ADDIS ABABA UNIVERSITY
EiABC

The Graduate School

Housing and Sustainable Development

SECONDARY DWELLING UNITS' EXTENSION

The case of residential houses in *Woreda* 2, Akaki-Kality sub city, Addis Ababa

MASTER'S THESIS

This thesis is submitted to the Ethiopian Institute of Architecture, Building Construction and City Development (EiABC) and to School of Graduate Studies of Addis Ababa University for partial fulfilment of all requirements of Master of Science in Housing and Sustainable Development.

By

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February 2015

Addis Ababa

Declaration

I declare that, this thesis prepared for the partial fulfilment of the requirements for the degree of **Masters of Science in Housing and Sustainable Development** entitled ***"*Secondary Dwelling Units' Extension: The case of residential houses in *Woreda* 2, Akaki-Kality sub city, Addis Ababa"** is my original research work prepared independently by my own effort with the close advice and guidance of my adviser. I also declare that this thesis has not been presented in any university and all sources that I have used or quoted have been indicated and acknowledged by means of complete references.

Alemayehu Hailemariam Bekele

Signature ——————————

Date ——————————

Certification

Here with I state that **Alemayehu** has carried out this research work on the topic entitled "**Secondary Dwelling Units' Extension: The case of residential houses in *Woreda* 2, Akaki-Kality sub city, Addis Ababa**" under my supervision and it is sufficient for submission for the partial fulfilment for the award of MSc Degree in Housing and Sustainable Development.

Elias Yitbarek Alemayehu (PhD)

Signature ——————————

Date ——————————

This thesis is submitted to the Ethiopian Institute of Architecture, Building Construction and City Development (EiABC) and to the School of Graduate Studies of Addis Ababa University (AAU) for Partial fulfilment of all requirements of Master of Science in Housing and Sustainable Development.

Title of Thesis: Secondary Dwelling Units' Extension: The case of residential houses in *Woreda* 2, Akaki-Kality sub city, Addis Ababa

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Date: January, 2015

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Acknowledgements

My genuine gratitude goes to my advisor Dr. Elias Yitbarek, for his constant and unlimited encouragement from the very beginning of this work and for his continued guidance and material support in the course of this thesis work.

I would especially like to extend my heartfelt thanks to my elder brother Samson for help while writing this thesis, for helpful moral contribution and valuable advices to the completion of my studies. I would also like to thank my brother Getahun and my sisters, for their help during the field work.

Lastly, it is my great pleasure to express my appreciation to my key informants in the study area especially to Ato Molla, Ato Bejiga and Ato Mulushewa all of whom in one way or another contributed to the successful completion of this thesis. I am also deeply grateful to Addis Ababa urban planning institute, Akaki Kality sub city and *Woreda* 2 Administration staffs and officials for their invaluable suggestions and help during data collection process.

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Abbreviations and local terms

Abbreviations

AASOID	Addis Ababa and the Surrounding Oromia Integrated Development Plan Project Office
CSA	Central Statistical Agency
FDRE	Federal Democratic Republic of Ethiopia
ORAAMP	Organization for the Revision of the Addis Ababa Master Plan
SDU	Secondary Dwelling Unit

Local terms

Birr	Ethiopian currency
Chika	Mud and wood construction
Derg	Committee
Kebele	An old lowest level of administrative unit.
Service biet/Yegowro biet	A local name given to secondary dwelling unit
Woreda	The lowest level of administrative unit; substituting the lowest level of administrative unit; *kebele*
Yensa Memeria	Building regulations manual

Abstract

This thesis examines secondary dwelling units' (a local name called "*Service biet*") extension in *Woreda* 2 Akaki-Kality sub city in Addis Ababa. The study was designed to better understand why and how secondary dwelling units have been extending for the past twenty years.

Data were collected from randomly selected thirty households by using semi structured interview. Housing surveys were conducted to gather data concerning secondary dwelling units' extension; family motivation for the extensions and space use through mapping, sketching and photograph. Household case stories were used to better understand the phenomenon of secondary dwelling units' extension. Secondary data: different maps, published and unpublished documents and archival study were used.

Based on the collected data and the analysis made, the study found families space needs that led the extension of secondary dwelling units. These are: rental income, home based business, accommodation of matured and married children, accommodation of close relatives and to add functional space for the primary house. Furthermore, the major initiation and purpose for extending secondary units in *Woreda* 2 were for accommodation of married children and to generate income through rental and home based business units. The study also found that the extension of secondary dwelling units relatively produce rapid, convenient, affordable varieties of housing options. In addition, it is a means of income generation for livelihood improvements. The study showed secondary dwelling units' extensions were hidden developments. The change of the neighborhood form or character because of secondary dwelling units and its extension is minimum.

Finally the study recommends; secondary dwelling units could be convenient planning strategy to inhabit and to supply affordable housing options for the growing urban population. The study also recommends proper building regulations concerning secondary dwelling units to improve, to achieve livability standards and for the efficient utilization of the dwelling units.

Key words: Secondary dwelling unit, primary/main house, extension

1. INTRODUCTION

1.1. Introduction to the study

This study investigates the space uses and the motivations for the extension of secondary dwelling units of residential plots inside *Woreda* 2. Which is one of *Woredas* in Akaki-Kality sub city of Addis Ababa, Ethiopia. (See figure. 1.1).

According to Central Statistical Agency (CSA) of 2008, the population of Addis Ababa was 2.3 million in 1994; in 2007 the city population escalated to 2,738,248. About the gender ratio: 52.4% are females and 47.6% are male. The above figures of population roughly prevails the increase of population density in the city. Moreover, ORAAMP 2002, stated that the population density reaches as high as 2,500 persons per hectare in the city core areas and as low as 75 persons per hectare in expansion areas of the city. According to the data obtained from the *Woreda* 2 administration office, the population in *Woreda* 2 was estimated around 15,500 in 2014. The population economically based on the locally located factories, office work, micro and small scale enterprises, private work and others. In *Woreda* 2 there are more than five factories that produce different products such as: metal products, clothes, and packaging materials.

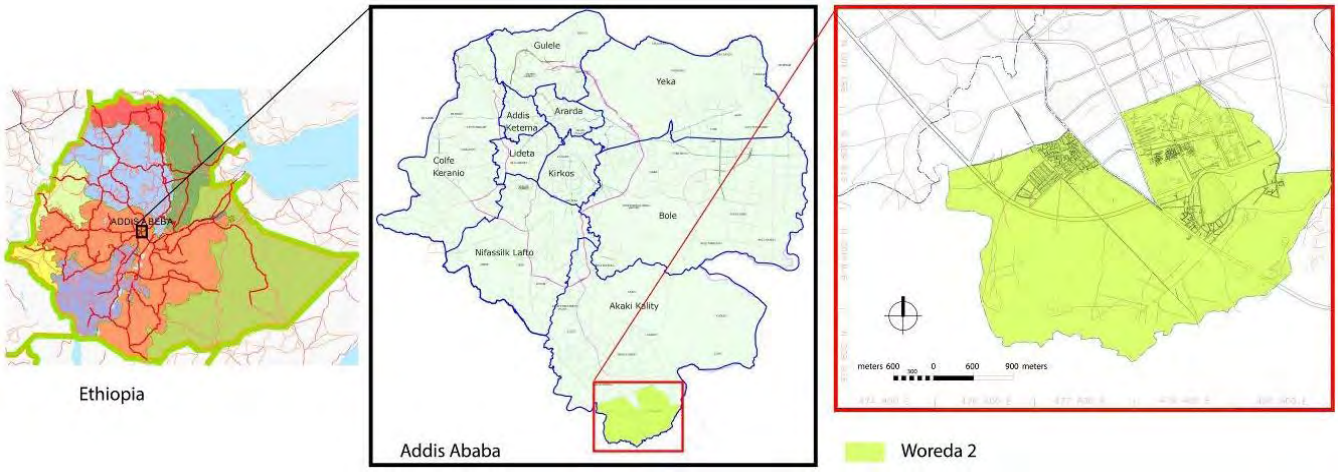


Figure 1.1 showing the case study area, *Woreda* 2, location

Sources: Modified from Addis Ababa and the Surrounding Oromia Integrated Development Plan Project Office (AASOID)

1.1.1. Motivation to the selection of the case study area

The selection of the case study area (*Woreda* 2, in Akaki) is based on deep motivation from nearly my lifetime experiences and personal observation of houses transformation and spatial changes since I born and rising up in this place. The case study area is private residential houses dominated area. Furthermore, according to the *Woreda* 2 Administration Office, more than half, 58.5 percent of residential houses owned by private households. As the study area located on the periphery of Addis Ababa city vulnerable to different informal developments and vibrant for different houses transformation methods. In addition, the study area passed through a long time of settlement expansion; contains both types of unplanned (organic) and planned (grid) residential areas. This make this study more concrete by having an opportunity of comparing residential houses transformation in planned and unplanned residential settlements in one area.

The residential plots in *Woreda* 2 have additional small housing units usually located to the sides or back of the main houses. These housing units known as by the local name, "*Service biet*"/"*Yegowro biet*" which are intended to provide supplementary services to the main houses such as: use as a traditional kitchen or as external bathroom/toilet or as store. However, these dwelling units ("*Service biet"*) progressively have been transforming by extension to add room/s, by change of building materials or by alteration of layout etc. Therefore, observing this "*Service biet*" extension initiated me to conduct depth study to know the driving forces that initiate households' to extend and the purpose/s that "*Service biet*" providing.

1.2. Research objective

General objective

The principal objective of this study is to explore housing supply potential of the secondary dwelling units and their extension in the case of residential plot in *Woreda* 2, Akaki.

Specific objectives

The specific objectives of the study are:

1. To explore the motivations of the households in *Woreda* 2 for extension of secondary dwelling units.
2. To identify and show the extended space of the secondary dwelling units use and housing supply potential.

1.3. Research questions

Based on the research objective and from the study area's observable residential housing development, the following research questions are posed to be examining in the study.

1. What households' space needs initiated the residents in *Woreda* 2 for extending secondary dwelling units?
2. To what extent has been the current secondary dwelling units' extensions process in *Woreda* 2 contributing to housing supply?
    - For what purposes are the residents in *Woreda* 2 using the extended secondary dwelling units' space currently?

1.4. Research methodology

For this study housing survey was employed. Formal interview by using semi-structured questioner employed; Informal discussion with residents and key local informants were involved to gather primary data on the bases of secondary units' extension and space utilization. Government offices' and institutions' published and/or unpublished records, archives and informal discussion with the officials concerning secondary units used as secondary source of data.

The objective of this study, as pointed out before, is to know the housing supply potential and the driving forces of secondary dwelling units' extension. Obviously, three variables could be identified among *Woreda* 2 residents: who do not have secondary dwelling unit, who have secondary unit but did not extended and residents who have secondary dwelling unit and did the extension. Therefore, the methodology depends on a series of techniques to identify and cross check the spatial changes done on the secondary dwelling units by:

i. Examining the case study area's existing and past secondary dwelling unit spatial changes while conducting the household survey. Analyze observations and measurements by sketching, mapping, and photograph.

ii. Examining the housing units change to the compound level with the help of GIS and Google Earth image.

iii. Use of governmental offices' and institutions' maps and documents (such as GIS maps, line maps) documented at different years. These used as reference data during site

survey to cross check secondary units' spatial changes with currently existed spatial condition.

1.4.1. Selection of samples

The sampling frame included all residential houses in *Woreda* 2. Random selection method was used to select sample residential houses to conduct the interviews with. To able to select sample randomly and in order to this study represent the whole *Woreda* 2 secondary units' extension phenomenon, vertical and horizontal grid lines drawn on the existed map of *Woreda* 2 that obtained from governmental institutions. The nearest point at which the intersection of the vertical and the horizontal grid lines drop, then the house selected as a sample of household to conduct the interview with. The grid lines created by using the existing coordinates provided on the map of governmental institutions as a reference. Moreover, the size of the grids adjusted according to the samples of residential houses needed for this study. If the intersection of the grid lines fell on non-residential houses or on open space, the next house that found in proximity to the intersection point was selected.

1.4.2. Sources of data

The study used the following primary and secondary data sources.

Primary data sources

- Key informants interview and household survey manipulated in order to deeply investigate the dynamics character of secondary dwelling units' extension and to collect data concerning the secondary units' extension at current time and at the time just before the extension occurs. The household survey data also helped to check spatial changes by comparing with the governmental institutions' data.
- Personal observations, mapping, photography and sketching of the study area's housing units' layouts were used in order to understand and compare houses extension phenomenon.
- Interviews and informal discussions were conducted with governmental institutions' professionals and local governmental officials such as with some *Woreda* and sub city administration leaders and professionals to understand in depth and to collect more structured data concerning the official process of house transformation, building

regulations, by-laws, and background of the case study's area houses statues in general.

Secondary data sources

- In order to analyze the secondary dwelling units' extension in *Woreda* 2, the study used the study area's maps prepared at different years that found in governmental institutions. Satellite images that shot at different year also used as secondary data to show the change of physical statues of the study area.
- Analysis of published and unpublished manuscripts and archival study concerning the study area were also used.

1.4.3. Data collection techniques

The data collection achieved in two parallel ways: through semi-structured interview and a detailed inventory of the spatial extension of secondary dwelling units located in the plot.

This detailed spatial extension of the secondary units could achieved by sketching floor plans, sections, elevations of the extended housing units and the layout of housing units inside the plot on grid paper form. The grid paper form attached with each questionnaires as a second form in addition to the questionnaire. These helps to see the dynamic character of secondary units' extension to better understand the motivation and use of dwelling units at each point the extension occurred.

The questioner was translated into Amharic before utilizing it on household survey. Since, the prior translation of the questionnaire reduces time of translation while conducting the interview plus more importantly, it helps forwarding the questions with short, precise and understandable words without leading the respondents into confusion and miss understanding while translating into the local language. Moreover, translation to Amharic helps to conduct the interview in everyday language which creates sensitivity towards the informants' life. Thus the respondents understand fully what asked and react exactly the way it means for them.

The household interview was conducted with composition of two people for the purpose of gathering lot of data without getting the respondents bored. The first person asked questions to the head of the house owner plus he documented with sketch on the grid paper based on the

questionnaire and the respondent's response. It was very relevant to receive information from users of the extended secondary units such as tenants who use the unit, extended family, matured children or users in commercial units etc... Therefore, the second person asked questions and conducted informal discussion with the occupants of the secondary units. The second person also took some photographs and sketches of the housing units to the compound level.

As some respondents may relate the interview to government planning and program issues, they may respond in the way seem beneficial to them. Therefore, in order not to collect misleading distorted information, the purpose of the interview was well told to the respondents before conducting the interview.

The interviews were carried normally from Monday to Saturday. However, in order to find the head of the house owner, most of the family members and the occupants of the extended secondary units; the interview was also conducted on Sunday by getting appointments.

1.4.4. Data analysis

Simple descriptive statistic was employed to analyze the collected data and the result was presented by using percentage, table and graphical representations. Selected interviewed families and houses were presented as case stories to illustrate house extension phenomenon more clearly and to show the complexity of extended space utilization.

1.5. Scope and Limitations of the study

Tipple, 1991 stated that the objectives for transforming house can be classified in general perspective as: physical, social, cultural and environmental. Furthermore, according to Susana's classification, there are two categories for the motivations of households to invest on housing: internal factor and external factors (Susana, 2005). The internal factors depend on the family's income and need of investing on housing because of increase family size (or demographics factors) reasons. Secondly, external factors include the improvements of: public services, public infrastructure investments, land tenure, micro-credit, etc.

Based on the availability of resources and time frame, the scope of this study is limited to presenting the internal motivations (i.e. family decisions), that initiates secondary dwelling units' extension residential houses in Akaki-Kality sub city, *Woreda* 2. The study only focuses on

secondary dwelling units (*Service biet*) extension that usually found in privately owned residential plots in *Woreda* 2 for the time period of 1994 – 2014.

There are some limitations to the study especially while collecting the data. Lack of proper documentations of statistical data in government offices forces local government officials to respond according to their perception during the interview. In some government offices the statistical documents exist in hard copies on shelve makes difficult and consume time to get the demanded structured data within anticipated time. A major limitation was seen in conducting interviews during site survey; while asking the questions concerning year of changes occurred, for instance when they extended their secondary dwelling unit, they didn't know exactly or tell the accurate year it happened. Rather they prefer to tell with reference to holidays, government transitions or they tell with relating to their family member's birth, death, marriage etc. days. Respondents were suspicious to give full information about secondary dwelling units. They fear the government may demolish their secondary units if it had not permission and more tax may come if they told secondary dwelling units' area and extension information.

1.6. Significance of the study

As Essayas (2000) has noted out, it is very relevant to study the potentials and drawbacks of residential house transformation in depth in different geographical locations and social contexts.

The significance of this study lies in providing an insight of a full housing unit's extension path starting from its inception in households' family up to the existing conditions of the housing units' space utilizations. So that the city administration bodies and other stakeholders may see the better way of supporting the real importance of secondary dwelling units' extension and residential houses transformation in general. Also this study provides relevant information on the current and future state of secondary dwelling units' extension; why and how secondary units' extension done. Furthermore, households' needs and aspiration to make extension as well as the potential this secondary dwelling unit's extension adds to the housings supply. Finally hope this study add something to a body of knowledge available on the house transformation particularly the case of Addis Ababa.

1.7. Organization of the study

This thesis organized into five parts. The first part introduces the study and the case study area, the justification and motivation for the selection of the case study area and how the research questions came up. This part also describes the methodology used for collecting families and housings data overtime, how households selected, how interviews were conducted. The data analysis were mainly focuses on graphical representations of family case stories' housing spatial changes overtime but also some simple statistical data were analyzed. Part 2 establishes theoretical framework with review of the extensive literature in house transformation and especially for the extension of residential housing, most of which in general, has been written in low income residential houses' transformation in one point in time. The contribution of this part is to look the macro level of theoretical discussion with relation to the study's case; secondary dwelling units' extension. Part 3 describes *Woreda* 2 with the context of others *Woredas* and with the sub city it located. This part illustrates *Woreda* 2's historical, physical, housing and socio-economic characteristics to put platform of information to begin with and to complement the study field survey findings. Part 4 covers the data analysis and synthesizes the findings. The last part, part 5, summarizes the findings and discuses some recommendations based on the findings' implication to the study case area's supply of housing, housing practices and regulations.

2. THEORETICAL BACKGROUND

Introduction

The main objective of this thesis is to understand the households' space need motivation for extending secondary dwelling units and extended space use by the households. Accordingly there are three key terms here: "motivation", "house transformation/extension" and "secondary dwelling units". In this literature reviews part each key term shall be illustrated by theories of scholars in wide depth.

Therefore, the first part defines house transformation in general; for the aim of establishing a platform for discussing housing issues. This part also reviews the context of this study, (secondary dwelling units' extension) meanings and concepts. In addition this section tries to theorize governmental housing standards, regulations within relation to residential house transformation. The second part tries to describe residential house transformation in relation to urban planning perspective. Finally, in the third part, some theoretical backgrounds concerning households' motivations/initiation for extending residential house covered. Furthermore, drawbacks and advantages of house transformation (extensions); land tenure, demographic changes and other factors that influence the motivation of house transformation will be covered in further.

2.1. The concept of house transformation

2.1.1. Definition of terms

There are some common terms that arise while discussing housing concept and housing transformation particularly in developing countries. Such as "spontaneous transformation", "self-help" and "progressive/incremental development" and other context related terms (key words of this study) like "secondary dwelling unit" and "extension" shall be illustrated firstly before getting into depth theories.

According to Khan (2014), spontaneous transformation of house defined as any alterations, additions, extensions or any modifications of both or either of the internal space or external form of any houses. House transformation can occur in any houses however, the probability of transformation occurrence is higher in self-built houses (Carmon, 2002).

"'Self-help' is the process by which poor people take control of their housing construction with the understanding that progressive improvements are to be expected and eventually achieved. Progressive development is the gradual construction of houses to meeting developing needs" (Susana, 2005, pp. 15).

The concept of self-help housing was introduced in contemporary literature by John Crane (Crane and Foster, 1953; Crane and McCabe, 1950). As Turner (1976) defined "self-help" housing in a simpler and by its literal meaning as "do-it-yourself" building. In which in this scheme the values of governmental building regulations and principles will be minimized. Low income groups well aware what they need according to their capacities rather than governmental officials dictation. They motivate to construct their dwellings by their capacity and skill if they get the opportunities; such as land and willingness from their government. As Turner (1976) has also noted self-help housing may not be physically pleasing but the builders will gradually improve the physical condition with their life condition.

There are different name given for houses found in backyard of privately owned residential plot. According to Dahl (2012), he named these houses as informal housing units that occupies mainly the backyard of privately owned (single-family) residential plots as 'Second unit', 'Accessory dwelling unit', 'in law apartment/unit', 'cottage-housing', 'granny flat', and 'accessory unit'.

As Chapple et al. (2011) have defined, secondary dwelling units are self-contained, smaller living units that found on the plot of a single-family home/plot that can be either attached to the main house or detached as an independent unit. Thus accordingly secondary dwelling units (SDUs) can be found independently or attached in any directions and positions to the primary/main house inside the plot of a single family home. Also secondary dwelling unit can be defined as a residence or "dwelling unit" that functions independently from the primary dwelling on the property, with facilities of a kitchen, bath, sleeping quarters and living area. It is referred

to as a secondary dwelling unit because it is subordinate to the primary dwelling and is limited in size (www.sccplanning.org, 2014).

In this study the terms ‘second unit’ and ‘secondary dwelling unit’ used as words having similar meaning (synonymous words). Also in this study, the concept of “self-help” housings represents the transformation of these second units by the initiation of the household.

2.1.2. Concept of home, housing and dwelling

It is very important to know clearly the concept of housing and need to clarify in which meaning and concept of housing used in general and in particularly in this study. Hence the use of ambiguous and confusion of words will be abandoned.

According to Dictionary.com definition, “housing” is a synonymous word with “shelter”, “lodging” or “dwelling” place or as any things that covers or protect. And “house” defined as “a building in which people live; residence for human beings.”

Home is one of over used words that we use it in day to day communication. But according to Gifford (2002), the earliest meaning of home, before sixteenth century, probably represented the place of one’s origin such as to express one’s country or habitat however, now a days “home” refer to one’s own domestic dwelling. Rapoport (1995) proposed to use the word “dwelling” instead of “home”. He argue that the term “dwelling” should be a research term which represent all types of home use worldwide. He defines a dwelling as a system of settings in which certain systems of activities occur. Moreover, he stated that the meaning of dwellings depend in the functional relations between the features of dwellings on the one hand and the goals and intentions of people on the other (ibid). As Norberg-Schultz (1971) has noted, the term “dwelling” notify the establishment of meaningful relationship between man and environment.

The relationships of “house” and “home” represented as “house” is simply denote the physical structure and “home” represents as the relationship people have to this structure and meanings attached to house as well (Rapoport, 1995). “Home” is explained in personal, social or cultural terms, or the psychological meaning of a dwelling place. Rapoport finds “home” as a research term but it is ambiguous and fuzzy plus nonexistence of the word “home” and/or different

meaning in different languages. The indirect expression of folk theory behind the word “home” need to be made clearer and examined. Moreover, as Benjamin, Stea & Saile (1995) has noted, due to globalization people becomes familiar with the word “home” in the way it used in the European and American.

On the other hands, in housing research, the word commonly used to describe the physical structures we live in is house. Ironically, housing research mainly based from Western countries and the term “house” refers their single-family house (Coolen and Meesters, 2011). But according to Oliver (2003), 90% of the world dwellings are built by the households or by members of the community. Accordingly Coolen and Meesters (2011), not all dwellings are houses; certain types of dwellings are characterized as slums, huts, cabins, shacks or tents. Therefore, context based meaning of house is difficult to manipulate generally all over the world. Therefore, Rapaport (1980) come up with a generic term known as “dwelling” which represents all physical structures used by people for living.

Literal meaning for housing is utilization as shelter. But the concepts of housing can be wider than utilization as a mere shelter. Housing includes not only the physical but also includes social and economic context as well. Turner and Fichter (1972), portrayed the concepts of “housing” by two English words verb and noun; he portrayed the concept of housing when it is used as a noun it implies as commodity or product. While if it used as verb it gives meaning as a process or activities of housing. According Turner and Fichter (1972) housing must be used as a verb rather than as a noun.

“Housing is one such activity, as are all those on which the immediate ends of life depend: the cultivation and preparation of food, the clothing of ourselves, the care of our bodies, the procreation and nurture of children, and the sheltering of these activities. Other activities, essential as they may be, are less amenable to personal direction or direct participation: the installation and operation of major communications systems, for example, or dealing with any mass-produced and mass marketed item, whether one is a factory operative, a distributor, or a consumer” (Turner, and Fichter, 1972 pp. 153).

Turner argued that the concept of housing should be seen from the perspective of what housing do for the people life rather than specifying with physical materials and with standards. This

means housing has important role in determining the livelihood of households. According to Payne (2001), residential houses usually used as income generation activities especially by the urban poor to sustain their livelihood. So it is very relevant to notice preconditions for increasing home based economic activities such as: locations with good access to markets and other major employment areas, mixed land uses, medium to high density levels and layouts can maximizes opportunities for home based economic activities which helps households to manage their livelihood (ibid). In contrary, As Turner (1976) has noted, many governments still define their housing policies in quantitative terms rather than housing meaning to the households' livelihood.

In this study the words "housing" and "dwelling" can be used frequently and the word "housing" represents the physical structure people live and the relationship of the household with this physical structure or/and what this physical structure mean to them. While "dwelling" mostly denotes the relationship of human with the environment.

2.1.3. Residential house transformation

The idea of house transformation is a very wide and complex issue. Human by nature like to design things and living environment the way suits. Moreover, to the most critical point human being made transformation, in different level, the place where he live (the dwelling) to make it suitable for day to day activities or for other socio-economic reasons. As Turner state in his book of "Housing as a Verb", in squatter settlements housing opportunities came through incremental housing and progressive self-management scheme. Housing is not like a manufactured object which its purpose only to give function for what it planned for rather the planning of house should consider the functional transformation or the needs of the residences throughout the course of time. Also Turner (1972) stated that house perceived as a process rather than as a final product. Of course, the spatial transformation of house influenced by the availability of spaces surrounding the building (Tipple et al., 2004).

The extended housing units should be at least as good as the original building. As Essayas (2000) has mentioned, in low income households transformation paved the opportunity to increase housing space for renting and home based economic activities so that the low income groups fulfill their economic, social, cultural, as well as their environmental demand. He also

pointed out some drawbacks; both the transformed house for tenants and the owner becomes condensed in small living spaces. In addition, the transformation causes physical housing condition to decay, inadequate lighting and ventilation, poor solid and liquid waste systems which results the increase of health risk and environmental degradation (Essayas, 2000). The physical views can be displeasure by the spontaneity incremental development character of the low income residential house causing some governmental bodies dissatisfaction that prefer the physical appearances rather than meeting what housing supposed to meet for people (UN-Habitat, 2011).

UN habitat (2003) stated that the continuous transformation of residential house such as extension and alteration in the way that ruins the building standards and building permission made by the users, may also change the formal housing into informal. Payne (1996) stated that with a continuous urban population increase, the conventional property right failed to work properly. He also noted that the majority of developing countries urban population already led life in the informal tenure accommodations and their number continuously increasing (ibid). For example, according to UNCHS (1984) estimation, 85 percent of Addis Ababa city population resides in the informal settlement.

According to Turner and Fichter (1972), any housing unit constructed without security of land and building; out of the legal framework of the given state and constructed or transformed by means of self-help construction termed as informal. On the other hands, Pamuk (1992) argued that the informal/formal classification is not specifically addressing what the terms depict.

"… the 'informal' housing activities are increasingly resembling formal housing markets by focusing on commercialization trends in 'informal' housing production and transactions. This illustrates the importance of analyzing the housing system along dimensions more specific than the formal/informal dichotomy offers. If security of tenure is being considered, the complexity introduced in some contexts may not fit the neat formal/informal dichotomy. If types of economic activities are being considered, the neglect of the overlap of self-employed and wage earners in the same household may complicate our analyses. Similarly, if types of housing delivery processes are considered, increased evidence of hired labor, and the prevalence of land agents and real estate brokers operating across formal/informal boundaries have to be taken into account" (Pamuk, 1992 pp.144).

Payne (1996) portrayed the terms: formal/informal or legal/illegal of housing as confusing words. Because in the 'informal' scheme there may exist extra-legal activities that varies the levels of conformity others give (ibid).Therefore, it is not necessarily that all self-help construction and extension of housing are informal. Self-help construction can also be constructed by formal real estate companies. In other words, it is difficult to observe separately formal and informal house extremes because the sectors are interconnected by housing market.

Transformation of residential houses can be undertaking construction activity to alter and extend existing housing units, turning housing residents into producers of houses. It thus involves the household sector in investment in the housing stock in a way that is both unexpected and provision of cheap housing for poor (UN-Habitat, 2011). According to Berner (2000), in developing countries' large cities the formal housing market provides housing for few populations. So, about 85% of the new housing stocks are produced by such residents' house production methods (ibid).

House extension normally done out of the house planning legal framework but today it secured many urban dwellers housing as a direct result of house extension produced by house owners. Nguluma (2003) conclude that transformation of residential house paved the way for many poor urban residents to access urban housing which are unable to address housing demand in the formal low income groups housing provision methods which facilitated by the government. He also suggested specific problem areas for further investigation.

Forms of extensions

There are different forms of house transformation (extension) occur according to the availability of space and structural stability and flexibility of the original dwelling. According to the Tipple et al., (2004), there are two ways of extension of the original house. The first one is extending the original dwelling itself as one entity if there is enough space from front, back or sides of the dwelling. The second form of extension is adding housing units as a free-standing structure. Here when we consider dwelling extensions we did not only observe the physical attachment/detachment of dwelling but also in terms of functional extension from the main house. That is the household run some household activities outside the main house in detached

housing units for example, kitchen can be located in a detached housing unit near to the main house but it serves the main house.

According to Tipple et al., (2004) house extension form may follow one or combinations; some rooms (living, dining, kitchen…) exist as free-standing units, and other rooms accessed by corridor at the back of those free-standing housing units; or the original dwelling may extended with free-standing rooms by facing the main house; or separate rooms added for the purpose of individual rented room; or house extensions can be the original dwelling extend into a large self-contained single-household unit (Tipple et al., 2004).

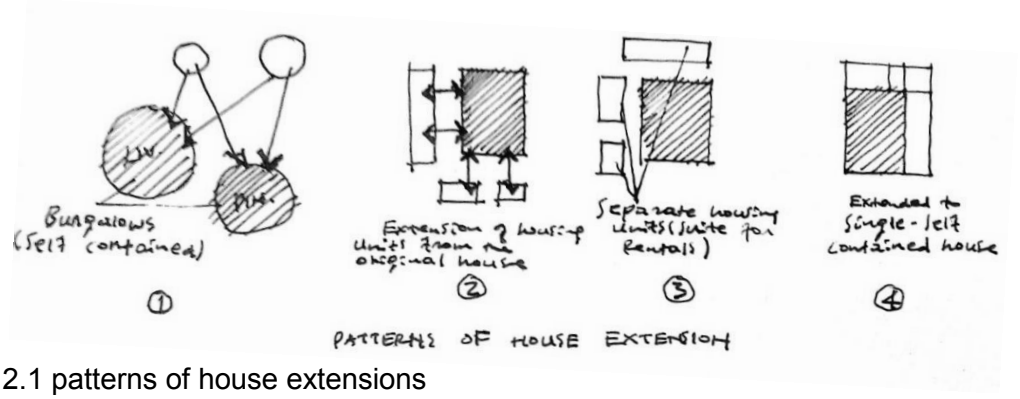


Figure 2.1 patterns of house extensions

Source: Modified from Tipple et al., 2004

Secondary houses extension

Secondary dwelling units' extension occurs in low raised low income's residential settlement is more like lateral expansion while on the other hands there is vertical increment in residential settlements which have the opportunities in terms of housing types and income statues.

According to UN-Habitat (2003), the idea of using the backyard of residential plot is not new. Accordingly the backyard of single-family residential plot has been used for informal constructions such as: for the intension of acquire new accommodations for expanding the household's families, or in order to benefit from rental income, extend and subdivide their properties. Households of a single-family residential house may extend house in courtyards, gardens and circulation space, add floors, or extend onto flat roofs (ibid). Where housing is owner-occupied this process tends to occur anywhere that the authorities allow it and often involves quite sophisticated neighbourly negotiations (UN-Habitat, 2003 pp.84). Un-Habitat

(2003) also pointed out that such kind of house extension may have effect on overloading public infrastructures and services but it needs further study to make it safe.

As Chapple et al. (2011), secondary dwelling units have great contribution for accommodating a large amount of low income population and well-suited creating compact urban area. For example, a study of Vancouver, British Columbia estimated that from 10 to 50 percent of single-family residences house have secondary unit; a Los Angeles study focusing only on garage conversions and found that they provided 2.5% of the county's housing stock; and a study of San Francisco suggested that at least 8% of citywide housing stock is provided by illegal secondary units (ibid).

According to Rudel (1984), secondary units or accessory units are utilized as an income generation means by means of renting with relatively low-cost. Secondary units are relatively affordable and low rental value compares to formal rental house such as apartments and non-secondary houses (ibid). As Chapple et al. (2011) has noted, one reason for low-rental cost of secondary dwelling units is the informality of secondary house. But at the same time, there exist some disadvantages of secondary dwelling units' development. According to Chapple et al. (ibid), the process of developing secondary dwelling units can increase housing costs and may worse the region's affordability crisis too.

2.1.4. Building standards, regulations and incremental houses

Building standards and regulations encompasses all aspects of house construction. Building standards and regulation includes: the types of building materials used in the construction of house, the building height, amount of left over space and built up space (BAR), setbacks, layout of building, building permission etc. Appropriate building regulations and regulatory frameworks have impact in reducing difficulty and long bureaucratic processes to enter into legal housing and minimize irregular and unplanned settlements. According to Essayas (2000), building codes and housing standards help to protect human welfare in case of developed countries too.

However, as Laquian (1983) has suggested, there are diverse ideas concerning the importance of building codes and housing standards to the developing countries. Hence, building codes and housing standards limit the capacity of low income households from building their own houses

(ibid). In most developing countries in Africa, most of the building standards and regulations are adopted from the developed countries without adjusting to the local context (Tipple, 2000; UN-Habitat, 2011). As Payne (2001) has noted, the regulatory frameworks and planning approaches in developing countries are based on the past historical concepts and assumptions of the colonial countries ironically these planning regulations still have been applied in developing countries. In the matter of facts, these approaches have been abandoned a very long time by the ex-colonial countries and they changed with more pragmatic, flexible and contextual related approaches (ibid). The alternative building materials such as the traditional building materials: straw bale or Rammed earth are not allowed in building regulations even in the recent time (Wheeler and Beatley, (eds), 2009). Many developing countries' building regulations adopted during colonization insist the use of conventional building materials rather than cheap and locally available materials (UN-Habitat, 2011).

As Turner (1976) noted, it is not only developing countries' policy problem, but also all national and international housing and planning agencies mislead the problem of housing by applying quantitative measures. Turner (ibid) argued that, quantitative methods cannot describe the relationships between housing and households. But quantitative methods can only indicate (not measure) non-quantifiable components. For instance the quantitative method may express resource allocation as well as helps to identify complex relationships. Turner (ibid) continue arguing, what relevant a house provide is the activity or the usefulness for the households which should not expressed by material standards unless it used as a manipulation for bureaucratic and commercial purposes. As Cities Alliance (2003) has pointed out, materials based building standards consequences housing price increase which in turn force low income households to extend/build and increase housing options as their finance and personal need informally.

According to UN-Habitat (2003), the violation of building standards and regulations becomes more harmful when house transformation carried out by the tenants rather than by the home-owners. Hence, the tenants have a little concern about the alteration and they are free of governmental building regulation responsibilities. As Abrams (1966) has identified, some of the drawbacks to self-help housing were that self-help houses take a long time to build; construction by families is imperfect due to lack of experience; and efficient construction is not achieved since the modern techniques of mass production are not used (Charles Abrams, 1966 p. 171). Low standard of housing condition created by the owner transformations (extension) improved

by the introduction of financial support and regulations (Cities Alliance, 2003). Also Turner (1976) stated, in self-help, if the residents have autonomy to decide on their houses, and then the housing condition improve over the time by the residents' own efforts.

From the above, building standards and regulations have great impact on the incremental housing construction. But the incremental process of housing construction that usually low income group employs allow them to build dwellings according to their needs and with the cost they can afford (Bahgat, 1984). Low income group usually construct their houses with low cost; locally available building materials which normally in contrary with building standards and regulations. So building standards may limit low income group from constructing of affordable houses for them and for other low incomes. In other words, for low income group meeting standards incur extra costs which they cannot afford. Several scholars and organizations support the flexibility of building standards and its restrictive nature (Rodwin, 1987; Tackie, 1983).

2.2. Urbanization and house transformation

According to Jenkins, et al. (2007), urbanization refers to the demographic process of usually shifting the balance of national population from 'rural' to 'urban' areas. And urbanization rate indicates the proportion of the population living in urban areas at a given time; urban growth rate is a measurement of the expansion of the number of inhabitants living in urban settlements (Jenkins, et al., 2007).

Many literatures, world reports and research papers in the world indicate that the world urbanization rate increasing (UN, 2012; UNCHS, 1996; El-Batran, and Arandel, 1998). According to the UNCHS (1996) urbanization estimation, the level of urbanization in developing countries projected to increase from 69.8% to 84.0% and the total urban population from 729 million to one billion; an average urban growth rate of 0.71% per annum over the period between 1975 and 2025.

Sub Saharan Africa countries including Ethiopia are among the fastest urbanization rate expectation country even if its majority population living in rural areas (UNCHS, 1996). As Tannerfeldt (1995) has noted, Sub Saharan African showing the fastest urban population growth and especially east Africa has the highest urban growth rate which is estimated around 5.6%.

In rapid urbanization the population growth obviously occurs on urban space with in a limited urban land which consequences compaction and densification of urban area as well as it becomes a root cause of informal house developments such as: squatting, illegal plot/land subdivisions and as well as informal economic activities in different land use of urban areas such as home based economic activities, street market etc. Rapid urbanization in most developing countries makes the formal housing and land market unable to work efficiently. These manifested by; According to Durand-Lasserve (1997), between 30 and 70 per cent population of developing countries live in informal settlements. Moreover, According to the UNCHS (1996), 64 per cent of the housing stock in low-income countries, and up to 85 per cent of new housing, is unauthorized. Ezeadichie (2012) also stated that, one of the major manifestations of rapid urbanization and underdevelopment is the re-emergence of informal sector activities. He noted that among the increasing informal economic activities one is home based enterprises in urban residential area that happened by transformation of the residential houses.

Rapid urbanization consequences informal housing developments, mostly undertaken by low-income urban residents, have usually contradict with government standards and result in so many disagreements in enforcing regulations as well as in legal issues (Ezeadichie, 2012). According to Berner (2000), informal house settlement termed as substandard (slum) often even squalid, by conventional judgments, and by most governments rather than observing the good sides these housing contribute to the housing demand and economic value adding to the whole country.

According to Turner (1976), informal housing development is problem solver for the escalation of housing demand because of rapid urbanization. Informal housings are means of solution at the best low income and middle income group families done to solve housing problem which becomes incapable by the government. Turner (ibid) has noted on the first UN-Habitat conference in Vancouver in 1976 that, there should be a paradigm shift in provision of housing and he also stated his idea in one of his book ‘Housing by the People’ (1976) are the noticeable moves on this paradigm shift towards an ‘enabling approach’; participatory and self-help housing provision. However, Turner’s concept of self-help housing was criticized. Burgess

(1982) has argued, its major aim was only to increasing the number of dwellings for urban poor and not consider the wider economic context.

According to Doebele (1977), urbanization becomes root cause for the motivation of residential houses development and transformation particularly in newly invaded land. Hence, the newly invaded land provides the opportunities for exceptional profits as the number of inhabitants increasing (ibid). The study made by Doebele (ibid) in Bogota, Colombia indicates that, informal residential houses growth in urban area have significant advantages; firstly it motivates for effective mobilization of savings and initiation for self-construction of housing. Secondly, it provides a means of income generations which can support the whole area population by opening small stores, artisan shops and tenants in the self-help structures. Thirdly, Informal settlements also have significance in provision of rental housing options.

2.3. Motivations for housing development

There are different motivations for progressive development of residential houses. According to Susana (2005), external factors and internal factors have influenced the motivations on housing investments. Turner (1976) also argued that, the willingness of people to invest their energy, initiative and their savings or other material resources for the progressive development of housing depend on the satisfactions they experience or expect as a result.

Susana (2005) has mentioned security of tenure, utilities (electricity, water) and financial support or loan (financial institutions) as external factors that motivate housing investment and she concluded that installation of utilities are not the strong motivating factors for investing on housing; granting of tenure system is not also the major factor as a motivation and finally, financial institutions in some level help the house owners to increment vertically and more helps to improve the physical house condition such as by finishing parts of the building wall and roof that started earlier.

According to Doebele (1987), investment on housing the case of developing countries' poor urban resident not only as a simple need of living but also to utilize the housing as means of income generation and improvement in the economic statuses. The urban poor motivated to invest on construction and transformation of housing for the reason of improving their economic level too (ibid).

Tipple et al. (2004) in his study of “user-initiated extensions in government-built estates in Ghana and Zimbabwe” he stated that, the main motivation of house extension for the case of Ghana study sample was need for including rooms to accommodate the growing households. They extend their dwelling on potential for extension space such as verandas to accommodate rent-free relatives or for adult family member (Tipple et al., 2004). On the other hands, he noted, about 50 percent of the cases of Zimbabwe study sample house transformers are motivated mainly for the intension of rental income (ibid).

2.3.1. Security of Tenure and house transformation

“Land tenure can be defined as the mode by which land is held or owned, or the set of relationships among people concerning the use of land and its product. Property rights can similarly be defined as a recognized interest in land or property vested in an individual or group and can apply separately to land or development on it. Rights may cover, inter alia, access, use, development or transfer and, as such, exist in parallel with ownership” (Payne, 1996 pp.3).

According to Durand-Lasserve and Selod, (2007), land tenure denotes the rights individuals and communities have with regard to land, which includes rights: to occupy, to use, to develop, to inherit, and to transfer land. So accordingly land tenure can be primarily be viewed as a social relation involving a complex set of rules that governs land use and land ownership.

According to UN-Habitat 2003 report, 72 percent of the urban population of sub-Saharan lives in slums. Furthermore, if no active measure taken slum resident continuously will increase in the world and the number of slum dwellers estimated to reach 2 billion around the year 2020 (UN-Habitat, 2003). Slum dwellers normally cannot access formal housings provided by the government because of their undermine income. As Baross and Van der Linden (1990) noted, in most developing countries informal market for land and housing become increasing because of the inability of the formal market to meet the demands of the majority of urban resident. Their choice becomes built informal housing for them and for rentals accommodation for each other (UN-Habitat, 2003). Informal house development may occur in two ways: The first one is informal house development on the government or public land without legal permits and the second one that happen on formally occupied private land without building and land use regulations and permits (Pamuk, 1992; El-Batran, and Arandel, 1998).

Payne (2000) stated that, security of tenure is generally accepted as precondition for households to invest in housing construction and improvements. He also stated that full security of tenure is a far reaching so, usually households seem initiate to invest in housing simply by signs of not to evict form their location. For instance, by official statement a settlement will not remove; or by the provision of services; or by the issuance of certificates of use (ibid). Also Turner (1967) stated that, security of tenure was identified as critical to the facilitation of housing improvement. In addition, he noted that, if land be made available on a secure tenure basis, then house development will be managed by the residents. The perception of security of tenure is critical especially for low income individual families for the mobilization to construct their own housing (Doebele, 1987; Payne, 2001). But more importantly the level of security matters. That means according to Doebele (1983); Gilbert (1990); Razzaz (1993) and Payne (2001), security of tenure depends less on legal status and more on matters of the residents' perception of the chance of eviction by the government. As Payne (2001) has noted, this concludes tenure may not be a critical factor; if households have adequate de facto security of tenure, then access to services and credit may be more important for investing on extending and improving housing and environment.

On the other case, According to Doebele (1987), in informal settlements the security of full legal tenure status makes commercial value of area to increase. This in turns reduce tenure security for most vulnerable social groups such as squatter tenants and low income group. In this scheme the low income groups have a choice of selling out to more affluent groups and use the money to develop alternative self-help housing in other place and spend the rest of the money for other household purposes (Doebele, 1987; Payne, 2000). Therefore, because of the suddenly received security of tenure, the squatter settlers and the low income group prefers to move out of the area by selling their land to the more affluent groups rather than motivation and mobilization to develop their house.

In some case transformation of house becomes a guaranty not to evict form the house. Payne (1996) pointed out that there exist revers cases in which investment in house improvements or increased property tax revenues becomes a cause for increased levels of tenure security. On the other hand as Carmon and Oxman (1984) mentioned, ownership to house was probably being a perquisite for transformation of the house. According to Tipple et al. (2004), ownership of house becomes an important catalyst for initiating transformation. He also said the probability of house transformation likely becomes high when house tenure changed into ownerships.

Obviously, for any change on housing need legal permission to do it. But according to UNCHS (1996), most governmental bodies are ignorant or do not permit house transformation (extensions) even if the concept of house transformation related with the concepts of city sustainability and increasing the role of household sector in urban development issues. Which are the main ideas of international organization such as UN-Habitat (UNCHS, 1996). That means house transformation supports production of housings by the households' effort within the existing urban land; protect form city expansion and unwise utilization of resources.

In order to pave the way of appropriate house transformation from obstacles; according to Tipple et al. (2004) the idea of house transformation such as extension should be adopted in local authorities and governmental planning scheme. Moreover, he has noted the relevance of taking the lessons from house transformation and including into planning school's curriculum.

2.3.2. Why households transform their houses?

There may exist various explanations as objectives for the transformation of house. But in general, According to Tipple (1991), the objectives for transformation of housing can be classified as physical, social, cultural and environmental.

People express their identity in different way. People may express themselves by the objects they belong and the physical environment they own (Goffman, 1959). Housing observed as means of expression once identity, belongingness and creativity (Max-Neef, 1989). Therefore, one way of expressing once identity is though dwellings or housing transformation which shows who we are and who other people are. Location, exterior and interior have something to say about the social group one belongs to, and provide information about one's lifestyle and personal character.

According to Robinson, "The spatial world in which we live tells us who we are. We find our self within it, we respond to it and it reacts to us. By manipulating it we affirm our identity" (Robinson, 2006 pp.23). According to Essayas (2000), wide verities of changes can be observed on residential housings including: decoration, changing colors and materials, addition of gardens, fencing, and etc.

“A detached dwelling contains more visible signs of lifestyle and identity than an apartment in a block where the residents have no influence on the exterior of the building” (Hauge, 2009 pp. 34). Rapoport, 1985 also argue that, the household’s identity reflected on house from the start of the household’s space and physical house choice.

According to Kellet (1993), housing also can be observed as expression of statuses; house transformation can be motivated in order to reflect different cultural values of the households. On the other hands, house transformation takes place for the need of getting to the standards because of the households judgment of inadequacy of spaces and quality (ibid). House transformation can be seen as housing adjustment mechanisms; getting more and improved space/rooms for the households and for tenants as well (Tipple et al., 2004). In addition, according to Ameen (1988), transformation more likely occur for the need of extra space for accommodation of extended relatives and need of private extra space to accommodate newly formed families (newly married family member) as well as need of extra space for their own use because of family size increase or for adult family member.

There are also objectives for house transformation because of thinking the future. As Kellet (1987) has noted, households can be aspired and motivated to have improved housing condition in future comparing the past. That means each household may have plan in future to improve the house such as by relating the income gain from different sources. This aspiration can be expressed through transformation of space, change in structures, physical condition of the house and building materials change. For example change from traditional building materials which the existing house constructed to modern and prefabricated materials construction (Larsson, 1988).

Most self-built houses extensions done for the objective of generate incomes by creating rentals housing units, transforming to create new shopping or for other commercial purposes, or small scale workshop etc. (Ameen, 1988; Kellet, 1993). And these transformed housing units built either in officially planned areas or in informally subdivided areas for which some legality can be claimed or totally in areas where no legal title obtained by the occupants (Payne, 1989).

According to Ezeadichie (2012), many households in developing countries especially low income group transform their house in order to generate income by means of home based

enterprise. Also Payne (2001) stated that, residential houses are often used for income generating activities by the urban poor which forms part of their survival strategy. Becker (2004) noted that, the economic contributions to whole the society mostly ignored, rarely supported, and sometimes actively discouraged by policy makers and government. Planners should consider home based enterprises in their design to emphasize the contribution of the informal economy to whole and to the low income group livelihood improvement as well (Ezeadichie, 2012; Carr et al., 2000). Tipple (1993) also has emphasized the importance of home based enterprises; stating that their roles vary depending on the type of neighborhoods in various developing countries. Tipple (ibid) also mentioned, in a poor neighborhoods, small retail trading and cooked-food production are the most prevalent home base enterprises which the resident have less access in terms of proximity to formal commercial sectors. Moreover, home based enterprise is not limited for low income groups but also it happening in middle and even in high income groups too (Kazimbaya-Senkwe, 2004; Strassman, 1986).

2.3.3. Demographic change and motivation for house transformation

When we say incremental house development, we not only associate with the physical transformations. Of course the physical transformation occurs due to the implication of gradual increase of population and economic, political and cultural activities. So it is necessary to see the nexus between population change and residential housing change in order to understand housing transformation fully.

According to the United Nation (2012) estimated that, world population based on the medium fertility rate; in mid-2013 to 7.2 billion will project to 8.1 billion in 2025 which increases almost by one billion over twelve years. Furthermore, this population escalation will continue to reach to 9.6 billion in 2050. At the country level, much of the overall increase of population between the 2013 and 2050 reside to countries having high fertility rate mainly in Africa and Asia (UN, 2012).

Urban areas of the world are expected to absorb all the population growth with decline of rural population. And most of population growth in urban area becomes significant especially in cities and towns of less developed regions. According to the UN World Urbanization prospect of the 2011 revision, the world urban population projects from 3.6 billion in 2011 to 6.3 billion in 2050. In less developed regions the urban population number expected to increase from 2.7 billion in 2011 to 5.1 billion in year 2050 with decline of rural population from 3.1 billion to 2.9 billion in the

same years (UN, 2012). Moreover, in Asia half of the population will live is urban areas by the 2020 and Africa probably will reaches this estimation in year 2035 (ibid). This urban population escalation trend has great influence in motivating house owners to transform their original houses to accommodation large number of urban residents. According to Nguluma (2003), it is visible that even in the informal settlement and in privately owned formal housings, house transformation is relevant as a source of new housings stock for rental propose as well is also have a great importance in improvements of existing dwellings.

According to El-Batran, and Arandel (1998), in the greater Cairo region (contain the city of Cairo, the city of Giza, three secondary cities and a few villages in the governorates of Qaliobia and Giza), its urban population rapidly increasing; 1 million in 1930, 6 million in 1965, 8 million in 1976 and 10.66 million in 1986 and 12 million inhabitants in 1998. Among the total area of 330 square kilometers of Greater Cairo, 220 square kilometers is built area. This makes it one of the densest cities in the world. Furthermore, it's built up area compared little over twice the area of the city of Paris which covers 105 square kilometers. But Greater Cairo has a population more than five times as large as Paris. As El-Batran, and Arandel, (1998) noted, the city is already denser and over populated, most of Cairo's physical spatial settlement expansion has occurred in informal subdivision of agricultural land and on public desert land located at the periphery of the city.

In Greater Cairo region population growth was one of the reasons for informal urban land settlements and most importantly most of these informal settlements have characteristics in common including the progressive and incremental construction of housing by small contractors and owners to allocate the vast increase of the population (El-Batran and Arandel, 1998).

Susana (2005) concluded in her study of the nature of incremental housing and the notion of progressive self-managed house development in Independencia in Lima, Peru; demographic change did not influence investment on housing. However, demographic change did influences transformation of the original house (ibid). Based on Susana (2005) study, the original house transformation manifested in creatively subdivision of the existing room; extension of the original house and by addition of temporary rooms.

2.3.4. Negative and positive aspects of house extension

Many studies showed house transformation's potential in terms of affordability and supply of houses for urban poor and as means of income generation for the improvement of the livelihood of low income groups (Turner, 1976; Kellet et al., 1993; Tipple, 1991). Moreover, the transformations of houses are in response to the need to satisfy social, cultural, economic, and environment demands of the households (Kellet et al., 1993; Tipple, 1991). However, the increase population and density of the existing housing area may overload infrastructure networks (Tipple, 1991; UN-Habitat, 2003).

Physical constraints may influence house improvements in house transformation activities. Especially, physical constraints imposed on house extension activities. According to some scholars the physical improvement of house extension activities in industrialized countries influenced by the physical characteristics of the property (Kirwan and Martin, 1972; Seek, 1983). For example, according to Gosling and Keogh (1993), dwellings that found in row do not permit significant extension opportunities. In some cases the original house structures such as slope of the roof may also limit the extension and even deform the appearances of the extended unit.

Essayas (2000) concluded in his study of low income housing in Addis Ababa, more than half of the transformed houses had poor quality when compared to the original houses. He also concluded that transformation of the residential house aggravate environmental problems; Transformation of residential house increases the densification of population, lacking of natural light and ventilation, health problems and environmental risk. As Nguluma (2003) has noted, residential house transformation has also negative aspects in terms of decreasing outdoor space, increase of housing density, blockage of ventilation and light inside the transformed houses.

As Nahrin (2008) stated, residential areas transformation negatively influence community life of city dwellers. He mentioned these negatives influences; as the transformation sustain a large amount of population number, consequences unplanned and irregular residential blocks which create difficulty for city planning authorities in provision of community facilities, infrastructures and public services. Even if these facilities installed with high cost, it may not be working

properly because of obstructions; unplanned characters of the residential areas; and by excess of these facilities as well. Transformation of residential areas also lead to a shortage of open space and play ground; changes of the social character of the area; social disintegrations because of non-residential elements' activities intrusion and because of increased insecurity and crime of the residential area (ibid).

On the other hands, transformations of residential houses own some potentials. According to Essayas (2000), transformation increases the livable spaces which help the households to generate income to improve the physical condition of the housing units and for the improvement of their livelihood; accommodate demographics increase by providing more housing options for extended families or elderly parents; creation of job opportunity in the process of extension, construction and renovation the dwelling units. Finally, house transformation has value to keep the stability of the residents in their place by providing affordable house; the social bond will not be disintegrated. Also Nguluma (2003) stated that, transformation of residential house (i.e. extension of house) has some positive aspects in terms of increased indoor space, increase of rooms for renting and increasing space for separation of functions. Many low income families especially those who are unable to access housing in the formal housing market system get access to housing.

In contrary to Nahrin (2008) and Essayas (2000); Tipple et al., (2004) argued that, house transformation not intensify physical housing condition deterioration, values reduction, crowding, and poor services in the transformed area. He noted that (in his study of user-Initiated Extensions in Government-built estates in Ghana and Zimbabwe) house extensions result in the physical house conditions improvement. Even the original structure improved in physical condition in some level such as improving by higher level of finishing materials. He also pointed out the extended units had more spaces, extension increased occupancy and services; the physical view of the area not deteriorated because of the extension (ibid). Also Chapple et al. (2011) concluded in their study on five adjacent cities within half mile of Bay Area Rapid Transit (BART) stations, cities with more secondary dwelling units, likely reduce parking requirements by not contributing to parking demand because secondary dwelling units tenants are less more likely to own a car and by creating a compact residential area with walkable service access. Secondary dwelling units have capacity to accommodate a significant share of future population growth plus secondary dwelling units have economic and fiscal benefit to the city. In addition,

Chapple et al. (ibid) also concluded, there is much interest among homeowners to construct and develop secondary dwelling units but administrative regulations prevent them to do it.

UN-Habitat (1996) portrayed cities as solutions for the rapid urbanization. Urbanization consequences increasing of population and densification of the existing urban area which have some advantages such as: high density implies much lower costs per households for the provision of services including emergency services; efficient use of resources and reduction of pollution hence short distance travel to access services and production-consumption of goods in proximity; high population concentration in a certain city implies reduction of land demand compared to the population (UNCHS, 1996 pp. 44). Extension of dwellings allows more people to live within the existed built up area of the city. So reduce the demand for peripheral development or inefficient city expansion and sprawl. Therefore, according to Tipple et al. (2004), house extension helps for efficient utilization of urban space by accommodating the rapid population growth.

Generally, the construction/extension of secondary dwelling unit has wide significance in long term and urban level perspectives. Secondary dwelling units development maximize densities and help to create income-integrated communities, which support and enhance public transit, local businesses and the local labour markets, as well as make more efficient use of infrastructure and services. Secondary dwelling unit development also a good solution for the increasing housing cost and exacerbation of affordability crises rather than infill development hence, it is hidden development. It not gets recognized from the street side (Chapple et al., 2011).

Extracting theories from different scholars, the above discussions covered residential houses transformation in general and secondary dwelling units' extension specifically. The discussions in theoretical part were macro level of residential housing transformation. The next sections try to see these theories with the local level and to the context of this thesis' study case area.

3. CONTEXTUAL BACKGROUND

Introduction

This section tries to observe and compare some physical and socio-economic characteristics of *Woreda* 2 in relation with a wider geographical context of other *Woredas* and to the sub city level. The main importance of this section is to create a platform of information and to validate and to make reliable the data gathered during household survey.

This section provides some insight on the main characteristics of the sub city's households where *Woreda* 2 located. It provides basic information such as: demography, income, employment, economic activities, physical housing conditions, basic services and infrastructure. The information mainly obtained from 1994 and 2007 population and housing censuses, from documents of governmental institutions and offices as well as from conducting interview with governmental officials and professionals.

The first section provides some highlights about the study area's (*Woreda* 2, Akaki) geographical, socio-economic and physical characteristics. The second section describes some part of historical development of *Woreda* 2 especially concerning the residential house development. The third section illustrates the physical characteristics of the study area such as: housing, housing ownership and it also provides some information about infrastructure and public services of the study area. Finally, the last two sections illustrate the study area's socio-economic characteristic such as population number and projection, household size and compositions and economic activities.

3.1. General descriptions of Akaki-Kality sub-city, Akaki and *Woreda* 2

Addis Ababa, the capital city of Ethiopia, covers 51,000 hectares of area at current time. The total population was 2,112,737 in 1994; 2,739,551 in 2007 (CSA, 1995; 2008). Thus, the population density of the city overall was 50.7 people per hectare (5,073.2 people per square kilometer) in 2007. It covers more than 30% of the country's urban population.

Addis Ababa had been expanding in different directions starting from its founding in 1886 by Queen Taitu. Addis Ababa covers an area of 21,000 hectares in 1965; and in 1984, it expanded by more than half of the original size (58.8%) to 51,000 hectares. Particularly the expansion has been rapid in east and south directions because of non-existence of topographic barriers in east and south directions. According to Dandena, 2008 Qaliti was defined as a satellite town in the 1959 by Bolton Hennessy and partners' master plan of Addis Ababa. Moreover, in 1965 a new

master plan proposed by a French consulting firm led by Luis De. Marien proposed industrial strip starting from the present Gotera area to Qaliti which extend the line to Akaki area due to freight terminal. However, Akaki which is 25 kilo meter from the core area included in Addis Ababa's master plan in the 1986 master plan (Dendena, 2008). The 1986 master plan preserved Akaki and Qaliti area as a main industrial and freight terminal services. In addition represent the two areas as growth poles for commercial and public services developments (ibid).

Addis Ababa divided by ten sub cities: Arada, Addis Ketema, Gulele, Yeka, Lideta, Kirkos, Colfe Keranio, Nifassilk-Lafto, Bole and Akaki-Kality. Further each sub-cities subdivided by *Woredas*. Akaki-Kality sub city divided by eleven *Woredas* (fig. 3.1). *Woreda* 2 is among one of the *Woredas* found in Akaki-Kality sub city. *Woreda* 2 located to the southern direction of the sub city boundary as well as Addis Ababa city boundary. Akaki-Kality is the second largest sub city which is 118.08 square kilometer next to Bole, which is 122.08 square kilometer (city government of Addis Ababa, 2014). However, most of the land of Akaki-Kality was dedicated for agricultural purposes.

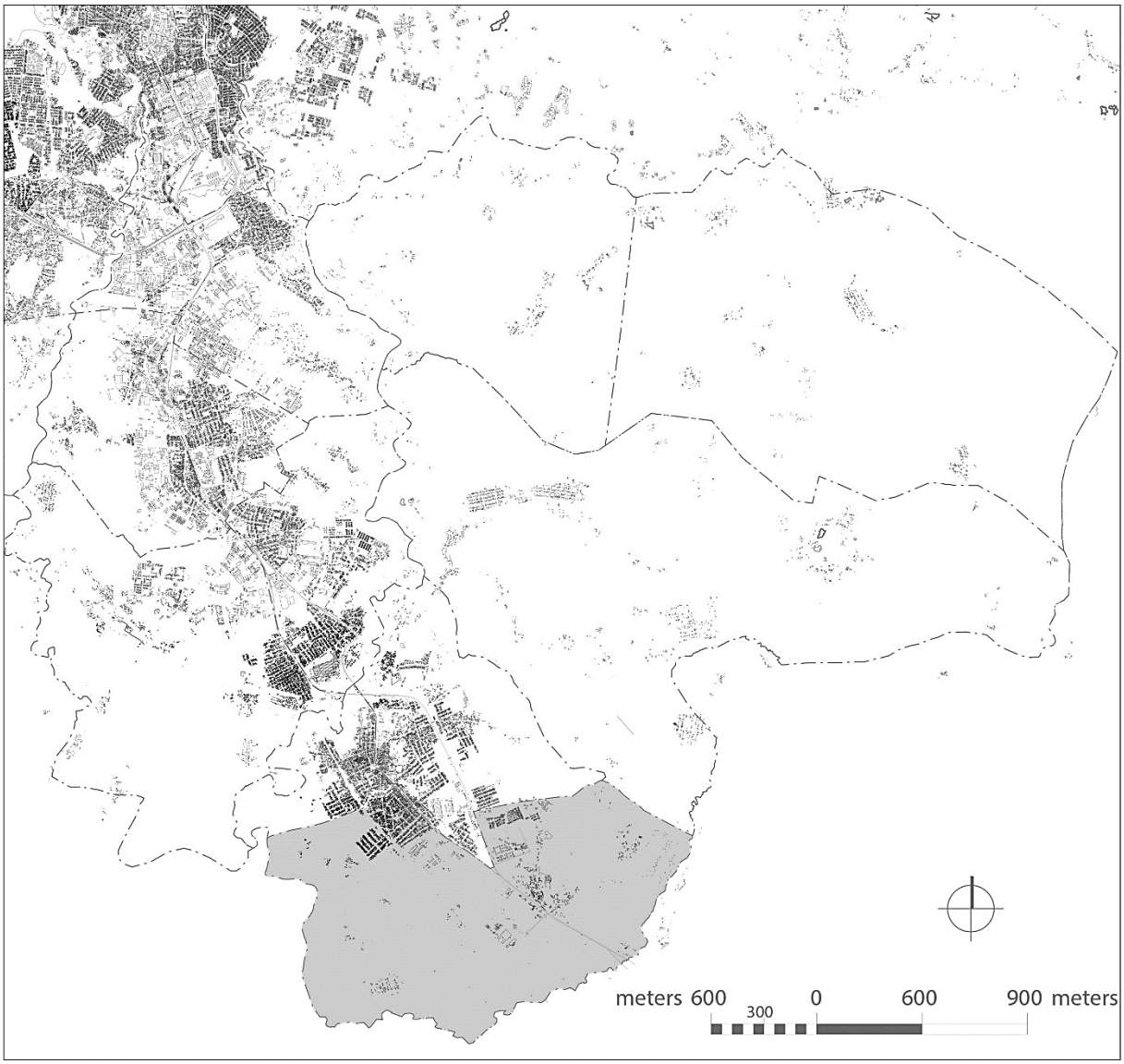


Figure 3. 1 Akaki-Kality sub city

Source: Modified from Akaki-Kality sub city planning department

Woreda 2, found in local area called Akaki, (1800-2700m above sea level) area which is one of the eleven *Woreda*s in Akaki-Kality sub city of Addis Ababa, Ethiopia. According to the previous Sub city and *Kebele* restructuring made by the Office for the Revision of Addis Ababa Master Plan (ORAAMP), *Kebele* 02, 07 and some Southern part of *Kebele* 06 were included in *Woreda* 2.

According to data found from *Woreda* 2 administration office, *Woreda* 2 cover approximately 4,189,918 square meters of area. *Woreda* 2 bounded by *Woreda* 3 and 1 from the Northern side. The Southern, Eastern and Western sides of the study area stretch up to the Southern boundary of Addis Ababa. It is the biggest *Woreda* among the three *Woredas* found inside Akaki. The study area is mostly a flat field; however, from the southern side there is hill which is used as a quarry for construction materials.

Woreda 2 covers approximately 4,189,918 square meters of area. The population of *Woreda* 2 estimated to be around 15,500. The population density of the area was 37 people per hectare (3,875.2 people per square kilometer). The population concentrated at the north-east and north-west parts. The rest of the land occupied by farm and industries lands. Fig. 3.2 shows that 31.8% of the land occupied by mixed used residential area. Among this only 10.5% of *Woreda* 2 land occupied by the existing mixed used residential and the rest 21.3% will be progressively occupy by proposed mixed used residential area. 9.65% captured by industries, warehouse, storage and 3.1% of *Woreda* 2 land occupied by forest. More than half of the total land, 54.4%, dedicated for agricultural uses and open space but now days agricultural lands transforming into mass residential housings expansion of large condominium construction site, community housing construction, and even warehouse and industries construction too.

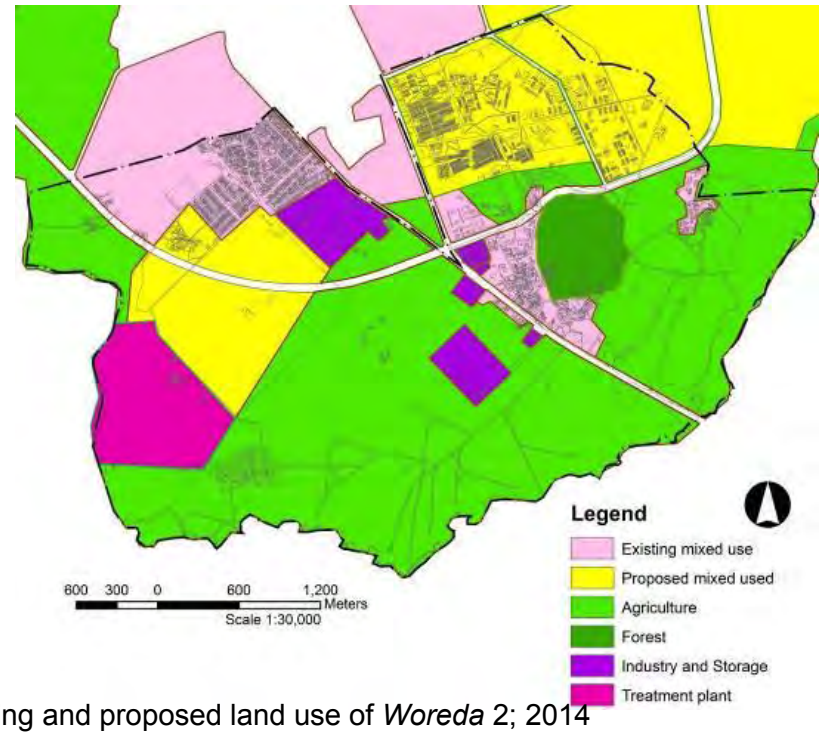


Figure 3. 2 Existing and proposed land use of *Woreda* 2; 2014

Source: Akaki-Kality Sub city Land Development and Management Office

3.2. Historical development of *Woreda* 2

The current organic urban pattern of Addis Ababa trace back to the period of monarchy ruling systems from the starting foundation of Addis Ababa in 1886. At that time the city was selected because of strategic position for military purpose and for availability of natural resources by Emperor Menelik II. Then the city started to grow from the Emperor's garrison town step by step by land allocation of the emperor to the noblemen, to the church and to the chiefs. Further the chiefs and the noblemen rent or parcel lands; construct houses to rent or to accommodate their respective tenants. Since these house developments and land subdivision done spontaneously without proper plan, created Addis Ababa's settlements to have organic urban pattern.

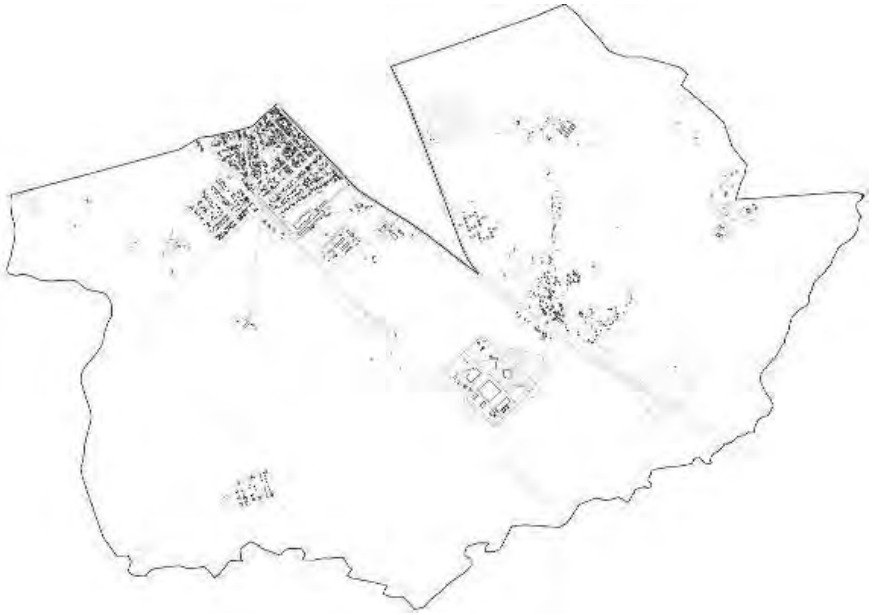
When *Derg* came in power 1974, all urban land was nationalized by the so called motto "land to the tiller". *Derg* adopt political ideology of socialism which promoted a fair distribution of resources among the citizens. Therefore, after came in to power changed the land ownership right and nationalized land by two influential land proclamations. Proclamation No. 31/1975 declared the nationalization of all rural land and transferred the landholding and benefit rights to the peasants. And Proclamation No. 47/1975 declared state ownership over urban land and extra houses of the landlords. During *Derg* era, the government started to subdivide urban land and provided up to 500 square meters to the citizens who did not have a private house (Sisay, 2012). These private residential lots continued up to present as a private land by Proclamation No.80/1993 which stated that urban landholding must be through lease however, this proclamation does not include urban land occupied before the proclamation on effect. Moreover these private lots get into lease system if it is transferred to third party. At *Derg* period peripheral location like Akaki, *Woreda* 2 is mainly open land which means technically unclaimed land; subdivided for residential uses. In some cases, the government provided public utilities and infrastructures.

Three types of residential housing settlements are clearly visible in *Woreda* 2 (see fig.3.3) that are develop through the different government systems of the country. These are settlements emerge during the monarchial ruling (during pre-*Derg* regime), post-*Derg* regime and pre-FDRE. The northern east section of *Woreda* 2 emerged during the monarchial era has organic road pattern characteristic, condensed houses and majority houses are *kebele* administered now days. Fig.3.4 illustrate that the progressive morphological transformation of the study area. Even though, the study area mainly open spaces and agricultural areas, these open spaces

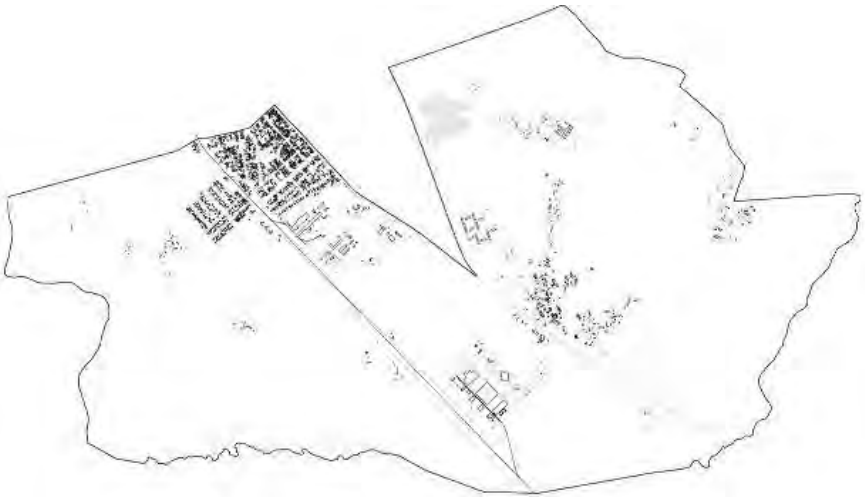
progressively converted into a built environment. Moreover, the existing built environment becoming denser and denser too.

Figure 3. 3 Ortho photo of the study area (*Woreda* 2, Akaki)

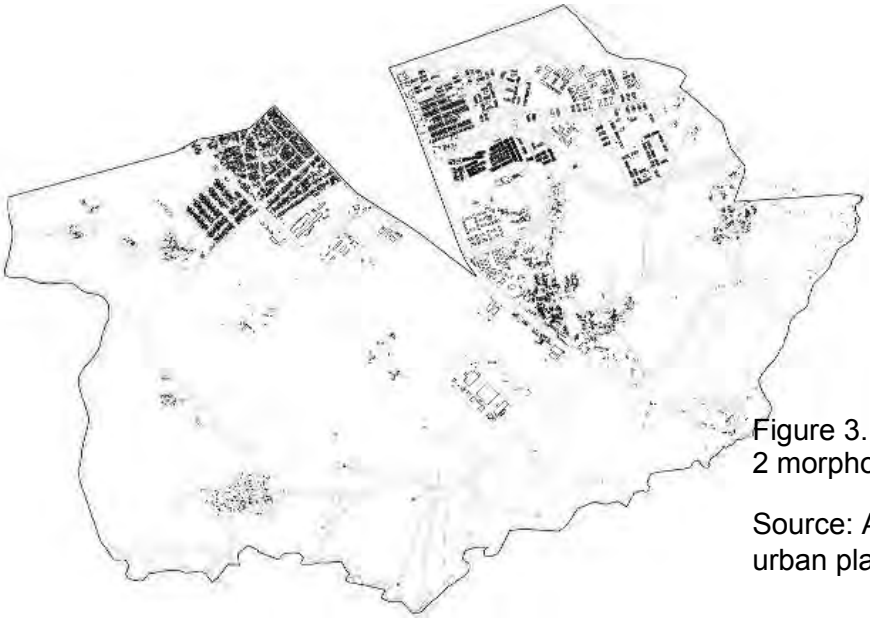
Source: Modified from AASOID



1994



2005



2011

Figure 3. 4 The evolution of *Woreda* 2 morphology, 1994-2011 E.C

Source: Addis Ababa administration urban planning institute

Informal settlement may happen in two ways. On public land and/or on private owned land (El-Batran and Arandel, 1998). Informal housing development also occurred in the study area. *Woreda*'s administration officials categorized informal residential house as: informal residential houses built on illegally occupied government/public land and informal houses that created by the house transformation. Such as house extension without building permissions on legally private owned residential plot. Informal/illegal public land grabbing for residential use in south-west area of *Woreda* 2 especially in place known as "Tullu Abo" happened in 2005.

3.3. Physical Characteristics of *Woreda* 2

Housing

According to the 1994 population and housing census, in the 1994 the number of housing units in Addis Ababa was 374,742 and the number of households was 414,262. That is the housing unit was 9.5% less than the number of households. In 2007 the numbers of housing units escalate to 628,986 while the number of households increased to 662,728. The housing units were 5.1% less than the number of households (see table 3.1).

Ownership of house is one of the expressions of housing characteristics. In Addis Ababa city the number of households who live in both either government or in private owned rental housing unit exceeded 20% than who lived in privately owned house. In the other words, households who owned private housing unit accounted 35.29 % and who rent either from government (*Kebele* & rental housing agency) or private households accounted 55.29%, (CSA WMS, 1996. sited in Addis Ababa city government, finance & economic development bureau, 2002 pp. 21). Moreover, 16.7% houses were rented from private house owners or other organizations, 2.5% houses owned by Housing Agency, 38% were *Kebele* owned houses and the remaining 34.42% were privately owned houses. That is private owned houses occupied the second place next to *Kebele* owned houses (ibid).

Housings																		
Number of households	Number of Housing units		Number of rooms (in housing units)		Physical structure (in housing units)													
					Wall													
47,373	45,749		One	19,771	Wood and mud	Wood and thatch/ wood only	Stone and mud	Stone and cement	Plastered hollow blocks	unplaste hollow blocks	bricks	Corruga ted iron sheet	Reed/ bamboo	Mud bric ks	Others			
	Conventional	44,367	Two	12,190	45,749	191	175	641	5,239	890	143	1,298	42	5	185			
	Improvised	1,361	Three	7,358	Roofing													
	Mobile	21	Four	3,364	Corrugated iron sheet	Concrete/c ement		thatch	Wood and mud	Bamboo/ reed		Plastic/ shera	Asbestos	others				
			Five	1,542	45,135	64		323	21	11		154	21	21				
			Six	731	Ceilings													
			Seven	281	no ceiling	fabrics	Bambo o/reed	Chip wood/h ard wood	Parquet or polished wood	Wood planks	Concrete /cement	Polythene sheet/"Ma daberia"	others					
			Eight and more	514	15,776	12,200	16		127	11	164	13,451	4,005					
					Flooring													
					Mud	Bambo o/Reed	Wood Planks	Parquet/ Polished Wood	Cement Screed/ Cement Screed Not Applied	Plastic Tiles	Cement Tiles/ Brick Tiles	Ceramic/ Marble Tiles	others					
					26,636	21	588		16,174	371	1,520	95	344					

Table 3. 1 Housing data and Number of households of Akaki Kality sub city: 2007

Source: Central Statistical Agency of Ethiopia (CSA), 2008

From the total housing units 97.3% are conventional. Among 76.9% housing units wall constructed of wood and mud, 13.0% constructed from plastered hollow block and 2.5% made of stone and cement.

According to the City Administration of Addis Ababa, durable house defined as house that is capable of protecting inhabitants from extremes of climatic conditions such as rain, heat, cold, humidity as well as house that not built on non-hazardous locations such as location under high tension electric line, natural disasters risky area (Addis Ababa city government. finance & economic development bureau, 2002 pp. 21). According to CSA, 2008, 80.2% of the housing units' wall made of non-durable wall material like, wood, thatch and mud. Only 19.2% of the households dwell in housing quarters built of relatively durable wall material such as cement, stone and hollow blocks.

In *Woreda* 2, the total number of registered housing units are 3,241 among 1,881 housing units (58%) are privately owned house either by free hold or through lease. 760 houses (23.3%) are administered by *kebele* and the remaining 600 (18.5%) houses are belongs to housing agency. More than half (58 percent) of the total housing units are privately occupied houses. Hence this

makes this study meaningful as it focused on the transformation (extension) of privately owned houses.

HOUSING OWNERSHIPS	USE OF THE HOUSE	HOUSING UNITS	%
Kebele house	Commercial house	10	0.3
	Residential house	750	23
Privately owned house	Commercial	305	9.4
	Residential	1576	48.6
Housing Agency owned house		600	18.5
	Total rental House	226	7
	Total housing units	3241	

Table 3. 2 House ownerships in *Woreda* 2

Source: *Woreda* 2 Administration Office, 2014

The number of buildings in 2011 increased by more than two folds than in 1994 and moreover the mean building foot area decreased by 33.3%

Year	Number of buildings	Total built up area (m^2)	Minimum building foot area (m^2)	Maximum building foot area (m^2)	Mean building foot area (m^2)
1994	2,687	163,418	2	11,768	60
2011	8,469	387,594	1	11,768	45

Table 3. 3 *Woreda* 2 number of buildings in years 1994 and 2011

Source: Addis Ababa administration urban planning institute

Housing development and Public services

The study area, *Woreda* 2, was mainly farm land and open spaces before 1982 then *Derg* government nationalized the land from the local landlords. Then up to 500 square meters plots parceled and distributed for residential use. According to the Key informants' interview during the site survey, *Woreda* 2's most residents were started settlement in late 1977 and early 1987. The land was farm lands that belong to different landlords firstly. *Derg* government came up with the most influential proclamation 47/1975, which states government ownership of extra land and house. So during this period the landlords' farm land become nationalized and sold to the individual who did not have land for housings with relatively minimum costs. However, there are locations inside Akaki were the residential housing settlements date back long ago to the era of monarchial government system too (See Fig 3.5).

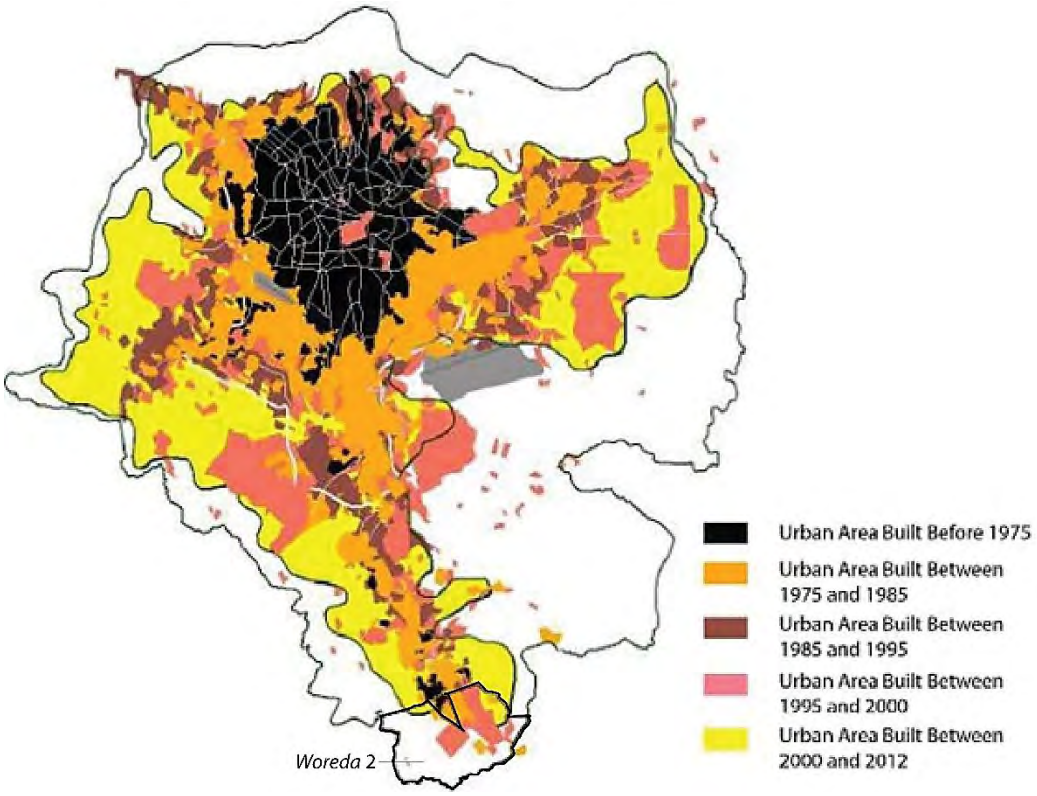


Figure 3. 5 Settlement trends between 1975 and 2012 in Addis Ababa

Source: AASOID

Table 3.4 illustrates the number of privately owned plot and year of settlement occurred. According to the data found during the households' survey, more than 76 percent, twenty-three privately owned residential housing plot were acquired between the years 1976 to 1985. Moreover, from the thirty families that interviewed, twenty seven (90 percent) are original settlers that got the land from the government. Three families (10 percent) got by purchasing through land subdivision process.

Year of plot acquisition	Quantity	Percent
Before 1975	3	10
1976 - 1985	23	76.7
1986 - 1995	4	13.3

Table 3. 4 Settlement trends in *Woreda* 2

Source: study area survey

In the study area, *Woreda* 2, infrastructures and services such as roads, electricity, water, drainage lines were installed years after the layout of the plots done. Residents built their houses and started living even the roads paved; with no electricity and water lines. This shows clearly that the lack of appropriate roads was no barrier to construction of houses in *Woreda* 2.

3.4. Socio-economic characteristics of the study area

Population

It is obvious the reason behind observing population growth and population projection when taking about housing issues. Since, there is usually a close linkage between housing and population change. So, it is necessary to trace population changes in order to trace all housing transformations and changes on housing.

According to central statistical agency of Ethiopia (CSA), the total population number of Ethiopian was 53.5 million in 1994, 77.1 million in 2007. That means within 12 years the population number increased by 23.6 million which means increased by 44%. The population number of Addis Ababa was 1,423,111 in 1984; 2,112, 737 (1,023,452 male and 1,089,285 female) in 1994; 2,739,551 (1,305,387 male and 1,434,164 female) in 2007. The causes for the increase of population determined by natural population increase; the level of net migration and also change of the population partially caused by the change of the boundary of Addis Ababa through Addis Ababa master plan preparation (CSA, 1994).

The study area, *Woreda* 2 which is one the eleven *Woreda* that found in Akaki Kality-sub city has population of 15,500 that occupied 8.55 percent of the total resident exists in the sub city.

SUB CITIES	BOTH SEXES	MALE	FEMALE
Akaki Kality	181,270	88,714	92,556

Table 3. 5 Akaki Kality sub city total Population number classified by sex: 2007

Source: Central Statistical Agency of Ethiopia (CSA), 2008

Table 3.6 shows that according to the 1994 population and housing censes, 21.7% of Akaki population live in *Woreda* 2. As compared to the other *Woredas*; *Woreda* 2 covers a large geographical area. However, contains small number of population. The reason for this

discrepancy is most land occupied by factories, industries and farm land. However, today the owners of farmlands get their compensation and relinquished their land to large government residential house expansions programs and to private mixed used buildings developments especially farm lands located along the main asphalt road. Consequently, the number of residents escalated from 9,919 in 1994 to 15,501 in 2012.

Woredas	**Both sexes**	**Male**	**Female**
Woreda 1	19,550	9,552	9,998
Woreda 2	9,919	4,789	5,130
Woreda 3	16,195	7,684	8,511

Table 3. 6 Total Population of *Woredas* in Akaki by sex: 1994

Source: Central Statistical Agency of Ethiopia (CSA), 1995

Woredas	**Number of households**
Woreda 1	3,412
Woreda 2	2,210
Woreda 3	4,078

Table 3. 7 Number of households in Akaki by *Woredas*: 1994

Sources: Central Statistical Agency of Ethiopia (CSA), 1995

3.5. Economic activities

The economy of *Woreda* 2 population are based on the locally existing factories, office work, on micro and small scale enterprises, private work and others. Furthermore, in *Woreda* 2 there are more than five factories that produce different products such as: metal products, clothes, and packaging materials.

Various small scale or home based economic activities are takes place in the *Woreda* 2. There are 316 households that involved in different economic activities among them 10 houses are owned by *kebele* administration. And the others are happened inside privately owned housings and agency housings. Table 3.8 shows the various home based economic activities in *Woreda* 2. Small shops take the highest percentage among the different home based economic activities that exist in *Woreda* 2. That is 39.2 % of the total economic activities in *Woreda* 2. These small shops usually found in front of the residential plot facing to the road. It can be independent detached house or it can be attached from the main residential house through the process of

transformation (extension of the main house).Café and breakfast reparation accounts 7.3%; Bar and grocery 7.3 % and Cattle fattening and sellers, 3.5 %, takes the first third economic activities in *Woreda* 2 stages. Actually all these economic activities take place along with in the residential house plot or by transforming the residential house.

Economic activities/ type of home based businesses	**Units**	**%**
Bar and grocery	5	7.3
Barbers	6	1.9
Café and break fast	23	7.3
Cattle fattening and sellers	11	3.5
Clothes sewing	3	0.9
Female beauty salon	7	2.2
Food sellers and food preparation	4	1.3
Fruit and vegetable vendors	2	0.6
Metal works	3	0.9
Pool and billiard house	5	1.6
Small shop	124	39.2
Traditional drinks vendors	4	1.3
TV and VCD renters	2	0.6
Others	91	31.4
Total	290	100

Table 3. 8 Type of home based businesses in *Woreda* 2: 2014

Source: *Woreda* 2 Administration Office, Trade and Industry Development Office: 2014

4. DATA ANALYSIS AND FINDINGS

Introduction

According to the data collected during the household interviews, this section identifies the different households' motives that triggered the extension of secondary dwelling units. Each motive was illustrated with additional data and better by households' case stories that were presented at the end of each motive to illustrate the complexity of the driving forces and the actual family decision for need of extra space/room (Figure 4.1). The illustrative photos in the life stories took during the field work physical statues of the houses. But it is not hard to identify the extensions done in different years by observing new and oldness of the structures and building materials changes done.

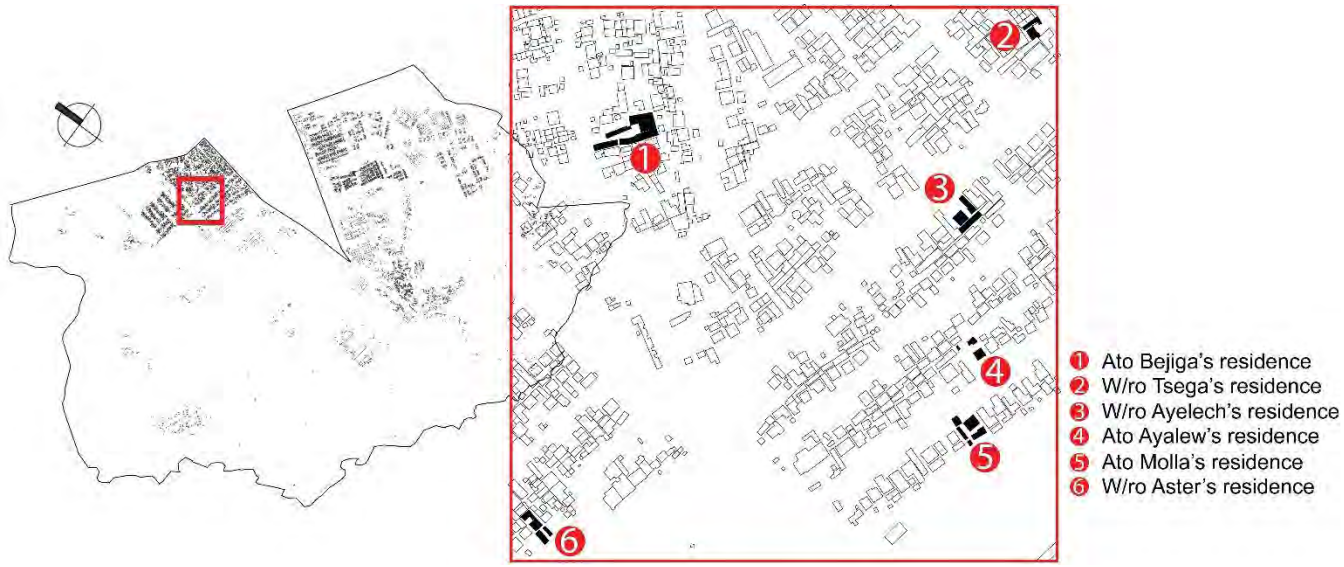


Figure 4. 1 Household case stories' location map

Source: Modified from Addis Ababa administration urban planning institute

After analyzing and processing data from thirty randomly selected residential houses' family interviews and housings surveys of *Woreda* 2, the following findings obtained to answer the research questions posed in the preliminary part of this study.

4.1. Family Motives for secondary dwelling units' extension

Table 4.1 shows the households' space need motives for extending secondary dwelling units and repetition of extension because of the driving motives. The repetition of the motives got by summing up all the thirty families interviewed during the site survey. Of course, there might be

more than one repetitions of one single motive of secondary unit extension in one family. The extended floor area got by measured the added spaces and/or asking the respondents during interviews. To cross check the extended floor area of the secondary units, satellite images by the help of GIS (Arc Map) software was frequently used. The amount of total extended floor area for the specific motives give additional information how much weight given by the households to that specific motive.

Motives for extension of SDU	**No. of households**	**Total dedicated extension floor area (m^2)**	**% (form the total extended floor area)**	**Repetition of extension of SDU (space/room)**	**%**
Accommodation of married children	14	625	41	28	29.2
Rental income	18	444	29	26	27.1
To run home based business	10	168	11	14	14.6
To accommodate matured children	14	217	14.2	12	12.5
Kitchen	2	15	0.98	9	9.4
Toilet and/or shower	1	16	1	4	4.2
To add functional room to the main house (toilet, kitchen, bedroom, store…)	1	24	1.6	2	2
Accommodate close relatives	1	20	1.3	1	1
Total	30	1,529		96	

Table 4. 1 Household motive for extending secondary units with respect to the frequency of extension.

Source: Study area survey

The above table shows accommodation of married children account the highest motivating factors for the extension of secondary dwelling units in the study's case area. Then extension to get rental income took the second place that motivated households to add additional space to their secondary dwelling units. In study's case area among the thirty respondents, in contrary to Kellet (1993) none of the respondent showed secondary units extension motivation to express

different cultural values of them. But the study find secondary units' extension motivated to acquire improved rooms/spaces and to come to standard of living space as Tipple et al. (2004) noted. This can be expressed by addition of extra rooms in secondary units after the occupiers get living longer with number of the family increased. This condition and the above extension motives will be illustrated in the following sections in wider depth.

4.1.1. Secondary dwelling units' extension to accommodate extended families

In study area, *Woreda* 2, the phenomenon of observing extension to accommodate matured children and married family member even grandchildren are very frequent. Usually the extended families accommodated in progressively extended rooms of secondary units. During the interview parents responded that they did not forced their children to get out of their home when they got matured or married, because the parents well informed the high cost of rental house and livelihood expenses which their children cannot afforded. Mr. Molla's life story (see fig. 4.5) can illustrates the above condition to the limit; even married children got out of their parents' home immediately after they got married, but after a few months or years they comeback to live together with their parent permanently.

Extension to accommodation married children

The study found an interesting relation between the parents and married children in the use of secondary units. One married child may follow any of the following four paths: married and share the secondary unit with parents; married and share the secondary unit with parents temporarily then left the parents' house after got rental/other housing options; married and left the parent's house and returned back to live either permanently or temporarily; or the parents force the married child to leave then the parents change the use of the secondary unit. However, during the site survey, in some case, it is common to see a strong relationship between the first and the third generation. Even grandparents offer their secondary dwelling units to accommodate grandchildren.

According to the data found during the case area survey, 37 married children (almost 80 percent) live within their parents' secondary dwelling units. Only six (13 percent) married children got out of their parents' home after they got married. (See table 4.2)

Place of children living after got married	Living in their parents' main house	Living in their parents' secondary units	Left their parents' secondary units	Left their parents' secondary units and come back again	Total
Number of married children	2	37	6	2	47
Percent	4.3	78.7	12.7	4.3	

Table 4. 2 Frequency of children's place of living after got married.

Source: Study area survey

The following families' stories illustrate the above situations; secondary dwelling units' extension initiated for accommodation of married children better.

1. Mrs. Tsega age 57 came to *Woreda* 2 from Saris (Addisu Sefer) in 1984. She was suffered much with rental house payment and the social life when she was in private rental house in Saris. Her husband died in 1981. Life becomes very difficult for her to raise five children by the only monthly income she gets. She has five children: *Derg*, Alemu, Danail, Abebe and Zelalem respectively as they born. All are male and born before coming to *Woreda* 2. Now all her children are matured well and got job. In 1984 she bought a 400 meter square plot of land with three roomed main house on it with the help of her children and the money she saved. After nine years (1994), she subdivided the plot and sale half of the land informally. She improved the main house and added two rooms for accommodating her first married son who used to live in rental house in other place. And she modified and extended the existing detached secondary unit that was used to serve as traditional kitchen and toilet constructed with fabrics wall and CIS roof for her second married son. Now her two married sons, Derege and Alemu join their mother's house and both have one child. The other three children not married and live in rental house outside of Tsega's house. She and her other three children have hop of one day they live together. All the five children have a plan to build house inside of their mother's plot to help their mother in close and enjoy life with together. Moreover, the rest of the three children said; they tired with unexpected addition of monthly rental payment despite of constant unsatisfied monthly income they get. In 2010 the older son, Alemu, remodeled his house. He extended one room 3 by 3.5 meter for living/dining room for his own family.

1994

The above layout shows the arrangement of the housing units immediately after she subdivided and sells the half plot.

1995

After she sold the half of the plot, she increased the number of rooms in the main house to accommodate one of her married son. In addition, she extended the secondary unit for her second married son accommodation.

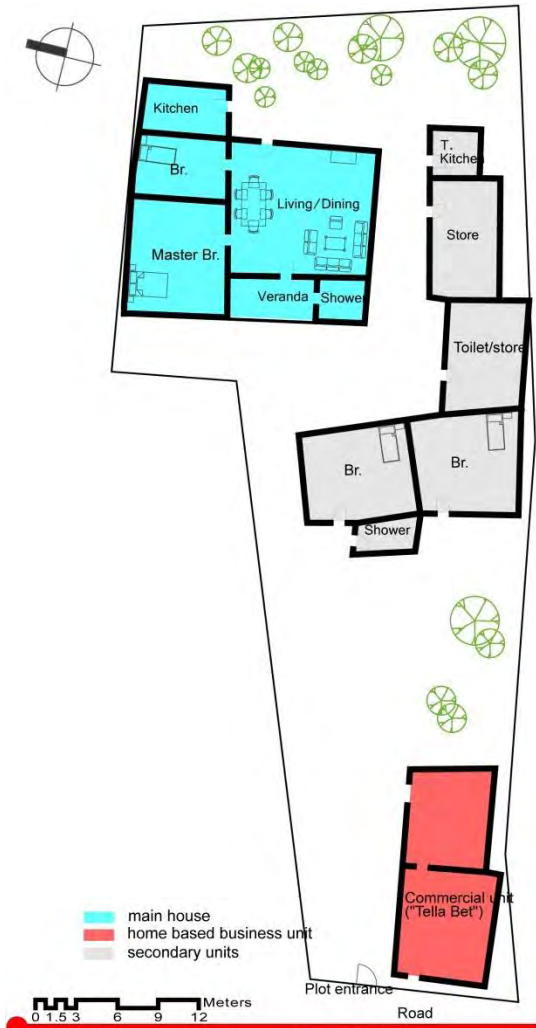
2010-2014

Her second son need additional space as he had two rooms. the first room dedicated for sleeping, living and dinning. His second room used as kitchen store. Therefore, he added 3X3.50 meter living/dining room by attaching from his kitchen store in 2010

Figure 4. 2 Mrs. Tsega's residence

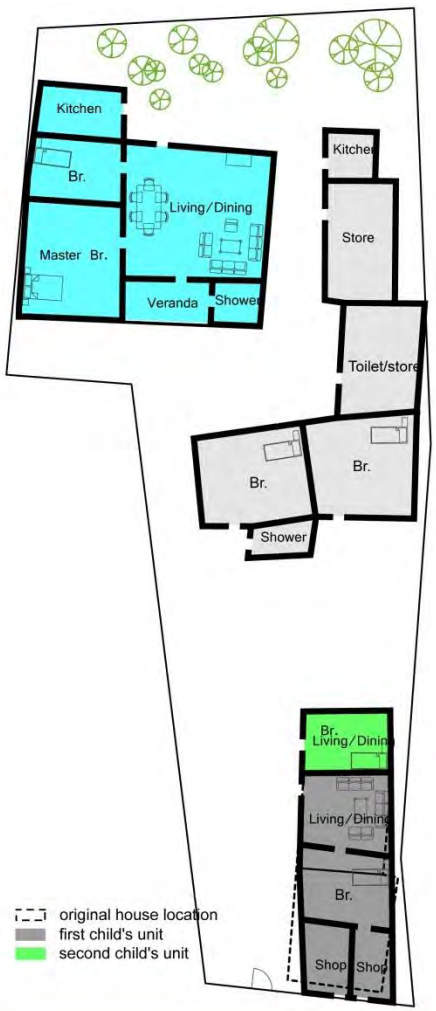
Source: Study area survey

2. Mr. Bejiga age 80 came to *Woreda* 2, from nearby rural area in 1962 and he bought 800 meter square plot of land from the landowner. He said the land used for farming proposes and there were very few thatched roof residential houses. He built the main house (includes: living/dining, master bedroom and bedroom) in 1966. Then he extended it to the backside for children bedroom and kitchen after 8 years, 1974. Some years later he built detached two *Service biet* (secondary dwelling units) (one for accommodation of his relative and the other is for home based business).Then he remodeled the two secondary units to accommodate his brother and his mother. Mr. Bejiga said the children were not matured and few in number at that time and they used to sleep inside the main house. Mr. Bejiga has seven children four male and three female. They are in order of older: Bekele, Dergu, Ocho, Eshetu, Tigist, Fantu and Ayelech. All got married now except Eshetu. Bekele and Fantu left their father's house to abroad. Ayelech got married and live in her husband's home. A few years later, add 3 housing units by extending from his brother's house wall laterally. The merit for the extension of the house is for the accommodation of his matured children. Then he adds two detached secondary units to right of the main house; in front of the previous extended house for rental propose. After that he continuously extended the secondary units exist inside the plot for rental. Now he reached ten rooms among these, five are rented with 300-500 *Woredas* per month and rests five are used to accommodate his married children and grandchildren. Now he is very old and cannot work and doesn't have any income except monthly rent money and 400 Birr retirement pension. He said "I built all these *Service biet* (secondary dwelling units) and the main house alone and now days I feel proud to see these houses accommodating my children, grandchildren and all rented resident." He continued "after I built the main house, I was built all secondary units found in the plot step by step and almost I was extending one room per year." The reason for the progressive extension was not to make aware the *kebele* officials and to some neighbors too as they may report to the officials about the illegal extensions. Currently he stops extending the *Service biet* because he runs out of space in his plot. Only left with small space left in the plot surrounded by the houses. At the day time this space used for draying spices, clothes and at night it used for his son's mini bus taxi parking purpose.



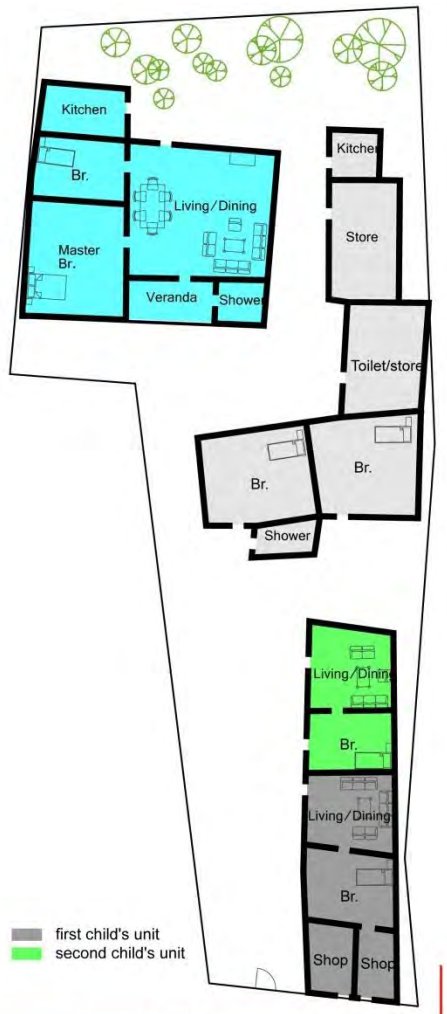
1987

800 meter square plot had three housing units: the main house, secondary unit (toilet, kitchen, store and sleeping places for close relatives) and commercial units for selling traditional drink "*Tella*". It built with temporary building materials: wood post and fabrics roofing.



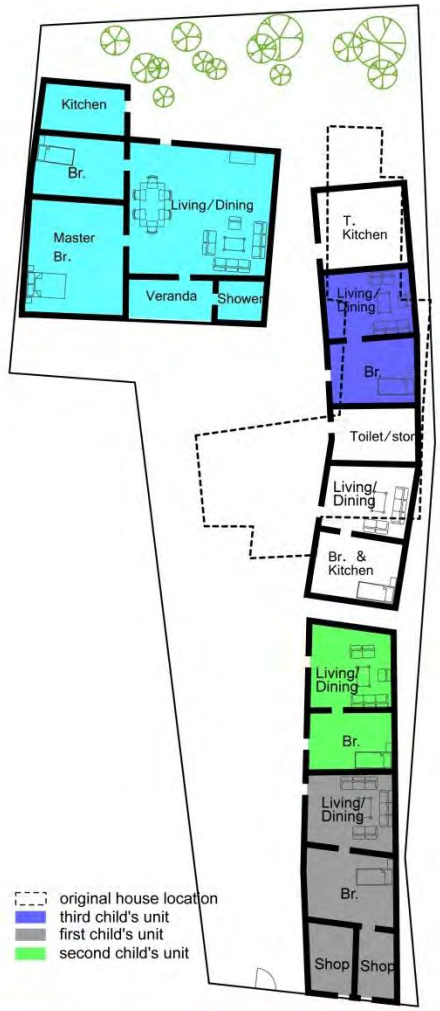
1988

The commercial housing unit modified and extended to accommodate shops and living spaces for two matured children (the first married child).



1989

After one year, the second child extended a living/dining room for himself planned to marry in 1990



1993

A major extension occurred on the secondary housing units to give space primarily for the third child accommodation and for traditional kitchen.

Figure 4. 3 Mr. Bejiga's residence

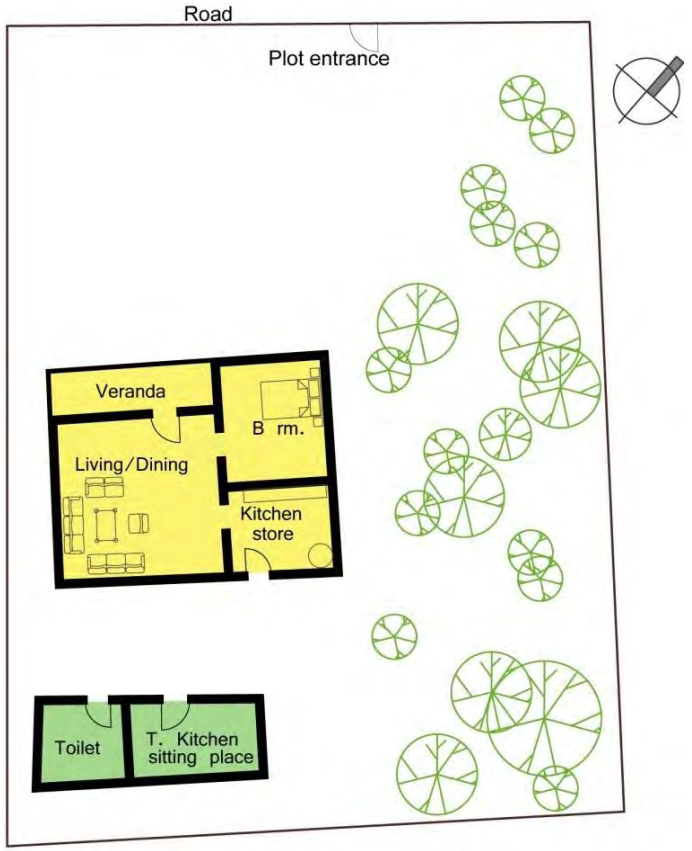
Source: Study area survey

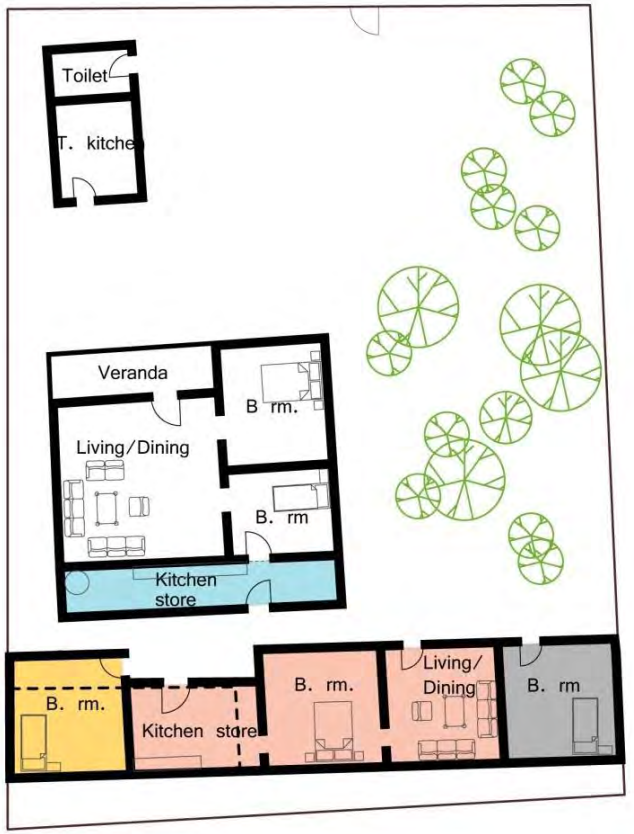
3. Mrs Abebech age 65 came to *Woreda* 2 in 1977 from Arsi. Her husband got the land from the government. Her husband was dead in 2007. Now Abebeche is a single mother. She has seven children and all born in her house. Two children got married and live with her, one went to abroad and the rest are students live with her in main house. Among the seven children the 3 have their own job and the rest 4 are dependent on her and their brothers' and sister income. Her average monthly income reaches 1500 Birr excluding the financial support she got from her children.

   Currently her *Service biet* (secondary dwelling units) located to the right side of the main house made of earth wall and floor with CIS roofing. The main house has five rooms: three bedrooms, one master bedroom and two for her four children accommodation, Living/dining room and kitchen/store.

   Mrs Abebech built the first secondary unit in 2004 for the rental purpose. However, after a couple of years her younger daughter, Zenabwa, got married and she need to live with her mother. Then Mrs Abebech quit renting the secondary units and gave to her daughter. She said money goes and money comes; the only thing lasts longer is people. Mrs Abebech also said, she would like surrounded by her children and grandchildren enjoying the rest of her life with them in her compound. Then in 2009 she extended her existing *Service biet* laterally with one common wall to accommodate her second marred son, Simion, and a shared traditional kitchen and toilet next to the Simion's room (9 square meters). Now Mrs Abebech got 3 grandchildren living with her.

4. Mrs. Ayelech age 65 came with her husband in 1979. They got 400 square meter plot from the government. Among the five children they have, the three were born after they built the main house. The children in order of eldest are: Tegist, Senaite, Tringo, Mulushewa and Asheber. Except Asheber all are now married. The second child, Senaite, she married and live with her husband's house. The rest children live with their parents' house currently. The first *Service biet* (secondary unit) extension done in 1997. The extension was started from the existing traditional kitchen and added four rooms for Tigist, who got married and for Mulushewa accommodation. Then after five years, the third child who got married built one roomed freestanding secondary house. However, later in 2011 she gave her house to her brother and she extended three roomed house starting from the older house of her. She said "the earlier house was enough just for me and my husband but as gave birth, the house was not enough for my child, me and my husband. So that I planned to have additional rooms and here I done it." The last child lives within his parents' main house. Currently, Mrs. Ayelech house sustain a total of nineteen people who are children, grandchildren and one brother of her. Mulushewa construct a 5 square meter room attached to his sister, Tirngo, home in order to open a barber shop. His intension was to support his mother financially who get 316 Birr per month from retirement pension and create job for his younger brother, Asheber. Asheber works in barber. He works regularly support him selves and his mother as well.





0 1.5 3 6 9 12 Meters

main house
secondary unit

kitchen store
fourth child's rooms
first child's rooms
brother's room

third child's room
kitchen
second child's rooms
first child's room
brother's room

Before 1997

Before 1997 there were two housing units in the plot; the main house and the secondary unit which contained traditional kitchen and toilet.

1997

the secondary unit extended for one matured and one married children plus to accommodate a close family. also the main house extended for the purpose to get room for additional bed room

2002

Independent secondary unit added to the right of the main house for the third married child.

Figure 4. 4 Mrs. Ayelech's residence

Source: Study area survey

Extension to accommodate matured children

In *Woreda* 2, Akaki, twelve families (40 percent) of the respondents were motivated to extend their secondary dwelling units for their matured children accommodation. Only two families of the twelve families that extended their secondary units to accommodate matured children have been changed the use of the extension space for other purpose. The reasons for this change according to the response obtained from the representative households were include: parents may told the children to leave their house after they matured enough or after the children got their own job. Children also may want to live independently to other places before and after they got married.

On the other hands, the matured children got married and needs of wide space may led further extension of their parents' secondary dwelling units. Out of fourteen families that initiated extending their secondary dwelling units because of accommodating matured children, in nine families' cases, the children got married and continued living in their parents' secondary dwelling units.

The following family case story illustrates the above situation better.

> Mr. Ayalew and his wife Ayelech came to *Woreda* 2 in 1973 E C. when they come, the whole *Woreda* 2 area was open space and there were only few residential houses. They got 443 meter square plot of land from the government. In the same year (1980) they built a one roomed house at the back of their plot. Later after one year, in 1981, built the main house and the former house changed into secondary dwelling unit (*Service biet or Yegowro biet)* and used as traditional kitchen. Mr. Ayalew has five children. Two got married. They were in order of age: Samson, Getahun, Adiss, Yonata and Genet. All used to leave in the main house. Mr. Ayalew's three sons were graduated from university and now got job. The two sons, Samson and Yonata, work and live outside of Addis Ababa and they came during the holidays to visit the family. Samson has wife and live in his own house in Dilla. The second child, Getahun is a primary school teacher. He teaches in the nearby primary school and lives with his parent. The other two daughters are not married. Adiss has her own work and the last child study in university. Both live in the main house. Getahun built his own room at the back of the main house by extending and modifying the existing traditional kitchen room in 2005 immediately after he graduated from the university. He said it only cost 3,000 Birr to do one 3.50 by 4 meter room extension at that time. He also said, it is very shame to live with your parents' room after you had a job. His father died shortly after his move to his newly transformed secondary unit at the back of the main house. After six years, in 2011, he extended to add bedroom. He said he was planned to get married and that was the reason behind demanding to separate bedroom and living/dining space. Then he got married in 2013 and add kitchen store. Then he extended another store rooms with in

one year interval. He said he built the store adjacent to his parents' traditional kitchen recently. His wife told him that they need additional room for storage of clothes and household things before she give birth. Because their living and bedroom already full with things and she may embarrass by friends who came to visit her. Now he just a one child father and he own four rooms in the *Service biet* (secondary units) located at the backyard of his family's main house

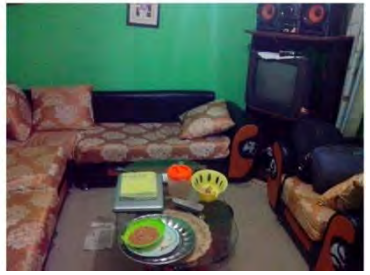


Figure 4. 5 Mr. Ayalew's residence

Source: Study area survey

4.1.2. Secondary units' extension for rental house

Figure 4. 6 Secondary dwelling units' rental advertisement at the gate of a private residential plot

Source: Study area survey

Concerning rental income as a motivation of secondary dwelling units' extension in *Woreda* 2 area, out of 30 respondents who had secondary dwelling units in their plots, sixteen (53%) were motivated because of questing for rental income (see table 4.3). Moreover, out of the sixteen families, two families (6.7%) were diverted from their initial motive (need of rental income) to other use after a few years.

Count of children	Motives for extension	Count of married children	Rental room in secondary units'
3	Rental income, matured children accom. & HBB	2	7
4	Rental income, married and matured children accom.	1	2
4	Rental income and matured children accom.	0	2
0	Rental income and to satisfy functional priority	0	1
7	Rental income, married children accom. & HBB	6	6
5	Rental income, married & matured children accom.	3	3
5	Rental income, matured children accom.	0	3
3	Rental and married children accom.	2	1
5	Rental and matured children accom.	1	6
0	Rental and toilet, T. kitchen	0	1
2	Rental income and HBB	1	2
6	Rental income and married children accom.	1	3
3	Rental income	2	4
3	Rental income, HBB and married children	3	4
3	Rental income, married children accom. & HBB	1	2
7	Rental income, matured children accom. & HBB	0	1

Table 4. 3 Frequency of secondary units' extension motives and rental secondary units

Source: Study area survey

In *Woreda* 2, there is probability that the extended secondary unit may dramatically change from the motivating space use into other use and even further extension may happen for the diverted motives. For example: first the originally secondary units extended to accommodate married and/or matured children but the matured and married children may either forced to leave their parents' home or they decide to lead an independent life with their beloved one. So, the space may allocate for rental use and further extension done on secondary units because of rental income satisfaction.

Below there are some families' case stories that were interviewed illustrating the above phenomena better.

a. Secondary dwelling units' extension motivated to accommodate married and matured children then convert to rental house

The following case stories illustrate the above topic which households first motivated to extend the existing secondary dwelling units for accommodation of matured children then after the children got out by various reasons (choosing rental housing outside of the family house for demanding independent or privacy life; get into the beloved wife's or husband's family house after marriage; by getting condominium house; buying house; family force to eviction; go to abroad or to other places because of different reasons) then, the housing unit become fully dedicated for rental and further extension for rental house will happen.

3. Mr. Girma age 65 has five children all are born after he came to *Woreda* 2. He own 440 meter square plot of land got from the government. The children are in order of eldest: Azeb, Tnsaye, Baby, Biruk and Girum. The first three children are married and the last two children are finished their regular education and they are working but not married now. Baby married and she lives in Sudan. The last two children: Biruk and Girum used to live within their parent house but now they get out and live in private rental house in other place. Mr. Girma built traditional kitchen with the same year when he construct the main house around 1978. Until 1992 the traditional kitchen house used for the purpose first planned for. Then in 1993 the house modified and extended to accommodation for his pregnant eldest child, Azeb. The traditional kitchen changed to open air kitchen. After one year, again the secondary unit extension done laterally in order to add one room for the second child, Tnsaye, accommodation. Then a few year latter further extensions was done to add traditional kitchen and a detached 3.5 meter by 2 meter housing unit built in front of the main house for Biruk accommodation. 2011 Azeb, left her parents' *Service biet* and transferred to private rent house in other place. Tnsaye who was accommodate one room to *Service biet* also married and left and live in private rent house too. Mr. Girma rent the two rooms (Azeb's and Tnsaye's room) with 300 Birr monthly plus the

front small detached house (that was built for Biruk) with 200 Birr per month. Biruk used to sleep in the main house's living room. Then in 2012 Biruk left his parents' house because his mother forces him to lead independent life as matured child. Mr. Girma and his wife have plan in future to extend additional two or three room for rental use because both are retired and the only income they get monthly retirement pension and three room rental income. So they need to increase their income by increasing rental housing units.

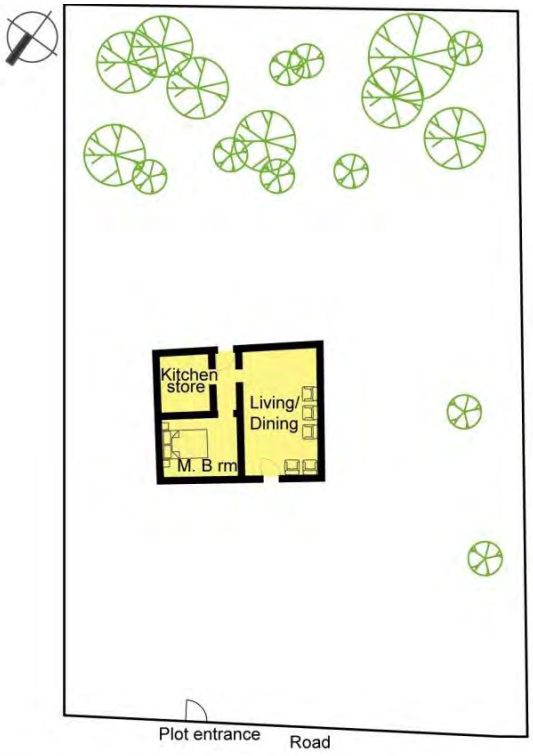
b. Secondary units' extension mainly motivated to get rental income and to accommodate married children

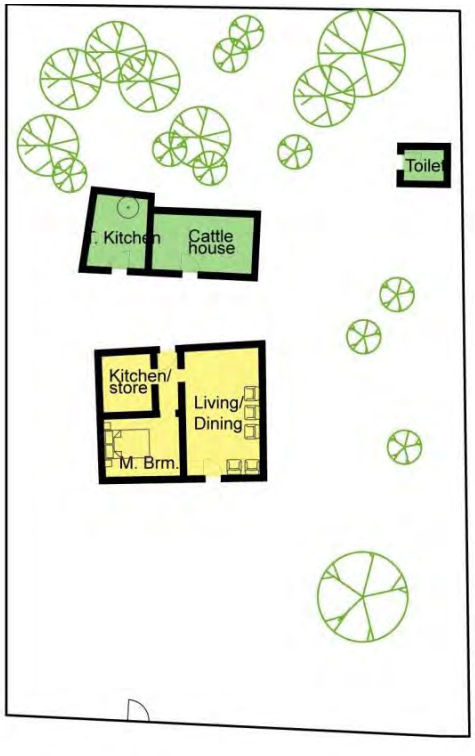
1. Mr. Molla age 62 and his wife came to *Woreda* 2 in the 1980 from rental house, a place that found inside *Woreda* 2 currently. He said, when he came except a few residential houses, the rest of the area was uncultivated open land. At that time the place have no any public services like electricity, water or telephone as well as infrastructure like road. However, the residents already started live and built their houses. Mr. Molla claim him selves as one of the prior settlers who own residential land from government (by "Mirrit"). He got 588 meter square plot from the government with 10 Birr payment for the corner stones and a minimum amount of money for the official process.

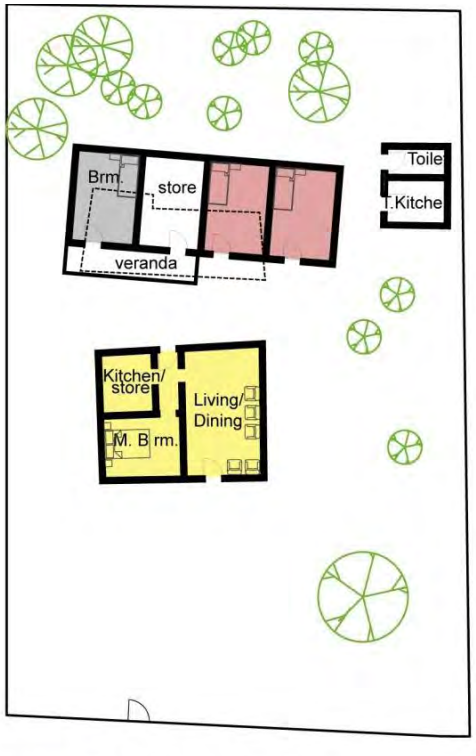
   Mr. Molla and his wife have three children all are born when they came to *Woreda* 2. They are in order of older age: Meseret, Getu and Genet. Meseret and Getu married now and Genet was sent to foreign country before two year. Before the first two children get married, they used to live in Mr. Molla's house together but after they got married they left the house and lead an independent life with their family and the last child used to live with him before she went to abroad. Now Mr. Molla and his wife, Atseda, live in the house alone. He demolished and reconstructs the original main house in 2004 by saving his salary paid from working to the nearby fibre factory and majorly from rental income. The rental incomes came from the two detached *Service biet* (secondary units); made of Mud and wood wall, corrugated iron roofing and earthed floor. The two rental rooms inside the detached housing units are almost 9 meter square each. He said that "I used to extend these housing units progressively and will do in future too because of the rental income." He also said the rental income he gets from those rental rooms highly support him financially when he maintain the main house in 2004. He has a stone and soil pile in his plot during the interview conducted as building materials for further extension of the rental secondary house. He said he bought the materials step by step by the money he got from the existing rental house. At the time of conducting interview with him, he reached seven rooms all are constructed by progressive extension starting from a detached housing unit by himself. He rent the four housing units with 250 Birr per month and the rest three units with 300 Birr per month. Around 60% of the rental housing units found to the back side of the main house and some are found to the side of the main house. Now all housing units are occupied by renters except one room. The two occupied by husband and wife who have children and the other the four housing unit

occupied by bachelors. Mr. Molla enjoy with the resident who rented his transformed *Service biet*. He shared open air cooking place and the toilet with them. He has a great motivation to extend the rental house now because now he get out and retired from the fibre factory where he used to work for 36 years and the only income he get is monthly retirement pension of his and his wife. So, he strongly wants to strength his rental housing as additional income. He said rental income does not need any hard effort as he compared to the factory work. He also said that he used to raising cow for its milk and products to sale but he quit a long time because raising cow is hard work and the money comes from selling its products is very much less satisfactory when compared to rental income. The secondary units' rental rooms were built and progressively extended by him selves with help of one or two local laborers.

After four weeks the interview conducted, Mr. Molla's son, Getu, added one 5 by 7 meter detached housing unit to the front left side of the main house. Mr. Molla's son, Getu, is living in rent house nearby *Woreda* 2. He planned to rejoin his father's plot after he left with his wife. Getu said the house should be finished as soon as possible because he is very tired of rent payment. He also building 3 by 4 meter detached housing unit to the back left side of the main house for kitchen and store for him selves. Getu has one child now.







0 1.5 3 6 9 12 Meters

main house
secondary units

the original house location
the main house
rental housing unit
second child's housing unit

1980

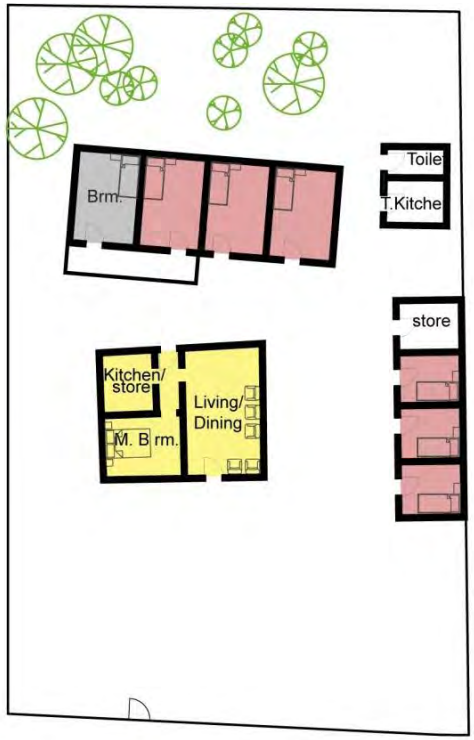
The original three room main house was constructed in 1980 as the family came to the *Woreda* 2 with no secondary housing units

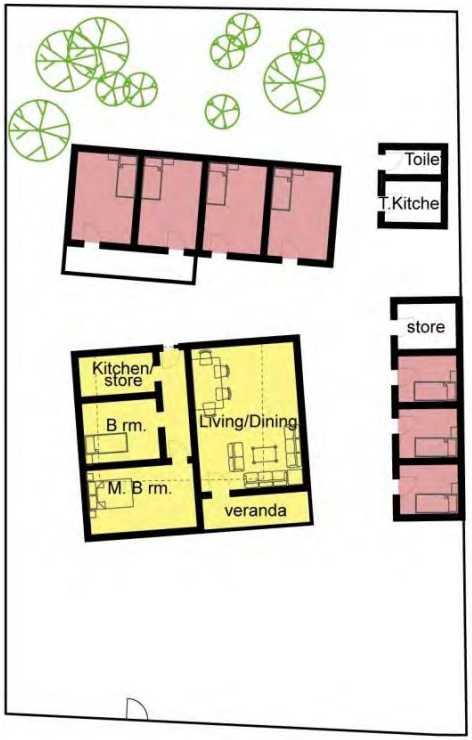
1982

secondary units were added for the use of traditional kitchen, cattle house and detached toilet

1987

The backyard secondary units was modified and extended to add two rental rooms. store and a room for the second child accommodation. Traditional kitchen was extended in the detached toilet unit.





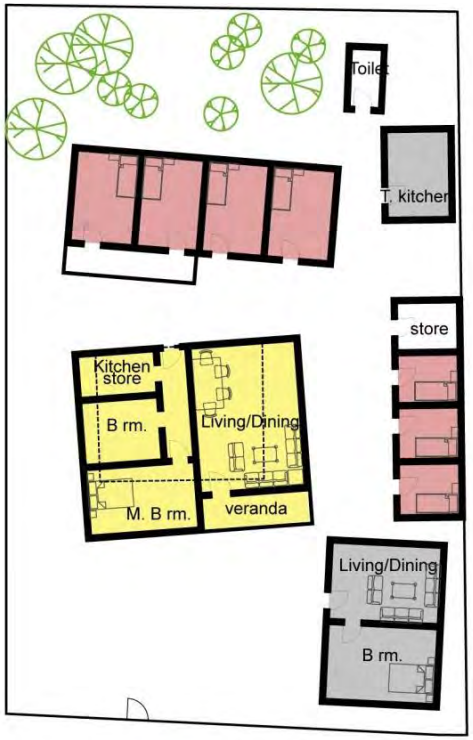


Figure 4. 7 Mr. Molla's residence

Source: Study area survey

the main house location
rental housing unit
second child's housing unit

the original house location
the main house
rental housing unit

the original house location
the main house
rental housing unit
second child's housing unit

1990

A new detached secondary housing unit was built for rental income.

2003

The whole rooms in the back secondary housing unit all dedicated to rental use.

2013

The second child who married and left, came back to his family and built a detached secondary unit and modified the detached kitchen to a shared kitchen

4.1.3. Secondary dwelling units' extension to add space to run home based businesses

According to the data obtained from the representative respondents, ten (25%) of respondents were initiated to extend their secondary dwelling units to run home based business. The income got from the home based business usually helps as an additional income source to the regular monthly incomes. The home based business limited in number and were covered small floor area compared to other space demands of the residents in *Woreda* 2. The study area survey was showed, except for cattle raising that need further extension for the storage purpose, none of the other home based business shows further spatial extensions.

The study area survey was found that variety of home based business including small merchandise shop, barber, food store and sales, metal work and cattle raising. Table 4.4 shows the types of home based business that motivated the secondary dwelling units' extension in *Woreda* 2. There were cattle raising in five of the houses (16.7 percent of the total 30 families interviewed) for the sale and household consumption of cattle products like milk and dung.

Type of home based business	Frequency
Cattle raising for its products	5
Small merchandise shop	3
Barber	1
Food store and sales	1
Metal work	1

Table 4. 4 Frequency of home based business run by secondary dwelling units' extension in *Woreda* 2, Akaki

Source: Study area survey

The following families' stories that were interviewed illustrate the secondary units' extension motivated to generate income by home based business.

a. Mrs. Aster came from Merkato area to *Woreda* 2, Akaki in 1988. She and her husband were in rent house when they are at Merkato. Then they bought 230 square meter of residential plot in 2000 with poor physical condition house in *Woreda* 2. She has five children. All are students and not at the age of marriage yet. The Four children live within their parent's main

house. The elder child sleeps inside semi-attached secondary dwelling unit to the back of the main house. Mrs. Aster demolished the original main house immediately after she and her husband bought the plot with house on it. Then they reconstructed on the same foot (floor area) as the original main house with the same building materials (i.e. mud and wood wall, CIS roofing and cement flooring) in 2000. In 2001 she add two rooms by adding detached housing unit to back side of the main house for traditional kitchen and for store. Then in 2002 Mrs. Aster, extended the secondary dwelling unit to add night time cattle house and a bedroom for her daughter. Also she add kitchen store which makes the secondary house semi-attached to the main house. She said the products of the cow sell to people who come to her house to buy cow dung for cooking fire. She utilizes the milk for her household consumption. Mrs. Aster spends the money generated by selling cow dung for daily expenses. In 2012 she built a three room housing unit in front right side of the main house for rental propose by the saving from her husband's incomes. Now she gets 400 Birr for each room per month as rental income. The first room rented for a single lady and the rest two occupiers are couples. One of the couples have newly born child. Mrs. Aster live with the resident rented her house with peace and she consider as family. She understands things that lead most renter and occupiers in disagreement. Such as the mutual use of piped water, toilet, shower and kitchen between renters and owner put the two in disagreements. She shares piped water, toilet, shower and traditional kitchen with the resident rented her house without any disagreements. The need for straw and for other cattle food storage, Mrs. Aster initiated to add one detached *Service biet* in front yard just before 1-2 years of the rental house was built (2012 E.C). The two secondary units (the rental units and the storage) exist independently to the front left and right sides of the main house. The storage constructed with corrugated iron sheet wall and roof. (see fig. 4.6)

Figure 4. 8 Mrs. Aster's residence. Source: Study area survey

4.1.4. Extending secondary dwelling units to add extra room for the main house and for satisfactory completion.

Out of the thirty families that interviewed, only two family (6.7%) were extended secondary dwelling units to add extra room/s for the primary/main house and extended the secondary units for satisfactory completion; to get a desire, relaxing and beautiful space; adding store etc. This type of motive for secondary dwelling units' extension is a rare type *Woreda* 2. The following family story can illustrate the above topic more.

a. Roman and her sister inherited 260 square meter plot after their parents passed out. Both have been working in private company earn 5,000 Birr per month. The main house deteriorated because of age. It is small in size. Only around 18 meter square total floor area, it has one bedroom and living/dining rooms. Roman and her sister live in secondary dwelling unit at the backyard. They have a detached toilet made of plastic wall in front yard. Roman said she tried many times to get building permit from *Woreda* administration. However, the office response was the zone where they located permits only the construction of G+2 villa and they cannot construct any house in the plot before the G+2 villa permit obtained. She said we have two options either get building permission for G+2 villa and build it or renovation permit for the existing primary house or for the secondary units. But Roman and her sister didn't afford to build a new G+2 building and more importantly they did not want to spend their money renovating the main house with the existing small size of it. So, they got renovation permission for the secondary units and then make the secondary unit renovation as well as extension illegally and add kitchen, toilet, wider living/dining and one bedroom spaces together. They also planned to renovate the main house such as some material change so that it used as family room. During the conduction of this interview the family was about to start the renovation and extension of the secondary units.

4.1.5. Secondary dwelling units' extension to add toilet, shower and traditional kitchen

According to the representative respondents, in all cases, toilet, shower and traditional kitchen were located outside of the primary houses as detached or as independent secondary units. These housing units were usually constructed with temporary building material. Such as: plastics, iron sheet, fabrics or in some cases even with no wall see figure 4.9.

Toilet, shower and traditional kitchen, in all thirty interviewed households, were constructed almost as equal as the main house. However, through the years, it may demolish and intern a new secondary house may construct at that location. The fate of the toilet, shower and/or traditional kitchen units became either construct with different location in the plot as independent unit and/or included in the newly built secondary dwelling units as extension.

Except one respondent, in all cases, as the number of the residences increased due to secondary dwelling units' extension; the original floor area and number of toilet, shower and traditional kitchen does not changed. Occupants of the secondary units share the main house's traditional kitchen, toilet and bathroom.

Figure 4. 9 Toilet, shower and traditional kitchen as detached units from the main house

Source: study area survey

4.2. Secondary dwelling units extension as a process

In order to answer the research questions posed in the introduction section of this study, secondary units' extension should not be observed at one point of time to reach analysis and conclusion. Continuous background of the spatial change should be studied before analysis and conclusion were drawn. Turner (1972) has noted, housing should be observed as a process rather than as a final product because housing is usually in a continuous transformation as long as it serves for human.

To understand the dynamic nature of secondary dwelling units' extension and to reach findings useful in answering the research questions; the approach of the study is continuous time span follow up of the transformation during the interviewing and observing the respective spatial changes. Also to understand the spatial changes that the extension done; GIS maps, Google earth images and different governmental institution maps and documents were used.

In this section, secondary dwelling units' extension space use and issues concerning the in the process of extensions illustrated. Such as: how really people doing this secondary units

extension with the perspective of building regulations or administrative by-laws and rules; where the extension finance came from; how much they spent for extension and who construct the extension: is it by homeowner, by community members participation, contractor or local carpenter.

4.2.1. Building regulations, standards and secondary dwelling units' extension in *Woreda* 2

There is building regulation that can be amended in a certain year interval that guides the construction of buildings in *Woreda* 2 administration office. The building regulation manual instruct the process of getting building permit to renovate, extend and newly build a house; building standards that can be least achieved and about building materials permissions (see the Appendix).

However, the building regulation manual has a holistic approach regarding secondary dwelling units. It does not dictates specifically about secondary dwelling units floor area, location in plot, building materials, permission zone to construct, setbacks to follow etc. It only dictated the process of getting building permission paper if one likes to expand the existing one. Non-written documents or norms sometimes work as a rule. For instance, one should leave 1.50 meters setback from the primary/main house to construct secondary dwelling units at the backyard and in front any secondary dwelling unit constructed within 2 meters from the front face of the plot costs high tax.

4.2.2. The cost of extension

The data collected during the site survey shows the sources of income and average monthly income of the head of the households. The figure includes both of the couples' average monthly income if the head of the house got married (table 4.5). More likely the heads of the household are the key decision maker of the family. So that more likely house extension determine by the constant and variable incomes of the heads of the house.

Even if the majority of the families were escapist while asking about their monthly income during the interview, but at least all families had a constant income sources. Thirteen families (43 percent) of thirty families got their constant income from retirement pension. Thirteen (43 percent), of them work in private company and four (14 percent) families' head work in governmental jobs.

Table 4.5 illustrates the average monthly constant source of income and the average cost of secondary dwelling units' extension. One family cost seventeen times the monthly income. Two families cost nine times of their monthly income and one family cost seven times of the monthly income. During the site survey, data collected regarding the building materials used for extension and the extra area came up by extension. Hence, the building materials used for extension of the secondary dwelling units as well as the area of newly extended units matters for lowering and escalation of extension costs. Twenty families (66.7 percent) secondary dwelling units' extensions maintain the same building materials of the newly extended unit with original and to main house. That is corrugated iron sheet roofing; fabrics ceiling; mud, (in some cases the mud plastered externally with cement) wall and earth material or cement flooring. Five families (16.7 percent) make a slight building material improvement on the newly extended secondary dwelling units. Such as the flooring changed from earth material to cement flooring; wall improved from mud to mud plastered with cement.

household s	**Source of income of the households' heads**	**Average monthly income (Birr)**	**Average Cost of extension (Birr)**	**Total Area of secondary units' extension (m^2)**	**Total repetition of extensions (x times)**	**No. of rental room**	**HBB activities**	**Extension Building material compaired with the original**
1	Retirement pension	316	2,800	65	3		Barber	similar
2	Retirement pension	1,500	4,500	74	4	7	cow raising	similar
3	Retirement pension	500		13				
4	Private company	2,000	7,000	6	1			slight improved
5	Private company	3,000	3,000	88	3	2	cow raising	similar
6	Private company and retirement pension	1500	3,000	34	2			similar
7	Retirement pension	380	3,300	96	3	2		similar
8	Retirement pension	150	2,500	24	3			similar
9	Retirement pension	2,000	1,000	26	1	2		Not improved
10	Private company	5,000	2,000	36	1			Not improved
11	Government work	1,500	1,500	15	1		small shop	similar
12	Retirement pension	500	3,500	383	7	6	Food store	similar

							&sell	
13	Retirement pension	1,500	1,500	45	4	3		similar
14	Private company	2,000	6,000	64	4	3	cow raising	slight improved
15	Government work	5,000	2,500	30	2		Barber	slight improved
16	Retirement pension	1500	2,800	21	4	1		slight improved
17	Private company	6000	1,200	7	2			similar
18	Private company	3000	4,000	144	4	6		similar
19	Private work and farming	2500	5,000	45	3			similar
20	Private company	5000	2,000	20	2	1		Not improved
21	Private company	2500	6,700	80	3	2	cow raising	similar
22	Private company	1500	8,000	22	1	0		better
23	Government work	6000	4,000	20	3	0		similar
24	Private company and governmental works	1500	1,200	70	3	3		similar
25	private company	800	6,000	130	4	0	small shop	better
26	private work, retirement pension	5000	1,200	114	6	0	small shop	similar
27	retirement pension	1500	8,000	20	2	4		similar
28	retirement pension	800		80	5	4	cow raising	similar
29	private work	4000	3,000	40	3	2	metal work	similar
30	private company	2800	1,500	46	5	1	small shop	similar

Table 4. 5 Table showing income versus reputation and cost of secondary dwelling units' extensions

Source: Study area survey

4.3. Space use of secondary dwelling units' extension

Types of secondary dwelling unit extension

Depending on the location of secondary dwelling units relative to the primary house, the study observed three types of secondary dwelling unit extension in *Woreda* 2: interior, attach, and detach. In two family cases, the secondary units located inside the main house. Interior secondary units observed in section 4.1.1 in Mrs. Ayelech's residence. And one family case showed secondary unit attached to the main house. In the 27 interviewed families (90 percent) cases, the secondary units exist as independent units (detached from the primary house);

among these 27 cases, 24 secondary dwelling units extension cases located as detached unit at the back of the main house, 15 cases located to the sides facing the main house and in 8 cases, found in front of the main house. That means more than 80 percent of the study area's secondary units' extension located to the back, sides and inside of the primary house. That is the extension processes are hidden or the structures are invisible from street level. Figure. 4.10 shows the extension trend of secondary unit inside the compound of the study's case area relative to the location of the primary house.

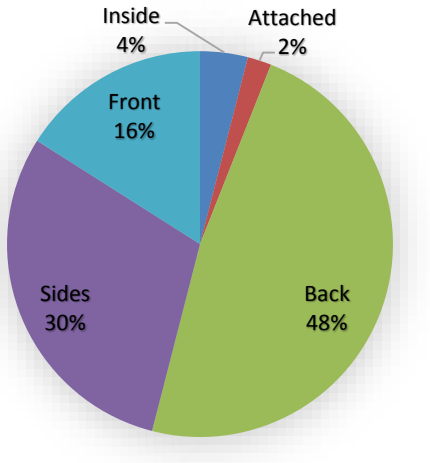


Figure 4. 10 Location of secondary dwelling unit relative to the primary house.

Source: Study area survey

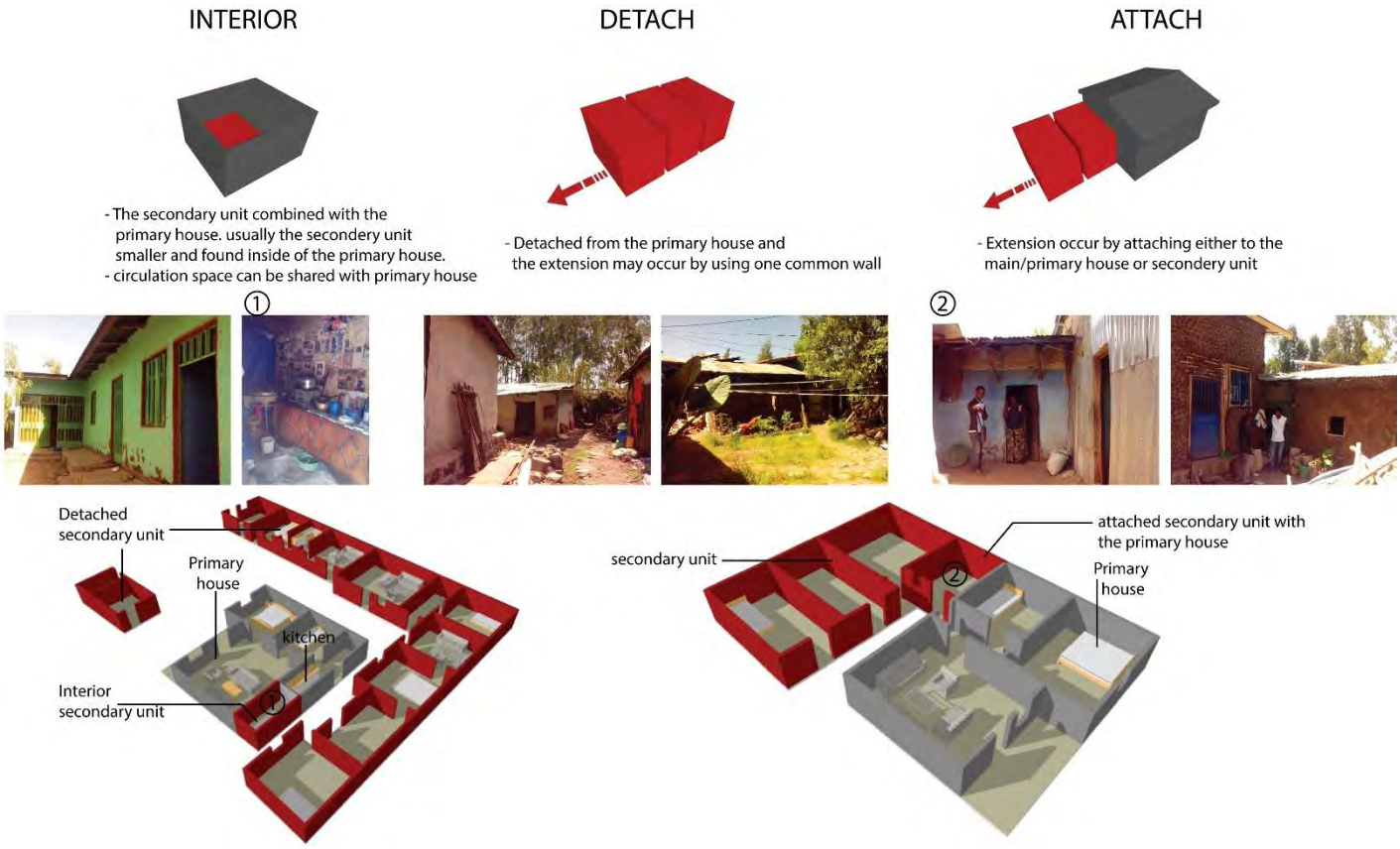


Figure 4. 11 Types of secondary dwelling units' extension interior, attach and detach.

Source: Study area survey

Spatial analysis of secondary dwelling units

From the discussion in the theoretical part in section 2.1, secondary units are smaller, self-contained living units that can be attached or detached to the primary house. However, the data found from the thirty respondents during the site survey, found that the secondary units have bigger floor area than the primary houses itself. 17 (56.7 percent) households extend their secondary dwelling unit more than one fold of the total floor area of the main/primary house. In figure 4.12 the light gray line represents the total floor area of secondary dwelling units which is in most points above the darker line i.e. the total floor area of primary/main house. Moreover, five (17 percent) of the households extend more than two folds of the primary house floor area (see figure. 4.12). The study also found the median of homeowners to tenants who occupy the secondary dwelling unit ratio is greater than 1:2. This showed that secondary units have potential to accommodate the growing urban population.

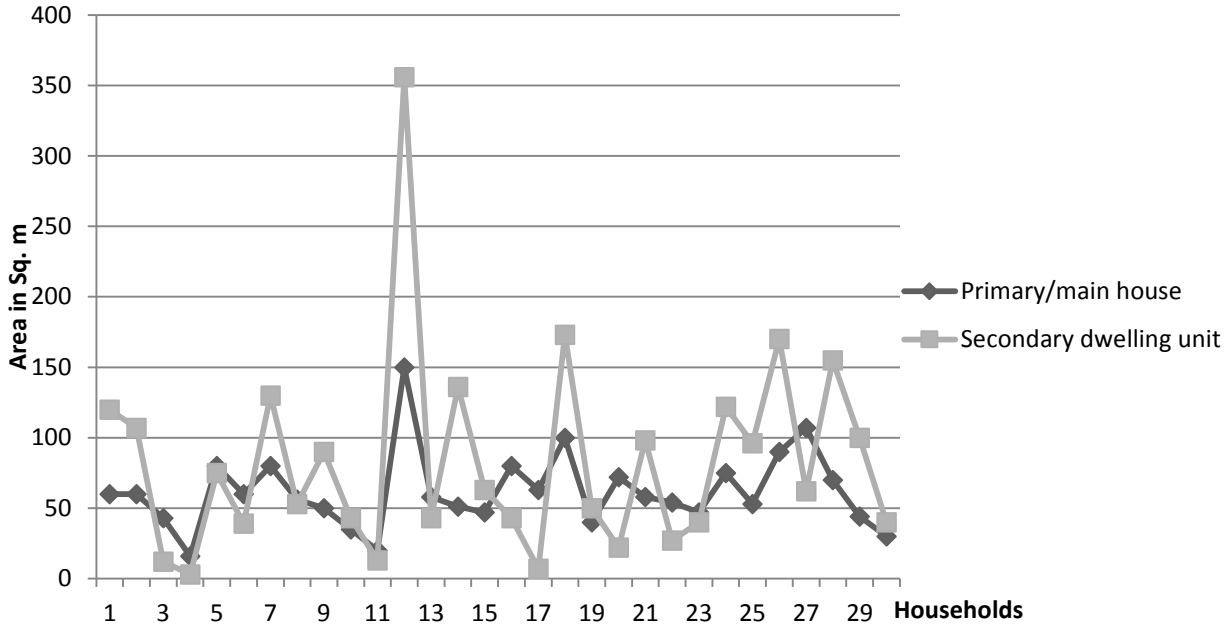


Figure 4. 12 Total floor area relationships of primary house and secondary unit

Source: Study area survey

Total floor area occupied by secondary dwelling units (Sq. m)	42.5
Habitable space occupied per person in secondary units (Sq. m)	10.8
Occupancy rate of secondary units (persons per room)	1
Habitable rooms occupied by secondary dwelling units (median)	4

Table 4. 6 Measure of occupancy for the secondary dwelling units (Median)

Source: study area survey

Person per secondary dwelling units (median)*	4
Percentage of tenant households in secondary units' with main houses' households	220
Percentage of respondents with rental secondary dwelling units	53
Percentage of respondents with rent free (family) tenants in secondary dwelling units	30

*considering secondary dwelling units (SDUs) existed in one compound as one or the figure indicate the median of person in SDU per household

Table 4. 7 Residents accommodation in secondary dwelling units

Source: study area survey

5. SUMMARY OF FINDINGS AND RECOMMENDATIONS

This thesis has attempted to increase the knowledge base about secondary dwelling units' (SDUs) extension. It has addressed secondary dwelling units' space utilization practices and space needs of households that motivated the extension of SDUs. Past trends and history of SDUs extensions was asked during site survey and backgrounds data were also collected from secondary sources and analyzed. By Looking at *Woreda* 2 inside Akaki, Akaki-Kality sub city as a case study, the thesis, after analyzing and processing data from thirty family interviews and housing surveys from randomly selected residents of *Woreda* 2, findings emerged to answer the questions originally posed in the study.

Motivation for secondary dwelling units' extension

The following are the motives that initiate households to extend their secondary dwelling units.

a. Accommodation of married children

It is a primary motive that initiated residents in *Woreda* 2 for extending their secondary dwelling units. In fourteen family cases (47 percent) secondary units extended because of accommodating married children. From the total thirty families' children, 80 percent of the children live with their parents' SDUs. The study found that further extensions occurred ones after the children married and settle in SDUs. Even in some cases the children came back to their parents' SDU after they left and they do further extension.

b. Rental income

Rental income came as second a motivating factor of secondary dwelling units' extension in *Woreda* 2. 16 respondents (53 percent) had done SDUs extension for rental income. The study also showed that there are cases where the first use of the secondary units changed to rental units with different reasons and further extension of SDUs may happen.

c. Accommodation of matured children

Twelve respondents out of thirty (40 percent) were initiated to extend SDUs to give spaces for their matured children in secondary units. Moreover, two respondents were showed change of space use to other use. Despite of more than half of the 14 families' matured children continued their existence in SDUs after they got married.

d. To run home based business

The study found different income generation means as home based business. These are: cattle rising, small merchandise shop, Barber shop, food store and sales and metal work. 10 respondents (25 percent) showed motivation of SDUs extension to add room/s to run home based business.

e. Extension motivated to add functional room to the main house

Only two families (6.7 percent) extended SDU because to add extra spaces for the primary house. This type of motive for extension of SDU is a rare type of motive. On the other hands, only one family motivated to extend SDU to accommodate close relative

Secondary dwelling units' extension as means of housing supply

In *Woreda* 2 this thesis found that secondary dwelling units are good example of hidden housing supply means (as more than 80 percent of the secondary units in the case study area hidden by the main houses from the street level).

Occupancy of SDUs: In *Woreda* 2 secondary units' extension was primary driven for accommodation of married children and for rental income generation. The homeowners see secondary units as place for their children home and rental house. This happened because of the continuous escalation of rental house payment that makes children stay in their parents' home and same scenario motivated homeowners to produce more rental housing by extension.

The preliminary sections of this study showed that secondary dwelling units' extension do increase the range of housing supply available to both renters and to house owners' members. On the positive side of secondary units' extension can be a means of more rental house choice production. Unlike, such as condominium residential housing, secondary units' extension is a cost-effective means of housing supply option. The home owner in *Woreda* 2 produce additional space in the secondary unit with short period of time with local building materials (usually *Chika* and corrugated iron sheet roofing) by themselves without financial help from other bodies. Moreover, it is hidden housing which does not change the form or characteristics of the whole neighborhood. Secondary units are suitable in terms of easy accessibility in and out to other facilities. Secondary units' extension can produce wide option of house types and location of rental accommodation in a low density area. Beside secondary units as rental housing option, it

is a means of income generation for the low income homeowners. The study found rental income can be a major income source which homeowner led life. Aged homeowner who unable to work and earn small amount of monthly retirement pension; the main financially support came from rental income. Secondary dwelling units' extension generates more spaces to allow families to stay together, by providing accommodation for matured child or for close relative. In addition, SDUs extension encourages more diverse communities in the neighborhood by allowing diverse socio-cultural and economic background peoples to live together.

Despite all the above merits of secondary units and its extension, it remains unconventional housing options. During the study area survey, respondents are skeptical when asked about secondary units rental because of fear of tax came due to rental house. In addition, the illegality of the units creates suspicion to give full information.

According the data found from *Woreda* Administration, in some places of the study area where building height regulated to the construction of ground plus two building, the construction as well as extension of secondary units prohibited unless the main house built according to the height regulation. The building material also fixed to conventional building materials. This study recommends that: building regulation should be rethought to integrate secondary dwelling unit's regulation so that SDU's potential can be utilized in an efficient way. There shall be clear and proper secondary dwelling unit regulations; such as limit the minimum floor area, the maximum percentage of secondary dwelling units of the total floor area of the primary house, Setbacks, zoning which secondary units allowed to build, height and location of secondary dwelling units relative to the primary house; So that it is possible to control substandard living physical space and the development of SDUs in general. In addition it helps SDU development in harmony or not overloads the existing infrastructures; blend with the existing neighborhood's architecture. As secondary units' extensions accommodate a large amount of tenants; it is good solution (or recommended) to accommodate the growing urban population as an urban infill and sustainable land use strategy.

Of course, secondary dwelling units' extension has its own negative sides: unsafe living space can be created and tenants may suffer by substandard living condition. However, they may be reluctant due to fear of losing what they can afford. Secondary dwelling units' extension may create very compact living condition which minimizes natural light and ventilation of the

spaces/rooms. Also diminishes outdoor social interaction spaces. Despite the fact, a proper building regulation and by-laws can regulate and direct unsafe living conditions and make to ripe the advantages of the secondary units.

This study can show the phenomenon of secondary dwelling units and its extension to give direction for policy makers. *Woreda* 2 is mostly private residential houses dominated area built between 1975 -2000; it is difficult to say that the same findings can be applied to other areas in the city due to the specificity of its history and geographical location. Though, further study should be conducted to find out deep knowledge about SDUs extension in different extremes.

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APPENDICES

Questionnaire

Survey questionnaire to household Heads for privately owned houses in *Woreda* 2, Akaki.

Date of interview_____

Questionnaire number _____

Introduction

In order to use this questionnaire as partial credential to answer the study's research questions; it contains three parts: the first part mean to gather basic households' information to layout basic knowledge about the household's background. For instance: the time the household start living in the study area, household size, sources of economic income etc. The second part intended to gather basic plot and housing information at the time of conducting the interview and past history of the house transformation. And the last part, third part, contains 28 questions which are some open-ended and others are close-ended questions that need to be respond by the head of the house owner. In addition, it is also very important to get data from other users of the extended housing units while conducting the interview with the household. Therefore, in each interview the second users of the transformed housing units should be included. These respondents can be resident using the transformed housing units for instance by paying rent, non-rent payers extended family, tenants or renters/users of the transformed house for commercial purpose etc.

PART I Basic household information

<table>
<tr><td colspan="2">Household head name</td><td colspan="5"></td><td>Age</td><td></td></tr>
<tr><td colspan="4">When did you move to this place?</td><td colspan="2"></td><td rowspan="3">Sources of income</td><td rowspan="3">1. Government
2. Private
3. NGO
4. Retirement/ pension
5. Remittance
6. others</td><td rowspan="3"></td></tr>
<tr><td colspan="4">From where did you move to this place?</td><td colspan="2"></td></tr>
<tr><td rowspan="2">Household size</td><td rowspan="2">Male
female</td><td rowspan="2"></td><td rowspan="2">Children age</td><td rowspan="2">Below 5
6-11
12-15
16-18
19-25
26-30
Above 30</td><td rowspan="2"></td></tr>
<tr><td colspan="2">Average monthly income</td><td></td></tr>
</table>

PART II Characteristics of plot and the transformed house

<table>
<tr><td rowspan="2">Tenure statues (a)</td><td rowspan="2"></td><td colspan="5">Physical condition of the main house</td></tr>
<tr><td>Plot size(m^2)</td><td></td><td>Total floor area</td><td>No.</td><td>Size (m^2)</td></tr>
<tr><td rowspan="7">mode of plot acquisitions
1. inheritance
2. Purchase
3. From gov't ("Mirite")
4. Lease
5. others</td><td rowspan="7"></td><td rowspan="3">No. of housing units inside the plot</td><td rowspan="3"></td><td>Total No. of rooms</td><td></td><td></td></tr>
<tr><td>Bed rm.</td><td></td><td></td></tr>
<tr><td>Living/dining</td><td></td><td></td></tr>
<tr><td rowspan="3">Physical structure of the housing units (b)</td><td rowspan="3"></td><td>Kitchen (c)</td><td></td><td></td></tr>
<tr><td>Bath rm.</td><td></td><td></td></tr>
<tr><td>Toilet (d)</td><td></td><td></td></tr>
<tr><td rowspan="2">Use of the plot
1. residence only
2. residence and commercial
3. others</td><td rowspan="2"></td><td>wall</td><td colspan="2">floor</td><td>roof</td><td colspan="2">ceiling</td></tr>
<tr><td>a. Mud
b. Wood and Mud
c. Wood and thatch
d. Wood
e. Reed and bamboo
f. Concrete block
g. Brick
h. Stone
i. Other</td><td colspan="2">a. Earth material
b. Cement
c. Wood
d. Others</td><td>a. CIS
b. Tiles
c. Plastic
d. Bamboo
e. Thatch
f. others</td><td colspan="2">a. Wood
b. Cheap wood or hardboard
c. Fabrics
d. no ceiling
e. others</td></tr>
</table>

a) 1. Owner occupied
2. Rented from *kebele*
3. Rented from house renting agency
4. Rented from other organization
5. Rented from private households
5. Tenants (unauthorized subdivision)
6. Tenant in contract (rented)
7. Un-regularized squatters
8. Regularized squatters
9. Others

b) 1. Attached
2. Detached
3. Semi-detached
4. Others

c) 1. Inside the house
2. Private inside the plot
3. Private shared kitchen
4. Public kitchen
5. Open air kitchen
6. No kitchen at all

d) 1. Inside the house
2. Private outside the house
3. Private shared toilet
4. Public toilet
5. No toilet at all

PART III

1. **Do you have secondary dwelling units (secondary dwelling units or service quarters)?**
   a. Yes b. no
2. **If "No" to Q. No. 1, why?**
   a. Planning on it
   b. Tried and failed
   c. Don't want
   d. Might want
   e. Never want

f. Other, specify, _____

3. **If yes to Q. No. 1, did you extend the secondary dwelling units?**

   b. Yes b. no

4. **If "No" to Q. No. 3, why you did not extend the secondary dwelling units?**

   a. Respecting government building codes and regulations
   b. Fear of demolishing of the extended housing units by the government(don't want)
   c. Shortage of money to transform the house (might want)
   d. No need to transform because of enough space owned already (never want)
   e. Planning on it
   f. Tried and failed
   g. Extended but now stop by the shortage of space
   h. Others, specify_____

5. **If "yes" to Q. No. 3:**

No.	1. Year of extension	2. How many space/room added by extending the secondary dwelling unit?		3. What motivate you to extend the secondary dwelling unit? (a)	4. Current use of the extended space	5. What Building materials you use for the extension? 5.1.Roof (b) 5.2.Ceiling (c) 5.3.Wall (d) 5.4.Floor (e)	6. How much the extension Cost you?	7. Who build physically for you? (f)	8. Do you have Building permission Yes/No
		Units	Area						
i.									
ii.									
iii.									
iv.									
v.									
vi.									
vii.									
viii.									

(a)

1. accommodation for extended family
2. family size increase and need of extra private housing unit for matured children
3. rental income
4. generate income as Home-Based Enterprises and Businesses
5. need of extension for raising cattle and poultry
6. Meeting household space (addition of household space such as kitchen, toilet…)
7. satisfying functional priority or to acquire wider and relaxing functional space
8. Increasing esthetic value or need of satisfactory completion such as extension of balcony, terrace…
9. accommodate religious house and office
10. Others, specify _____

(b)

1. CIS
2. Tiles
3. Plastic
4. Bamboo
5. Thatch
6. Others

(c)

1. Wood
2. Cheap wood or hardboard
3. Fabrics
4. No ceiling
5. Others

6. Concrete block
7. Brick
8. Stone
9. Other

(d)

1. Mud
2. Wood and Mud
3. Wood and thatch
4. Wood
5. Reed and bamboo

(e)

1. Earth material
2. Cement
3. Wood
4. Others

(f)

1. Self-built
2. Local builders/Carpenters
3. Contractors
4. members of the community

6. **Where the secondary dwelling units located inside the plot?**
   a. At the backyard of the main house
   b. To front yard of the main house
   c. To sides of the main house
7. **What kind of other transformation you done on the secondary dwelling units?**
   a. Change of building materials
   b. Slight renovation with the same building materials
   c. Adding floor vertically (vertical increments)
   d. Adding a detached housing unit inside the plot
   e. Demolished and rebuilt with new design and building materials
   f. Nothing
8. **Did you extend the secondary dwelling units for the reason to generation income as home base business?**
   a. Yes b. no
9. **If "yes" to Q. No. 8, what kind of home based business the extended secondary house run?**
   a. Small merchandise shop
   b. food and traditional drink sale
   c. barbers and female beauty salon
   d. TV and VCD renters
   e. selling and sewing clothes
   f. maintenances, metal works and garages works
   g. Cattle fattening and sellers
   h. Fruit and vegetable sale
   i. Bar and grocery
   j. Pool and billiard house
   k. Others, specify _____
10. **Do you rent the extended housing units?**
    a. Yes b. no
11. **If "yes" to Q. No. 10, how many room/s you rent?**
    a. 1 b. 2 c. 3 d. 4 e. 5 f. 6 and more
12. **If "yes" to Q. No. 10, what is the size of the rental rooms?**

a. less than 4 m^2
b. 6 m^2 -15 m^2
c. 16 m^2- 24m^2
d. More than 30m^2

13. **How much you rent the extended housing unit/room per month in average?**

_____

14. **How do you contact with the customers who rent or use your extended housing units?**

a. By posting notice paper on your gate
b. Though communicating with friends and neighbors
c. By formal ways of noticing
d. Telling to broker
e. Other ways, specify, _____

15. **Did you regain the expenses you spent in extending the secondary house?**

b. Yes b. no

16. **How many households rented the transformed housing unit (rent payers)?**

a. 1 b. 2 c. 3 d. 4 e. 5 f. 6 and more

17. **Number of none rent payers (relatives, family members, tenants …)**

a. 0 b. 1 c. 2 d. 3 e. 4 f. 5 and more

18. **What are the occupations of the rent payers (renters)?**

a. laborers
b. factory workers
c. merchants
d. student
e. teaches
f. government, office and administrative workers
g. non-government workers\
h. others, specify, _____

19. **Do you need additional rental housing units in future?**

a. Yes b. no

20. **Did you satisfied by the space you have now; for instance the area and appearance of living, dining, kitchen or bedroom?**

b. Yes b. no

21. **If "No" to question No. 20, which space/s or room/s you didn't satisfied with?**
    a. kitchen
    b. toilet/bathroom
    c. bedroom
    d. living room
    e. dining room
    f. others
22. **If "yes" to question No. 20, your level of satisfaction ranged as:**
    a. very satisfied
    b. satisfied
    c. neutral
    d. not satisfied
    e. very dissatisfied
23. **What is your plan in the future regarding the secondary dwelling units you owned?**
    a. I want to continue transforming or extending
    b. I want to stop extending
    c. I want to demolish the existing extended house
    d. I don't know
    e. Others; specify _____
24. **How do you rate the whole appearances (inside and outside) of the extended secondary dwelling units?**
    a. Very good b. Good c. Fair d. bad e. very bad
25. **Did you satisfied with the physical and space wise of recently extended housing units?**
    a. Yes b. no
26. **Do you think transformation (extension) of the house have positive impact on the livelihood of the homeowner?**
    a. Yes b. no
27. **If "yes" to Q. No. 26, in what way?**

_____

_____

28. **If "no" to Q. No. 26, what are the negative impacts of house transformation (extension) on the households and on residential area (neighborhood) in general?**

_____

_____

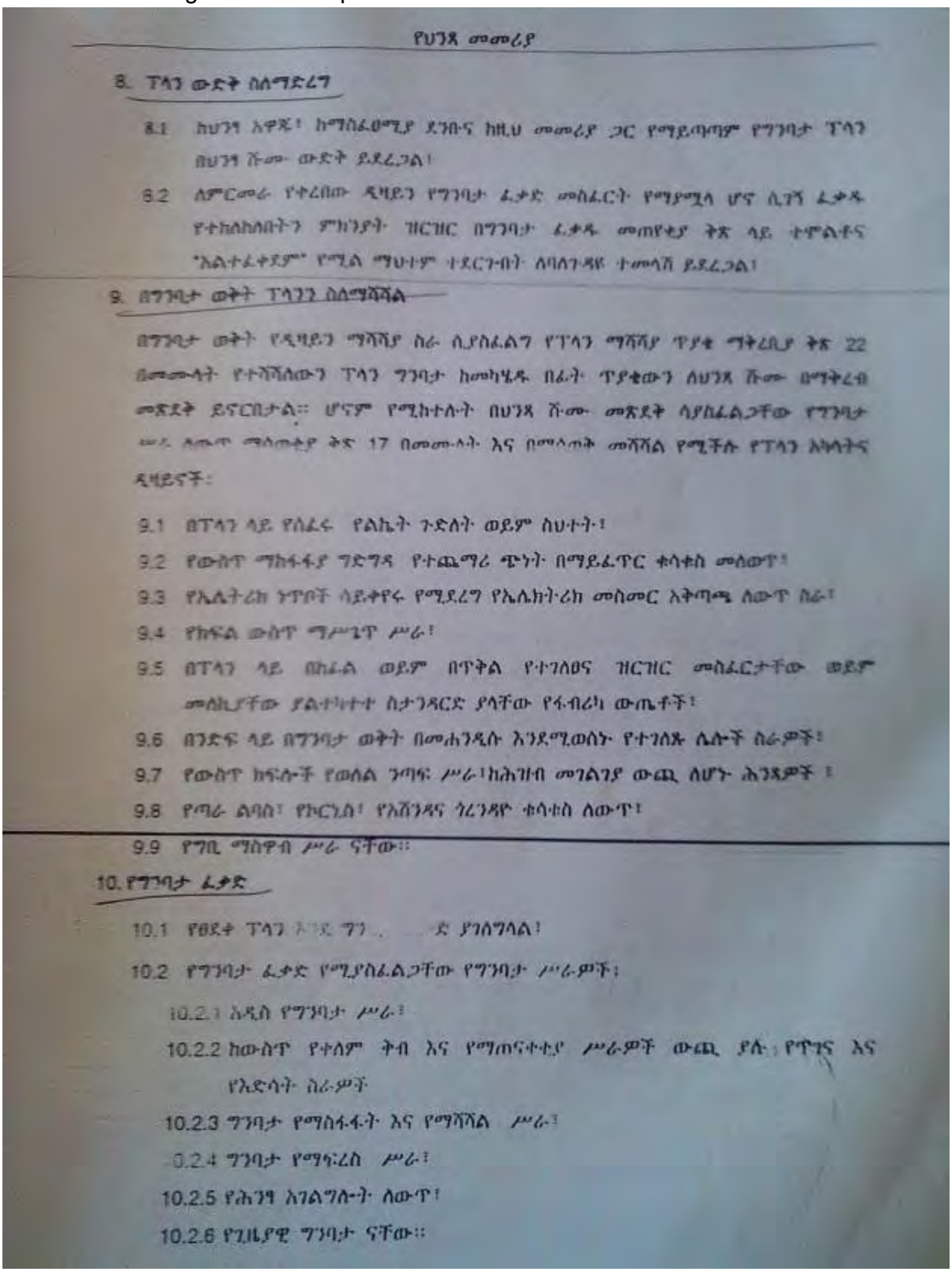
Guideline Questions for governmental institutions' professionals and officials

1. Background and historical settlement development of *Woreda* 2 and Akaki in general
2. Quantitative and qualitative Statistical and maps data concerning residential houses, demography, public services and residential housing prospect in *Woreda* 2 specifically.
3. The legal situation or building regulations of secondary dwelling units specifically with respective of extension.
    - Is secondary dwelling units' extension legal or illegal?
    - How secondary houses built and extend legally?
    - What the building regulation dictate about secondary houses should construct: building materials, setbacks, room standards etc.?
    - What process to follow to extend secondary dwelling unit legally? How much fine one should pay to process the extension legally?
    - Who are the responsible bodies for permitting building and extension of secondary dwelling units?
4. Number of private houses renters, home based business activities in side *Woreda* 2
5. Data about housing tenure. Population, number and projection of residential housings; transformation of residential housing.
6. The economic, social, environmental and urban impact of secondary dwelling units' extension.

Local building regulations and by-laws

Yensa Memeria (May 2003), Addis Ababa

A. About building construction permit



የህንጻ መመሪያ

8. ፕላን ውድቅ ስለማድረግ

8.1 ስህንፃ አዋጁ፣ ከማስፈፀሚያ ደንቡና ከዚህ መመሪያ ጋር የማይጣጣም የግንባታ ፕላን በህንፃ ሹሙ ውድቅ ይደረጋል፣

8.2 ለምርመራ የተረበው ዲዛይን የግንባታ ፈቃድ መስፈርት የማያሟላ ሆኖ ሲገኝ ፈቃዱ የተከለከለበትን ምክንያት ዝርዝር በግንባታ ፈቃዱ መጠየቂያ ቅጽ ላይ ተሞልቶና "እልተፈቀደም" የሚል ማህተም ተደርጉበት ለባለጉዳዩ ተመላሽ ይደረጋል፣

9. በግንባታ ወቅት ፕላንን ስለማሻሻል

በግንባታ ወቅት የዲዛይን ማሻሻያ ስራ ሲያስፈልግ የፕላን ማሻሻያ ጥያቄ ማቅረቢያ ቅጽ 22 በመሙላት የተሻሻለውን ፕላን ግንባታ ከመካሄዱ በፊት ጥያቄውን ለህንጻ ሹሙ በማቅረብ መጽደቅ ይኖርበታል። ሆኖም የሚከተሉት በህንጻ ሹሙ መጽደቅ ሳያስፈልጋቸው የግንባታ ሥራ አጨጥ ማሳጠቂያ ቅጽ 17 በመሙላት እና በማሳጠቅ መሻሻል የሚችሉ የፕላን አካላትና ዲዛይኖች፡

9.1 በፕላን ላይ የሰፈሩ የልኬት ጉድለት ወይም ስህተት፣

9.2 የውስጥ ማስፋፋያ ግድግዳ የተጨማሪ ሜኑት በማይፈጥር ቁሳቁስ መለወጥ፣

9.3 የኤሌትሪክ ኑፖቦች ሳይቀየሩ የሚደረግ የኤሌክትሪክ መስመር አቅጣጫ ለውጥ ስራ፣

9.4 የከፍል ውስጥ ማሥጌጥ ሥራ፣

9.5 በፕላን ላይ በስራል ወይም በጥቅል የተገለፀና ዝርዝር መስፈርታቸው ወይም መለኪያቸው ያልተካተተ ስታንዳርድ ያላቸው የፋብሪካ ውጤቶች፣

9.6 በንድፍ ላይ በግንባታ ወቅት በመሐንዲሱ እንደሚወሰኑ የተገለጹ ሌሎች ስራዎች፣

9.7 የውስጥ ክፍሎች የወለል ንጣፍ ሥራ፣ከሕዝብ መገልገያ ውጪ ለሆኑ ሕንጻዎች ፣

9.8 የጣራ ልባስ፣ የኮርኒስ፣ የአሸንዳና ጎረንዳዮ ቁሳቁስ ለውጥ፣

9.9 የግቢ ማስዋብ ሥራ ናቸው።

10. የግንባታ ፈቃድ

10.1 የፀደቀ ፕላን [illegible] ድ ያገለግላል፣

10.2 የግንባታ ፈቃድ የሚያስፈልጋቸው የግንባታ ሥራዎች፡

10.2.1 አዲስ የግንባታ ሥራ፣

10.2.2 ከውስጥ የተለም ቅብ እና የማጠናቀቂያ ሥራዎች ውጪ ያሉ የጥገና እና የእድሳት ስራዎች

10.2.3 ግንባታ የማስፋፋት እና የማሻሻል ሥራ፣

10.2.4 ግንባታ የማፍረስ ሥራ፣

10.2.5 የሕንፃ አገልግሎት ለውጥ፣

10.2.6 የጊዜያዊ ግንባታ ናቸው።

11.3.6 የግንባታ ማፍረሻ ፈቃድ የአገልግሎት ጊዜ እንደ ህንፃው ዓይነት በከተማው አስተዳደር ይወሰናል፡

11.3. የነባር ግንባታ ማሻሻያ ፈቃድ

11.3.1. የሕንጻ ሹም የከተማውን የኢንቨስትሜንት ቦታዎች ፍላጎት እና የከተማውን ፕላን ዕቅድ እያገናዘበ የነባር ግንባታ ማሻሻያ ፈቃድ ሊሰጥ ይችላል፡

11.3.2. የነባር ግንባታ ማሻሻያ ፈቃድ የሚጠይቅ ማንኛውም ሰው ለዚሁ ተብሎ የተዘጋጀውን ቅጽ 001 ሞልቶ የፕላን ስምምነት፣ ቀደም ሲል የተሰጠ የግንባታ ፈቃድ ሙሉ ሰነድ እና የማሻሻያ ዲዛይን ሠነዶች አያይዞ ማቅረብ አለበት፡

11.3.3. የነባር ግንባታ ማሻሻያ ፈቃድ በሚቀርብበት ይዞታ ላይ የሚገኝ ግንባታ በሙሉ በግልጽ ተለይቶ በንድፉ ላይ መታየት ይኖርበታል፡

11.3.4 በይዞታ ውስጥ የግንባታ ፈቃድ ደንብ እና መመሪያን የማይጠብቁ ተገንብተው የተሰሩ ግንባታዎች በነባር ግንባታ ማሻሻያ ፈቃድ ላይ ተመልክተው የማሻሻያ ፈቃዱ እንደማይመለከታቸው በፈቃዱ ላይ በግልጽ ተጠቅሶ መፃፍ አለባቸው፡

11.3.5. የነባር ግንባታ ማሻሻያ ሥራ የማስፋፋት ስራን የሚጠይቅ ከሆነ፣

ሀ) የፕላን ስምምነት ማስረጃ፣

ለ) የይዞታ ማረጋገጫ ሰነድ፣

ሐ) በይዞታው ላይ የሚገኘውን ነባር ህንጻ የሚያሳይ ፕላን ቅጂ፣

መ) ከዚህ ቀደም ወጪ የተደረገ የግንባታ ፈቃድ ሙሉ ሰነድ እና የማሻሻያ ዲዛይን ሰነዶችን አያይዞ ማቅረብ አለበት።

11.4. የምሽት ግንባታ

11.4.1. ማንኛውንም ከምሽቱ አንድ ሰዓት እስከ ንጋቱ 12 ሰዓት ባለው ጊዜ ውስጥ ግንባታ ለማከናወን የሚፈልግ ሰው የምሽት ግንባታ ሥራ ፈቃድ መጠየቂያ ቅጽ 020 በመሙላት ማመልከት ይኖርበታል፡

11.4.2. የምሽት መገንቢያ ፈቃድ ሲጠየቅ ከዚህ በታች የተዘረዘሩት መስፈርቶች መሟላት ይኖርባቸዋል፡

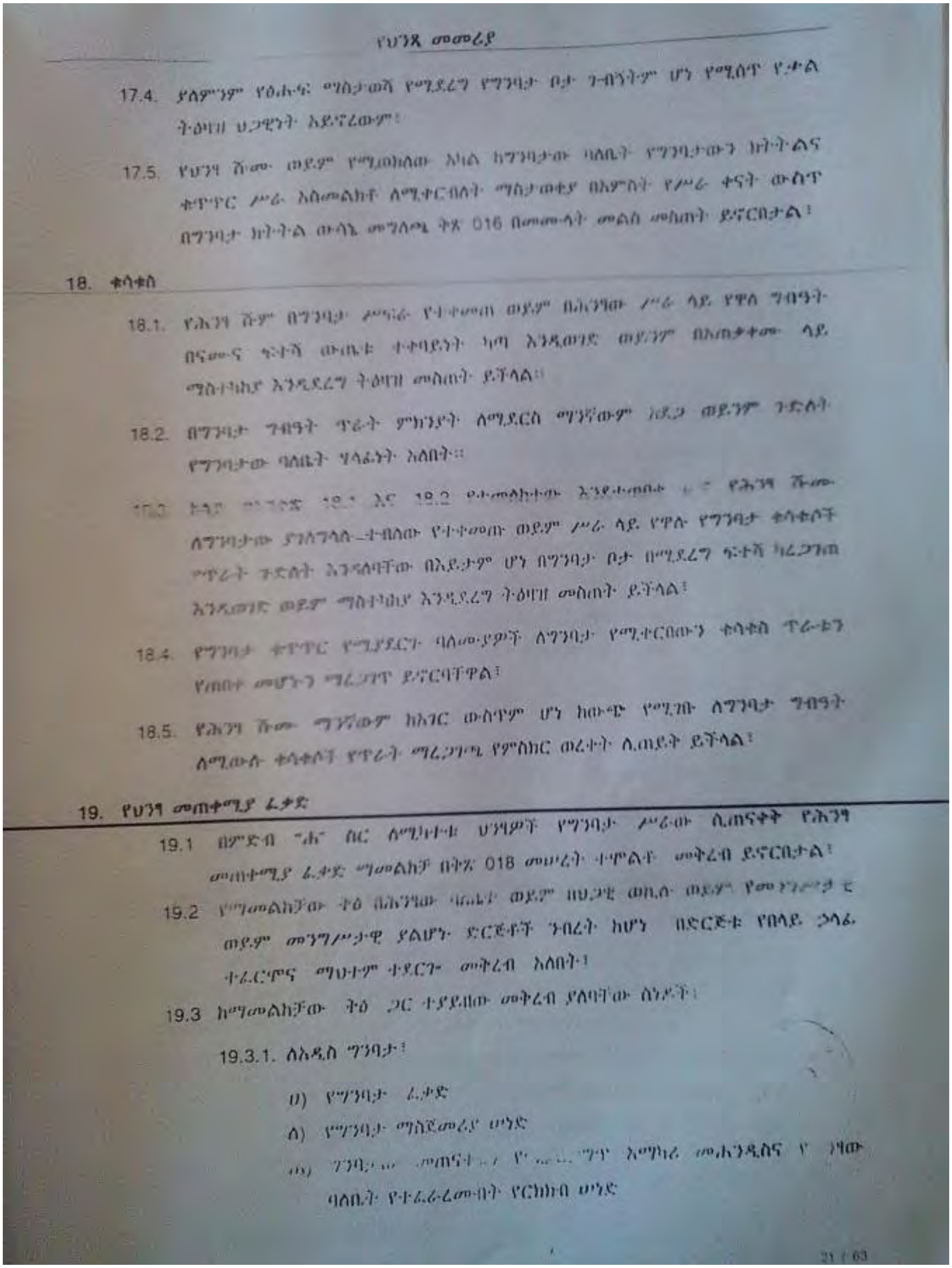
ሀ) የአካባቢውን ነዋሪ ፀጥታ የማያናጋ መሆኑን ማረጋገጥ፣

ለ) ለህገወጥ ግንባታ አመቺ ሁኔታ የማይፈጥር እና ተቆጣጣሪ መገኘት ያለበት አይነት የግንባታ ሥራ አለመሆኑ መረጋገጥ፣

ሐ) የግንባታ ማስጠንቀቂያ ወይም ማስቆሚያ ትዕዛዝ ያልተሰጠበት መሆኑ መረጋገጥ ይኖርበታል።

11.4.3. የሕንጻ ሹም በምሽት ለመገንባት ከሚጠየቁ ሥራዎች ውስጥ ሊፈቀዱ የሚችሉትን ስራዎችና በተገኛኝ መወሰድ የሚኖርበትን ጥንቃቄ በመዘርዘር ፈቃድ መስጠት [illegible]

B. About building materials use



17.4. ያለምንም የፅሑፍ ማስታወሻ የሚደረግ የግንባታ ቦታ ጉብኝትም ሆነ የሚሰጥ የቃል ትዕዛዝ ህጋዊነት አይኖረውም፣

17.5. የህንፃ ሹሙ ወይም የሚወክለው አካል ከግንባታው ባለቤት የግንባታውን ክትትልና ቁጥጥር ሥራ አስመልክቶ ለሚቀርብለት ማስታወቂያ በአምስት የሥራ ቀናት ውስጥ በግንባታ ክትትል ውሳኔ መግለጫ ቅጽ 016 በመሙላት መልስ መስጠት ይኖርበታል፣

18. ቁሳቁስ

18.1. የሕንፃ ሹም በግንባታ ሥፍራ የተቀመጠ ወይም በሕንፃው ሥራ ላይ የዋለ ግብዓት በናሙና ፍተሻ ውጤቱ ተቀባይነት ካጣ እንዲወገድ ወይንም በአጠቃቀሙ ላይ ማስተካከያ እንዲደረግ ትዕዛዝ መስጠት ይችላል።

18.2. በግንባታ ግብዓት ጥራት ምክንያት ለሚደርስ ማንኛውም ኪሳራ ወይንም ጉድለት የግንባታው ባለቤት ሃላፊነት አለበት።

18.3 [illegible] 18.1 እና 18.2 የተመለከተው እንደተጠበቀ ሆኖ የሕንፃ ሹሙ ለግንባታው ያገለግላሉ ተብለው የተቀመጡ ወይም ሥራ ላይ የዋሉ የግንባታ ቁሳቁሶች የጥራት ጉድለት እንዳለባቸው በእይታም ሆነ በግንባታ ቦታ በሚደረግ ፍተሻ ካረጋገጠ እንዲወገድ ወይም ማስተካከያ እንዲደረግ ትዕዛዝ መስጠት ይችላል፣

18.4. የግንባታ ቁጥጥር የሚያደርጉ ባለሙያዎች ለግንባታ የሚቀርበውን ቁሳቁስ ጥራቱን የጠበቀ መሆኑን ማረጋገጥ ይኖርባቸዋል፣

18.5. የሕንፃ ሹሙ ማንኛውም ከአገር ውስጥም ሆነ ከውጭ የሚገቡ ለግንባታ ግብዓት ለሚውሉ ቁሳቁሶች የጥራት ማረጋገጫ የምስክር ወረቀት ሊጠይቅ ይችላል፣

19. የህንፃ መጠቀሚያ ፈቃድ

19.1 በምድብ "ሐ" ስር ለሚካተቱ ህንፃዎች የግንባታ ሥራው ሲጠናቀቅ የሕንፃ መጠቀሚያ ፈቃድ ማመልከቻ በቅጽ 018 መሠረት ተሞልቶ መቅረብ ይኖርበታል፣

19.2 የማመልከቻው ቅፅ በሕንፃው ባለቤት ወይም በህጋዊ ወኪሉ ወይም የመንግሥት [illegible] ወይም መንግሥታዊ ያልሆኑ ድርጅቶች ንብረት ከሆነ በድርጅቱ የበላይ ኃላፊ ተፈርሞና ማህተም ተደርጎ መቅረብ አለበት፣

19.3 ከማመልከቻው ቅፅ ጋር ተያይዘው መቅረብ ያለባቸው ሰነዶች፣

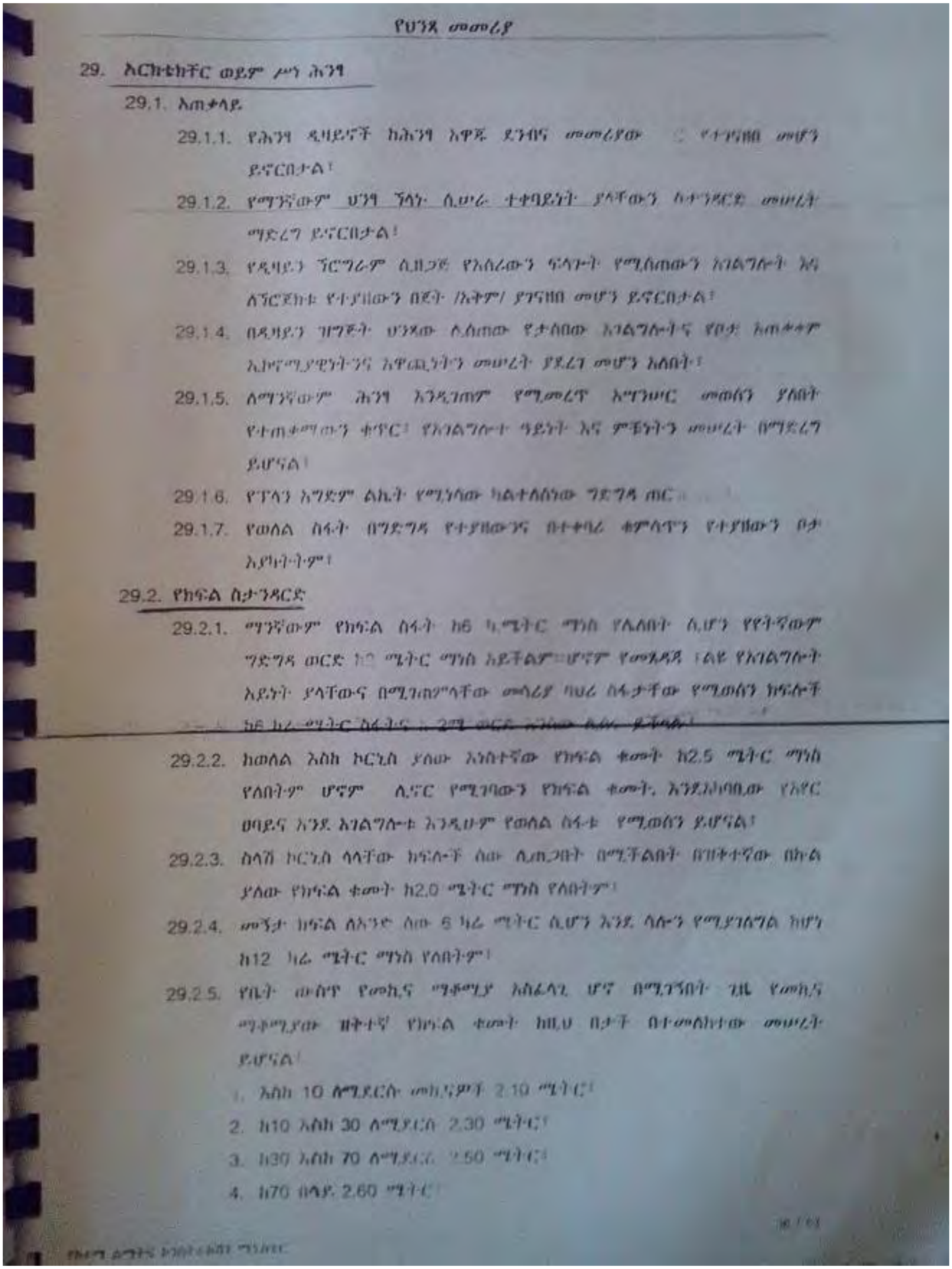
19.3.1. ለአዲስ ግንባታ፣

ሀ) የግንባታ ፈቃድ

ለ) የግንባታ ማስጀመሪያ ሠነድ

ሐ) ግንባታ[illegible] መጠናቀ[illegible] የ[illegible] አማካሪ መሐንዲስና የ[illegible] ባለቤት የተፈራረሙበት የርክክብ ሠነድ

C. About building standards



የህንጻ መመሪያ

29. አርክቴክቸር ወይም ሥነ ሕንፃ

29.1. አጠቃላይ

29.1.1. የሕንፃ ዲዛይኖች ከሕንፃ አዋጁ ደንብና መመሪያው ጋር የተጣጣመ መሆን ይኖርበታል፤

29.1.2. የማንኛውም ህንፃ ኘላን ሲሠራ ተቀባይነት ያላቸውን ስታንዳርድ መሠረት ማድረግ ይኖርበታል፤

29.1.3. የዲዛይን ፕሮግራም ሲዘጋጅ የአሰራሩን ፍላጎት የሚሰጠውን አገልግሎት እና ለፕሮጀክቱ የተያዘውን በጀት /አቅም/ ያገናዘበ መሆን ይኖርበታል፤

29.1.4. በዲዛይን ዝግጅት ህንጻው ሊሰጠው የታሰበው አገልግሎትና የቦታ አጠቃቀም ኢኮኖሚያዊነትንና አዋጪነትን መሠረት ያደረገ መሆን አለበት፤

29.1.5. ለማንኛውም ሕንፃ እንዲገጠም የሚመረጥ አማንሠር መጠሰን ያለበት የተጠቃሚውን ቁጥር፤ የአገልግሎት ዓይነት እና ምቹነትን መሠረት በማድረግ ይሆናል፤

29.1.6. የፓላን አግድም ልኬት የሚነሳው ከልተሰሰነው ግድግዳ ጠር ...

29.1.7. የወለል ስፋት በግድግዳ የተያዘውንና በተቀባሪ ቁምሳጥን የተያዘውን ቦታ አያካትትም፤

29.2. የክፍል ስታንዳርድ

29.2.1. ማንኛውም የክፍል ስፋት ከ6 ካሬ ሜትር ማነስ የሌለበት ሲሆን የየትኛውም ግድግዳ ወርድ ከ2 ሜትር ማነስ አይችልም፤ሆኖም የመጸዳጃ ፣ልዩ የአገልግሎት አይነት ያላቸውና በሚገጠምላቸው መሳሪያ ባህሪ ስፋታቸው የሚወሰን ክፍሎች ከ6 ካሬ ሜትር ስፋትና ... ወርድ ... ይችላል፤

29.2.2. ከወለል እስከ ኮርኒስ ያለው አነስተኛው የክፍል ቁመት ከ2.5 ሜትር ማነስ የለበትም ሆኖም ሊኖር የሚገባውን የክፍል ቁመት እንደአካባቢው የአየር ፀባይና እንደ አገልግሎቱ እንዲሁም የወለል ስፋቱ የሚወሰን ይሆናል፤

29.2.3. ስላሽ ኮርኒስ ላላቸው ክፍሎች ሰው ሊጠጋበት በሚችልበት በዝቅተኛው በኩል ያለው የክፍል ቁመት ከ2.0 ሜትር ማነስ የለበትም፤

29.2.4. መኝታ ክፍል ለአንድ ሰው 6 ካሬ ሜትር ሲሆን እንደ ሳሎን የሚያገለግል ከሆነ ከ12 ካሬ ሜትር ማነስ የለበትም፤

29.2.5. የቤት ውስጥ የመኪና ማቆሚያ አስፈላጊ ሆኖ በሚገኝበት ጊዜ የመኪና ማቆሚያው ዝቅተኛ የክፍል ቁመት ከዚህ በታች በተመለከተው መሠረት ይሆናል፤

1. እስከ 10 ለሚደርሱ መኪናዎች 2.10 ሜትር፤
2. ከ10 እስከ 30 ለሚደርስ 2.30 ሜትር፤
3. ከ30 እስከ 70 ለሚደርስ 2.50 ሜትር፤
4. ከ70 በላይ 2.60 ሜትር፤

29.2.6. የቆጥ ወለል ክፍል ቁመት ዝቅተኛው 2.1 ከፍተኛው 2.7 ሜትር መሆን ይኖርበታል። ሆኖም የወለሉና የቆጥ ወለል የክፍል ቁመት አጠቃላይ ድምር ከ6 ሜትር ከበለጠ እንደ ሁለት ወለል ይታሰባል።

29.2.7. የክፍል ቁመት ከ6 ሜትር በላይ የሆነ ግንባታ ወለል ብዛት የሚሰላው የክፍሉን አጠቃላይ ቁመት ለ3 በማካፈልና የሚገኘውን ውጤት ወደ ዝቅተኛው ስሌት በማስጠጋት ይሆናል።

29.2.8. የጣሪያ ላይ ክፍሎች ወለል ስፋት የደረጃ መውጫና እና የአሳንሰሩን ወለል ስፋት ድምር ሳይበልጥ ሌሎች ለህዝብ አገልግሎት መስጫነት የማይውሉ ክፍሎች ሊኖሩት [illegible] ላይ ክፍሎች ያሉት የጣሪያ ወለል እንደ አንድ ወለል ይታሰባል።

29.2.9. ማምረቻ ወይም ማከማቻ ወይም የሕዝብ መሰብሰቢያ አዳራሽ ከሆኑ ግንባታዎች ውጭ የቤኒጋዛ ጣሪያ ከፍታው (ከፊፍ ሳይጨምር) ከ2.8 ሜትር በላይ የሆነ ጣሪያ እንደ አንድ ወለል ይታሰባል።

29.3. የተከፋች ስታንዳርድ

29.3.1. ማንኛውም ተከፋች ከይዞታ ወደ ውጭ መከፈት አይችልም።

29.3.2. ወደ ግቢ መግቢያ ቢያንስ ለመኖሪያ 3 ሜትር ለሌሎች 4 ሜትር መጠበቅ ይኖርበታል።

29.3.3. ከወለል ከ1.7 ሜትር በላይ ከፍ ብሎ ዝግ ወይም ተከፋች መስኮት በተገጠመለት በኩል ያለ ግንባታ ከወሰን ቢያንስ 1 ሜትር ርቀት መገንባት አለበት።

29.3.4. በልዩ ባሕሪያቸው ተከፋች እንዲኖራቸው ከሚፈለጉ ክፍሎች በስተቀር ለእያንዳንዱ ክፍል ቢያንስ አንድ በር እና አንድ አየርና ብርሃን ማስገቢያ መስኮት ወይም የተያያዙ አንድ በርና መስኮት መኖር አለበት።

29.3.5. ለመጸዳጃ ቤት፣ ለሕዝብ መሰብሰቢያ አዳራሽ፣ ለቤት ውስጥ መጫወቻ አዳራሽ፣ [illegible] አየርና ብርሃን የሚያገኙበትን ሜካኒካል አማራጮችን ለመጠቀም የሚያስፈልጉ የአየር ማስተንፈሻ መስመር (Ventilation Duct) በዝርዝር መመልከት እና የAir conditioner መስመር ከመጠባበቂያ የኃይል አቅርቦት ጋር የተሟላ መሆኑን በዲዛይኑ ላይ በግልጽ መታየት ይኖርበታል።

29.3.6. የመፀዳጃና ባልኮኒ የበር ስፋት ከ70 ሳ.ሜ እንዲሁም ቁመት ከ200 ሳ.ሜ ያነሰ መሆን የለበትም።

29.4. የመታላለፊያ ስታንዳርድ

29.4.1. ማንኛውም ከአንድ ሰው በላይ የሚተላለፍበት ኮሪዶር፣ ደረጃ ወይም ራምፕ የጎን ስፋቱ ለሕንፃ ምድብ "ዐ" እና "ሰ" ሰመኖሪያ 90 ሳ.ሜ ለምድብ "ሐ" ሕንፃዎች ከ120 ሳ.ሜ ማነስ የለበትም፣ የተጣራ የክፍሉ ቁመት ከ200 ሳ.ሜ ማነስ የለበትም፣

29.4.2. የመውጣጫ ደረጃ መርገጫ እና መወጣጫ ምጥጥን መጠበቅ ያለበት ሲሆን መርገጫው ከ25 ሳ.ሜ ማነስ እንዲሁም መወጣጫው ከ20 ሳ.ሜ ከፍታ መብለጥ የለበትም፣

29.4.3. በአንድ ተከታታይነት ባለው የመወጣጫ ደረጃ የተለያዩ የመርገጫ ስፋት ወይም የመወጣጫ ከፍታ መጠን መጠቀም አይቻልም፣ ሆኖም ወደ ውሃ ማጠራቀሚያ ፕንጣ ወይም ወደ ማሽን ክፍል ወይም ለተመሳሳይ አገልግሎት ሰዋሰ ክፍሎች የሚያደርስ ደረጃ ከሆነ ከተጠቀሰው መጠን የተለየ ሲሆን ይችላል፣

29.4.4. ለሕዝብ አገልግሎት የሚውል አሳንሰር ስፋት ከ90 ሳ.ሜ፣ ወርድ ከ150 ሳ.ሜ ማነስ የለበትም፣

29.4.5. ለሕዝብ አገልግሎት የሚውል ህንፃ የምድር ወለል በተሽከርካሪ ወንበር ሰሚንቀሳቀሱ አካል ጉዳተኞች ተደራሽ እንዲሆን ከ4.5% ያልበለጠ ተዳፋት ramp መውጣጫ መኖር አለበት፣

29.5. በርና መስኮት

29.5.1. የመስኮት ስፋት ከክፍሉ ስፋት በ.ያንስ 10% መሆን ያለበት ሲሆን ዝቅተኛው ከ0.2 ሜ.ካ ማነስ የለበትም፣

29.5.2. የበር ስፋት የተጣራ 70 ሳ.ሜ እና ቁመት የተጣራ 200 ሳ.ሜ ማነስ የለበትም፣

29.5.3. የራት መስታወት ነጸነነ (mirror glass) ወይንም ተመሳሳይ ውጤት እንዲኖረው የተደረገ መስታወት ለማንባታ የውጭ አካል አገልግሎት አይቻልም፣

29.5.4. በህንፃ ላይ ለሚገጠሙ የውጭ መስኮቶች አንሀባራቂነት የነዋሪውን ደህንነትና የትራፊክን እንቅስቃሴ የሚያውክ መሆን የለበትም፣

29.5.5. ለህዝብ አገልግሎት ለሚውል ህንፃ ዋና መግቢያ በር ስፋት ከ150 ሳ.ሜ ማነስ የለበትም፣

29.5.6. አየር ማስገቢያ ላይኖረው በርሃን ብቻ የሚያስገባና በተጎራባች ወስን ላይ ስለሚሰራ ግንባታ ውሳኔያቸው ከ5 ሳ.ሜ የማንያስ የመስታወት ብሎኬቶችን መጠቀም የሚቸል ሲሆን ይህም በሚተርበው ዲዛይን ላይ በግልጽ መቀመስ ይኖርበታል፣

29.5.7. የኩሽና፣ የሳሎን እና የመኝታ ክፍል የበር ስፋት ከ80 ሳ.ሜ ቁመት ከ2.0 ሜ. ማነስ የለበትም፣

29.6. የመኪና ማቆሚያ ስታንዳርድ

ለማንኛውም ተሽከርካሪ የማቆያ ቦታ እንደ ከተማው ዕድገት እና መልካምድራዊ አቀማመጥ በከተማው አስተዳደር ተጠንቶ በሚዘጋጅ መመሪያ መሠረት ተግባራዊ መደረግ ይኖርበታል፣

29.7. ባልኮኒ

ሀ) የባልኮኒ መደገፊያ የፍርግርጉ ስፋት ከ0.11 ሜትር መብለጥ የለበትም፣ መደገፊያ ቁመቱ ከ1.05 ሜትር ማነስ የለበትም፣

ለ) በባልኮኒ አካባቢ የሚፈጠርን ፍሳሽ አወጋገድ በዲዛይኑ ላይ መመልከት አለበት።

29.8. ኮሪዶር፣ የውስጥ ደረጃ

29.8.1. ኮሪደር ለመኖሪያ ቤት ከ 90 ሳ.ሜትር ያነስ መሆን የለበትም፣

29.8.2. የደረጃ ስፋት ለውስጥ ደረጃዎች ከ0.75 ሜትር ማነስ የለበተም፣

29.8.3. የውስጥ ደረጃ ስፋት (thread) ከ25 ሣንቲ ሜትር ማነስ ከ30 ሣንቲም ሜትር መብለጥ የለበትም፣

29.8.4. የውስጥ ደረጃ ቁመት (riser) ከ20 ሣንቲ ሜትር መብለጥ የለበትም፣

29.9. የእጥር ስታንዳርድ

29.9.1. የእጥር ከፍታ የሚለካው ከተፈጥሮ የምድር ወለል ጀምሮ ነው፣

29.9.2. በሁለት አዋሳኞች መካከል የሚገነባው እጥር ከፍተኛው የግንብ ቁመት 2.5 ሜትር መብለጥ የለበትም፣

29.9.3. በዋና መንገድ የሚፈቀ[illegible] ወደ ውስጥ በሚያሳይ ቁስ ወይም ግንብ ከተሠራ ቁመቱ ለመኖሪያ 1.50 ሜትር፣ ለድርጅት 90 ሳ.ሜ ያልበለጠ ሆኖ ቢያንስ 75% ወደ ውስጥ በሚያሳ[illegible] ሜትር [illegible] ማጠፈግ ይቻላል፣

29.9.4. ለመኖሪያ ከዋና መንገድ በኩል ሠሚሃሰነው እስከ 70 ሳ.ሜ ቢያንስ 75% ወደ ውስጥ በሚያሳይ ቁስ እስከ 1.5 ሜትር ከፍ ማድረግ ይቻላል፣

29.9.5. ለቢሮ እና ለሴሎት ፣ ንግድ ተቋማት 70 ሳ.ሜ መብለጥ የለበትም፣

29.9.6. ለማምረቻ፣ ማከማቻ እና ማህበራዊ ተቋማት 80% ወደ ውስጥ በሚያሳይ ቁስ በመገንባት እስከ 1.5 ሜትር ከፍ ማድረግ ይቻላል፣

29.9.7. ለኢምባሲዎች እና ዲኘሎማቲክ ተቋማት እስከ 2.5 ሜትር በድፍን ቁስ መሥራት የሚቻል ሲሆን ተቋሙ በሚያቀርበው የደህንነት መጠባበቂያ ዘዴ ምርጫ እስከ 3 ሜትር ከፍታ መሸፈን ይቻላል፣