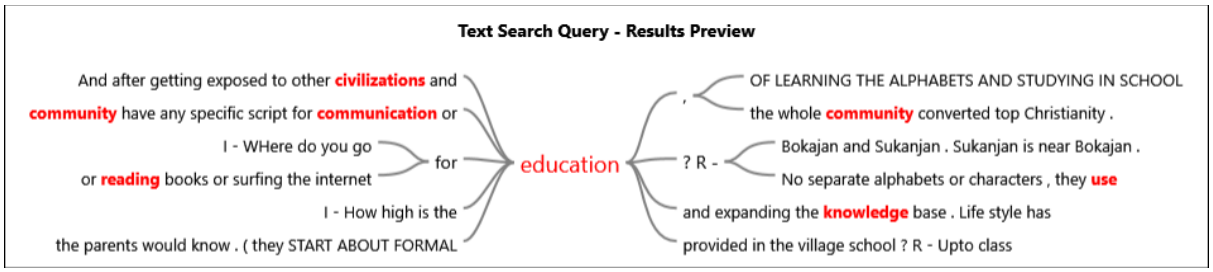

Figure B- 10 Text query, root term: Education

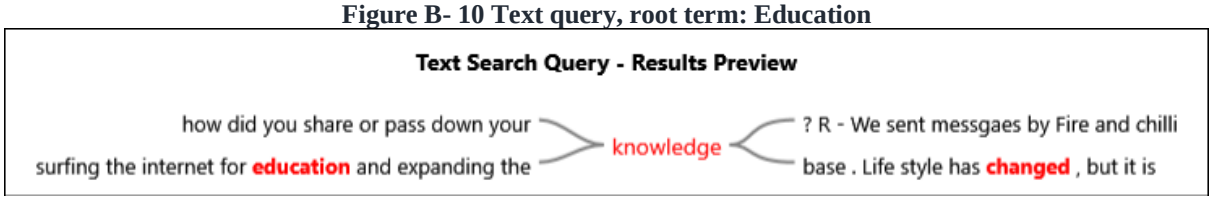

Figure B- 11 Text query, root term: Knowledge

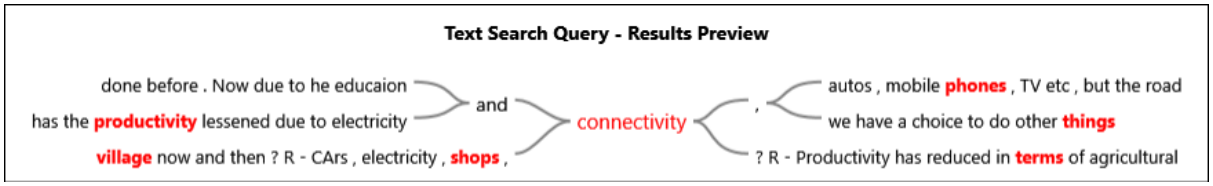

Figure B- 12 Text query, root term: Connectivity

Figure B- 10, Figure B- 11 and Figure B- 12are results around communication and knowledge sharing in the context of the Kuki village case. The results are word trees around the root terms 'education', 'knowledge' and 'connectivity'.

Community Infrastructure

Word Input: Building OR School OR Church OR Market OR Healthcare

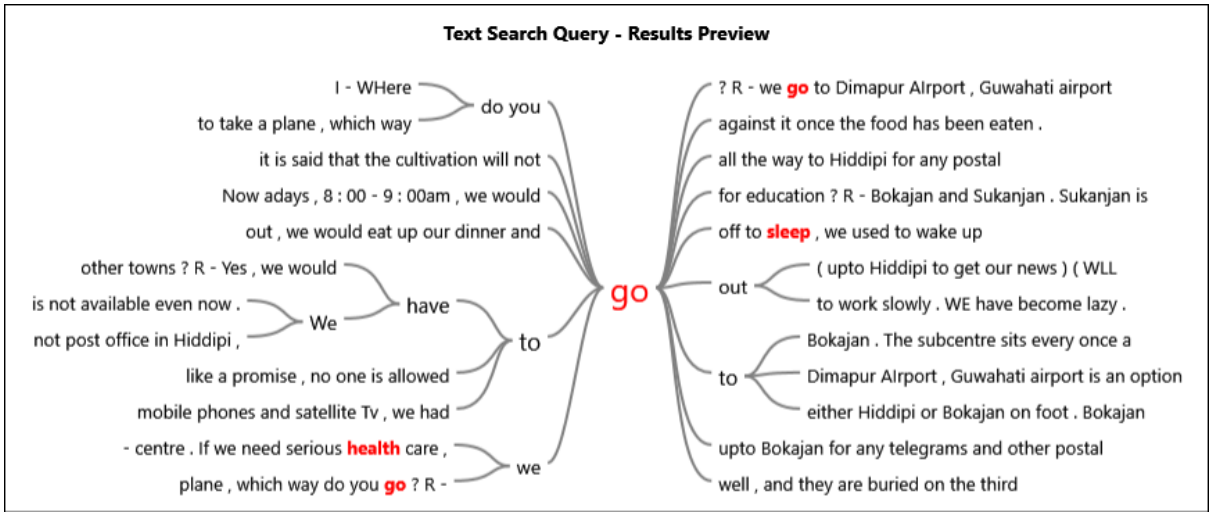

Figure B- 13 Text query, root term: Go.

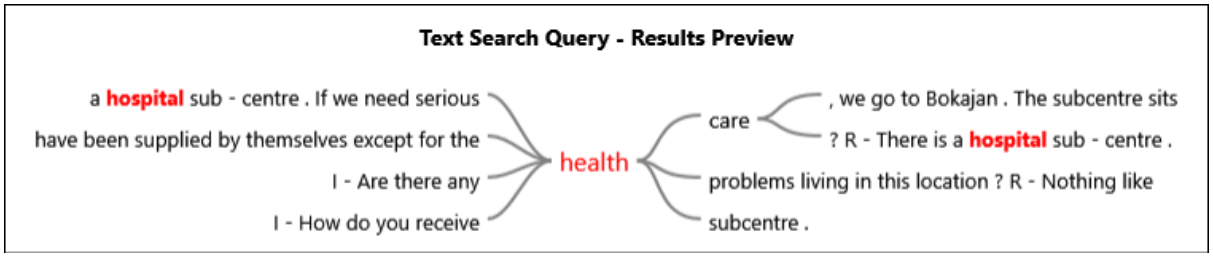

Figure B- 14 Text query, root term: Health

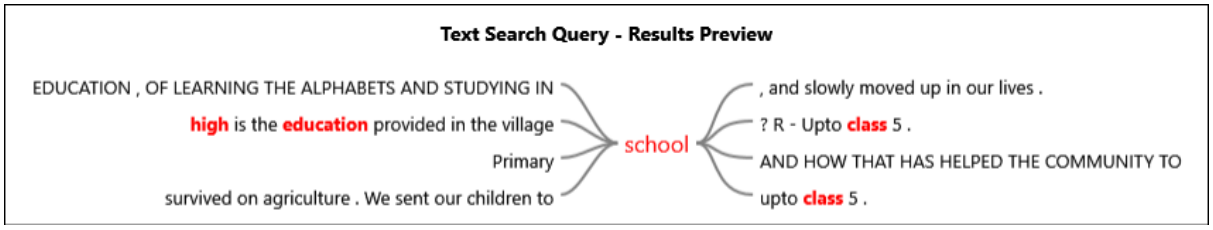

Figure B- 15 Text query, root term: School

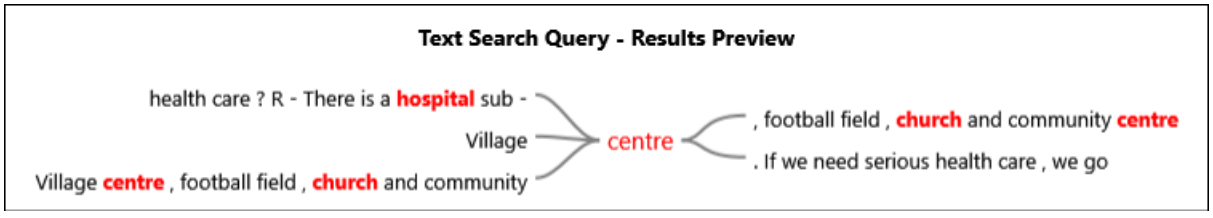

Figure B- 16 Text query, root term: Centre

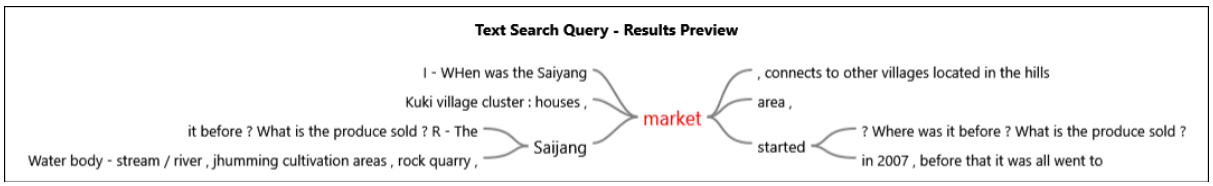

Figure B- 17 Text query, root word: Market

Figure B- 13, Figure B- 14, Figure B- 15, Figure B- 16 and Figure B- 17 are results around community infrastructure in the context of the Kuki village case. As per the word input, the results of the word tree are around the root terms ‘health’, ‘school’ and ‘market’.

Livelihood

Word input: Livelihood OR Jobs OR Employment OR Work

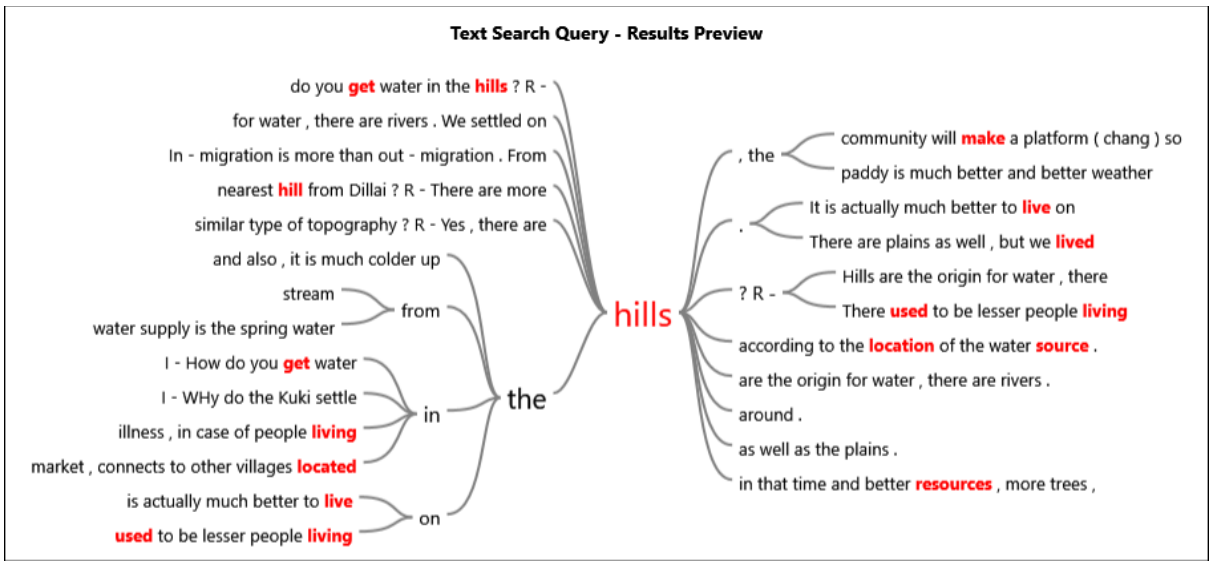

Figure B- 18 Text query, root term: Hills

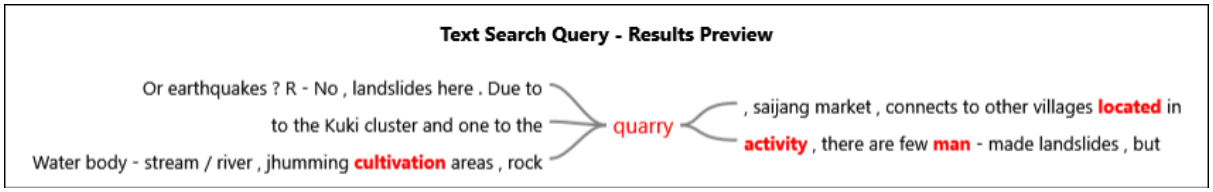

Figure B- 19 Text query, root term: Quarry

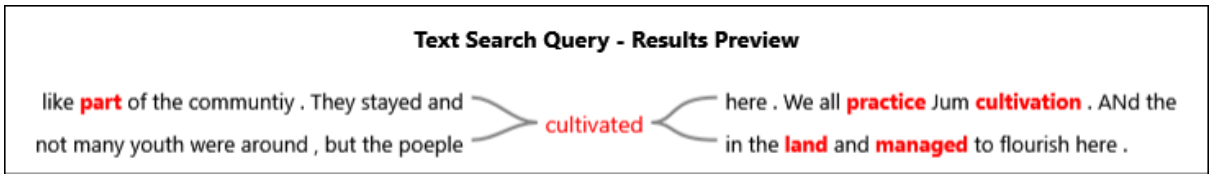

Figure B- 20 Text query, root term: Cultivated

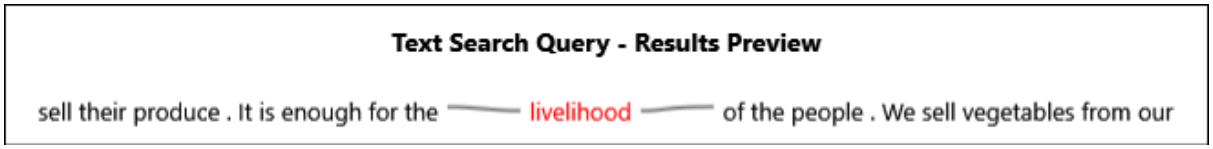

Figure B- 21 Text query, root term: Livelihood

Figure B- 18, Figure B- 19, Figure B- 20 and Figure B- 21are the results around livelihood in the context of the Kuki village case. The word tree results are around the root terms ‘hills’, ‘quarry’, ‘cultivated’ and ‘livelihood’.

Resources and Services

Word input: Water OR Electricity OR Plumbing OR Telecommunication

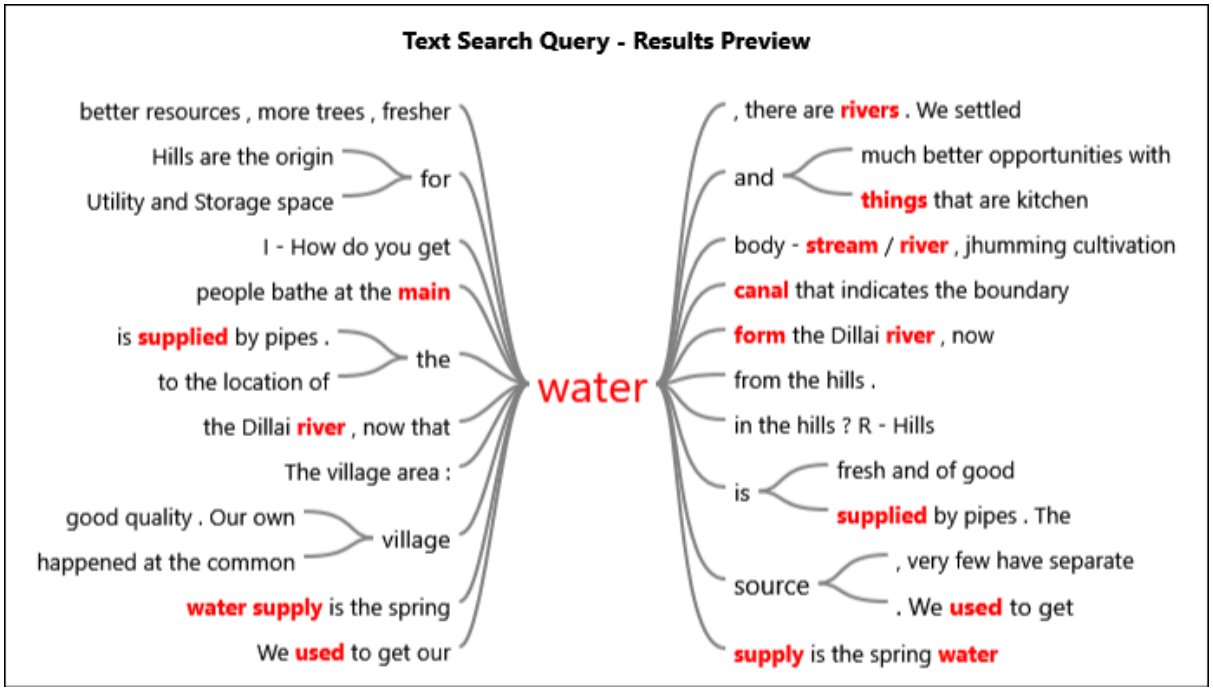

Figure B- 22 Text query, root term: Water

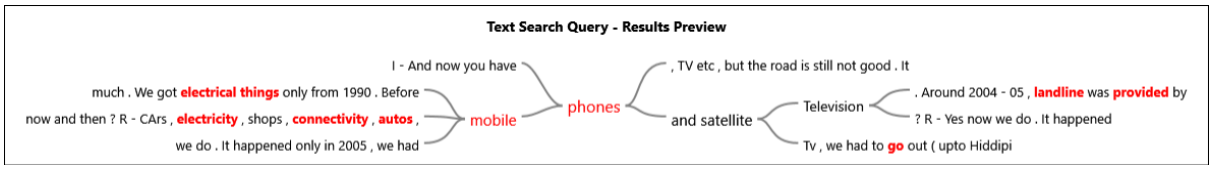

Figure B- 23 Text query, root term: Phones

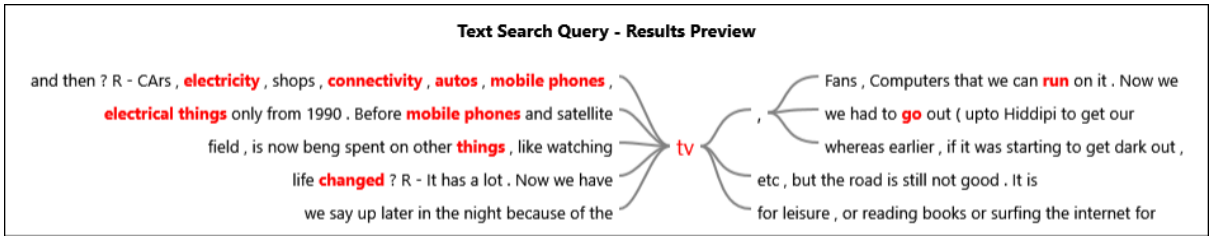

Figure B- 24 Text query, root term: TV

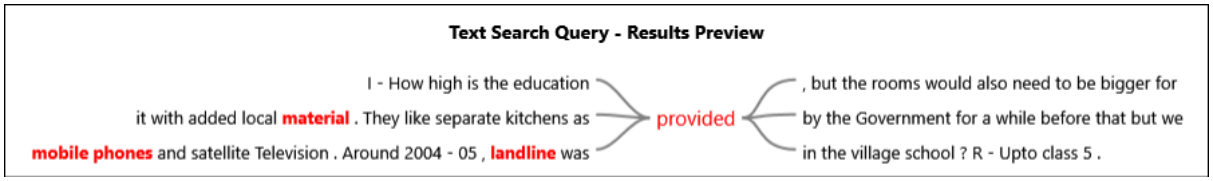

Figure B- 25 Text query, root term: Provided

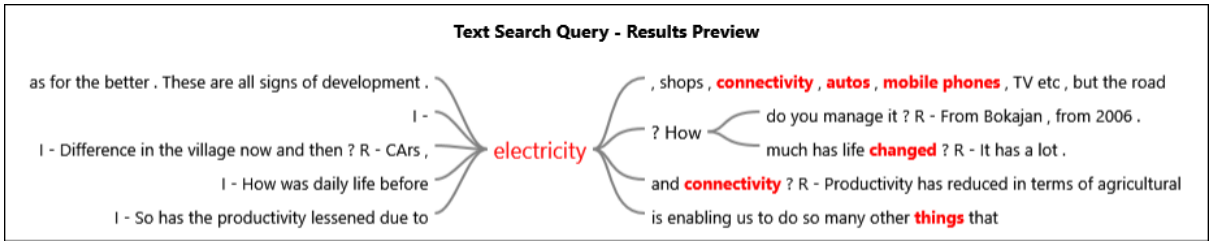

Figure B- 26 Text query, root term: Electricity

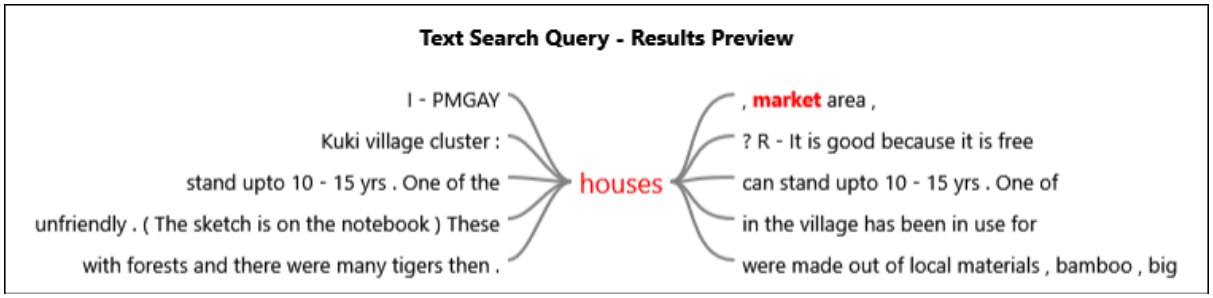

Figure B- 27 Text query, root term: Houses

Figure B- 22, Figure B- 23, Figure B- 24, Figure B- 25, Figure B- 26 and Figure B- 27are the results around resources and services in the context of the Kuki village case. The word tree results are around the root terms ‘water’, ‘Tv’, ‘phones’, ‘provided’, ‘electricity’ and ‘houses.

Traditional house

Word Input: House OR material OR space OR room OR construction

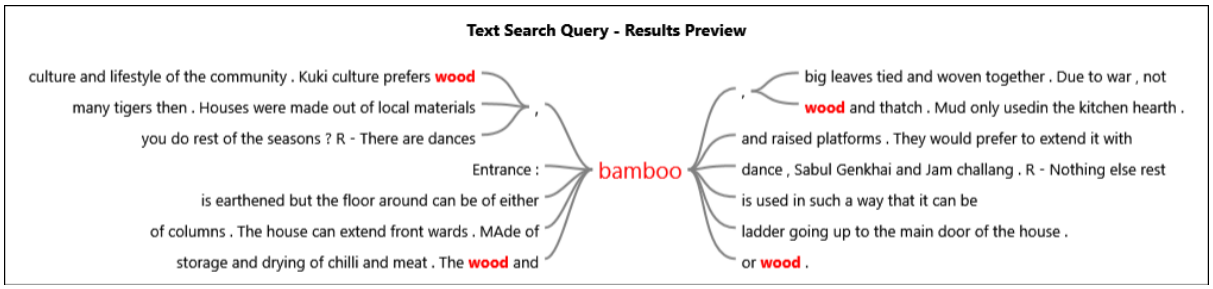

Figure B- 28 Text query, root term: Bamboo

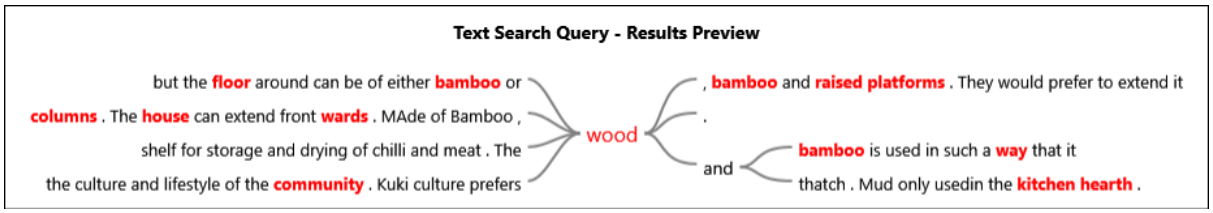

Figure B- 29 Text query, root term: Wood

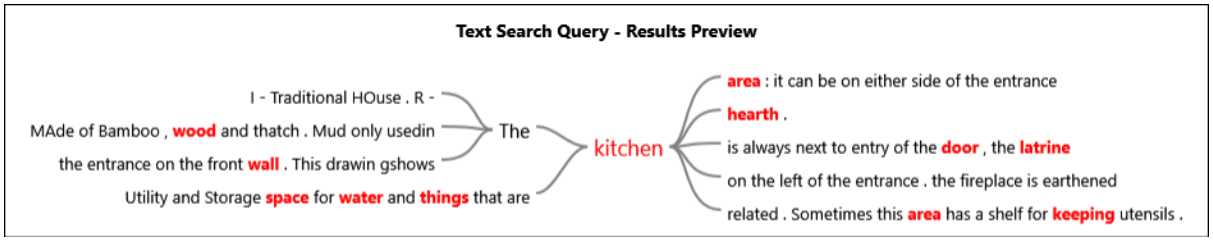

Figure B- 30 Text query, root term: Kitchen

Figure B- 28, Figure B- 29 and Figure B- 30 are the results around the traditional house in the context of the Kuki village case. The word tree results are around the root terms ‘wood’, ‘bamboo’, and ‘kitchen’.

Karbi

The following figures correspond to the results obtained from the focus group discussion transcript for Karbi village case. The combined discussion of the text search query results is presented in Section 4.1.2.

Access

Word Input: Road OR roads OR Transport OR Vehicle OR Car OR Foot OR Way OR path OR street OR bicycle

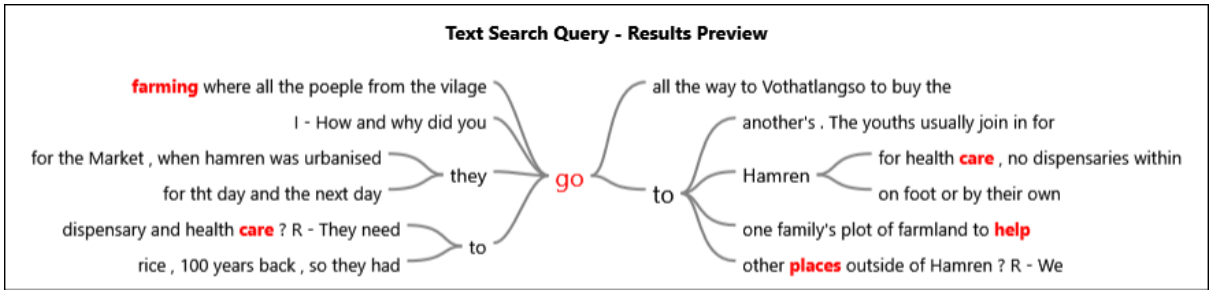

Figure B- 31 Text query, root term: Go.

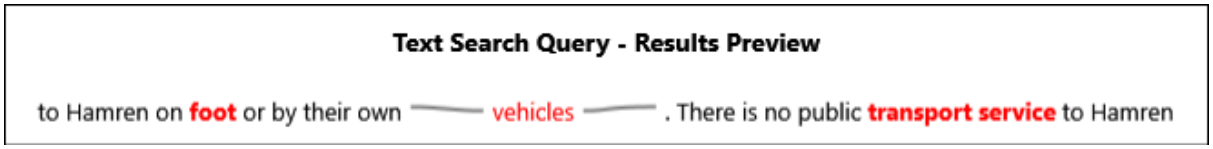

Figure B- 32 Text query, root term: Vehicles

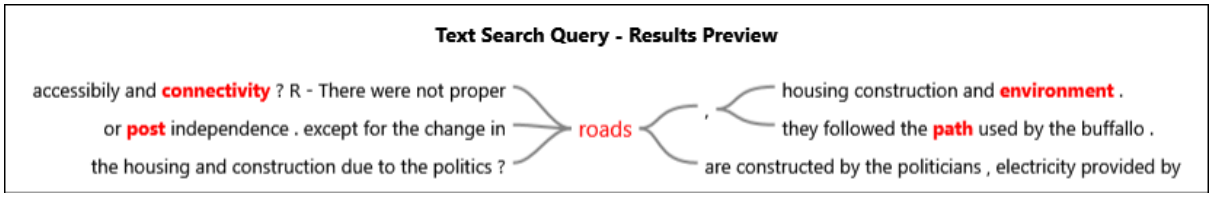

Figure B- 33 Text query, root term: roads

Figure B- 31, Figure B- 32 and Figure B- 33 are the results around accessibility in the context of the Karbi village case. The word tree results are around the root terms ‘Go’, ‘Vehicles’ and ‘roads.

Social traditions and practices

Word Input: Traditional OR Practice OR Culture OR Social OR Religion OR festival OR celebration

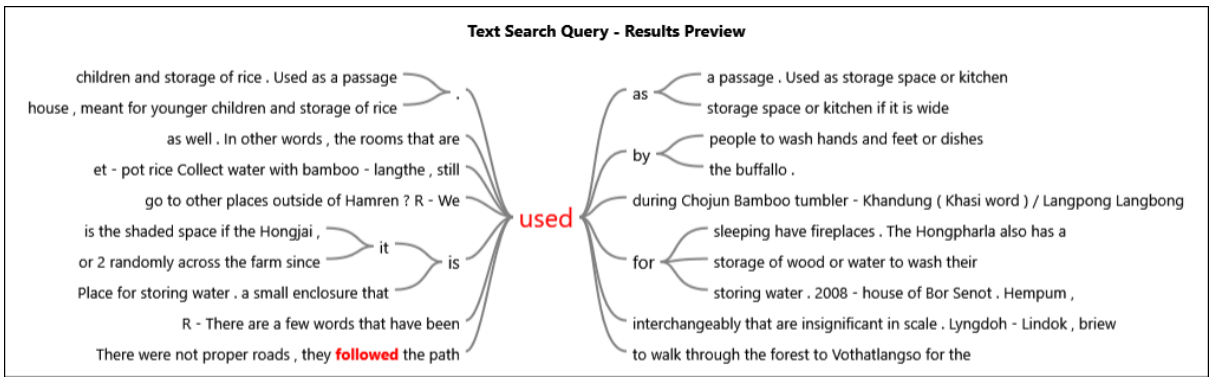

Figure B- 34 Text query, root term: Used

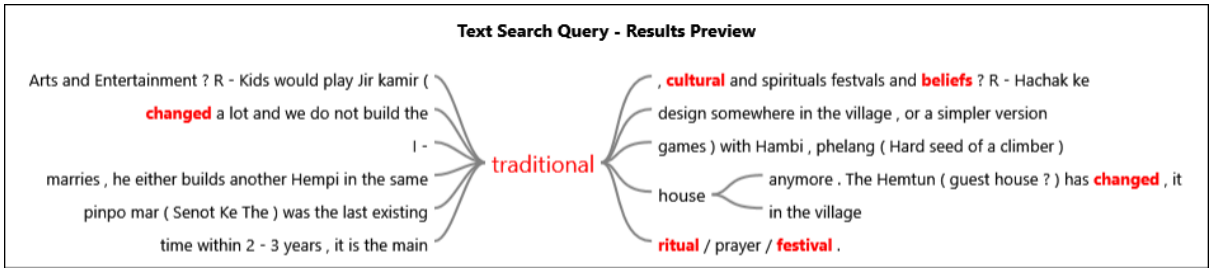

Figure B- 35 Text query, root term: Traditional

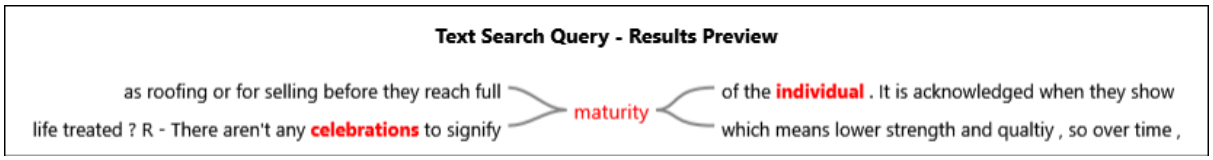

Figure B- 36 Text query, root term: Maturity

Figure B- 34, Figure B- 35 and Figure B- 36 are the results around social traditions and practices in the context of the Karbi village case. The word tree results are around the root terms 'Used', 'traditional' and 'maturity'. The results indicate links to religion, cultural beliefs, maturity of an individual, agriculture, housing layout based on social structure etc.

Communication and knowledge sharing

Word input: Communicate OR Educate OR Message OR Knowledge OR Learning

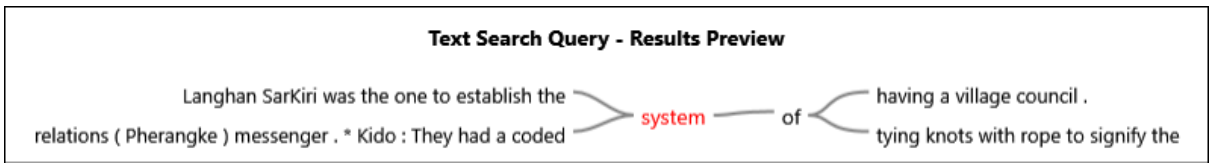

Figure B- 37 Text query, root term: System

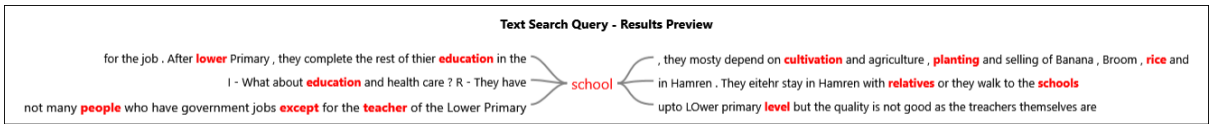

Figure B- 38 Text query, root term: School

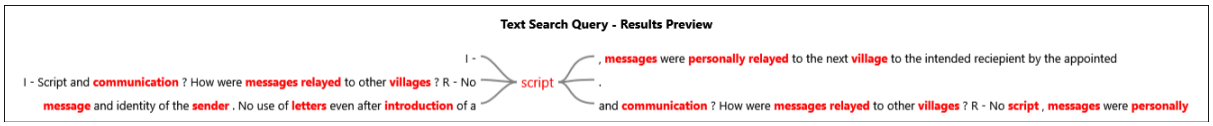

Figure B- 39 Text query, root term: Script

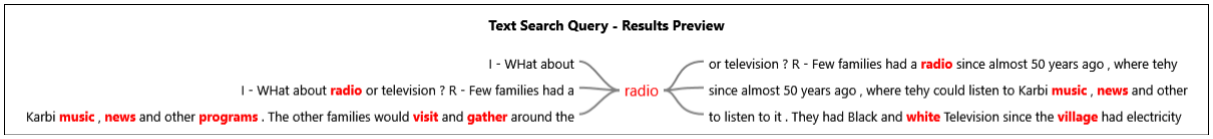

Figure B- 40 Text query, root term: Radio

Figure B- 37, Figure B- 38, Figure B- 39 and Figure B- 40 are the results around communication and knowledge sharing in the context of the Karbi village case. The word tree results are around the root terms 'System', 'School', 'Script' and 'Radio'.

Community infrastructure

Word Input: Building OR School OR Church OR Market OR Healthcare

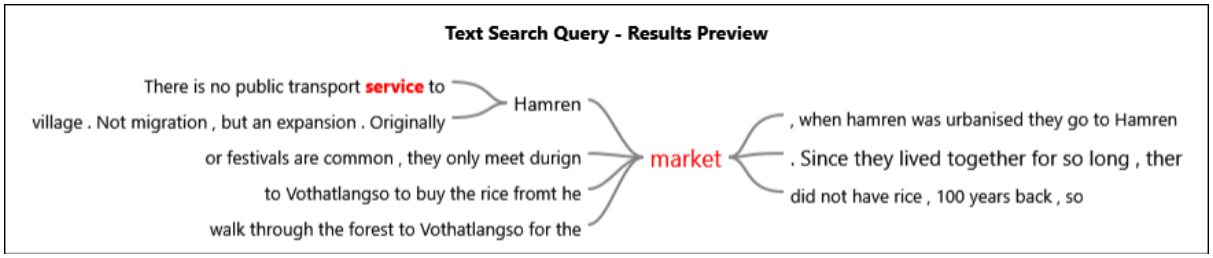

Figure B- 41 Text query, root word: Market

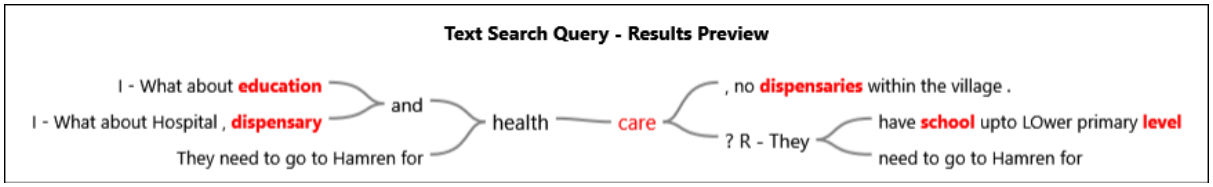

Figure B- 42 Text query, root word: Healthcare

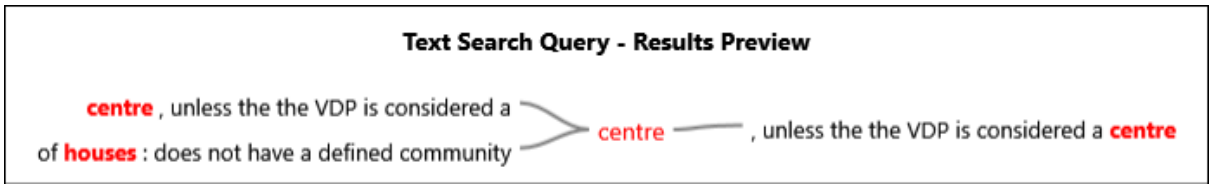

Figure B- 43 Text query, root term: Centre

Figure B- 41, Figure B- 42 and Figure B- 43 are the results around community infrastructure in the context of the Karbi village case. The word tree results are around the root terms 'Market', 'Healthcare' and 'Centre'.

Livelihood

Word input: Livelihood OR Jobs OR Employment OR Work

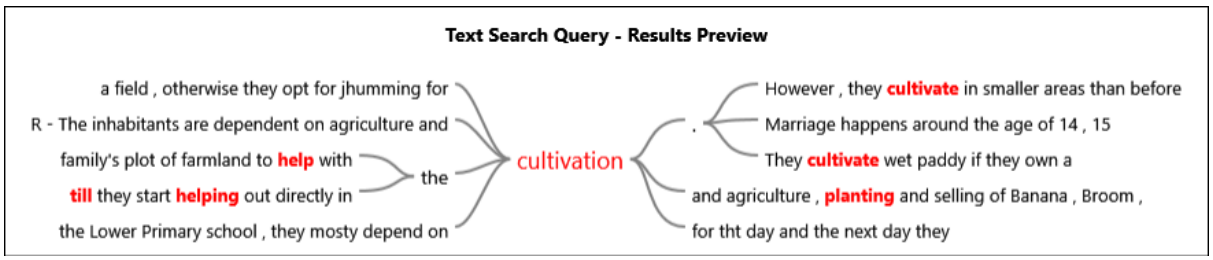

Figure B- 44 Text query, root term: Cultivation

Figure B- 45 Text query, root term: Farming

Figure B- 44 and Figure B- 45 are the results around livelihood in the context of the Karbi village case. The word tree results are around the root terms 'Cultivation' and 'Farming'.

Resources and services

Word input: Water OR Electricity OR Plumbing OR Telecommunication

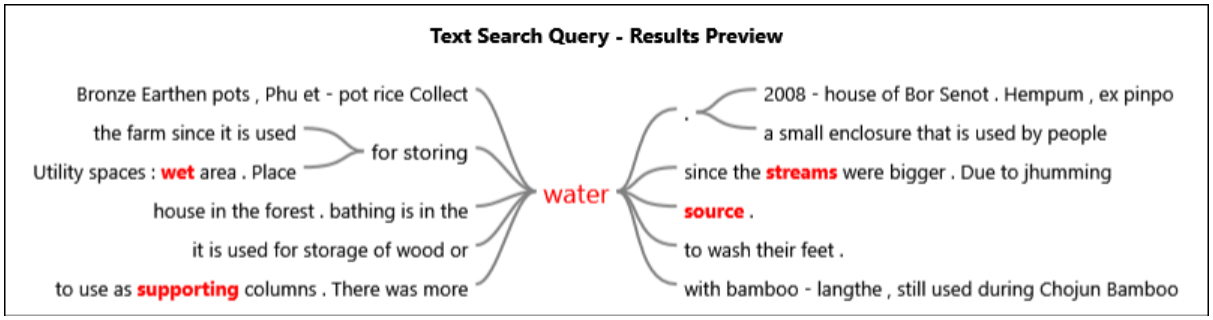

Figure B- 46 Text query, root term: Water

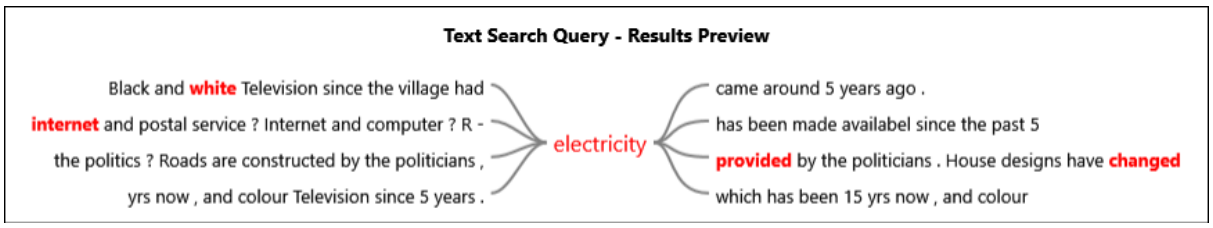

Figure B- 47 Text query, root term: Electricity

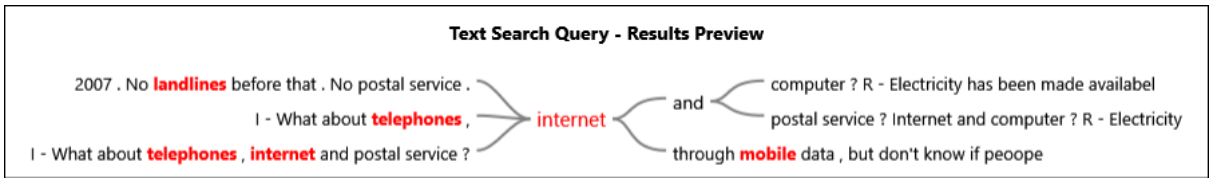

Figure B- 48 Text query, root term: Internet

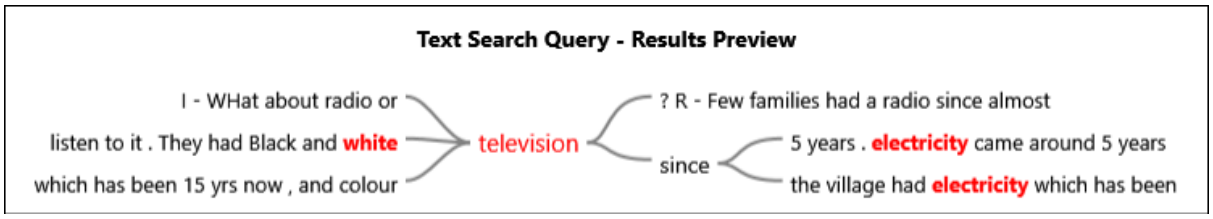

Figure B- 49 Text query, root term: Television

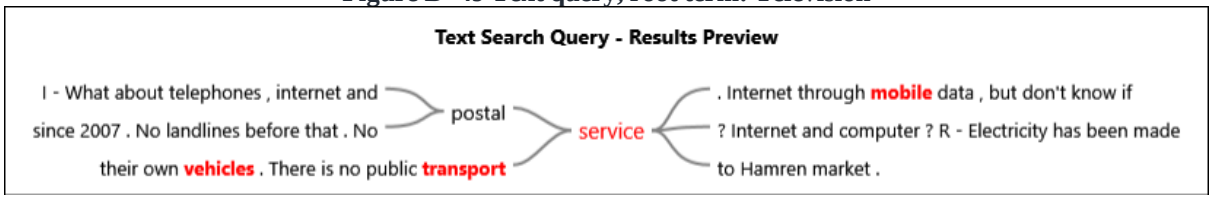

Figure B- 50 Text query, root term: Service

Figure B- 46, Figure B- 47, Figure B- 48, Figure B- 49 and Figure B- 50 are the results around resources and services in the context of the Karbi village case. The word tree results are around the root terms ‘Water’, ‘Electricity’, ‘Internet’, ‘Television’ and ‘Service’.

Traditional House

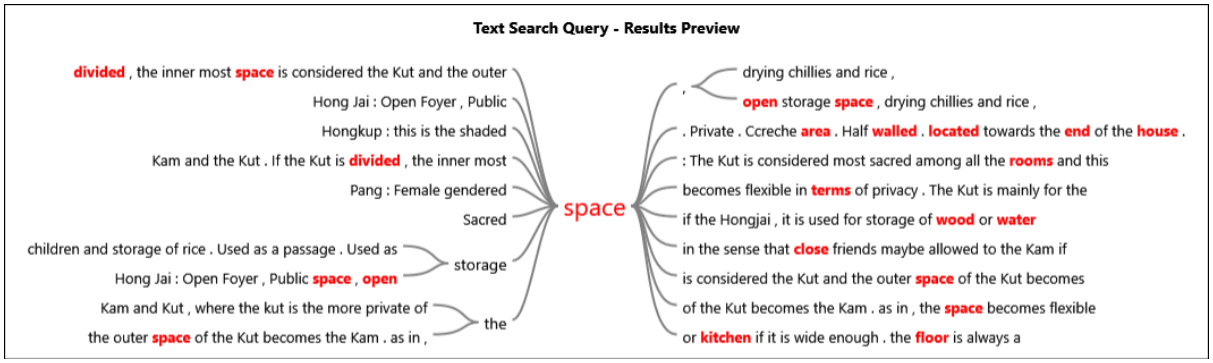

Figure B- 51 Text query root term: Space

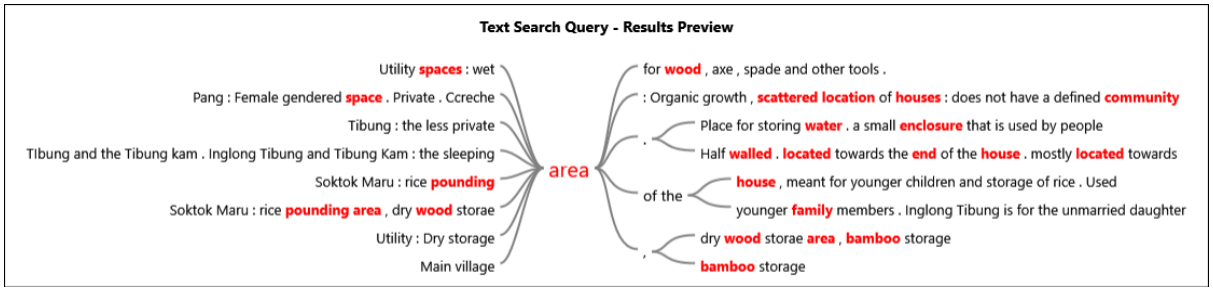

Figure B- 52 Text query, root term: Area

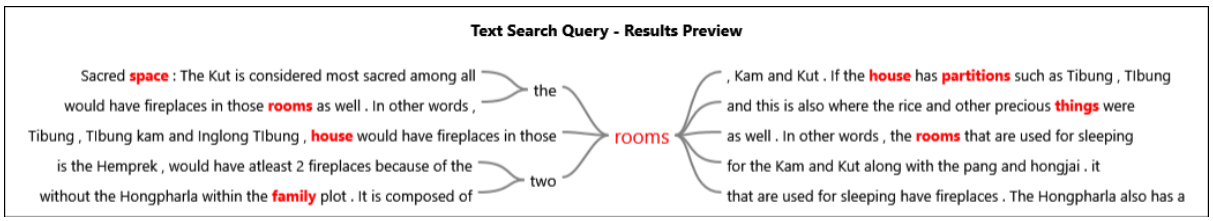

Figure B- 53 Text query, root term: Rooms

Figure B- 51, Figure B- 52, and Figure B- 53 are the results around traditional house in the context of the Karbi village case. The word tree results are around the root terms ‘Space’, ‘Area’, ‘Rooms’ and ‘Material’.

Dimasa

The following figures correspond to the results obtained from the focus group discussion transcript for Dimasa village case. The combined discussion of the text search query results is presented in Section 4.1.3.

Access

Word Input: Road OR roads OR Transport OR Vehicle OR Car OR Foot OR Way OR path OR street OR bicycle

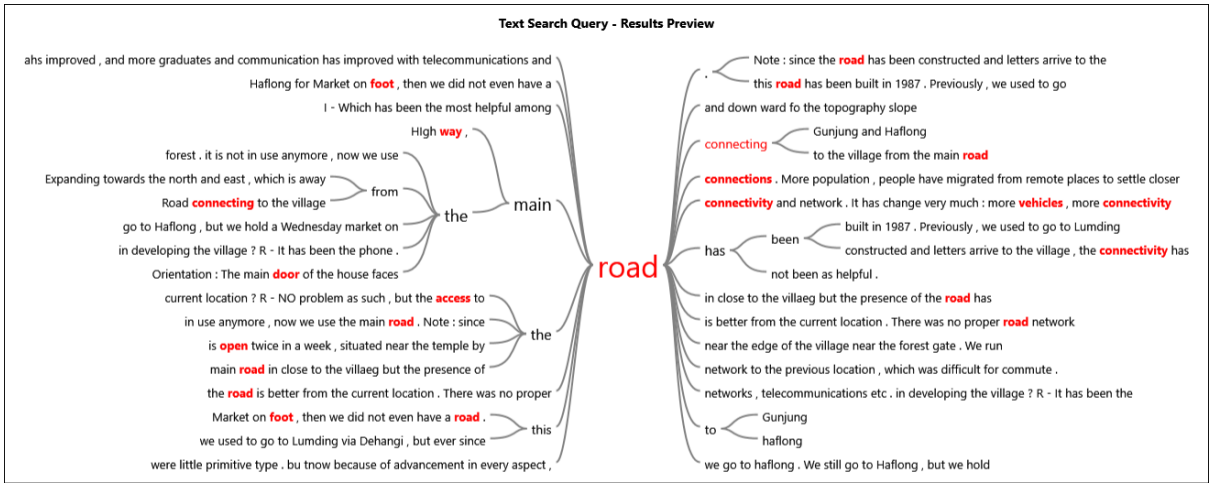

Figure B- 54 Text query, root term: Road

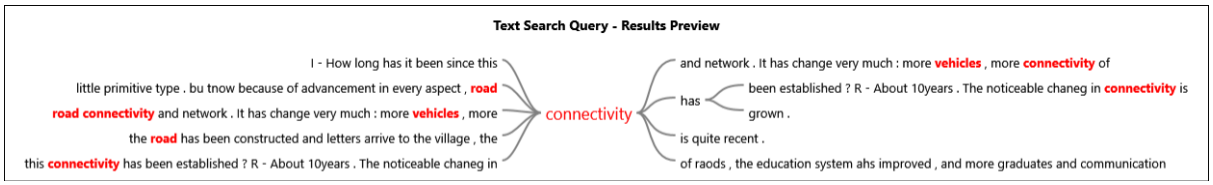

Figure B- 55 Text query, root term: Connectivity

Figure B- 54 and Figure B- 55 are the results around accessibility in the context of the Dimasa village case. The word tree results are around the root terms ‘Road’ and ‘Connectivity’.

Social Traditions and Practices

Word Input: Traditional OR Practice OR Culture OR Social OR Religion OR festival OR celebration

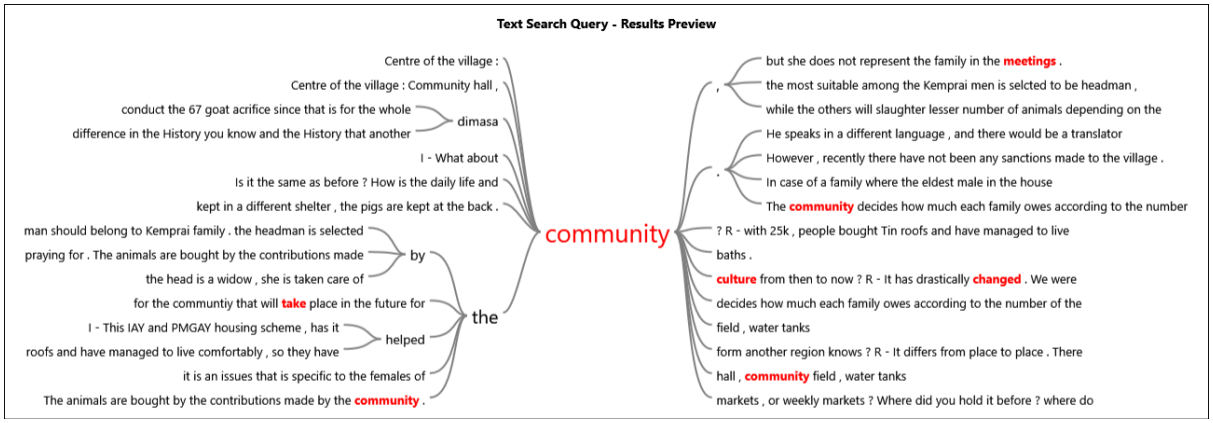

Figure B- 56 Text query, root term: Community

Figure B- 57 Text query, root term: Traditional

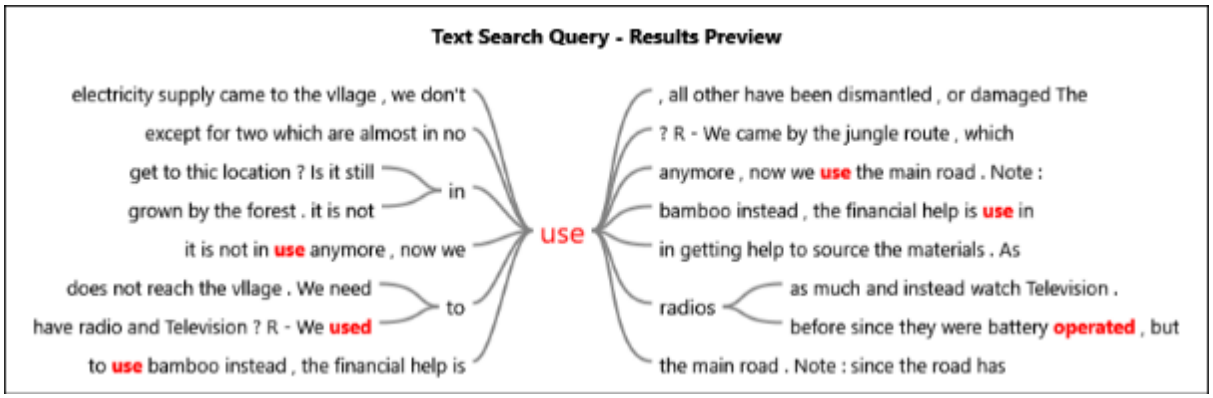

Figure B- 58 Text query, root term: Use

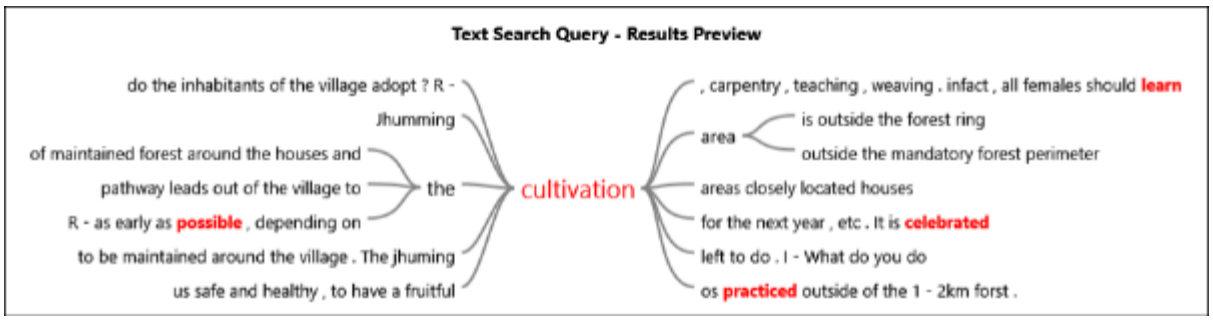

Figure B- 59 Text query, root term: Cultivation

Figure B- 56, Figure B- 57, Figure B- 58 and Figure B- 59 are the results around social traditions and social practice in the context of the Dimasa village case. The word tree results are around the root terms ‘Community’, ‘Traditional’, ‘Use’ and ‘Cultivation’.

Communication and Knowledge Sharing

Word input: Communicate OR Educate OR Message OR Knowledge OR Learning

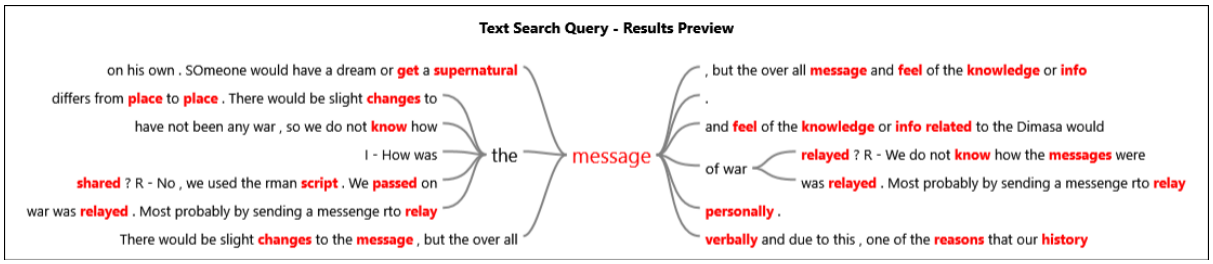

Figure B- 60 Text query, root term: Message

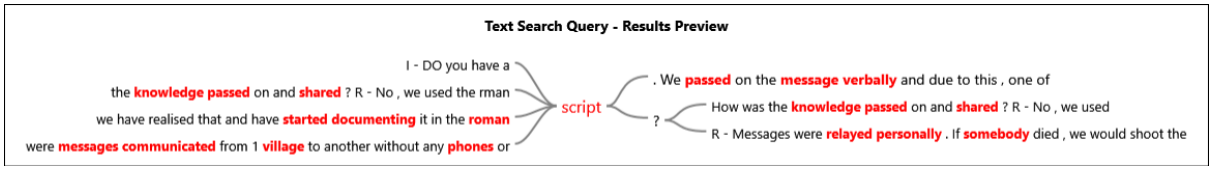

Figure B- 61 Text query, root term: Script

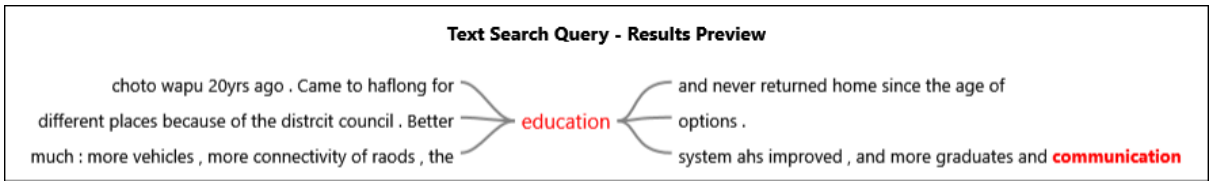

Figure B- 62 Text query, root term: Education

Figure B- 60, Figure B- 61 and Figure B- 62 are the results around communication and knowledge sharing in the context of the Dimasa village case. The word tree results are around the root terms ‘Message’, ‘Script’ and ‘Education’.

Community Infrastructure

Word Input: Building OR School OR Church OR Market OR Healthcare

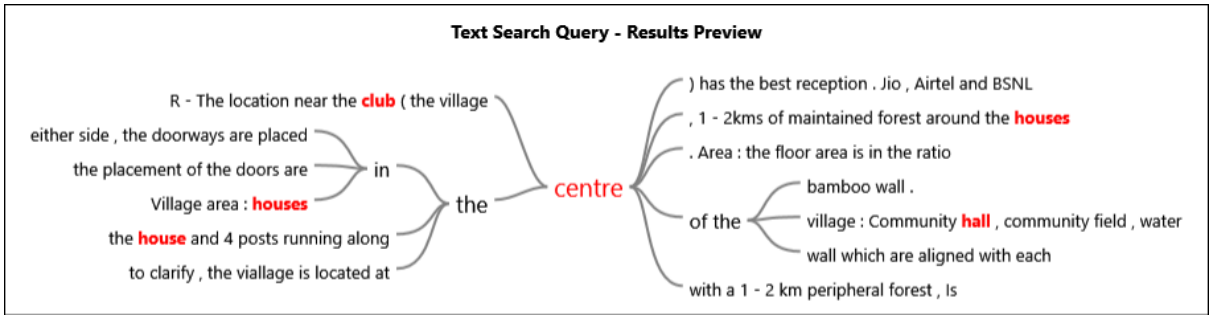

Figure B- 63 Text query, root term: Centre

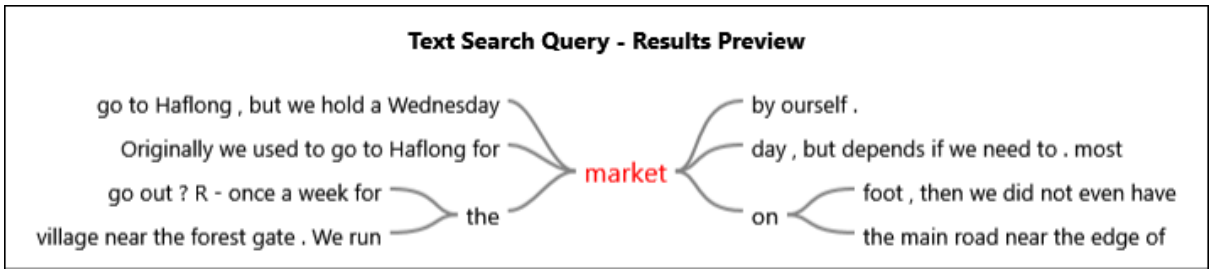

Figure B- 64 Text query, root tern: Market

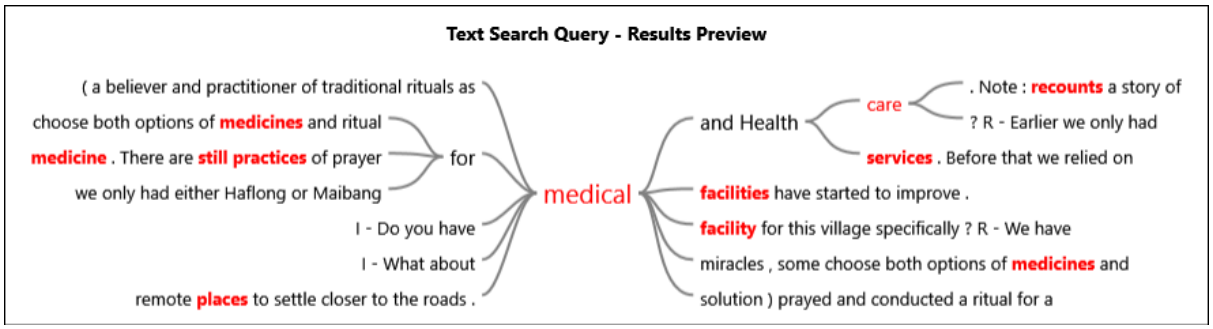

Figure B- 65 Text query, root term: Medical

Figure B- 63, Figure B- 64 and Figure B- 65 are the results around community infrastructure in the context of a Dimasa village case. The word tree results are around the root terms ‘Centre’ ‘Market’ and ‘Medical’.

Livelihood

Word input: Livelihood OR Jobs OR Employment OR Work

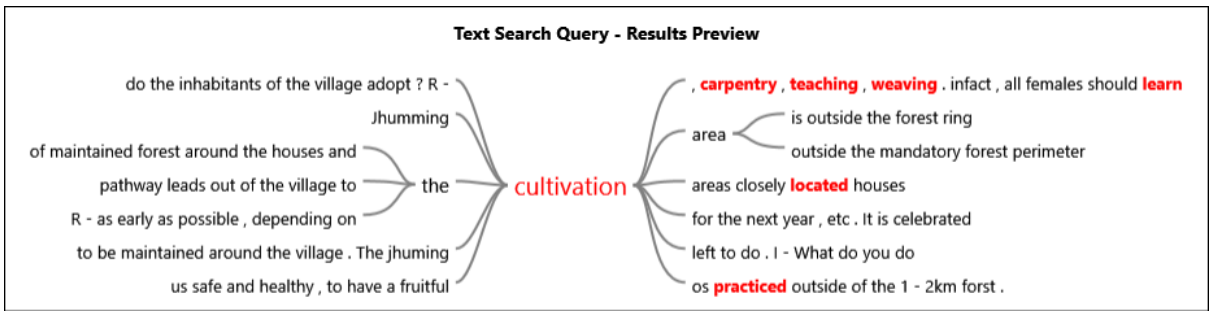

Figure B- 66 Text query, root term: Cultivation

Figure B- 67 Text query, root term: Land

Figure B- 66 and Figure B- 67 are the results around livelihood in the context of a Dimasa village case. The word tree results are around the root terms ‘Cultivation’ and ‘Land’.

Resources and Services

Word input: Water OR Electricity OR Plumbing OR Telecommunication

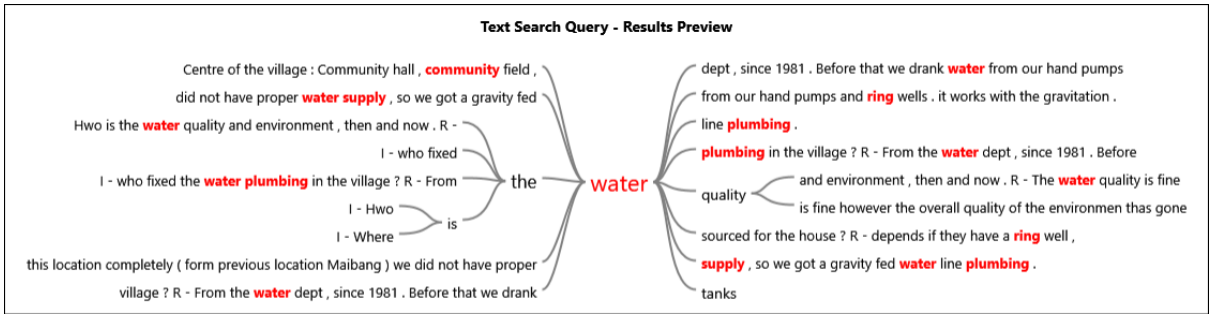

Figure B- 68 Text query, root term: Water

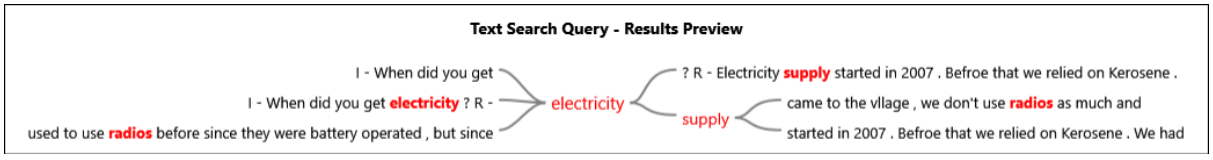

Figure B- 69 Text query, root term: Electricity

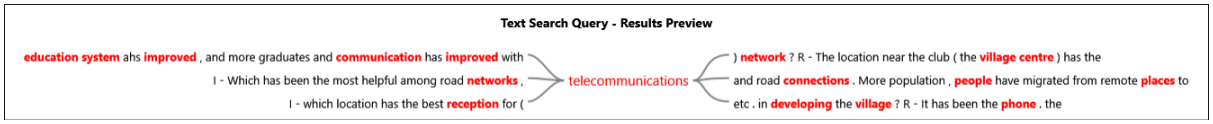

Figure B- 70 Text query, root term: Telecommunications

Figure B- 68, Figure B- 69 and Figure B- 70 are the results around resources and services in the context of a Dimasa village case. The word tree results are around the root terms ‘water’, ‘electricity’ and ‘telecommunications’.

Traditional House

Word Input: House OR material OR space OR room OR construction

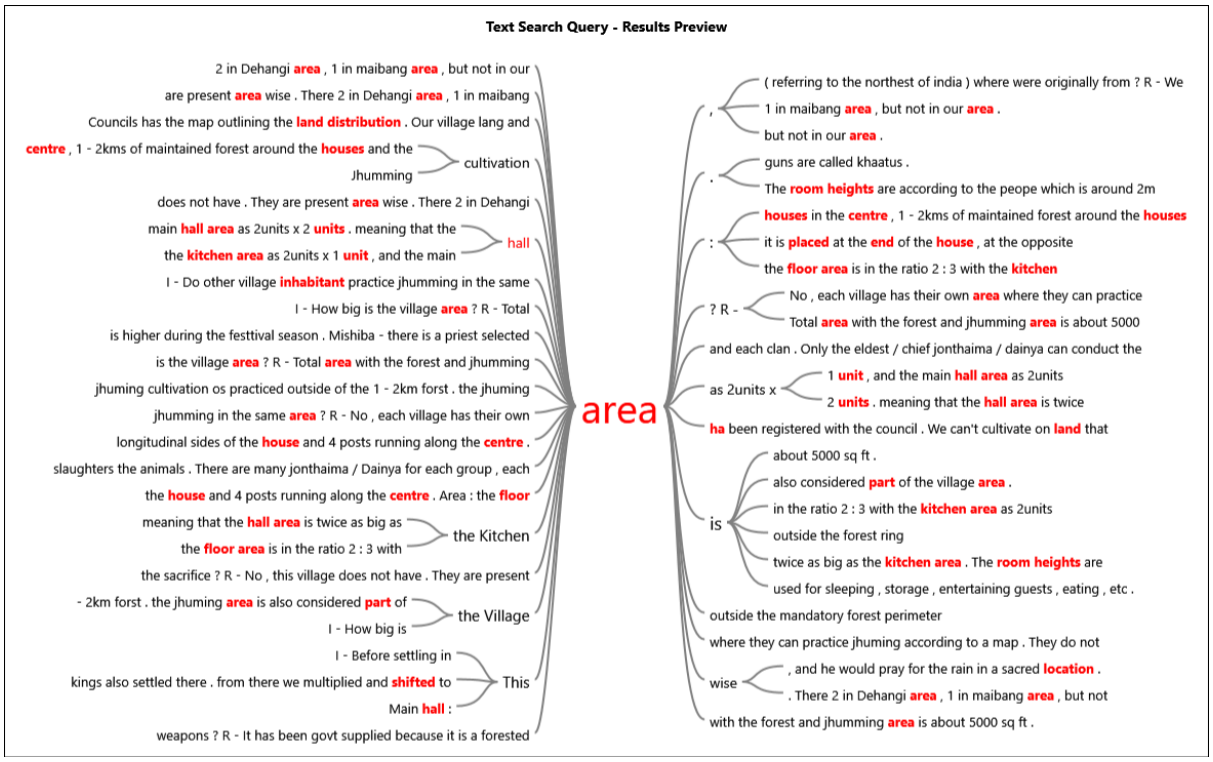

Figure B- 71 Text query, root term: Area

Figure B- 71 is the results around traditional house in the context of the Dimasa village case. The word tree result is around the root term ‘Area’.

Labang

The following figures correspond to the results obtained from the focus group discussion transcript for Labang village case. The combined discussion of the text search query results is presented in Section 4.1.4.

Access

Word Input: Road OR roads OR Transport OR Vehicle OR Car OR Foot OR Way OR path OR street OR bicycle

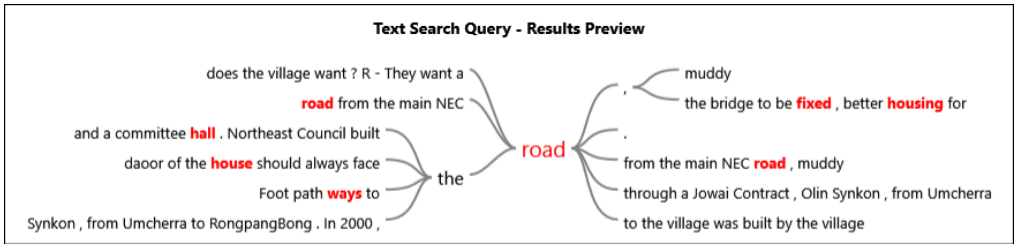

Figure B- 72 Text query, root term: Road

Figure B- 72 is a result around accessibility in the context of Labang village case. The word tree is formed around the root term 'Road'.

Social Traditions and Practices

Word Input: Traditional OR Practice OR Culture OR Social OR Religion OR festival OR celebration

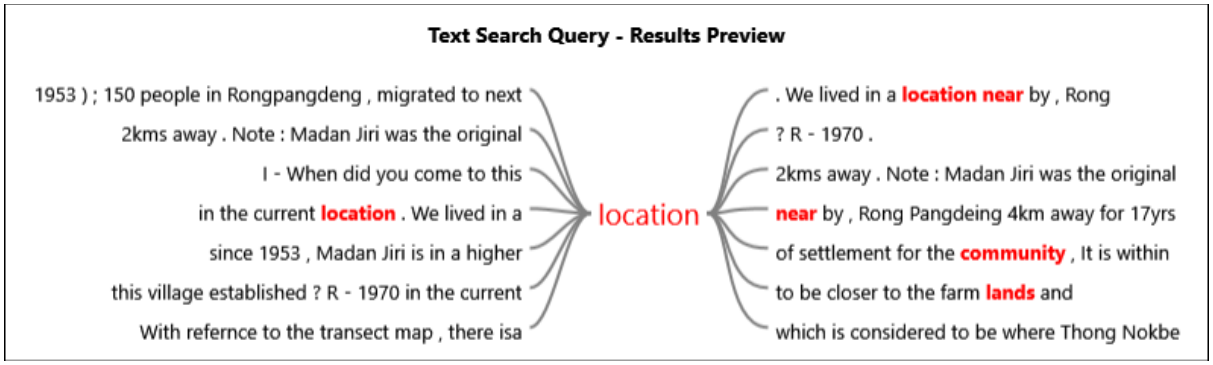

Figure B- 73 Text query, root term: Location

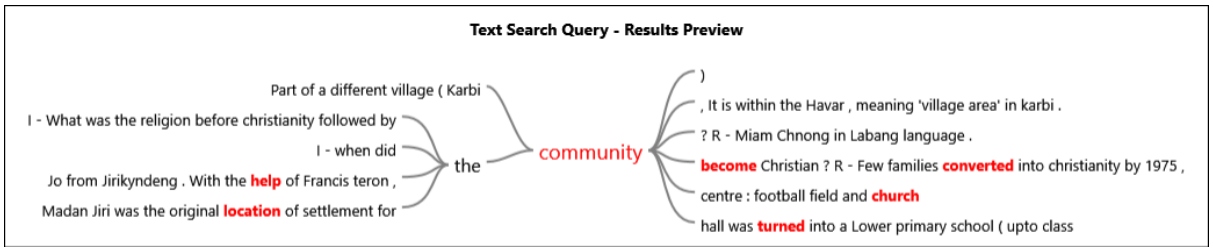

Figure B- 74 Text query, root term: Community

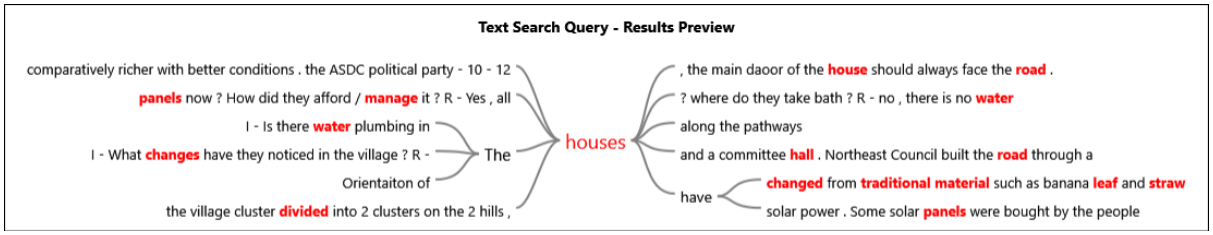

Figure B- 75 Text query, root term: Houses

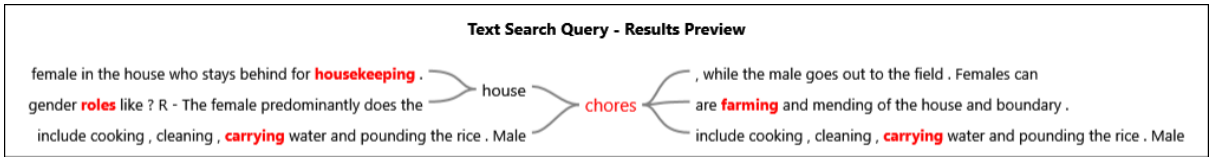

Figure B- 76 Text query, root term: Chores

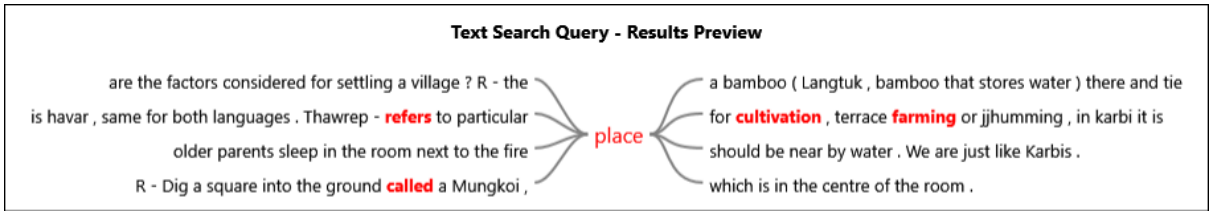

Figure B- 77 Text query, root term: Place

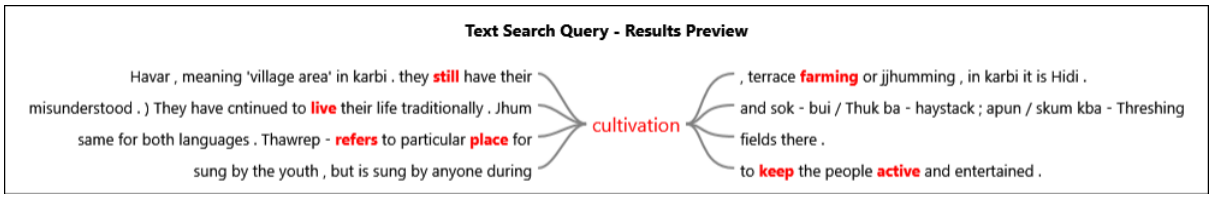

Figure B- 78 Text query, root term: Cultivation

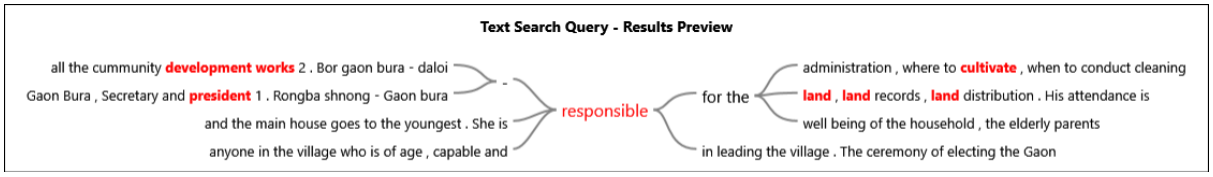

Figure B- 79 Text query, root term: Responsible

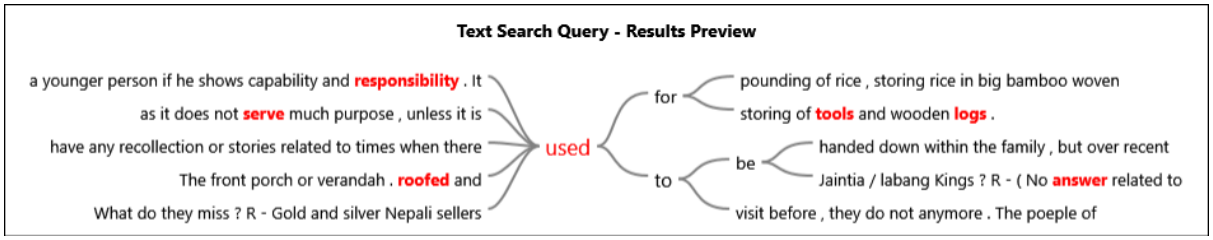

Figure B- 80 Text query, root term: Used

Figure B- 73, Figure B- 74, Figure B- 75, Figure B- 76, Figure B- 77, Figure B- 78, Figure B- 79 and Figure B- 80 are the results around social traditions and practices in the context of Labang. The results are the root terms ‘location’, ‘community’, ‘houses’, ‘chores’, ‘place’, ‘cultivation’, ‘responsible’ and ‘used’.

Communication and Knowledge Sharing

Word input: Communicate OR Educate OR Message OR Knowledge OR Learning

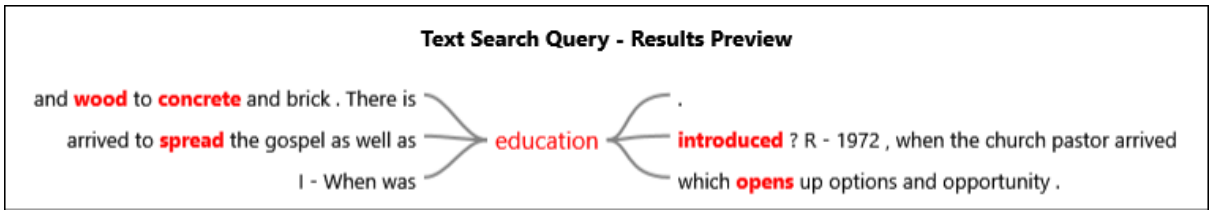

Figure B- 81 Text query, root term: Education

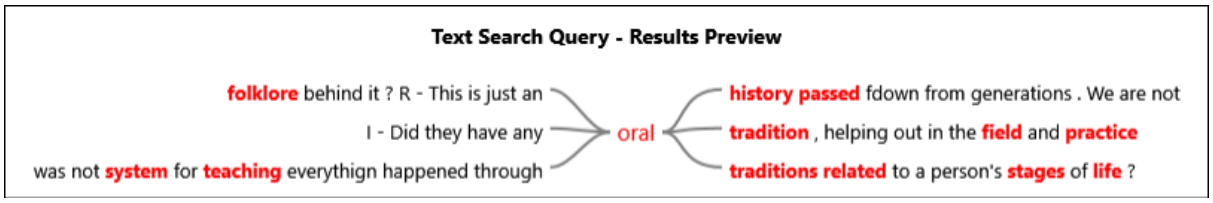

Figure B- 82 Text query, root term: Oral

Figure B- 81 and Figure B- 82 are results around communication and knowledge sharing in the context of Labang village case. The word trees are around the root term ‘education’ and ‘oral’.

Community Infrastructure

Word Input: Building OR School OR Church OR Market OR Healthcare

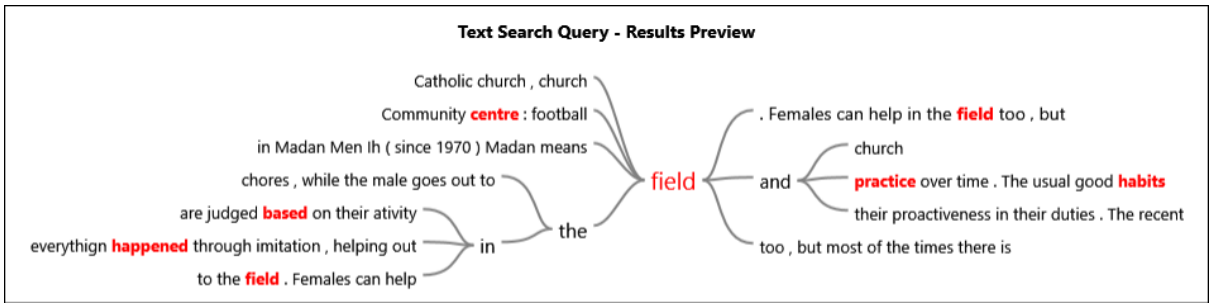

Figure B- 83 Text query, root term: Field

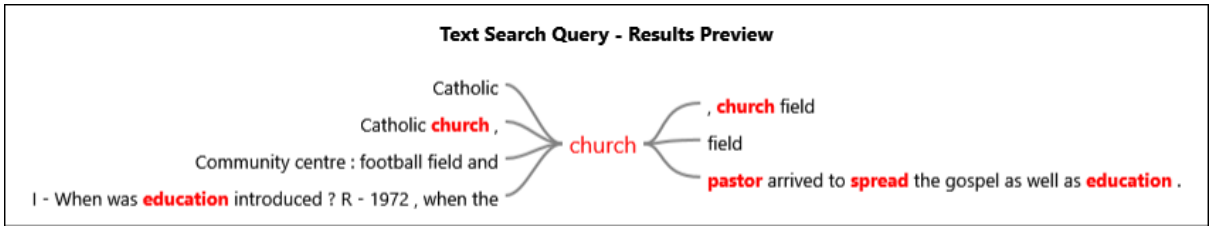

Figure B- 84 Text query, root term: Church

Figure B- 83 and Figure B- 84 are the results around community infrastructure in the context of Labang village case. The results are around the root terms ‘field’ and ‘church’.

Livelihood

Word input: Livelihood OR Jobs OR Employment OR Work

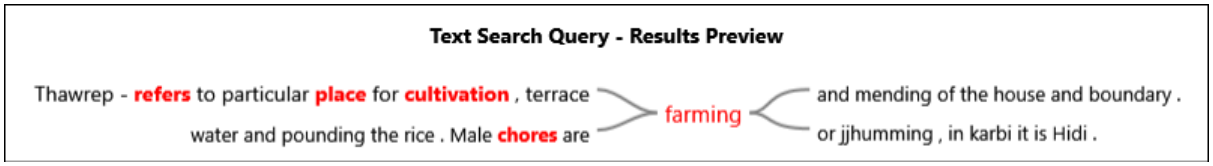

Figure B- 85 Text query, root term: Farming

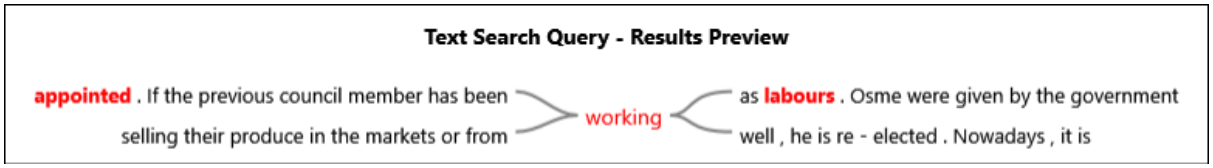

Figure B- 86 Text query, root term: Working

Figure B- 85 and Figure B- 86 are the results around Livelihood in the context of the Labang village case. The root terms are ‘farming’ and ‘working’.

Resources and Services

Word input: Water OR Electricity OR Plumbing OR Telecommunication

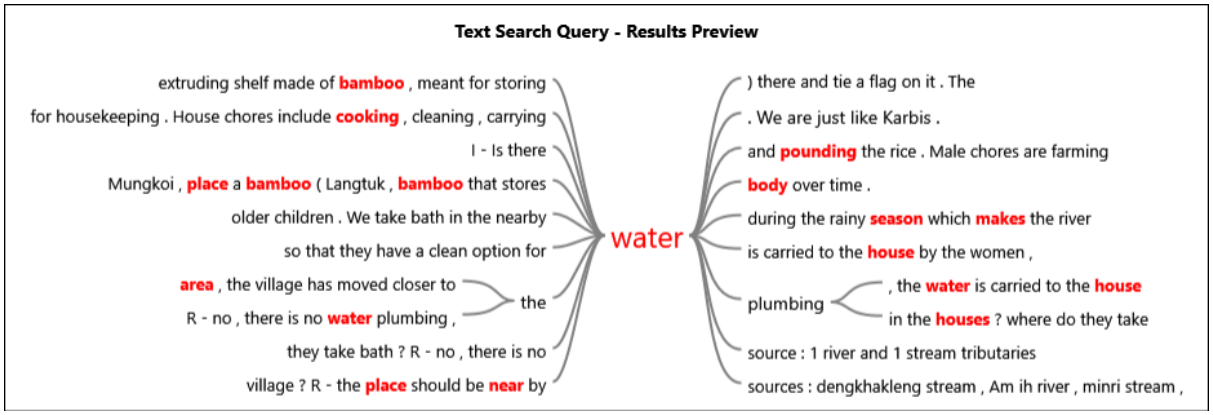

Figure B- 87 Text query, root term: Water

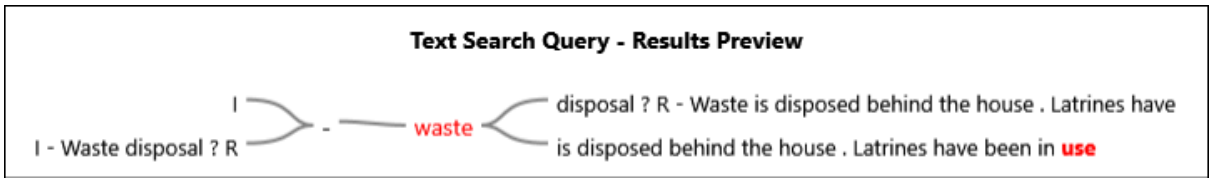

Figure B- 88 Text query, root term: Waste

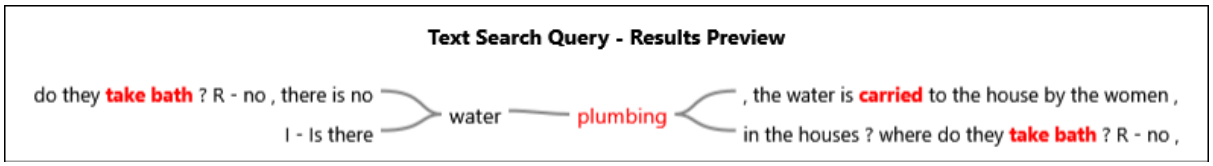

Figure B- 89 Text query, root term: Plumbing

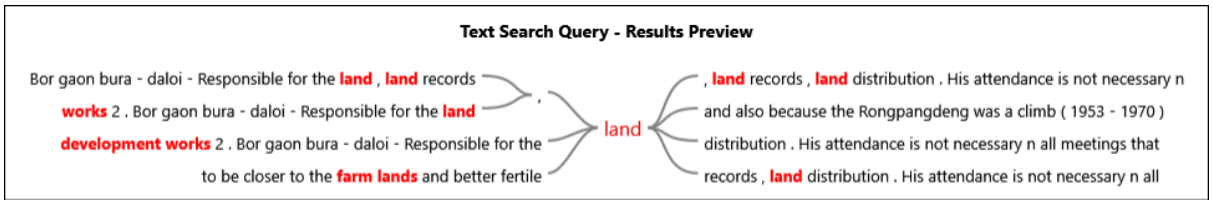

Figure B- 90 Text query, root term: Land

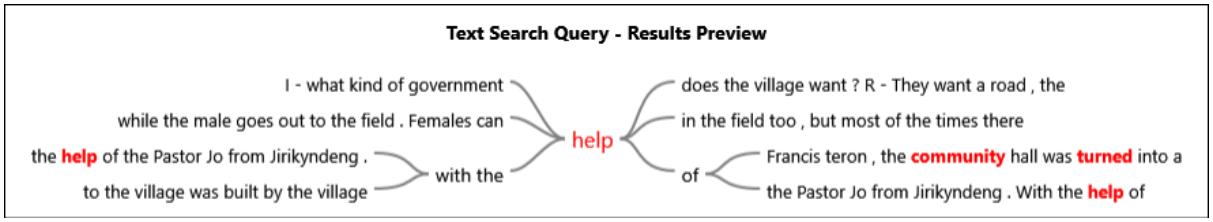

Figure B- 91 Text query, root term: Help

Figure B- 86Figure B- 87, Figure B- 88, Figure B- 89, Figure B- 90 and Figure B- 91 are the results around resources and services in the context of Labang village case. The root terms are ‘water’, ‘waste’, ‘plumbing’, ‘land’ and ‘help’.

Traditional House

Word Input: House OR material OR space OR room OR construction

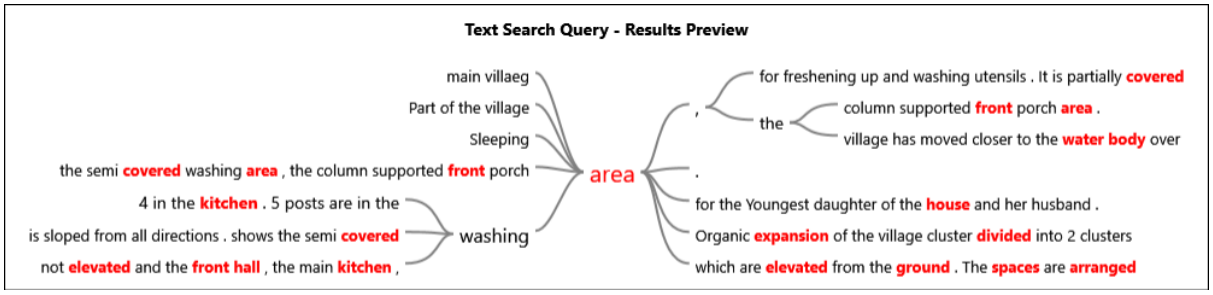

Figure B- 92 Text query, root term: Area

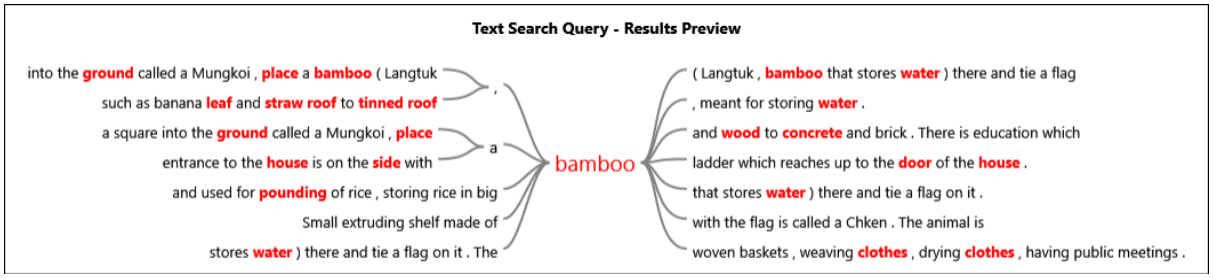

Figure B- 93 Text query, root term: Bamboo

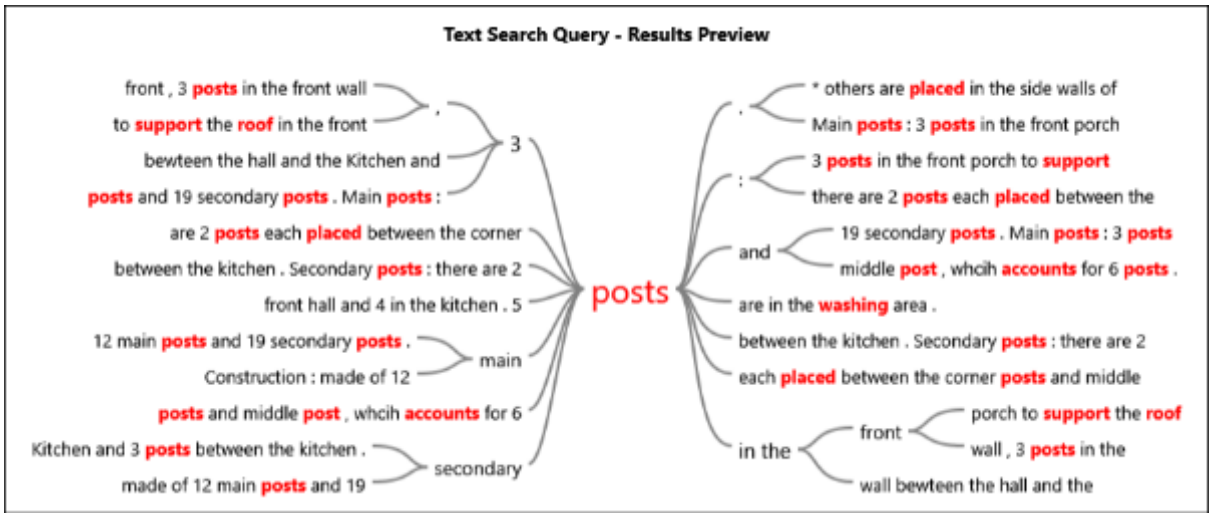

Figure B- 94 Text query, root term: Posts

Figure B- 92, Figure B- 93 and Figure B- 94 around the traditional house in the context of Labang village case. The root words are ‘area’, ‘bamboo’ and ‘posts’.

Appendix C. Contextual Plans and House Layouts

This Section has the images of the house layouts of the remaining ten households that were studied during the data collection but were not included in the data analysis in Chapter 5.

Kuki House: KuH03

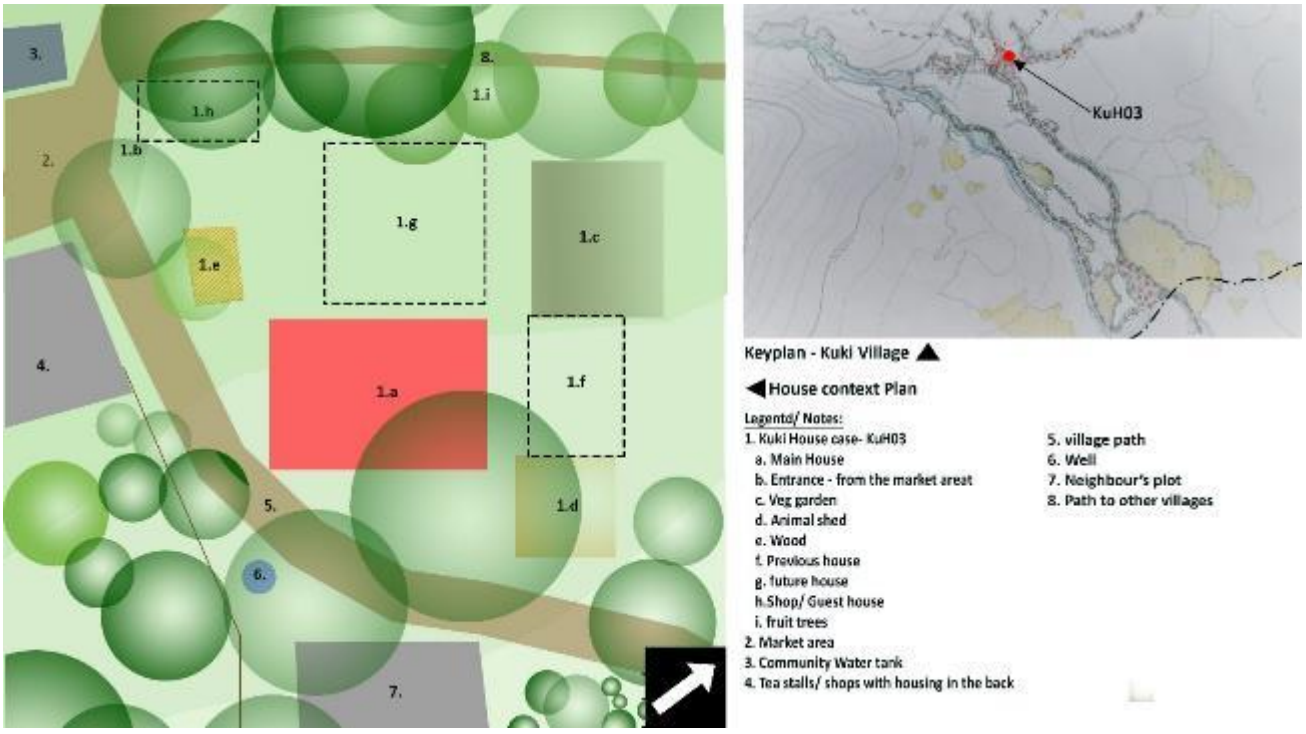

Figure C- 1Kuki house, KuH03

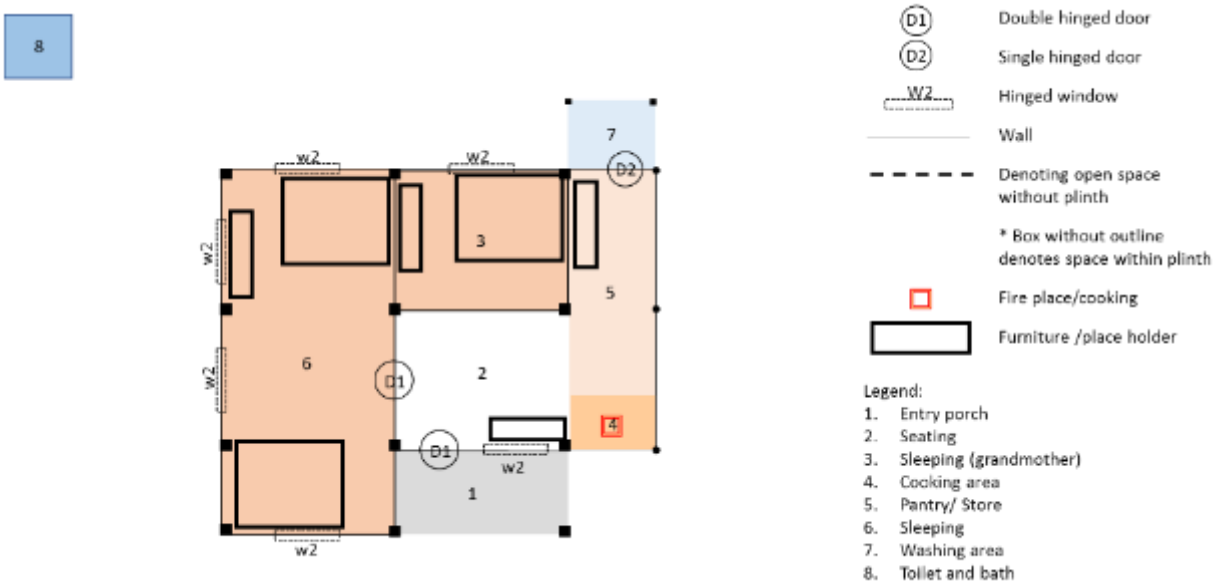

Figure C- 2 KuH03, current layout

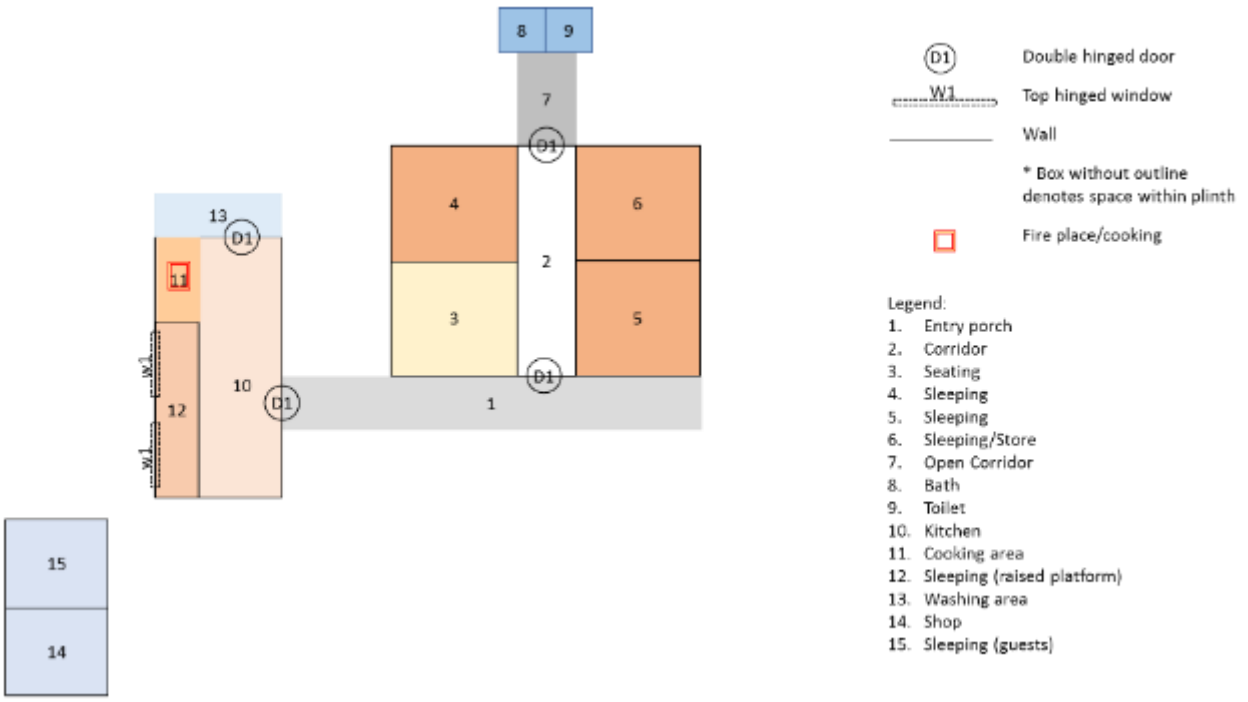

Figure C- 3 KuH03, future layout

Kuki House: KuH08

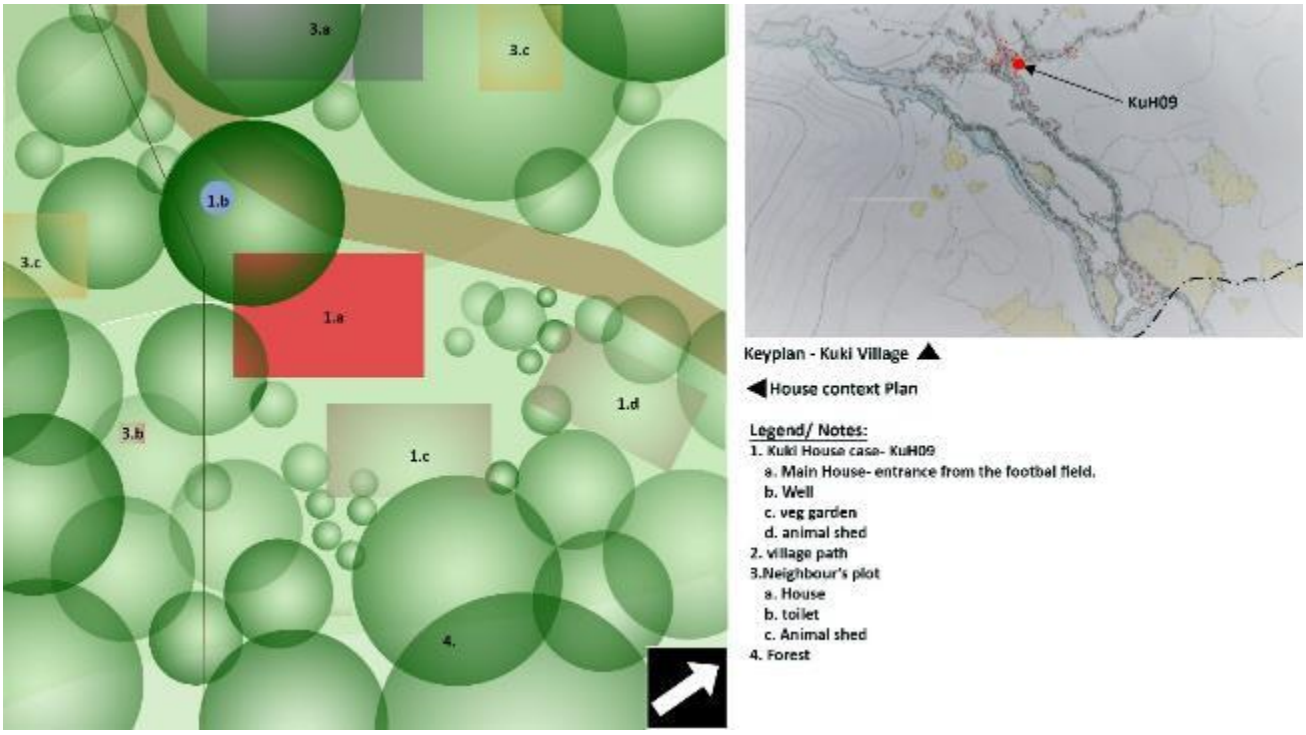

Figure C- 4 Kuki house, KuH08

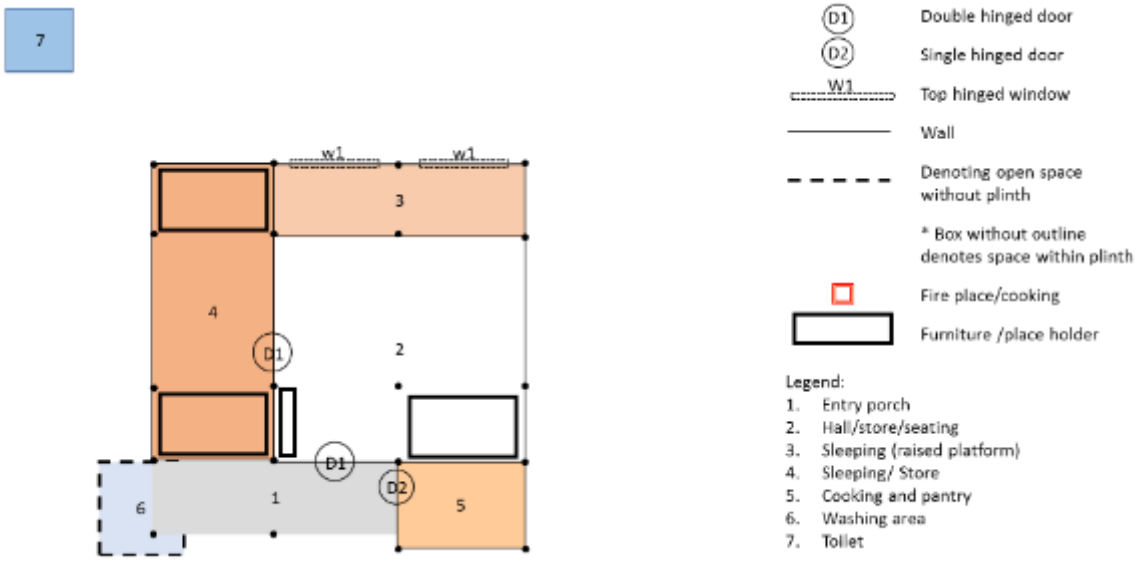

Figure C-5 KuH08, current house layout

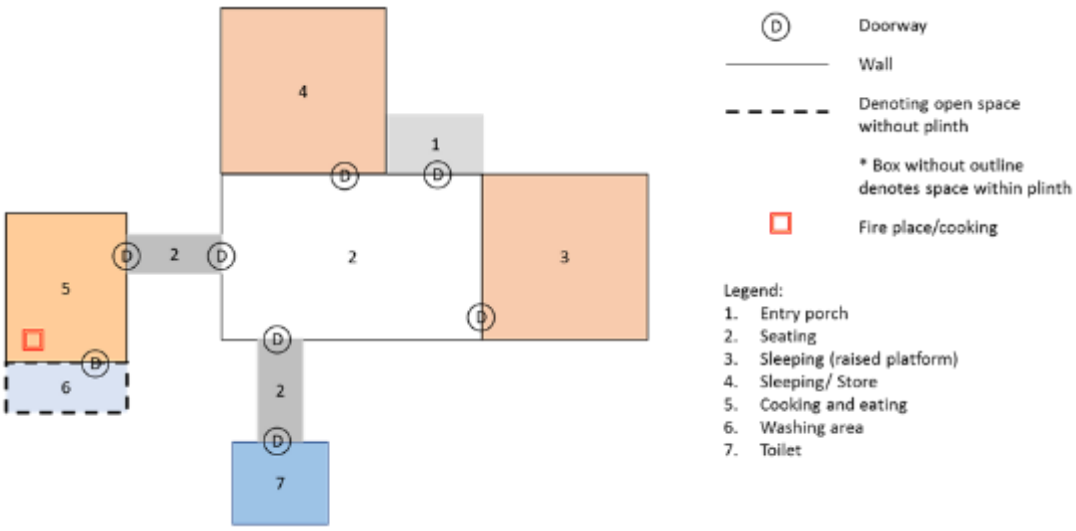

Figure C- 6 KuH08, future house layout

Kuki House: KuH19

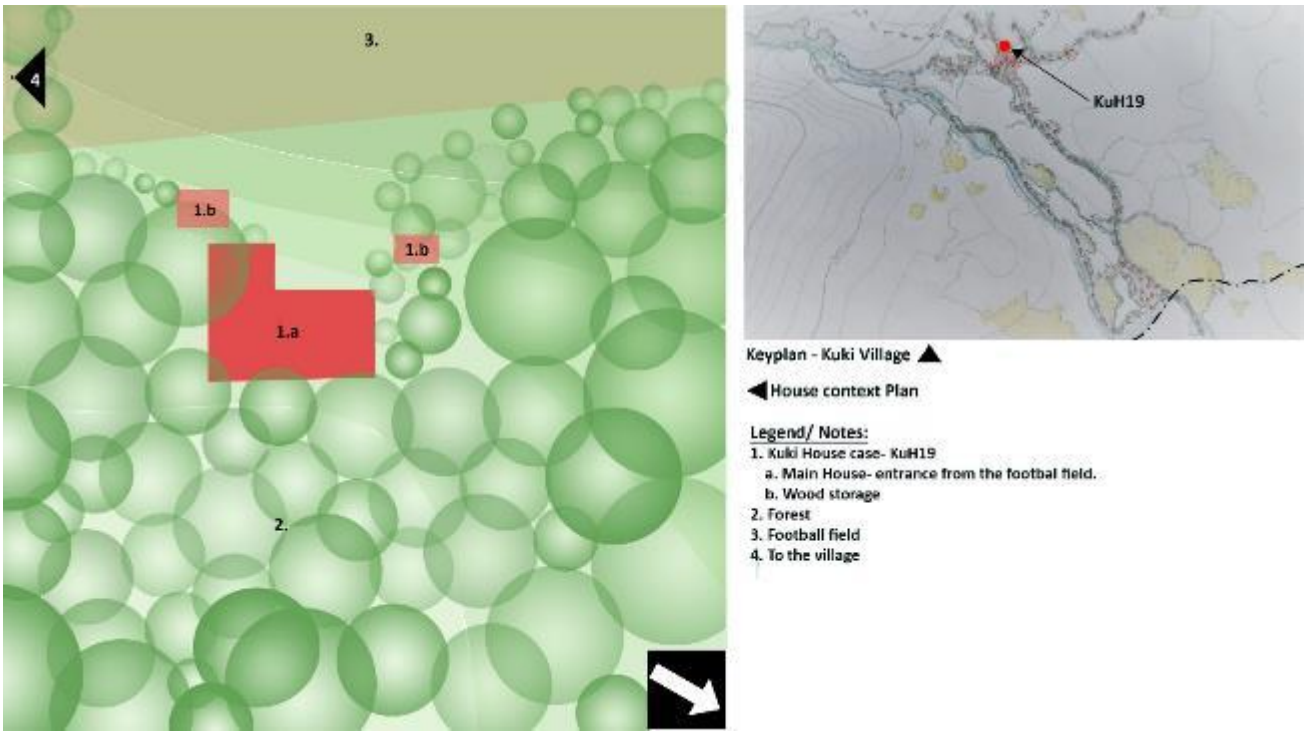

Figure C- 7 Kuki house, KuH19

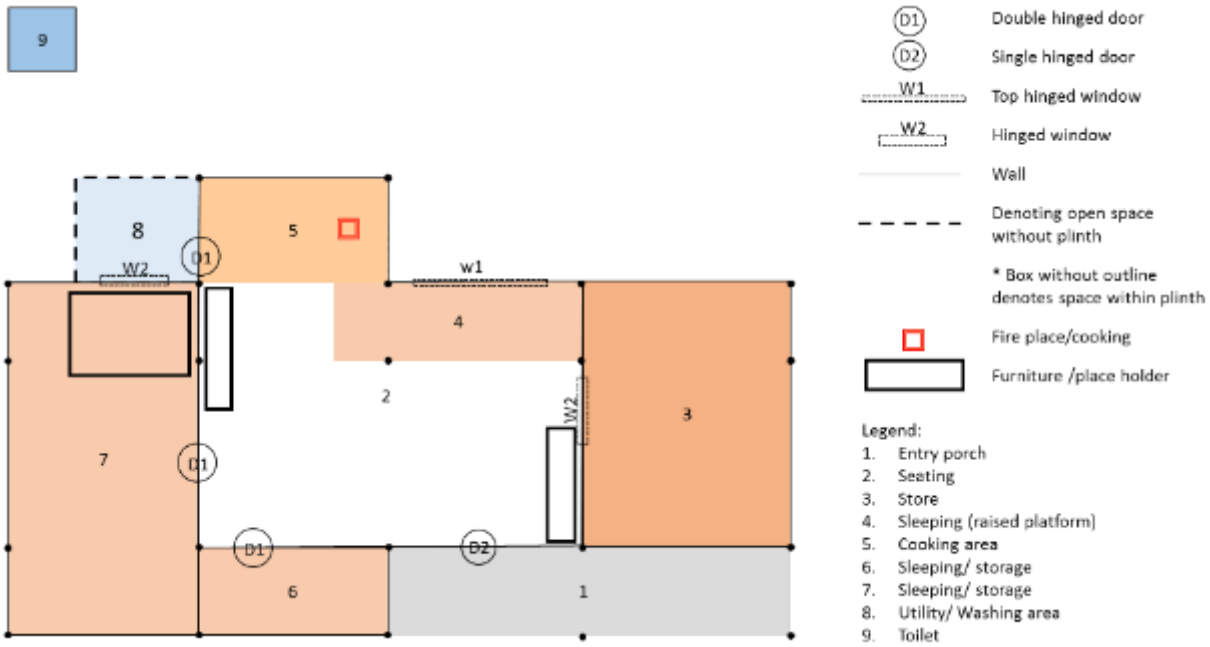

Figure C- 8 KuH19, current house layout

Karbi House: KaH01

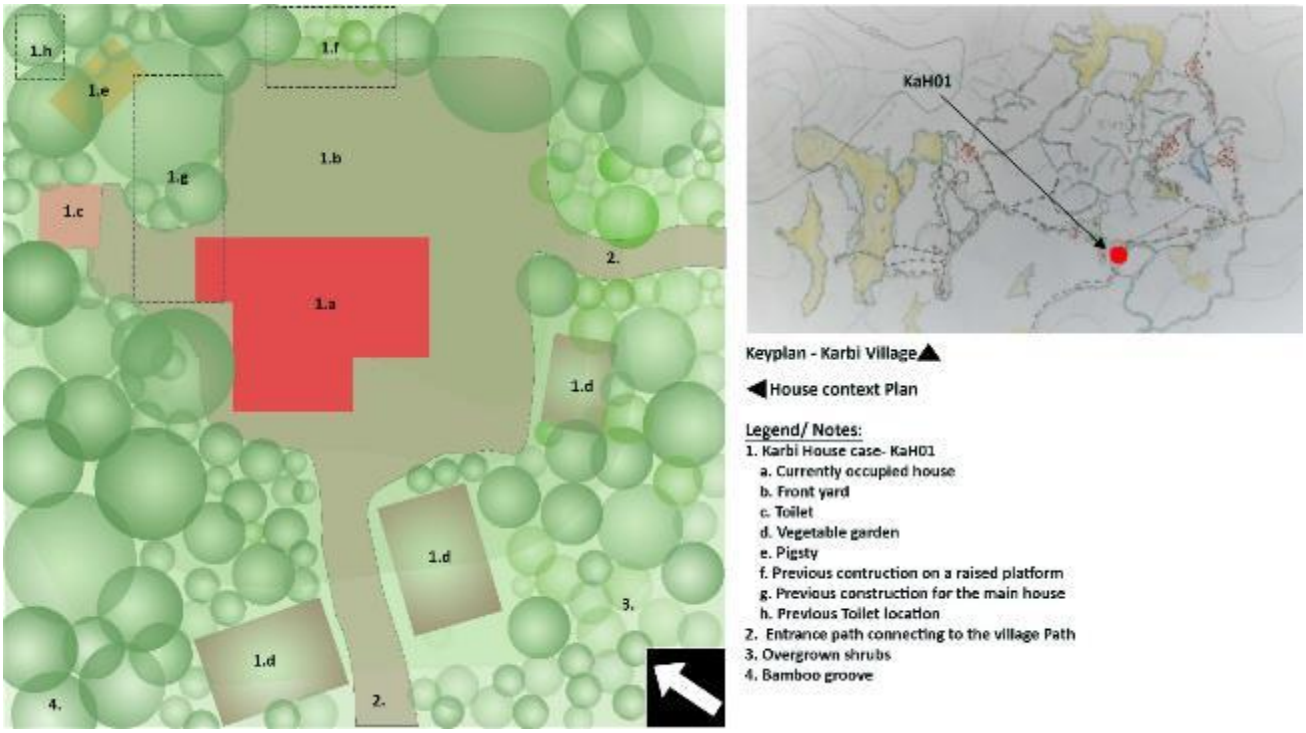

Figure C- 9 Karbi house: KaH01

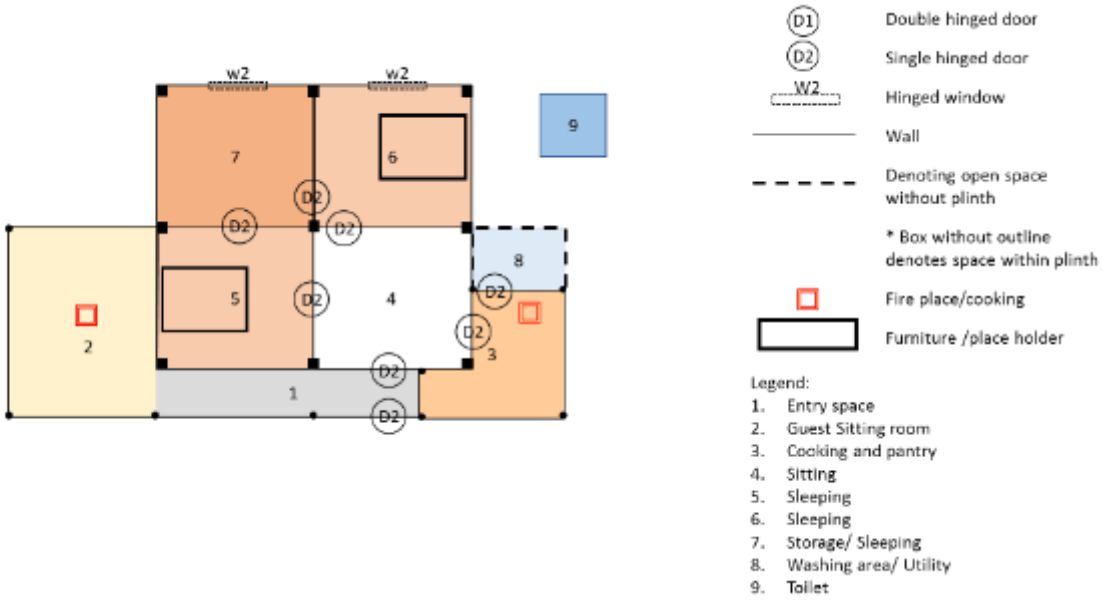

Figure C- 10 KaH01, current house layout

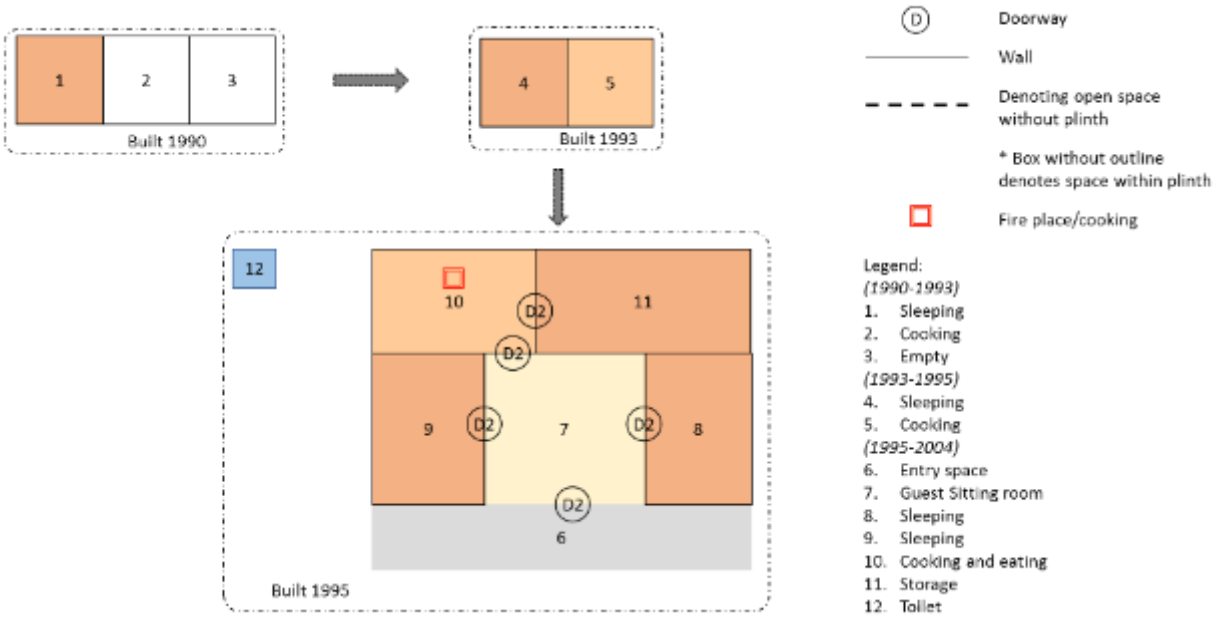

Figure C- 11 KaH01, past house layout

Karbi House: KaH19

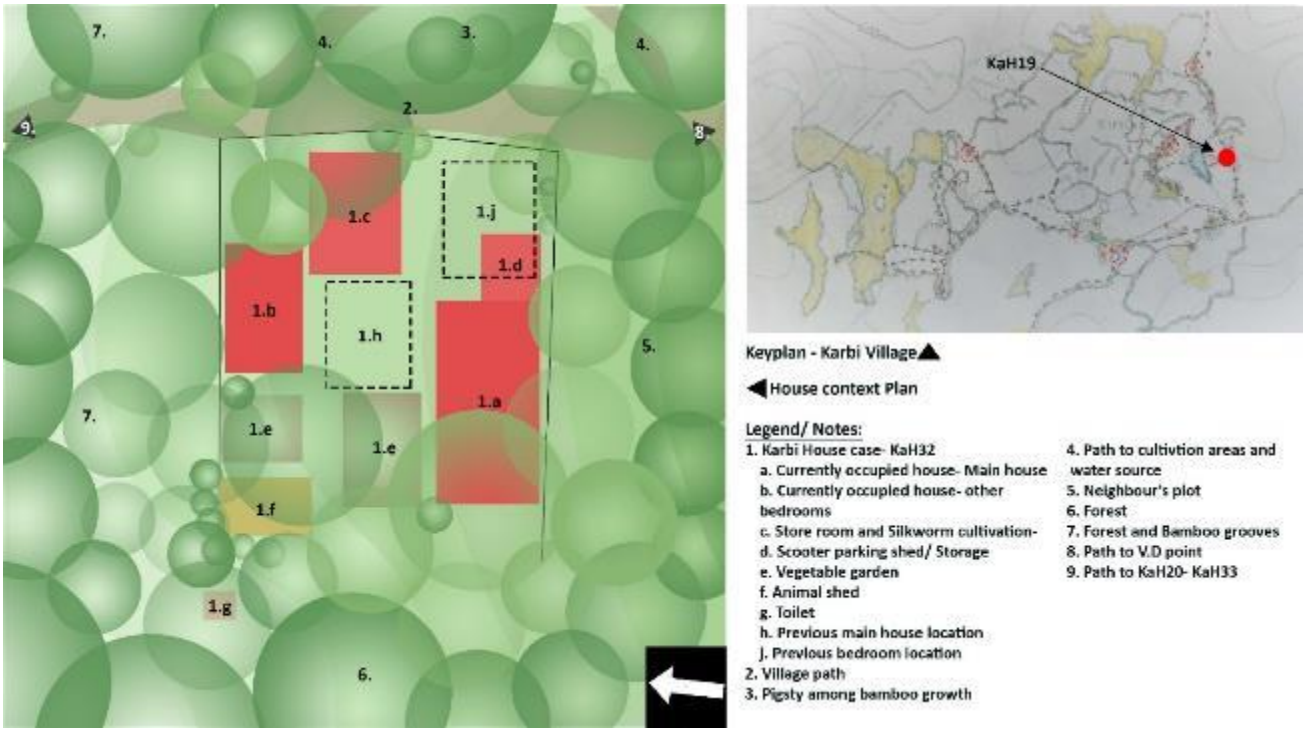

Figure C- 12 Karbi house, KaH19

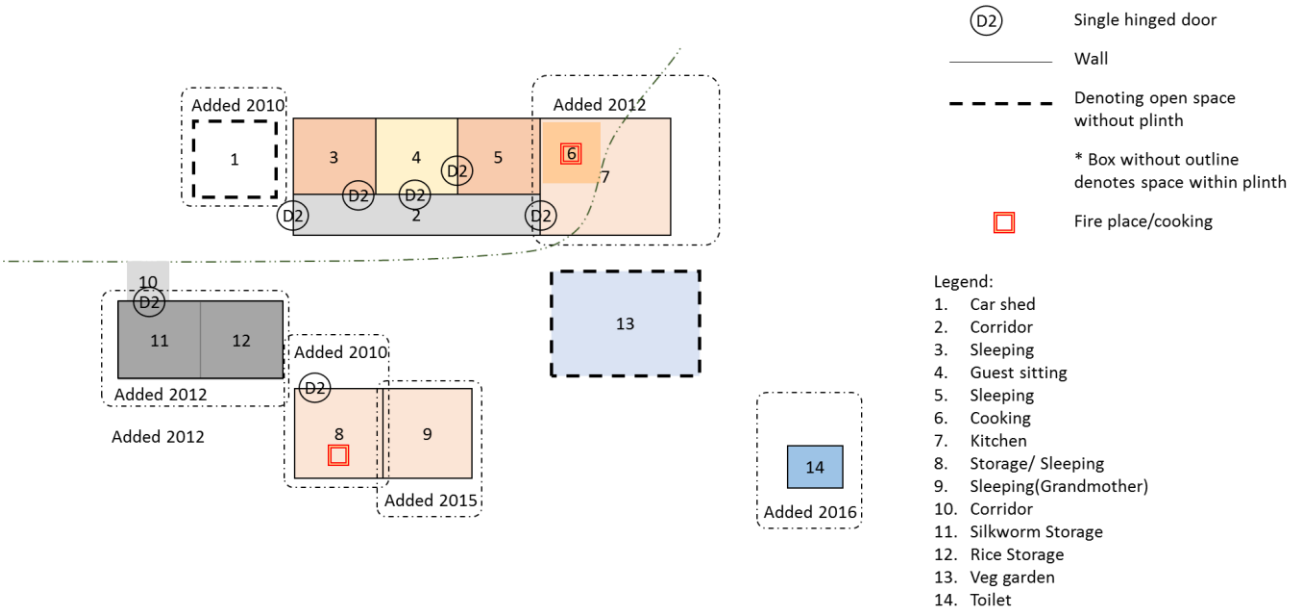

Figure C- 13 KaH19, current house layout

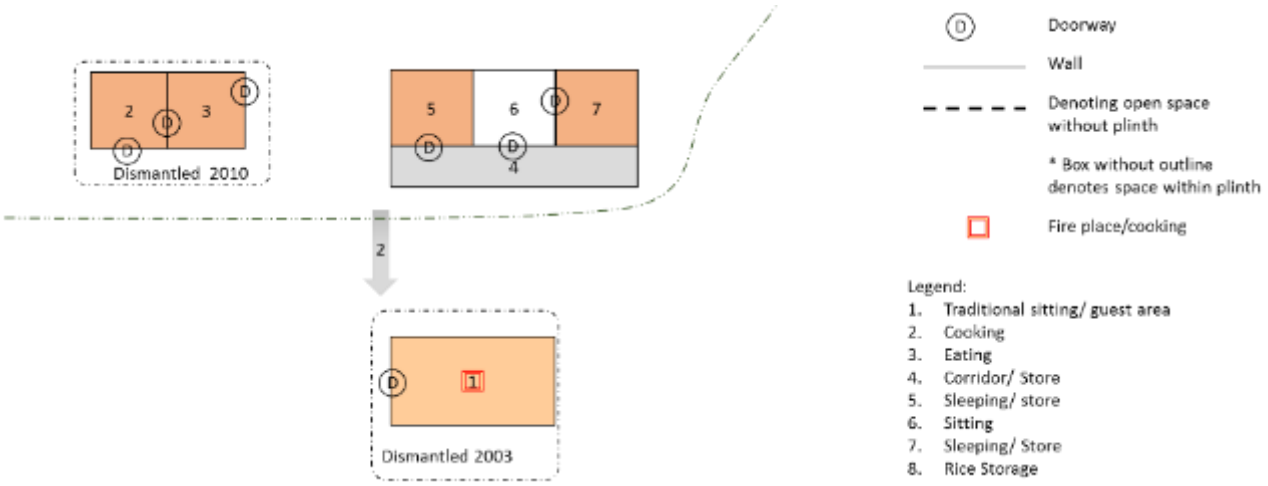

Figure C- 14 KaH19, past house layout

Karbi House: KaH26

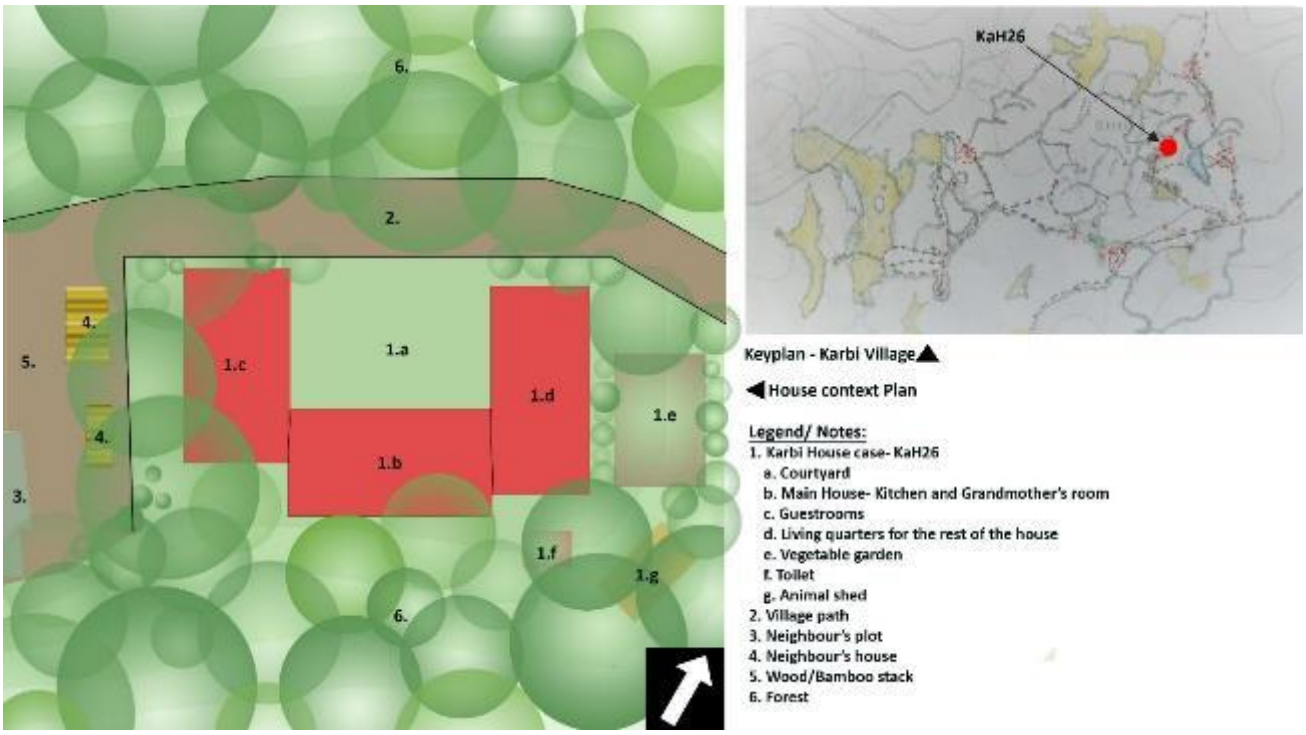

Figure C- 15 Karbi house, KaH26

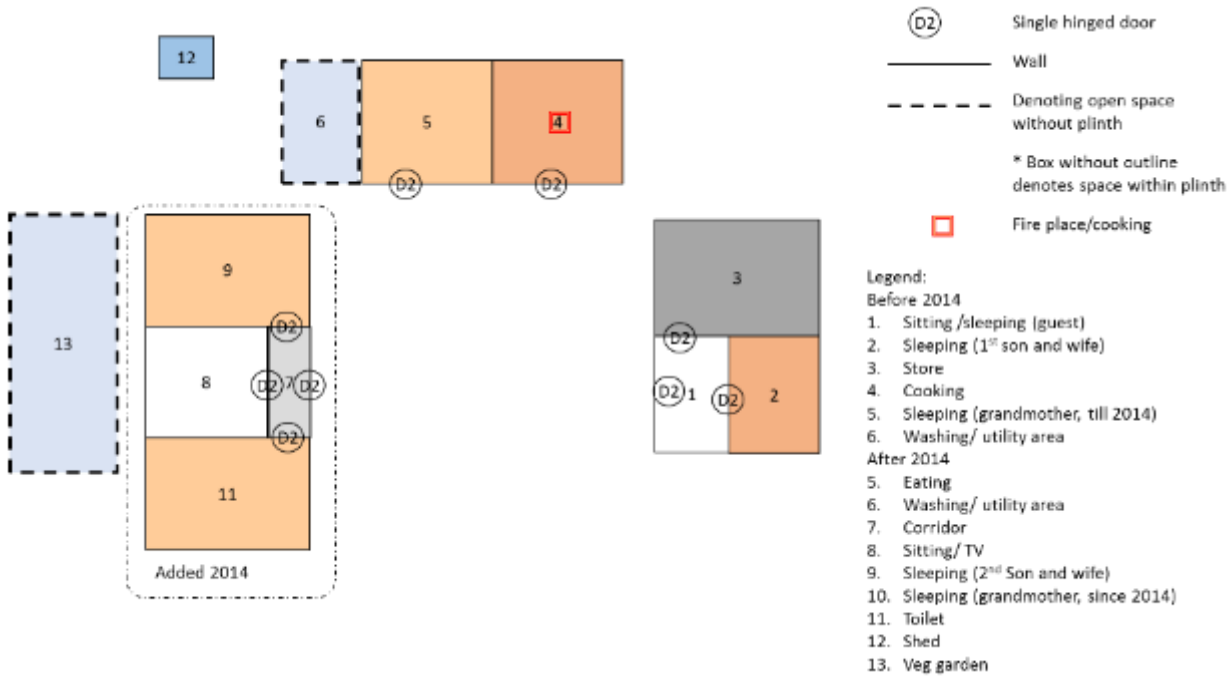

Figure C- 16 KaH26, current house layout

Dimasa House: DiH01

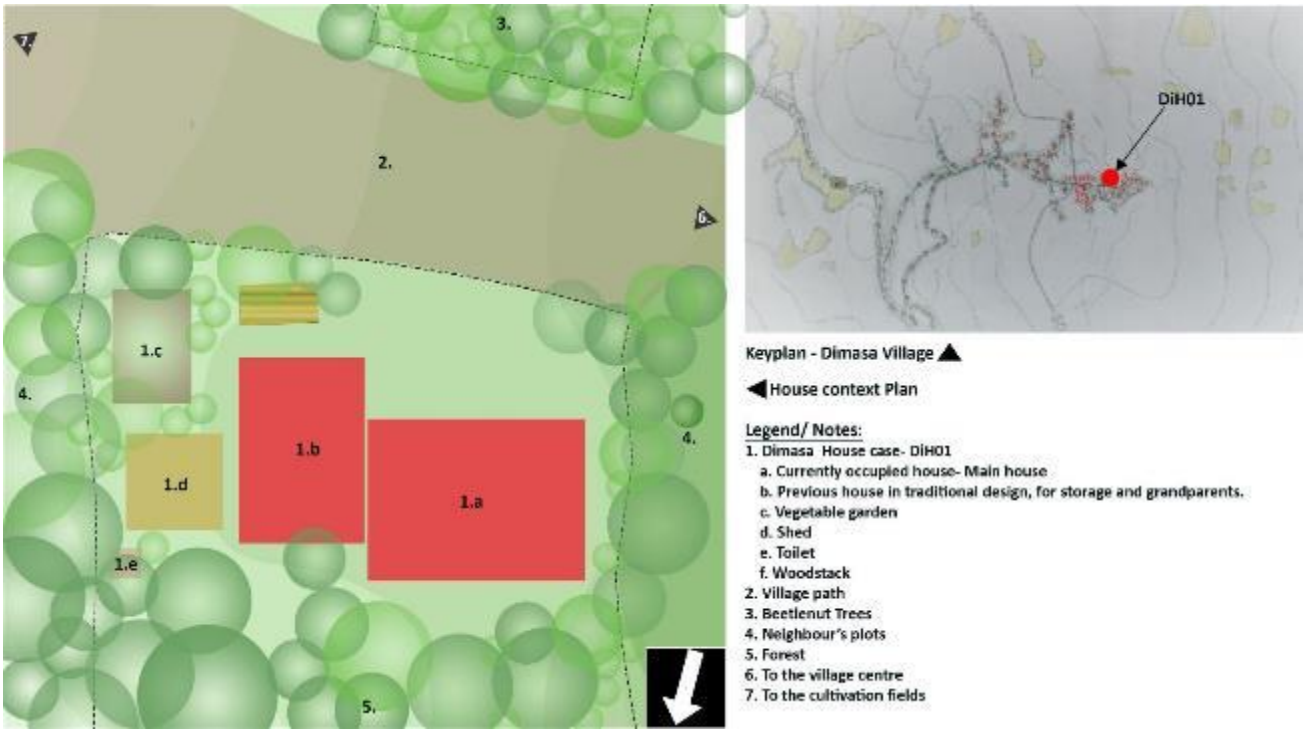

Figure C- 17 Dimasa house, DiH01

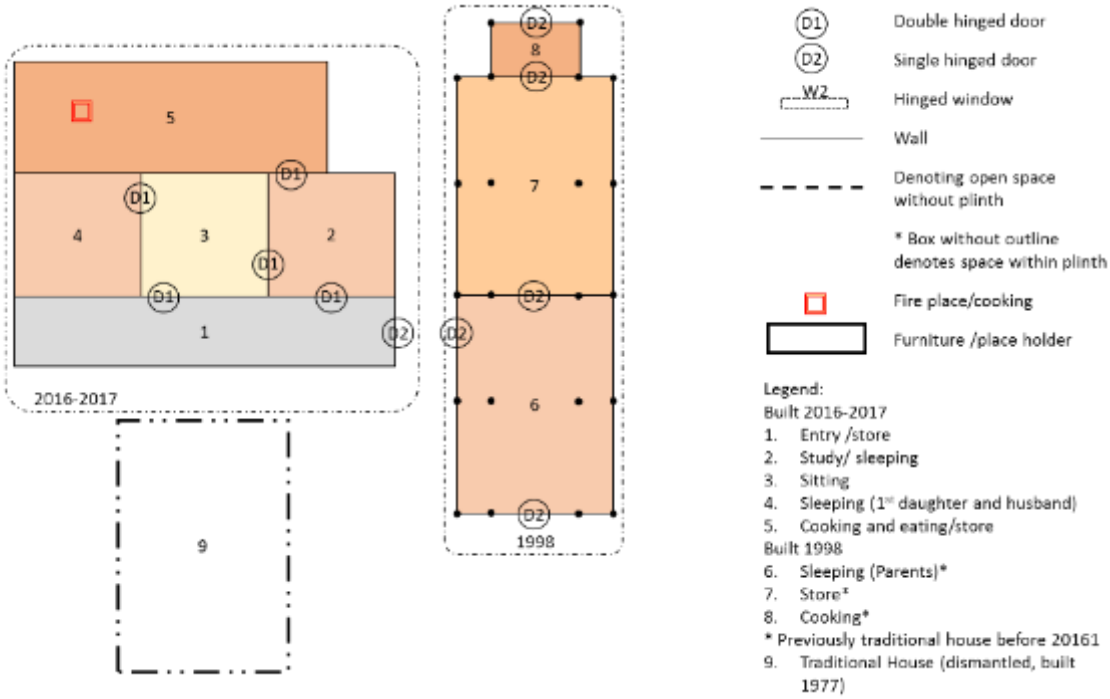

Figure C- 18 DiH01, current house layout

Dimasa House: DiH05

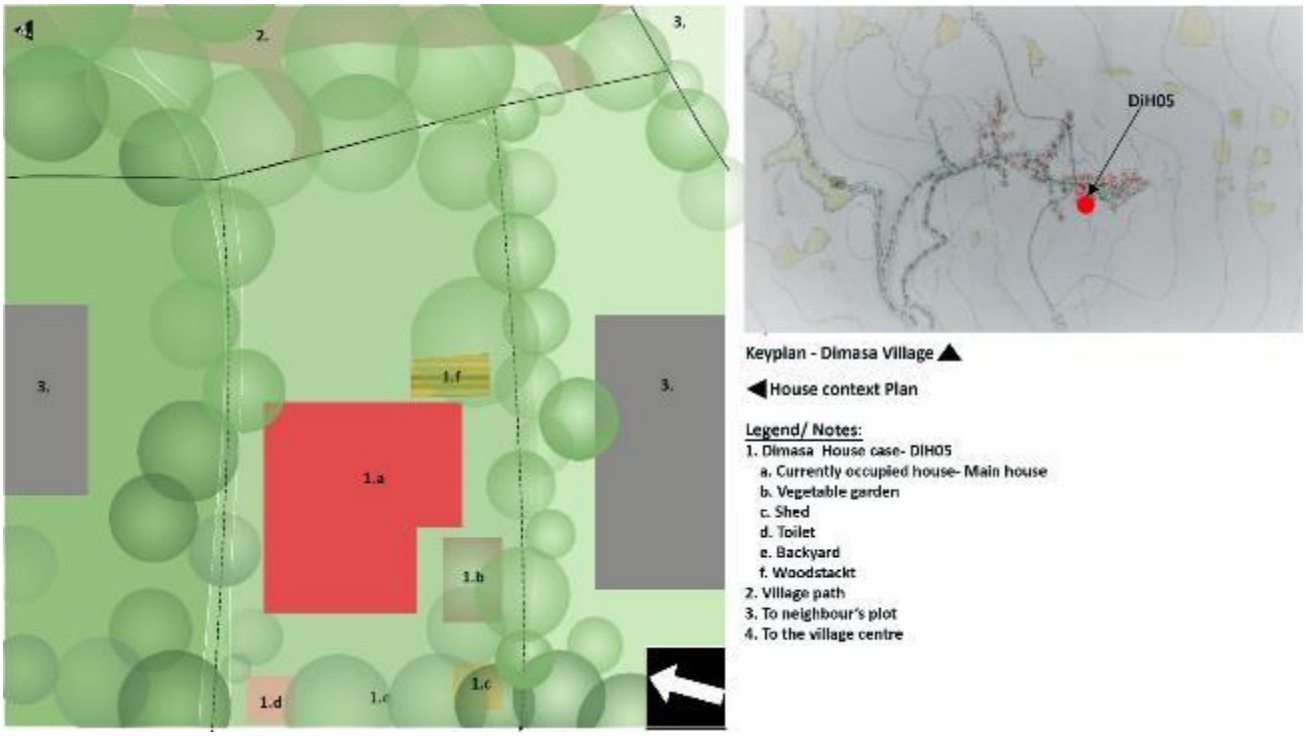

Figure C- 19 Dimasa house: DiH05

Figure C- 20 DiH05, house layouts

Dimasa House: DiH11

Figure C- 21 Dimasa house, DiH11

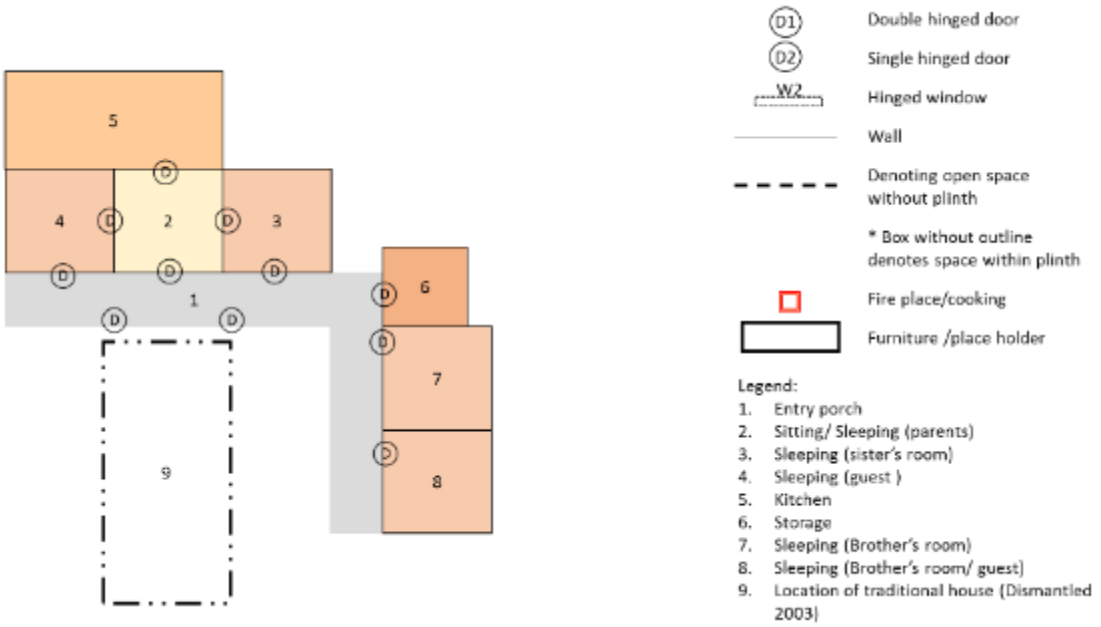

Figure C- 22 DiH11, current house layout

Labang House: LaH01

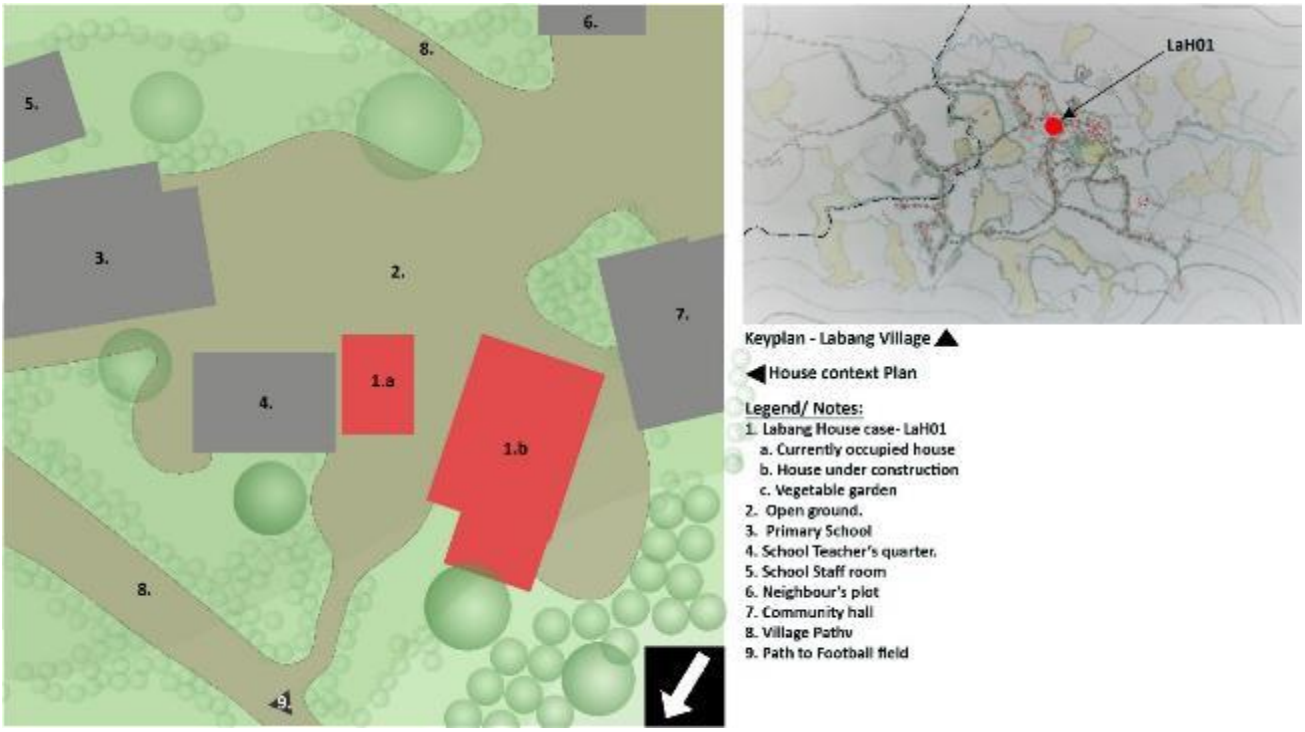

Figure C- 23 Labang house, LaH01

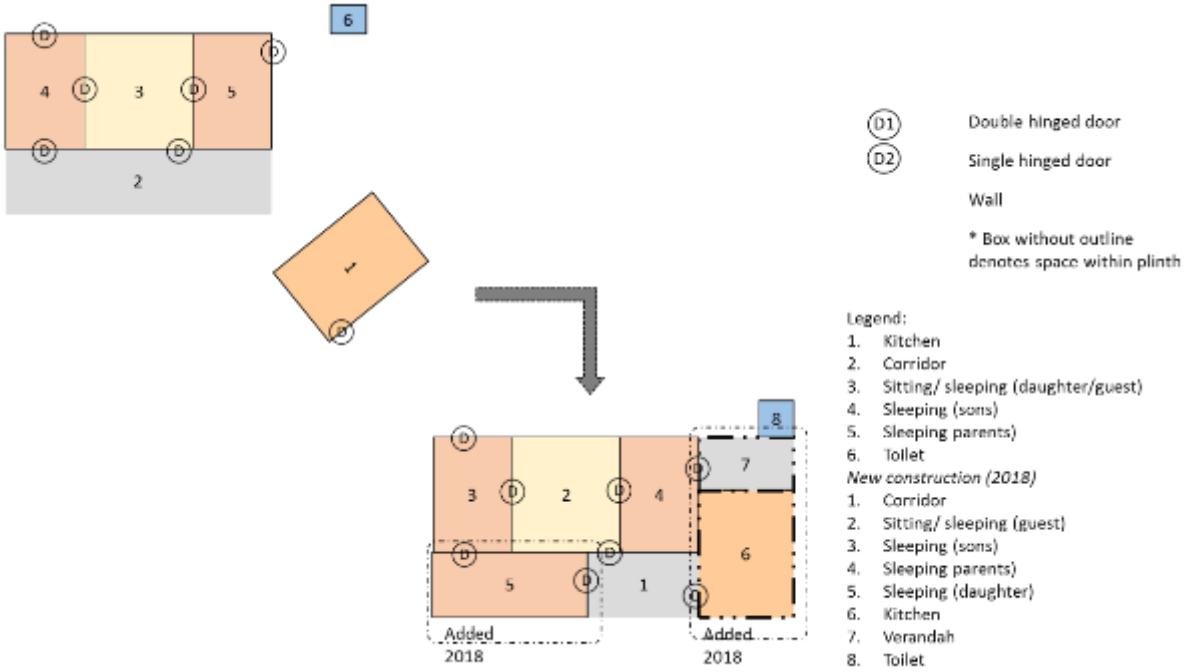

Figure C- 24 LaH01, house layout