

Urbanization and Density in Zanzibar

- Recommendations for Sustainable Urban Development from Swahili Houses to Apartment Houses



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Foreword

This thesis represents 15 weeks of fulltime study which is equivalent to 22.5 Swedish credits. It is a part of our degree in Bachelor of science in Engineering, specializing in Architecture, at LTH Faculty of Engineering.

Topics regarding sustainability and housing is, and has been for a long time, to us dear to the heart. That interest grew facing possibilities when sustainable solutions regarding housing issues can be included to prevent problems. Density and urbanisation could be used as a tool for the development of more harmonious cities and societies.

In the first term in our education, we became familiar with the work of the department of Housing Development & Management –HDM at LTH and some of their staff members Erik Johansson and Johnny Åstrand. We participate in an additional course in International Sustainable Construction after advice from HDM and then we began to plan our thesis in this topic. We, together with HDM, found the city of Zanzibar in Tanzania as a suitable case study and where contacts with the municipal, town planners and local architects were possible due to HDM's educational and research activities in the country.

Thanks to Erik Johansson, Maria Rasmussen, Johnny Åstrand and Muhammad Juma for their benevolence to help us, we got the opportunity to travel to Zanzibar, Tanzania, to study their problems within urban development.

We would also like to take the opportunity to thank the following people for their help and encouragement:

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Amour Khamis – Assistant land planner at DoURP, who helped us with everything we needed in the field

Helsingborg Sweden, March 2014

Anders Mattsson and Mattias Möllerström

Abstract

Urbanization and Density in Zanzibar

- Recommendations for Sustainable Urban Development from Swahili houses to low-rise multi-storey houses.

The rapid urbanization process in Africa is a major challenge for politicians, urban planners and society in general. The archipelago of Zanzibar in Tanzania is in the middle of this process.

Traditionally, low and middle income families live in Swahili houses, houses characterized as low rise houses, usually one floor, resulting in urban environment with a horizontal growth instead of vertically. Because this group of population is very voluminous the problem is reflected on the occupation of very large areas of land used for housing.

Large parts of the local families have not responded positively to the attempts to deal with density issues increasing the number of homes in low-rise multi-storey buildings. The urbanization process is so fast that the different needs seem to compete with each other, and therefore priorities must be made.

We visited the island during the month of April 2012 and we spent three weeks in Zanzibar, living with a local family to make the field study. Apart from observations, and interviews with locals, town planners and experts on the fields, we conducted a survey questionnaire with residents divided in two groups: one living in Swahili houses and a second living in low-rise multi-storey houses. The purpose of this survey was to understand and to be able to analyze the situation, but also to see what opportunities exists to develop neighborhoods and residential areas, so that they better meet the need for sustainable living now and in the future. We also did a climate analysis due to the fact that the indoor climate is important for us humans to thrive and feel well.

Keywords: Urbanization, Density, Sustainable housing development, Swahilihouse, Zanzibar

Sammanfattning

Urbanisering och densitet i Zanzibar

- Rekommendationer för hållbar stadsutveckling från Swahilihus till flervåningshus.

Den snabba urbaniseringen i Afrika är en stor utmaning för politiker, stadsplanerare och samhället i allmänhet där Zanzibar i Tanzania är mitt i denna process.

Traditionellt bor låg- och medelinkomst familjer i Swahili hus, hus som karakteriseras av låga byggnader oftast envåningshus, vilket resulterar i en stadsmiljö med en horisontell tillväxt i stället för vertikal. Eftersom denna grupp är en mycket omfattande del av befolkningen blir resultatet att mycket stora arealer av mark används för bostäder.

Stora delar av de lokala familjerna har inte reagerat positivt på de försök som gjorts att hantera densitets frågor därför antalet bostäder ökar i låga byggnader vilket medfört fortsatt horisontell tillväxt. Urbaniseringen är så snabb att de olika behoven tycks tävla med varandra, och därmed måste prioriteringar göras.

Vi besökte ögruppen under april månad 2012 där vi tillbringade tre veckor på Zanzibar, vi levde med en lokal familj för att göra fältstudien. Förutom observationer och intervjuer med lokalbefolkningen, stadsplanerare och experter genomförde vi en undersökning genom intervjuer med två grupper, de som bor i Swahili hus och de som bor i flervåningshus. Syftet med undersökningen var att förstå och kunna analysera situationen, men också att se vilka möjligheter som finns att utveckla stadsdelar och bostadsområden, så att de bättre tillgodoser behovet av hållbar livsstil nu och i framtiden. Vi gjorde också en klimatanalys på grund av det faktum att inomhusklimatet är viktigt för oss människor att trivas och må bra.

Nyckelord: urbanisering, densitet, hållbart byggande, Swahilihus, Zanzibar

Abbreviations

DoURP	Department of Urban and Rural Planning
HDM	Housing Development & Management
LTH	Lund University, Institute of Technology.
TIC	Tanzania Investment Centre
URT	United Republic of Tanzania
ZMC	Zanzibar Municipal Council

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1 Introduction

1.1 Background

In our first year of the program of Constructional Engineering at LTH, we got the opportunity to attend a course in housing development held by the Housing Development and Management (HDM), University of Lund. It was an interesting course in housing development in developing countries, and made us even more interested in global sustainable development.

When we two years later started our third year, we chose to immerse ourselves even more in sustainable development by attending a none mandatory course in International Sustainable Development.

In consulting with HDM and The Department of Urban and Rural Planning, DoURP, in Stone Town, main city of Zanzibar, we decided to locate our studies in Zanzibar. Now we hope, that by writing our thesis, we can contribute somehow to a better understanding of the housing situation of low and medium income families and maybe find a more modern housing solution for Tanzania, considering multi-storey houses.

The field studies have been conducted in different settlements throughout Zanzibar, mostly in Stone Town, during the 3 weeks of field study. The further analysis was completed in Sweden.

*“Urbanization is a fundamental transformation of society, with far reaching economic, social, cultural and political consequences”
(Tannerfeldt & Ljung, 2006)*

This thesis aims to analyse problems that can come with urbanisation and to give a guideline on the considerations that need to be taken in account, when searching for solutions solved in a sustainable way. We have focused on what we consider an important issue, the tool of densification. We looked into the reasons of why the previously attempts to increase density didn't result in sustainable solutions.

1.2 Problem Definition

Tanzania has a high population growth of 2,6 % per annum in urban areas and 1,1 % per annum in rural areas. Urban growth also has a major impact on the urban environment. With urban growth means the growth of population, not the geographic expansion of the urban core. The urban growth can be divided into natural population increase and migration, where the natural population increase is the more important of the two due to its much larger percentage amount (Kweka 2009).

Zanzibar, like other places in Tanzania, struggles with the fact that overpopulation has been, and still is, a big problem for a sustainable city. Furthermore problems caused by that high level of urbanization and urban growth:

- Inhabitants building their own houses, Swahili houses, with only one story cause a more dense housing area and a faster urban sprawl
- Inhabitants building houses with poor knowledge on housing and on construction techniques
- The plot boundaries are not easy determined
- The maintenance required for houses is not provided

Due to many things, past housing projects have not been so successful solutions in the long run in Stone Town (Census 2002, 2002, TIC, 2012). For example, the past housing projects have not been adapted to the climate, to the extent needed and the issue of maintenance has not been resolved.

1.3 Objective

This study aims to point to housing issues caused by urbanization in Zanzibar, and to give a guideline in how to solve them in a sustainable way, so that further development can proceed more successfully. We will also with this thesis examine the attitudes on living in multi-storey houses, compared to traditional Swahili houses and try to understand and describe the living conditions for low and middle income families in the city.

We strive to find a sustainable solution for these housing problems, focusing on possibilities for dwellers in the transition from Swahili houses to multi-storey houses. The possibilities will be presented as a guideline where we also take climate into account using our climate analysis.

We hope that this report will give knowledge and valuable ideas and highlight the issue of thermal comfort, that will help on housing discussions in Tanzania and specifically at the Department of Urban and Rural Planning in Zanzibar, related to their future housing projects.

1.4 Method

To prepare us as much as possible for this thesis, we took a course in International Sustainable Development, and we consulted literature and reports niched in housing, from among others the library of HDM specialized in housing in different countries. We prepared ourselves with a general background on the country and on Zanzibar archipelago, always focusing on social issues.

The duration of this thesis was 15 weeks, of which 3 were implemented as field study in Stone Town, Zanzibar.

During our field study in Zanzibar we interviewed workers at the DoURP and at the water plant of Saateni as well as local residents, so that we could get a broader picture of the housing situation in Zanzibar. The persons in the interviews were selected from different professions and economic classes to get as broad a perspective as possible.

We also conducted a questionnaire survey of low and medium income residents in the outskirts of Stone Town in Zanzibar, in which we studied and compared the differences in housing between living in normal Swahili houses compared to multi-storey houses. The total number of participants in the survey was 17. In addition to this, we made observations by ourselves during our stay and took pictures in order to get a good insight in the current housing situation. We also made a climate analysis using Givoni chart and Mahony tables compiled in diagrams and pictures.

1.5 Limitations

This thesis focuses on analysing density and urban growth in the context of Zanzibar and for the low-middle income families. The thesis explores the differences between living in Swahili houses and multi-storey houses, basically within a physical approach to the houses, avoiding cultural or religious issues.

2 Background on Tanzania and Zanzibar

2.1 Introduction

To better understand the issues and the topics of this thesis, we hereafter present background facts and fundamental knowledge about the country. This thesis will only consider Zanzibar, the main island of the Zanzibar archipelago, but due to the fact that Zanzibar is a part of Tanzania, it is important to have some basic facts about the mainland Tanzania.

2.2 Basic Facts

2.2.1 Tanzania

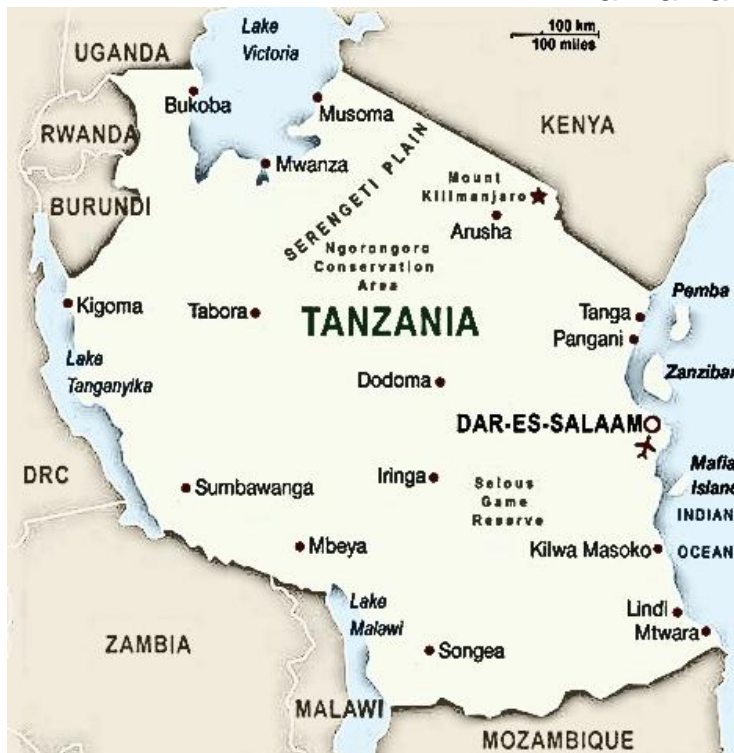


Fig 2.1 Map of Tanzania (Map of Tanzania, 2013).

Area:	Total 947,300 sq.km (includes the Zanzibar Archipelago)
Capital City:	Dodoma
Largest City	Dar es Salaam
National Population:	Approx. 48'262'000
Dodoma Population:	Approx. 180'000
Dar Population:	Approx. 3'200'000
Land Boundaries:	Burundi, Democratic Republic of the Congo, Kenya, Malawi, Mozambique, Rwanda, Uganda, Zambia.
Constitution:	Republic
Language:	Official Swahili, English is common and Arabic is spoken in Unguja and Pemba islands (The World Factbook, 2013).

2.3 History

The island of Zanzibar has been inhabited for approximately 20'000 years. People moved from the mainland to the island for trading pursues and made Zanzibar and its main city Stone Town a very important trade hub between Africa, India and the Persian Gulf. Today, Zanzibar is a multi- ethnic and multi-cultural society (African Wanderer History, 2013).

In the 10th century people from the Persian Gulf immigrated to Zanzibar, and became the population called Shirazi. The contact that occurred between Shirazi and the local Bantu people became an important component of the trade between Asia, Africa and Europe (Zanzibar History, 2013).

The Portuguese had for a brief period of time established a trading empire on the island. During the 17th century, Arabs from Oman began to take over the financial control of the northern part of Zanzibar, and during the 18th century, they took control over the entire island (Zanzibar History, 2013).



The African slave trade was centered in Stone Town, and the slaves were transported to Zanzibar in appalling conditions. If they were lucky they were still alive at arrival. The slaves were commonly used for cultivation, and many of them were sold to other countries outside Africa (Zanzibar History, 2013).

Fig 2.3 Omani Sultan Said bin (Wealth of the Sultans, 2012)



Fig 2.4 One of the two remaining slave chambers in Stone Town

The colonial competition about Africa was intense, and in 1890 United Kingdom declared the protectorate of Zanzibar and abolished the slave trade. Zanzibar became independent from Britain in December 1963. The year after the independence Zanzibar was united with Tanganyika on the mainland and formed the Republic of Tanzania (Nationalencyklopedin, 2012).

Stone Town, also known as *Mji Mkongwe* (Swahili for "old town"), is the old part of Zanzibar City. It is located on the western coast of Unguja, the main island of the Zanzibar Archipelago. Former capital of the Zanzibar Sultanate, and flourishing centre of the spice trade as well as the slave trade in the 19th century, it retained its importance as the main city of Zanzibar during the period of the British protectorate. When Tanganyika, the main land and Zanzibar joined each other to form the United Republic of Tanzania, Zanzibar kept a semi-autonomous status, with Stone Town as its local government seat (An introduction to Zanzibar Town, 2012).

Stone Town is a city of prominent historical and artistic importance in East Africa. Its architecture, mostly dating back to the 19th century, reflects the diverse influences underlying the Swahili culture, with a unique mixture of Arab, Persian, Indian and European elements. For this reason, the town was designated as a UNESCO World Heritage Site in 2000 and it attracts tourism from all over the world (Stone Town UNESCO, 2012).

2.4 Geography

Tanzania is located along the east coast of Africa. Dar es Salaam was the capital city of Tanzania until February 1996 when the capital moved to Dodoma. Dar es Salaam remains influential to Tanzania, because a lot of governmental offices still are located the former capital.

Tanzania's nature varies greatly throughout the country. From the great Lake Victoria in the north, the biggest in Africa, to Lake Tanganyika in the west, the world's second deepest. Tanzania's highest mountain is Kilimanjaro and it is also the highest in Africa, with an altitude of 5895 meters. At the top of Kilimanjaro you will find a magnificent glacier and the surroundings of the mountain are used by farmers (Geografi.nu, 2012).

Zanzibar Archipelago is a part of Tanzania and is situated about 35km from the Tanzanian coastline. It consists of two main islands, Unguja and Pemba. Unguja is most commonly known as Zanzibar with landmarks such as Zanzibar Town, the biggest city in the archipelago with its remaining old city core called Stone town. The layout of Stone Town remains intact, but it's in great need of renovation. In 2000, UNESCO declared Stone Town as a World Heritage Site. As the World Heritage Convention describes Stone Town:

“The Stone Town of Zanzibar is a fine example of the Swahili coastal trading towns of East Africa. It retains its urban fabric and townscape virtually intact and contains many fine buildings that reflect its particular culture, which has brought together and homogenized disparate elements of the cultures of Africa, the Arab region, India, and Europe over more than a millennium.”

- (Stone Town UNESCO, 2012)

2.4.1 Climate

Zanzibar has a warm tropical climate without significant changes of temperature over the year. There are two rainy seasons, the long between March and May and the short between November and December. It happens that it rains during the dry season, but not in any significant way. The climate analysis for Dar es Salaam which represents the climate for Zanzibar is shown in appendix 9.1 (Weather and climate, 2012).

2.4.2 Social Conditions

2.4.2.1 School System

After the union 1964 large sums were invested in the school system resulting in more people with the knowledge of reading and writing. Nowadays, in Tanzania every fourth person is illiterate. The education sector has suffered due to the economy crises from the beginning of the 1990's.

The trend is now broken, nine out of ten children attended elementary education in 2006 (Landguiden Utbildning, 2012).

According to The World Fact book the rate of illiteracy is high, only 69.4% can read and write one of the main languages of the country, and there is a difference between male literacy of 77.5% and female 62.2% according to the census of 2002.

The structure of Tanzania school system constitutes of two years of preschool education, seven years of elementary school, four years of Junior High (ordinary level), and two years of Senior High (advanced level). When finishing the last grade, it is possible to study three, or more, years of tertiary education (Sinare, 2008).

Today it is less than five percent who starts tertiary education, although they get disproportionately large resources. Therefore, it's an important part of the new strategy to reallocate within the budget and distribute more resources to the elementary school (Sinare, 2008).

2.4.2.2 Political System

The Republic of Tanzania had a one-party political system from 1977 until 1992. After 1992 the constitution was amended and a multiparty system was introduced, and since then Zanzibar has its own internal self-government with its own constitution, parliament and government. The current ruling of Tanzania, The Revolutionary Party (CCM), has its headquarters in the city of Dodoma and has a strong influence on Zanzibar by the laws (Landguiden Politik, 2012).

Zanzibar has a system of local governance, where the island is divided into 5 regional administrations, three in Unguja Island and two in Pemba Island. Each region has a Regional Commissioner appointed by the President. The functions of the Regional Commissioner include:

- Monitoring, supervising, and assisting in the execution of the functions of the government in his region

- Assuring that the policies, plans and directives of the government are observed
- Maintaining law and order in the region in collaboration with law enforcement agencies
- Assuring that resources, both material and manpower are used for development in the economy to enhance welfare

Zanzibar is also divided into local governments, which are divided into districts. They, in turn, are divided into Shehias¹, which can be explained by an area controlled by the Sheha. The local governments of Zanzibar with the districts are shown in table 2.1. This is the title of the local leader appointed by the Regional Commissioner upon advice from the District Commissioner. The system of local government is not considered as Union matter and is thus regulated entirely by separate Zanzibar legislation, which is different from Mainland Tanzania (Local Governance, 2003).

¹ Sheia: an area controlled by the Sheha, a neighbourhood leader appointed by the Regional Commissioner upon advice from the District Commissioner.

Table 2.1 Table of distribution of population, districts and shehias in Zanzibar local governments

Local Government	Population	Number of districts	Number of Shehias
Zanzibar Municipality	206,292	24	40
West District Council	184,701	11	29
North A District Council	84,315	12	28
Micheweni District Council	83,519	10	13
Mkoani District Council	82,622	12	19
Wete District Council	73,371	10	15
Chake Chake District Council	63,155	10	16
Central District Council	62,537	11	38
North B District Council	52,605	10	23
South District Council	31,16	10	18
Wete Town Council	25,01	7	3
Chake Chake Town Council	20,196	7	4
Mkoani Town Council	10,154	7	3
Total:	979,637	141	249

2.4.2.3 Economy

Poverty is a big problem in Tanzania and income disparities are wide. One of the most important sources of income for the inhabitants is farming, with production of cotton, coffee, tea, cashew nuts, tobacco and spices. Extracting minerals by mining is another source of income together with tourism, which is increasing throughout the whole country especially in the Zanzibar Archipelago.

The last ten years, Tanzania has had a positive development in many areas. The economy has been strengthened considerably and a lot of money has been invested since the political situation became increasingly more stable. The fight against poverty has become a more central target, due to the stable political situation. A new development strategy (Sida Strategy, 2013) focuses on:

1. More jobs and developed energy and agricultural markets

- *Increased access to safe and sustainable energy, including the ambition that at least 300 000 people gain access to electricity.*
- *Developed markets in agricultural production with the ambition that more poor people – primarily women – find employment and increase their incomes.*
- *Increased legal security regarding land rights for small-scale farmers and large-scale investors.*

2. Improved education and increased entrepreneurship

- *Greater number of girls and boys who acquire basic knowledge and skills in school.*
- *Greater number of young people who complete vocational education and training, including the ambition that at least 10 000 people find employment.*
- *Increased opportunities for women and young people to start and run productive businesses.*

3. Strengthened democratic accountability and transparency, and increased awareness of human rights

- *Increased capacity and reduced corruption in Tanzanian public administration.*
- *Enhanced capacity in civil society to demand accountability and increased awareness of human rights.*

(Sida Strategy, 2013)

2.4.2.4 Housing Situation

In Tanzania, land is owned by the state. Therefore people hire their own property from the government under various lease bases, with lengths between 33 and 99 years. The residents strive to own their own houses instead of renting them. On a national basis, approximately 84 percent owns their own house, however about one-third leases their accommodation, in urban areas. In comparison to rural residents, urban residents have a great shortage of housing, due to urbanization. Nationally, the households have a shortage of bedrooms and currently the average housing occupancy rate is 2.4 persons per room, as compared to the 1992 rate of 2.6 persons per room (Sinare, 2008).

Houses are being built in both planned and unplanned areas. When it comes to these informal settlements there are problems with plots unlawfully sold by individuals without any authorization. The plots follow few or none of the town planning ethics and codes of conduct.

The main characteristics of the informal settlements:

- Low quality houses
- Lack of/or inadequate infrastructure and social services.

There are no services for waste disposal in the rural areas. However, in some inner urban areas and in very few areas on the outskirts of the urban areas, services of collection of waste are to be found.

The informal settlements are perceived as both the problem and solution to the housing needs in Zanzibar. Informal settlement, as it is defined today, was not considered as illegal by the authority previously. That basically meant that residents were allowed to build as they liked, without any ethics and codes of conduct. The expansion of trading in the early 19th century resulted in the fast growth of the population and the Zanzibar Town itself, and now 70 percent of the urban population lives in these informal settlements (Ali & Sulaiman, 2006).

2.5 The Department of Urban and Rural Planning (DoURP)

The Department of Urban and Rural Planning, DoURP, for Zanzibar has been hosting and helping us during our field study. The office of DoURP is located in central Stone Town, next to the historical fort “The Old Fort”, *Ngome Kongwe* in Swahili. DoURP are working with municipalities and other sectors, and their main tasks are, in short, to prepare for new housing areas and plan for these.

Some of their responsibilities are:

- To prepare and supervise national land use plans
- To supervise land use in regions, district and villages
- To prepare for new housing areas
- To review and prepare Master plans
- To cooperate with the municipality and other sectors
- To do research about all matter concerning urbanisation
- To resolve dispute between people

According to DoURP,

“Today, Zanzibar town faces challenges in terms of its management and its development. More than 70% of the urbanization in the town is an informal settlement. Urban sprawl² has become a norm rather than a mistake. DoURP aims to oversee these challenges.” - (DoURP, 2012)

To achieve that target, the urban planning and landscape section is working in following activities:

- Reform the urban Development Control Authority
- Develop schemes to upgrade Ng’ambo (suburb) neighbourhoods
- Develop landscapes and protect heritage assets in the Zanzibar town
- Coordinate with Zanzibar Municipal Council (ZMC) to ameliorate procedure of construction permits
- Assist Zanzibar Municipality, town councils and all districts commissions in local planning
- Coordinate with partners and stakeholders for research in the domain

(DoURP, 2012)

The time we spent in Stone Town gave us a good impression of DoURP and their work. They are in the beginning of building a sustainable working process to deal with housing issues. Planning, improving and restoration are some of their most essential topics to work with.

² Sprawl refers to the rural acres lost as an Urbanized Area spreads outward.

3 Theoretical Framework

3.1 Urbanization in non-Industrialised Countries

The concept of urbanisation can be seen from different perspectives, but there seem to be a consensus on the agreements on variables that characterise urbanization. The main variables include:

- Demographic changes
- Concentration of economic activities within a limited geographical space, which are presumably triggered by industrialisation
- Spatial expansion of settlements
- Changes in people's lifestyles

Unlike industrialised countries, where urbanisation was triggered by industrialisation, in many 'non-industrialised countries' urbanisation is portrayed by:

- Rapid increase of population
- Uncontrolled expansion of cities with limited economic or productive base

Cities in most of these non-industrialised countries are growing at a very high rate due to inherent demographic changes, such as natural population growth and immigration (Lupala, 2002).

3.2 General Housing Guidelines for Developing Countries

A Swedish study has compiled 11 housing projects in different non industrialised countries, and parts of its conclusion establish some overall guidelines of manners for future housing projects. These guidelines will be a kind of background for our case study, Zanzibar. Here we have pointed out some of the main conclusions that could be applicable for Zanzibar and that could benefit the work at DoURP.

- *Make detailed preliminary studies* – It is shown that detailed preliminary studies result in efficient improvements at low cost and with a fast project development.

- *Consult the residents in what they are seeking* – It is important that the residents are consulted in their needs, which order of priority the different needs are prioritised in, and at what cost they are willing to pay for them.
- *Give clear information* – To prevent any unpleasant surprises which can lead to insecurity and scepticism for the project, it is important to be clear and informative to the residents.
- *Optimize the residents' participation* – When optimizing the residents' participation in the housing projects, labour costs are reduced and makes the costs for improvement at a reasonable proportion to the households income. Increased participation of residents in the construction can be achieved if the government allows loans for building materials, provides technical assistance and provides infrastructure.
- *Develop and pass knowledge* – It is important to educate those involved when new building techniques are implemented. This so that the new techniques are applied deliberately.
- *Guarantee of tenure* – When residents get a guarantee of tenure they automatically invest in housing improvement. Sometimes leasehold contracts are to prefer over ownership as the later sometimes can lead to speculation, which favours the rich on the expense of the poor. Leasehold contracts which are hard to sign away are suitable.
- *Ensure continuity* – Housing improvement projects are rarely short term but often stretch over a long time. It is important that organisations which are working with housing are able to work with the projects during a long period of time, both to further develop the current project and to follow up the maintenance of the new building.

(Johansson & Åstrand, 1988)

3.3 Urban Density

According to Acioly Jr and Davidson (1996), the term density is determined by its perceiver. What is determined as high density by inhabitants in eastern Africa may not be the same for people living in other parts of the world. The determination of what is perceived as high and low density is a subjective matter. There are various factors that influence one's perception of density. Where you come from, your social background, your religion are all examples of these factors. The determination of density is very complex since differences within the same nationality exist.

In general the pressure on town planners and other decision makers get increasingly higher. There are higher demands on how they plan cities, infrastructure, environment, social areas, and the use of natural resources.

For Acioly Jr and Davidson, density is one of the most important design parameters in housing and human settlements. In this technical aspect, density is most commonly expressed as population per unit of land.

There are two different ways to present the density, net and gross density (Acioly Jr and Davidson).

In gross density, roads, public spaces and buildings are included in opposite to net density, which includes only the settlement itself.

High density can assure a maximization of public investments including transportation, infrastructure and services. It also allows efficient utilization of land area. It can guarantee efficient revenue and high rates of return if there are benefits deriving from a high concentration of inhabitants and activities. But high density can also lead to crowded and unstable environments for human settlements produced by overloaded infrastructure and public services putting pressure on land and residential areas. The advantages and disadvantages by high and low density are shown in Fig 3.1.

Extremely high density often leads to poor health conditions because of the higher risk of disease transmission (many people living under the same roof and for example sharing beds). This is often caused by a high density combined with poverty.

Social implications of high density are associated with low income, liveliness, social contact and the issue of conflict.

Low densities are associated with high income, and a low degree of social contact.

A stable high density settlement with good human environment can be achieved with good settlement planning without crowding problems. But it is difficult to identify what is the cause of crowding, high density or poverty. (Acioly Jr and Davidson, 1996)

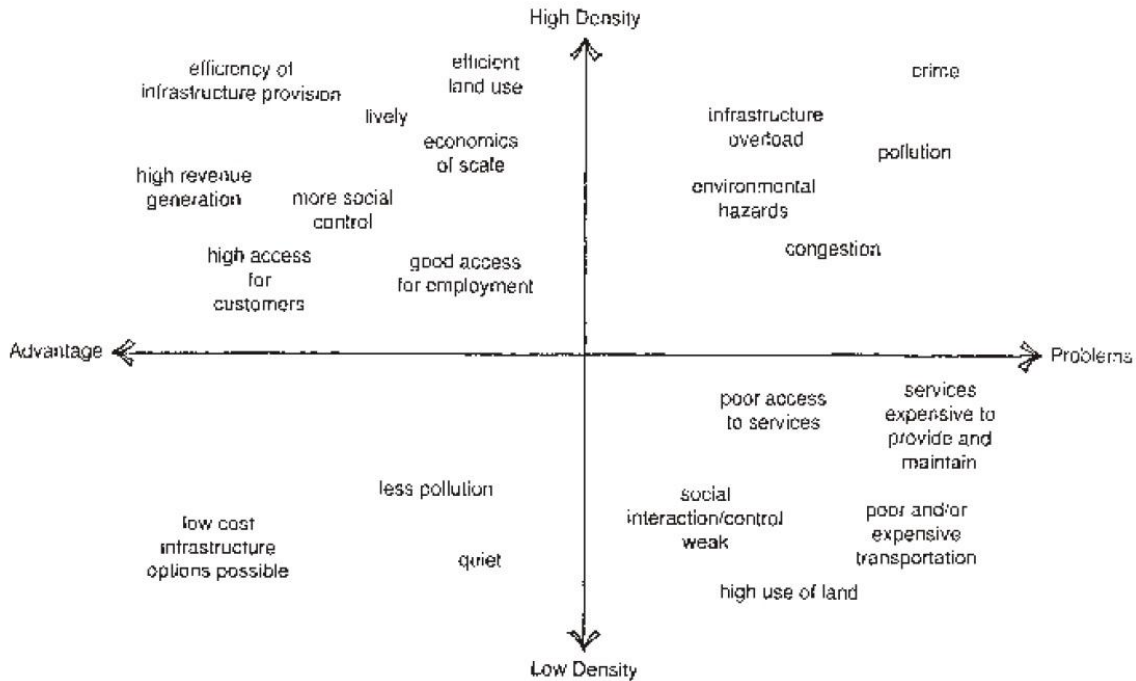


Fig 3.1 Advantages and disadvantages of high and low density (Acioly Jr and Davidson, 1996)

There are many factors that affect density which can be seen in Fig 3.2. Some factors can be dealt with, others are more difficult to influence.

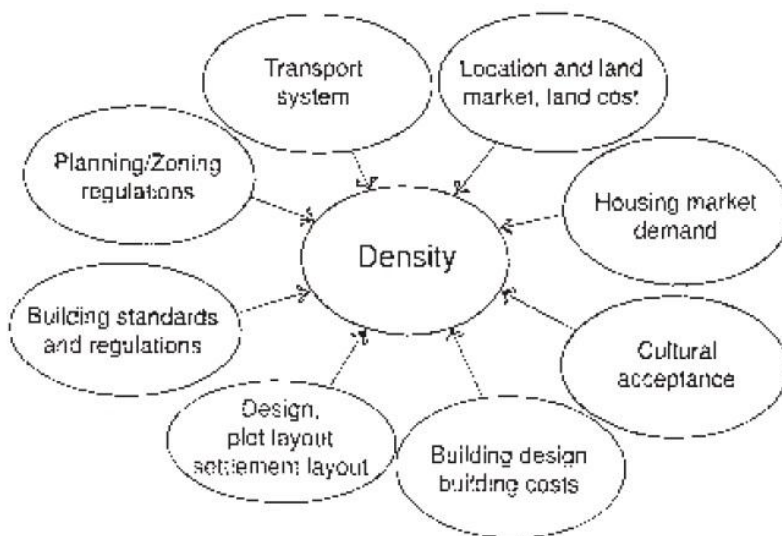


Fig 3.2 Influences on density (Acioly Jr and Davidson, 1996)

Swahili houses

Apartment houses



Fig 3.3 Differences of density between a Swahili house- and multi-story house area

4 Survey and Analysis

4.1 Questionnaire Survey

In order to assess and to get a clearer picture of the existing problems in housing in Zanzibar town, we made a questionnaire survey in English, which was translated into Swahili by DoURP. The study was conducted at various neighborhoods, Stone Town, and Kikwajuni by the coast and Michenzani, Kisiwandui, Kisima Majongoo, by the inland. We, together with our guide and interpreter, visit both traditional Swahili and multi-storey houses.



Fig 4.1 The chosen locations for the study

Area:	Swahili households	Apartment households
Michenzani		2
Kisiwandui	4	
Kisima Majongoo	4	2
Kikwajuni Juu		3
Mombasa		2
Total:	8	9



Fig 4.2 The chosen locations for the study

DoURP helped us with the administrative part of the study, which included contact with the ministry to get the proper documents of permission to show the *Shehas* or neighborhood leader, in order to conduct the survey.

The survey questionnaire focused in general on the residents' living standards, costs and preferences (See annex 9.2). We asked for their thoughts, about positive and negative aspects of their current housing situation, and of the other housing type in our survey. The results have been compiled in diagrams where the differences and similarities can be seen.

We chose to focus the survey on Swahili houses and multi-storey buildings as they represent the majority of the housing as well as the living standards for low to middle income earners in Zanzibar.

The survey consists of eight Swahili residents and nine apartment residents. There is a difference in living standards between the residents of Swahili houses and apartments. The areas and households included in our survey were chosen due to their house types and in agreement with DoURP. The selection of interviews was also divided into several areas of Stone Town so that differences in the same housing type would be taken in consideration.

To get a survey based only on the housing types we interviewed people from both sexes, from a broad range of ages and different family structures.

4.2 Housing Typologies

4.2.1 Swahili House Type

The Swahili house was defined in this study, based on our observations and interviews with local dwellers and local architects and town planners. Swahili houses, the traditional housing type in Zanzibar, are a rather simple form of housing. They are highly represented by self-built constructions and are commonly single storey houses. They are fairly square and usually built by masonry blocks with windows consisting of a hole in the wall with grid for protection. The roofs usually consist of sheet metal lying on wooden beams of and the floor can vary between solid concrete to floor of compacted soil.



Fig 4.3 Street view of a Swahili house neighbourhood.



Fig 4.4 The façade of an old Swahili house.



Fig 4.5 Aerial photograph of a Swahili House Type area.



Fig 4.6 Street view of a Swahili neighbourhood.



Fig 4.7 Locally produced masonry clay blocks used in Swahili house types.

One characteristic of the Swahili house is the bench integrated in the building foundation, facing the road. The bench is called *baraza* which means council in Swahili. For the residents this bench is more than just a bench, it is also a meeting place where social activity takes place. Traditionally, the Swahili houses have two entrances. One is used as the main entrance and the other is mostly used by the women for private and domestic activities in the house. It is important for the women to avoid contact with other men during their daily activities, due to their religious beliefs. Although the area of the Swahili houses in the visited neighbourhood is of a small scale, there is a division of functions for private and social activities.



Fig 4.8 Visiting a family and their Swahili house in Kisima Majongoo accompanied by Sheha, village leader, Maalim Mohammed. Sitting on their baraza.



Fig 4.9 A Baraza outside a Swahili house in the outskirts of Stone Town during an interview

In general the Swahili houses in Zanzibar are placed very close to each other. One of the house facades is usually facing a road, or in many cases footpaths, the front side or main facade with access to the social spaces is different from the back facade of the house which acts as courtyard in relation to women's domestic activities of a more private character.

The climate in Swahili houses differs a lot because nearly every house is different in orientation, construction, design and so forth. The urban fabric responds more to land issues than that of climatic considerations. Overall, people living in Swahili houses complain about too high temperature and humidity, and also about strong solar radiation during the day in their homes.

Water supply differs between different neighbourhoods and houses. The dwellers either have a solution with private water tank and a pump in the property, or they have to go and collect water in buckets at a public tap.

In the Swahili house areas, the disposal of garbage is a problematic issue. The waste is either buried in the ground nearby the houses or just simply burned. When the garbage is being burned, a lot of smoke and toxic gases are formed which is not healthy to the inhabitants or to the environment.

4.2.2 Multi-storey House Type



Fig 4.10 Multi-storey buildings in Michenzani

In the outskirts of Stone Town there are some housing project areas where multi-storey houses have been built, most commonly with three to seven storeys and in principle, basements does not exist. The buildings are usually located in the east west direction (long axis), with the apartments having windows in both facades. They are constructed as a single banked house and are made of heavy stone material and thereafter plastered in beige colours.

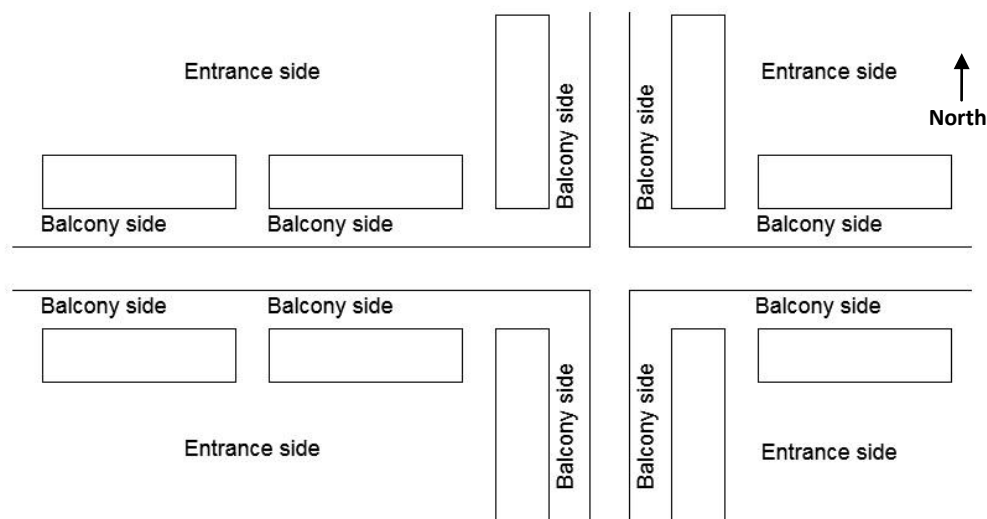


Fig 4.11 Scheme of an area with multi-storey buildings. Building placement with the orientation of apartment houses along main streets

The apartment sizes vary from three to five bedrooms but the most frequent is three rooms, with a kitchen and a toilet. Balconies are very common but due to problems with criminality in some areas, they have to put bars on the balconies. The main use of the balconies is for dry laundry and storage.



Fig 4.12 Apartment houses in Michenzani area



Fig 4.13 Apartment houses in Michenzani area

The questionnaire survey showed that the indoor climate of the apartments is rather comfortable and often accepted by residents (See appendix 9.2). Indoor hot areas caused by exposure to the sun are a problem in some apartments, but this is not that common due to the following factors:

- Shadow from the other buildings
- Good positioning of windows and openings
- Thick heavy walls that prevent heat from coming inside (with the problem of releasing heat during the night due to time-lag)

The water system in a multi-storey house is dependent of external water delivery by a truck. The water is then pumped into tanks both inside as well as outside the house. These tanks are placed at high level to give a natural pressure to the tap water and being used as the residents reservoir and must be filled once again when the water is used up. The sizes of the tanks vary from one to several cubic meters and the water is led into the apartments from the tanks.

The waste management in a multi-storey house is not functional. When garbage cans are missing dwellers solves this by either throwing their garbage in a pile outside the building, burying it or simply just burning it outside the house, like they do in the Swahili house areas.



Fig 4.14 Water tanks placed on the roof to get pressure



Fig 4.15 The most common type of water tank

4.2.3 Comparison between Swahili house and apartments in multi storey houses

The questionnaire survey (see appendix 8.3), interviews and our observations shows that the apartments in multi storey buildings are smaller in size but have a better indoor climate than Swahili houses according to the survey.

Accessibility for elderly is better in Swahili houses than the apartment buildings as they are located on the ground floor while the apartment buildings only have accessibility via stairs to the different levels.

The proximity to relatives, religious places and communal areas for socializing is important for those participating in the survey. Accessibility to the residence is also important because the interviewed families want to live in the same residence with family members of all generations, elderly included. Another important issue is the proximity to work, because of the access to transportation. Most residents do not own or have access to a car. To walk, cycle or ride with Dalla Dallas³ is the most common means of transportation.

The big difference we can see in the survey between those who live in apartments and those living in Swahili houses is the closeness to relatives. We can also see in the survey that it is important to live nearby their relatives as the younger generations often take care of the elderly. Those who live in apartments do not have the opportunity to live in larger family composition under the same roof because of the small apartment sizes and the lack of accessibility as mentioned earlier.

Another important thing to mention that is not shown in the survey but that came up in many interviews we had with those who lived in Swahili houses is the lack of information and knowledge on how it is to live in an apartment house. When questioned if they would consider moving to an apartment, we often got a negative answer, but when we questioned why we got no real good answers more other than "we have it good as it is now."

The questionnaire survey shows that more families would consider moving to apartment houses and we believe that if the dwellers of Swahili houses knew a little more about what it is like to live in an apartment and the benefits that exist there, they will be even more positive on considering moving to a multifamily house.

³ Dalla Dalla is the local name for public busses.

Table 4.1 Table of advantages and disadvantages between Swahili houses and Apartment houses

	Advantages	Disadvantages
Swahili houses	<p>Bigger in size. Accessibility. The possibility to live in large families. Isn't unfamiliar. Maintenance.</p>	<p>Indoor climate. The city grows horizontally not vertically. Garbage disposal. Water supplies.</p>
Apartment houses	<p>Indoor climate. Ability to a denser city. Great opportunity for improvements.</p>	<p>Smaller in size. Difficult to live in large families. Accessibility. Unfamiliar habitat to most. Maintenance. Garbage disposal. Water supplies.</p>

4.3 Climate Analysis

Climate is a very important factor to take in consideration when building in a sustainable way. All new housing developments have to be attractive for prospective residents. Therefore this thesis includes a climate analysis to show the variations in climate during 12 months.

Zanzibar is situated on the sixth degree latitude south of the equator with a tropical climate, hot and humid. There are two rainy seasons, one long and one short. The long one begins in the end of March and continues to the end of May. The short rainy season begins in October and ends in November. The rest of the year the weather is mostly clear with sunshine and low precipitation.

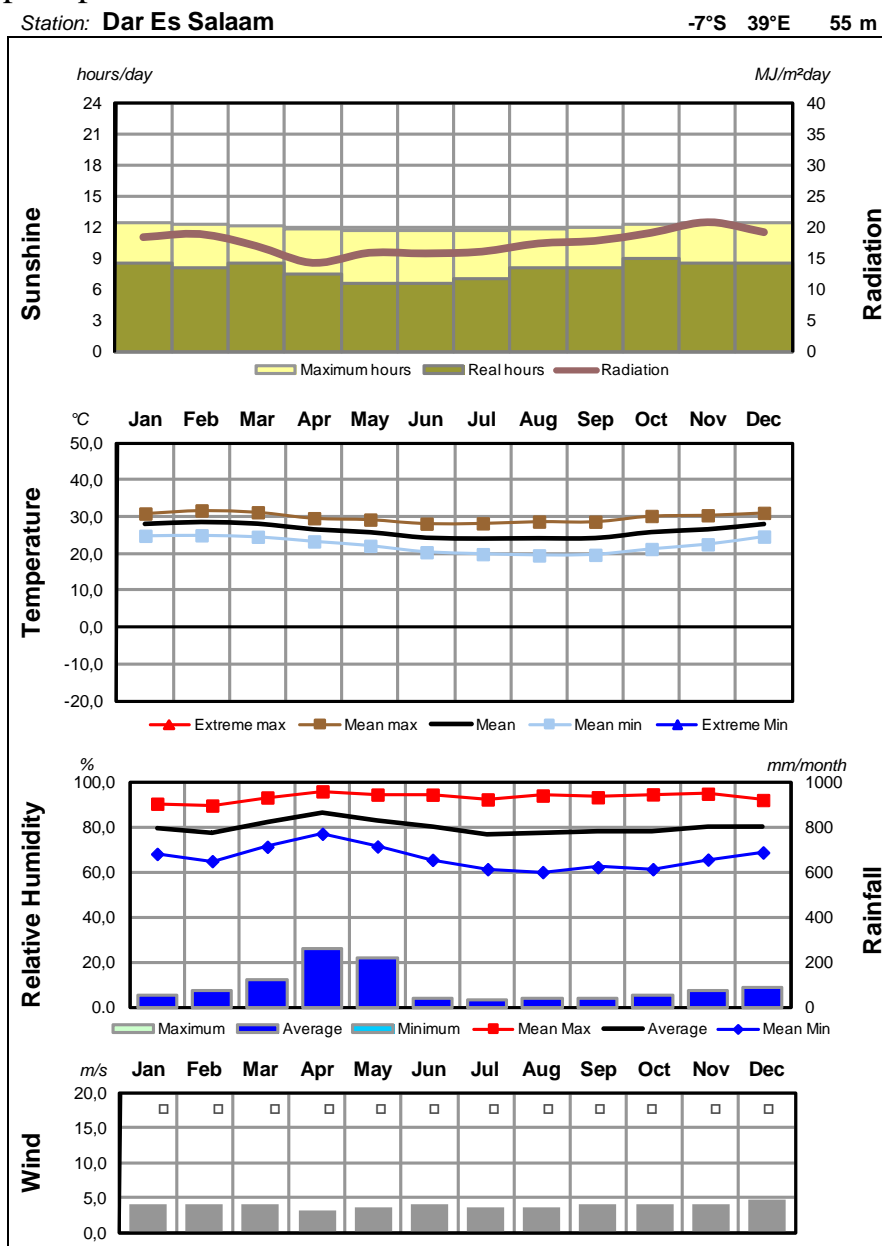


Fig 4.16 Climate data for Dar es Salaam used in the climate analysis

To get a sense of the climate in Zanzibar we used the closest available climate data to Zanzibar, Dar es Salaam. With the climate data of Dar es Salaam we used the Mahony tables and Givoni chart to illustrate the climate in diagrams. The diagrams (Fig 4.16) show the differences of solar radiation across months. Due to the long rainy season during March, April and May the value of solar radiation decreases. On the other hand, during the long rainy season flooding is a big problem for low-lying houses. The temperature and humidity is quite stable during the whole year but some increase in humidity occurs during the rainy seasons. Zanzibar is exposed to an even breeze during the whole year.

4.3.1 General Climate Recommendations

From the Givoni chart, we see that there is a great need to dehumidify the air, when the humidity is usually between 70 to 100 percent throughout the whole year. In practice this normally means that air-conditioning, which apart from lowering the air temperature also lowers the humidity, has to be used. From Givoni we can also see that the upper thermal comfort is around 26 degrees Celsius. This can be increased to 30 degrees Celsius if there is adequate ventilation.

The Mahoney tables recommend large openings between 40 to 80 percent of the vertical building area. The positioning of openings in the houses should be placed in walls facing North and South, at body height on windward side. The structure of the house itself should be constructed in a single banked way (see Fig 4.17) in a North and South direction (along the East-West axis). Roofs, walls and floors should be made out of light, low thermal capacity, materials to prevent *time-lag*. Surfaces in contact with solar radiation should be painted in bright colours to reflect as much sunlight as possible. The houses should also be constructed with a well-functioning drainage system, due to the large concentrated amount of rainwater during rain seasons.

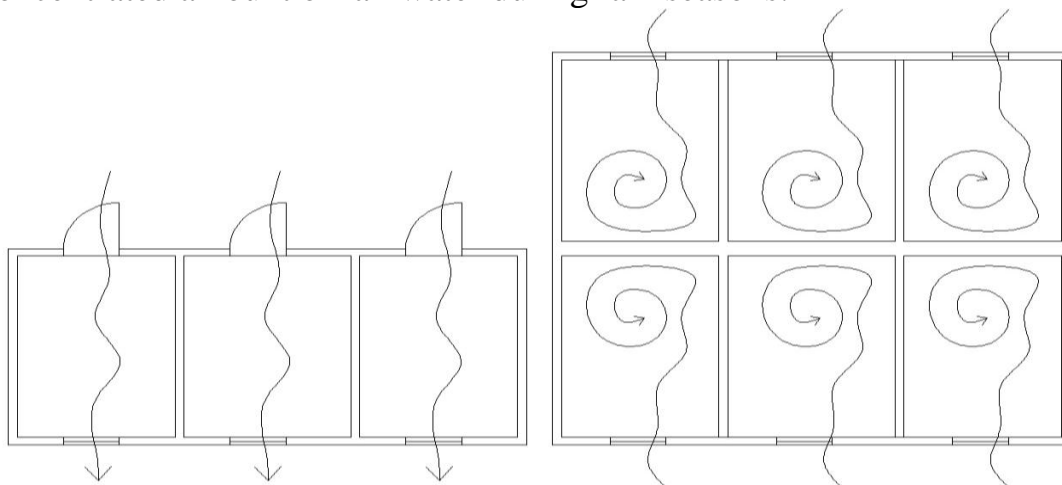


Fig 4.17 To the left, single banked house construction. To the right, double banked house construction

5 Recommendations for Sustainable Urban Development from Swahili Houses to Apartment Houses

5.1 Recommendations related to Densification

- **Building vertically**
Density becomes higher by building more vertically in the city. This allows the population and development to increase without the city growing in periphery in a low-rise horizontal way.
- **Creating local centers**
By creating small local centers in the various districts, they obtain better communication and commerce but these centers also act as a central meeting place in the area in comparison to only have a single central point in the city.

5.2 Recommendations related to climate improvement

- **Solar radiation and Precipitation**
There should be sun protection for windows and other openings in the buildings to reduce solar radiation and thereby improve the indoor climate. During the two periods of high precipitation during the year there has to be a good drainage system to avoid problems with flooding and destruction of the houses.

5.3 Recommendations related to ventilation

- **Construction**
A single banked house construction with large openings between 40 to 80 percent of the vertical building area. This will help to take advantage of the natural breeze.
- **Technical equipment**
Air-conditioning will help to dehumidify the air and will lower the indoor temperature.

5.4 Recommendations related to improvements on services and infrastructure

- **Water supply**

Building new water towers, since those who are available can't provide the city to the extent needed. It's not a sustainable solution to maintain a multi-storey building with the small water pumps that are used. An alternative is to use a smaller number of pumps, but larger with more capacity. By using the service of one pump per multi storey house it will simplify the distribution of water as it radically reduces the number of service points.

- **Garbage handling / disposal**

A simple form of garbage handling can be obtained by mounting a vertical tube in apartment houses, which leads to a container litter can be reduced and a more pleasant appearance can be achieved. However, this requires that the garbage can be transported and handled in a different place.

- **Public Transportation**

Better public transport links between existing and new multi-storey housing areas is required.

- **Market / Supermarket and shops**

It is important to integrate local markets and supermarkets in residential areas, also make it possible to have business in the ground floors of the apartment houses.

- **Attractive environments**

A more varied orientation of buildings, more green and social areas. Create basic exercise facilities close to the residential areas. Simply integrate social spaces.

- **Maintenance of the buildings and the surrounding areas/ neighbourhood public spaces**

To get people to feel comfortable requires not only that the home is functional the environment around the house should also be appealing. This is a difficult task to improve due to the owner of the houses', the government, lack of funding and that the residents neither have a financial interest or money for maintenance and improvements. One way to overcome this obstacle is to give the residents themselves responsibility, shared between one another, to maintain and improve the area. Some problems can still be seen like the risk of seeing these

common areas as property divided between those who are put in charge of them. In this case, the surfaces will not be available to all residents a common residential area as intended.

5.5 Recommendations related to improvements on social aspects

- **Awareness campaigns**

Produce information to increase awareness, to make people conscious on the advantages of living in a multi storey building. An alternative may be to do a display apartment so everyone can be able to have a look. Increased interest for apartment houses can be achieved by pointing out the positive things, for example a better indoor climate.

- **Safety**

Inevitably there is some crime and corruption that is slowly increasing, but thought all the people feel very safe. It is important to understand the value of and maintaining the security that people feel and work with the crime there is to maintain safety and security.

- **A good mix of public space**

Designing good public space that can be used safely by the community, for instance using yards as semi-public spaces for the families living in the multi storey buildings.

6 Discussion

Former housing projects in Zanzibar have not only been unsuccessful. Many problems have been solved while others have not been taken into consideration. We see many benefits of the efforts made and we intend to start to point out the positive elements of these.

Apartment buildings that are built to improve the living standards of low- and middle-income earners on the island are inhabited, and the residents feel safe in their living situations. There is a sense of community in the different housing types, but this is not improved by its architecture. A specific example of this is the type of benches, Barazas, which is moulded in the Swahili houses' foundation, they allow a social meeting place for the neighbourhood. These benches are not included in the housing projects and have significantly reduced the social space in the apartment buildings.

Climate differences between the traditional Swahili houses and apartment houses are considerably large. Both ambient temperature and humidity differs significantly between the two types of buildings. The residents in the Swahili houses experience higher humidity and temperature than those living in apartment houses. This is due to the thicker walls in the apartment buildings, named heavy walls in the Mahony table. They cause "time lag" which means that it takes longer for the heat to be transported through the wall. This implies a more uniform temperature variation in the apartment houses during the day compared to the Swahili houses with their thin walls, where the procedure of heat transportation is faster. The advantage of this is that the indoor temperature during the day is slightly lower compared to Swahili houses. However, this causes the indoor temperature at night to be somewhat higher than in the Swahili houses.

The humidity follows the curve of the indoor temperature, i.e. when the temperature goes down the relative humidity increases. The absolute vapour content in air is higher in Swahili houses than in apartment houses during the day's warmer period.

After all there are problems that need to be taken into consideration with the current housing situation in Zanzibar. We find that there are management problems with the housing projects that must be resolved, before moving on to improve and develop apartment houses. The state owns and charges rent matching producing and construction cost of the houses that cause problem of maintenance. The state does not handle any maintenance because they have not included these costs in the rent. The people who live in the apartments are

not willing to renovate because they don't own their apartments, or they simply can't afford it.

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8 Annexes

8.1 Climate Analysis

8.1.1 Mahoney table Results

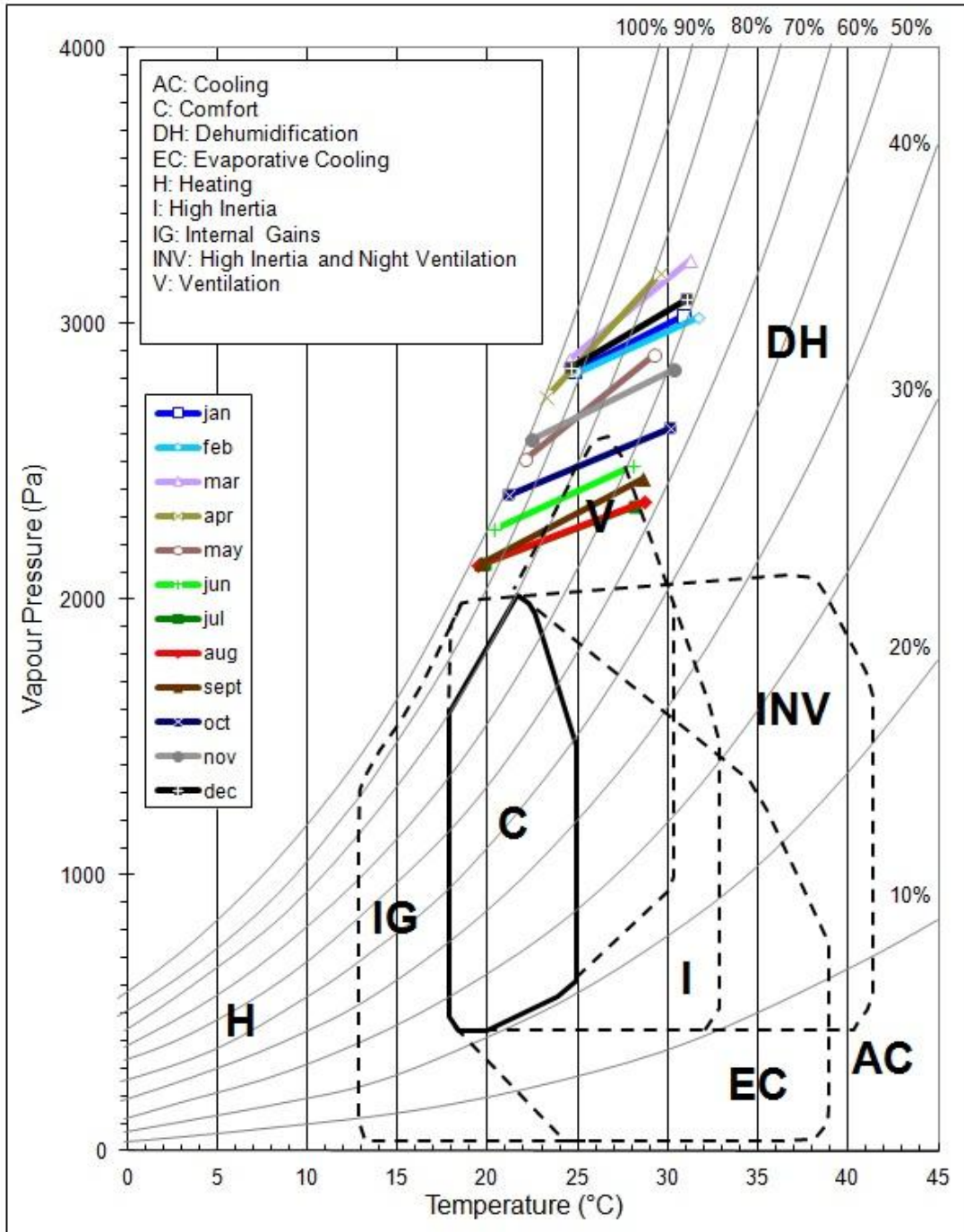
General recommendations

						Layout	
			0-10			X	Orientation north and south (long axis east-west)
			11-12		5-12		
					0-4		Compact courtyard planning
						Spacing	
11-12						X	Open spacing for breeze penetration
2-10							As above, but protection from hot and cold wind
0-1							Compact layout of estates
						Air movement	
3-12						X	Rooms single banked, permanent provision for air movement
1-2			0-5				
			6-12				Rooms double banked, temporary provision for air movement
0	2-12						
	0-1						No air movement requirement
						Openings	
			0-1		0	X	Large openings, 40-80%
			11-12		0-1		Very small openings, 10-20%
Any other conditions							Medium openings, 20-40%
						Walls	
			0-2			X	Light walls, short time-lag
			3-12				Heavy external and internal walls
						Roofs	
			0-5			X	Light, insulated roofs
			6-12				Heavy roofs, over 8h time-lag
						Outdoor sleeping	
				2-12			Space for outdoor sleeping required
						Rain protection	
		3-12					Protection from heavy rain necessary

Detailed recommendations

						Size of opening	
			0-1		0	X	Large openings, 40-80%
					1-12		Medium openings, 25-40%
			2-5				
			6-10				Small openings, 15-25%
					0-3		Very small openings, 10-20%
			11-12		4-12		Medium openings, 25-40%
Position of openings							
3-12						X	In north and south walls at body height on windward side
1-2			0-5				
			6-12				
0	2-12						As above, openings also in internal walls
Protection of openings							
					0-2	X	Exclude direct sunlight
		2-12				X	Provide protection from rain
Walls and floors							
			0-2			X	Light, low thermal capacity
			3-12				Heavy, over 8h time-lag
Roofs							
10-12			0-2			X	Light, reflective surface, cavity
			3-12				
0-9			0-5				Light, well insulated
			6-12				Heavy, over 8h time-lag
External features							
				1-12			Space for outdoor sleeping
		1-12				X	Adequate rainwater drainage

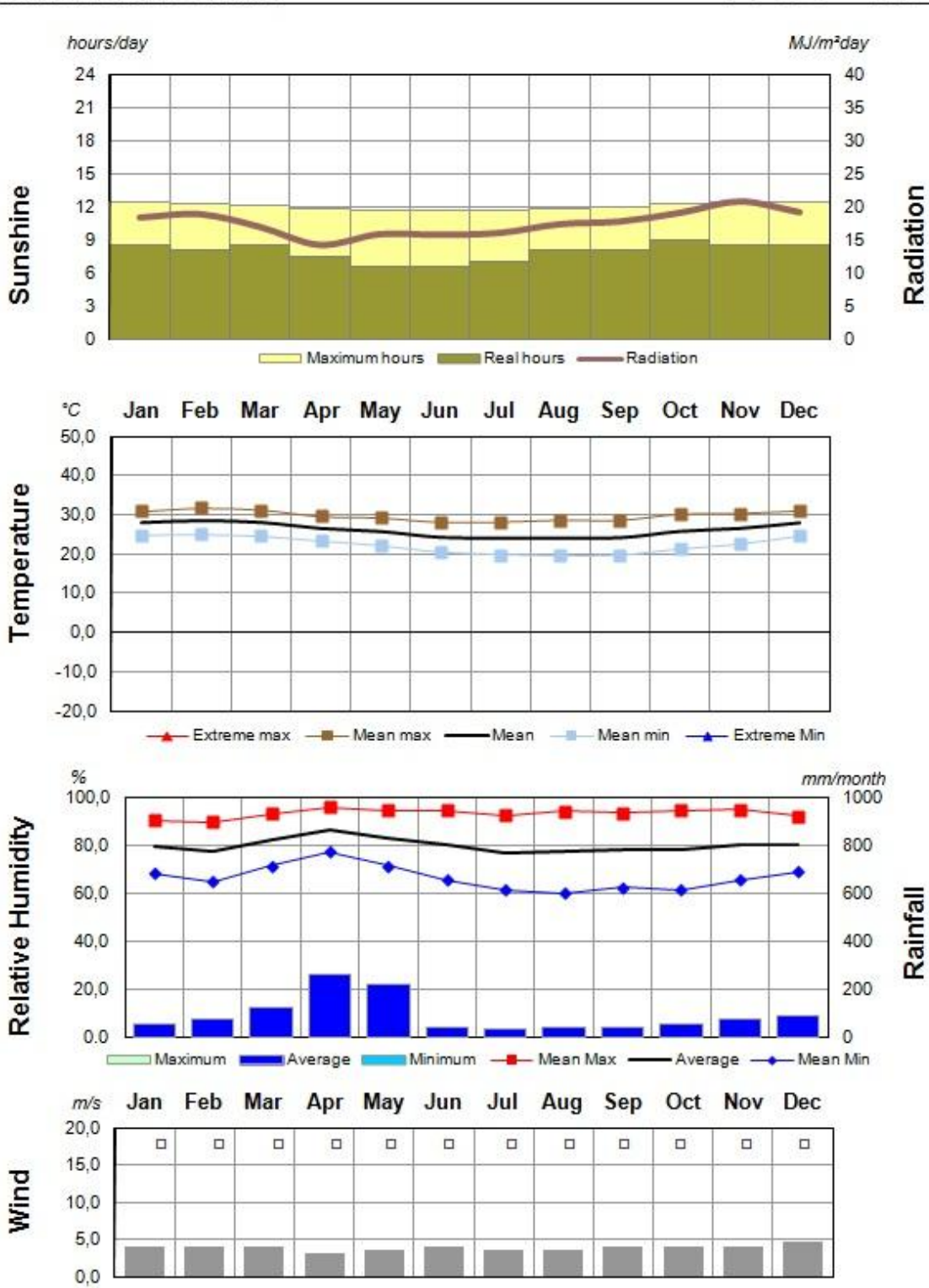
8.1.2 Givoni diagram



8.1.3 Data summary

Station: **Dar Es Salaam**

-7°S 39°E 55 m



8.2 Questionnaire

Urbanization and Density in Zanzibar - A Guideline for Sustainable Urban Development

Date: _____

Name: _____

Age: ? _____

Sex: Male Female

How many residents in the household?

1 2 3 4 5 6 7<

How many children in the household?

0 1 2 3 4 5 6<

When do the children move out? _____

Type of accommodation?

Swahili house Multifamily house Single stories Two stories
Other

Can you consider living in a multifamily/Swahili house? Yes No

Advantages with current living situation? _____

Disadvantages with current living situation? _____

Size of current accommodation? (Number of bedrooms)

1 2 3 4 5 6 7<

Number of employments in the household?

0 1 2 3 4 5 6<

What do you do for living? _____

How faraway is your workplace? _____

Do the older people live in the same house? Yes No

Do boys and girls have separate rooms? Yes No

The main positive thing of your current accommodation? _____

What do you have in your current household and is it important or not?

Electricity important	Very important	Important	Not
Water important	Very important	Important	Not
Toilet important	Very important	Important	Not

What's your average monthly housing cost? _____

Do you feel insecure in your current living situation?

Safe Neither safe/unsafe Unsafe

**Safe/Unsafe,
why?** _____

Do you live nearby your relatives and is it important to you to live nearby your relatives?

Yes No Yes No

Is it important to have social areas like green spaces or soccer field? Do you have access to such place/places?

Yes No Yes No

Is it important to have a nearby supermarket? Is there any nearby supermarket?

Yes No Yes No

Is it important to have a nearby religious place like a church or mosque? Is there any nearby?

Yes No Yes No

How is the climate in your current accommodation?

To hot Neither hot /cold To cold

To Humid Neither humid/dry Dry

Problem with indoor sun No problem with indoor sun

Furthermore: _____

Do you have any kind of problem during the two rain seasons like flooding?

Yes No

Furthermore: _____

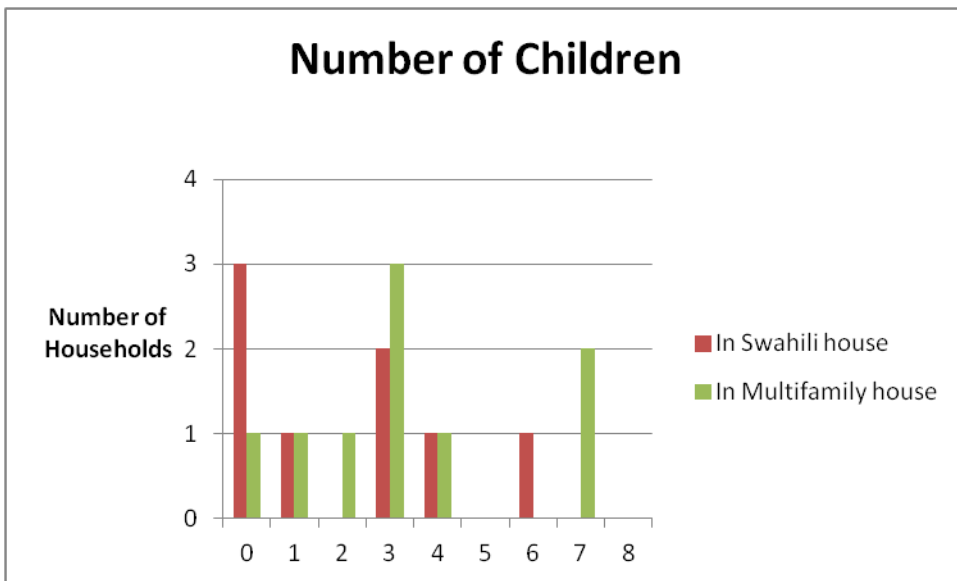
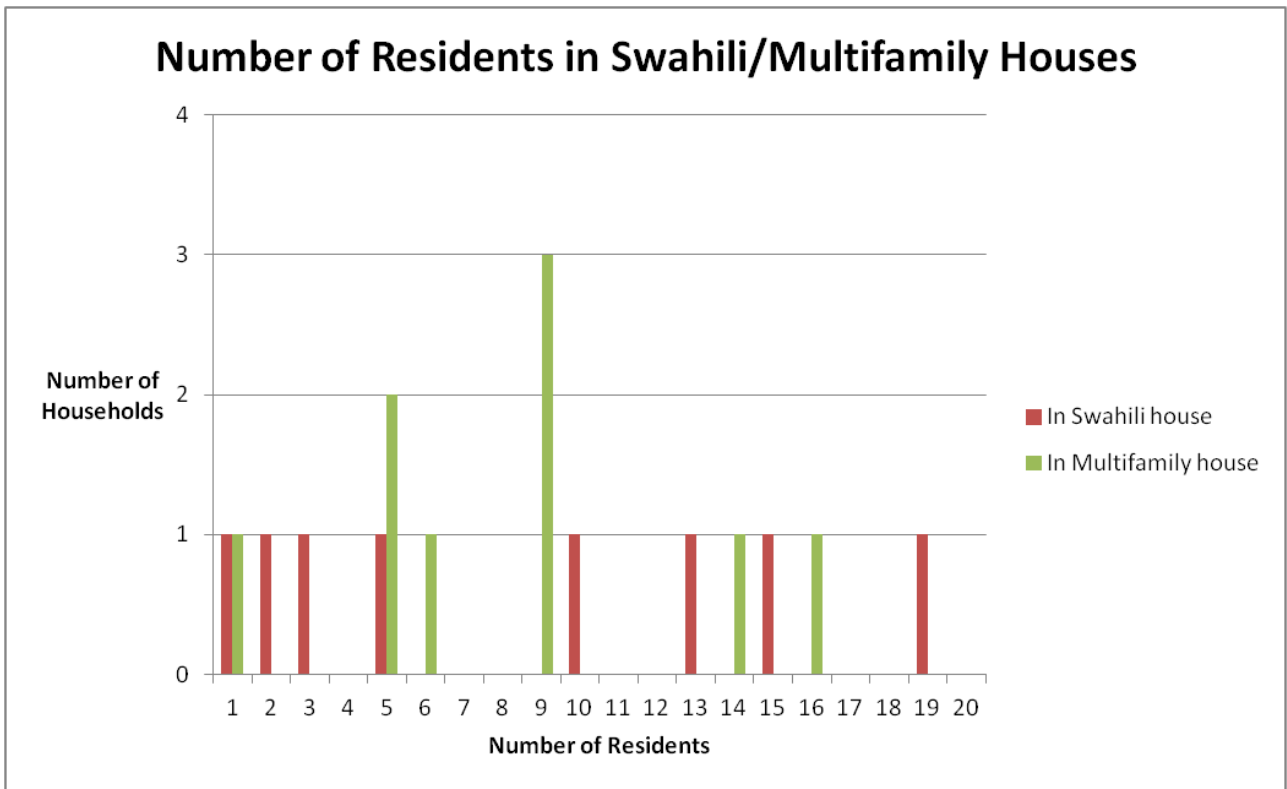
Do you have car?

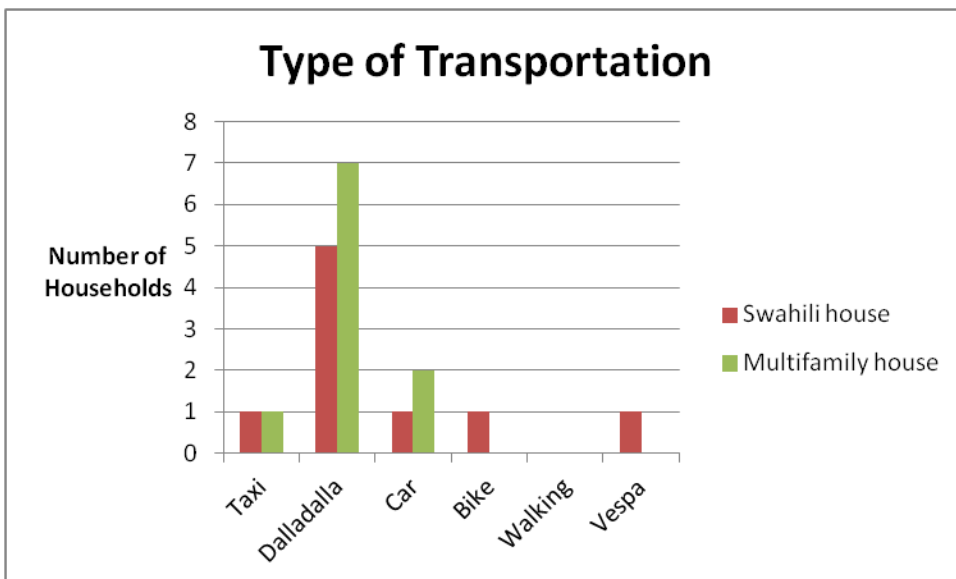
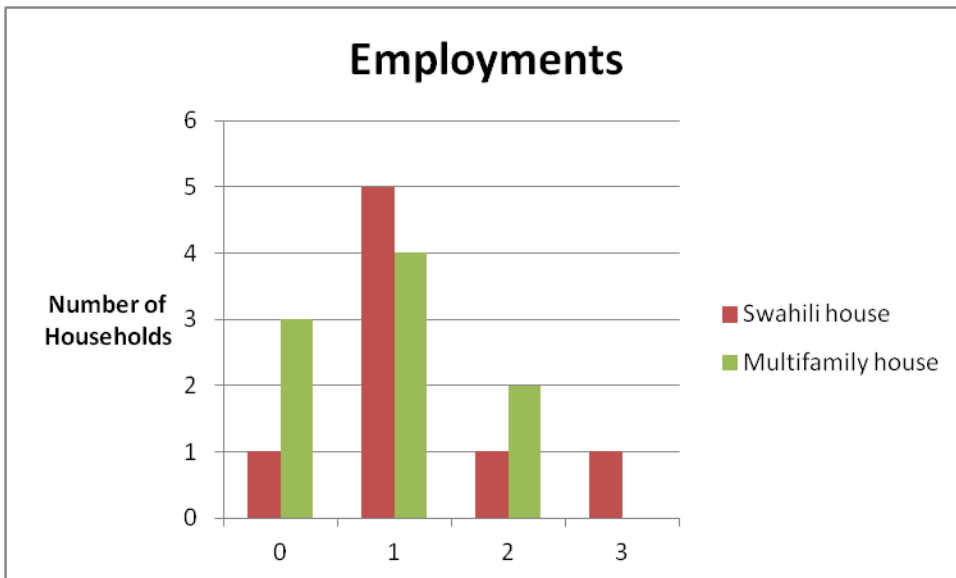
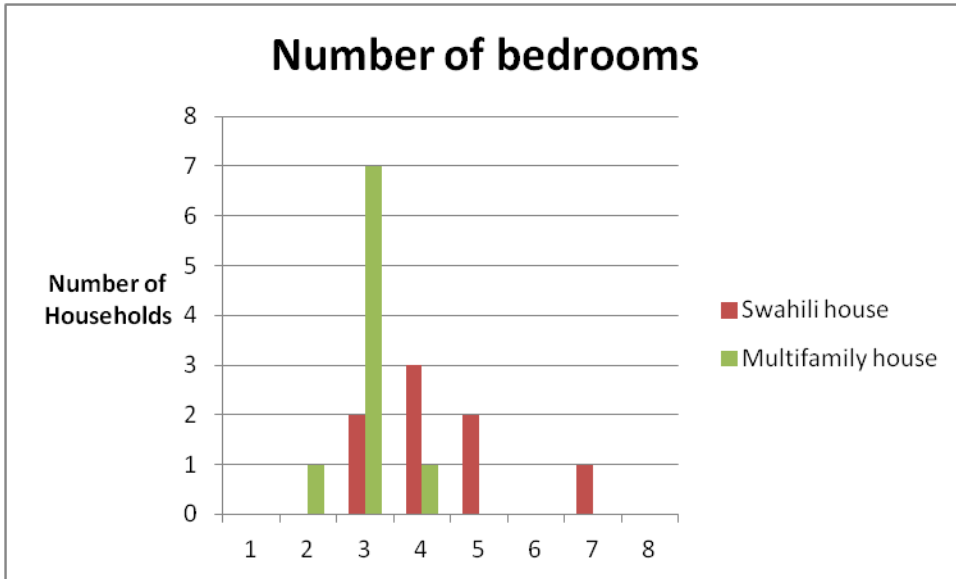
Yes No

What kind of transportation do you mostly use?

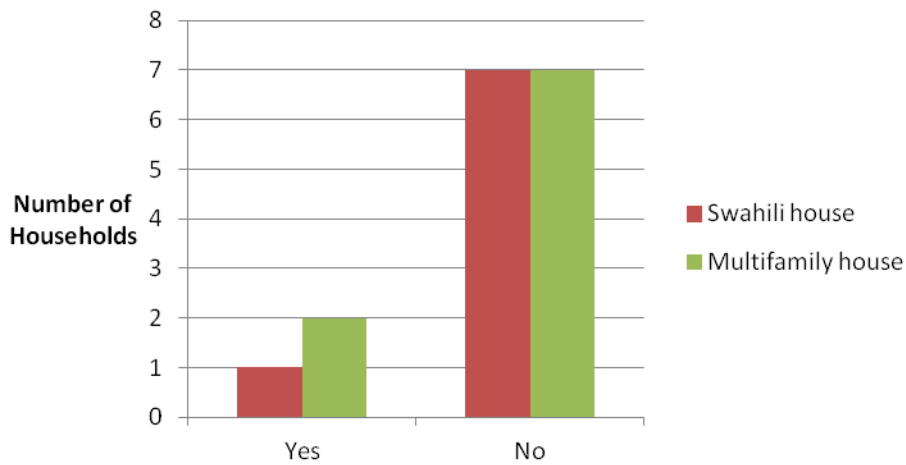
By Taxi By dalladallas By Car By Bike By Walking

8.3 Questionnaire survey results

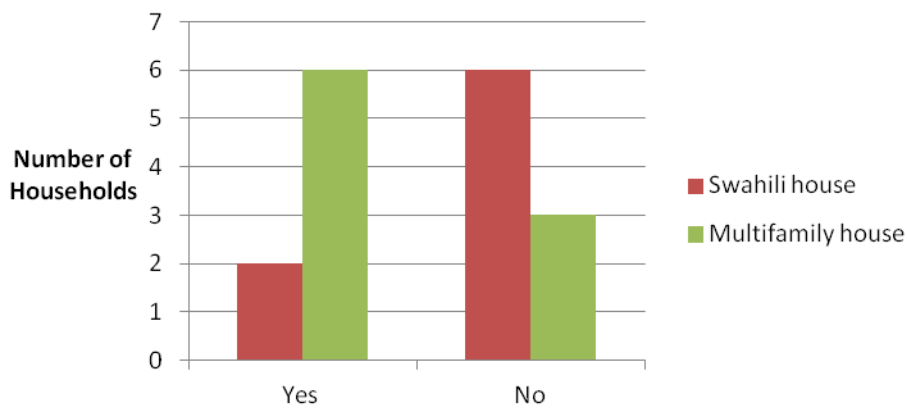




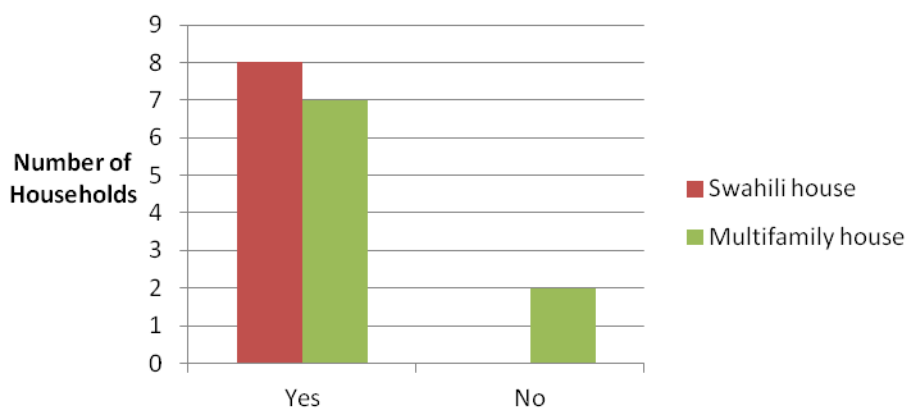
Ownership of Car



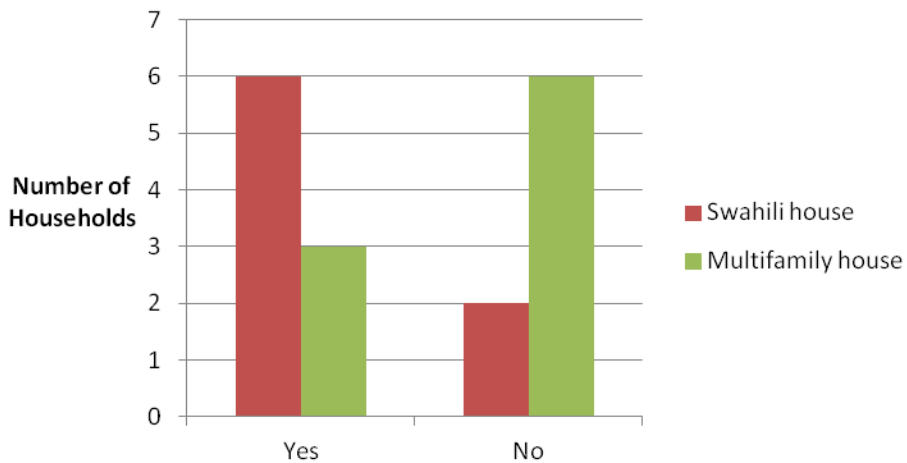
Can you consider moving to a Swahili/Multifamily house?



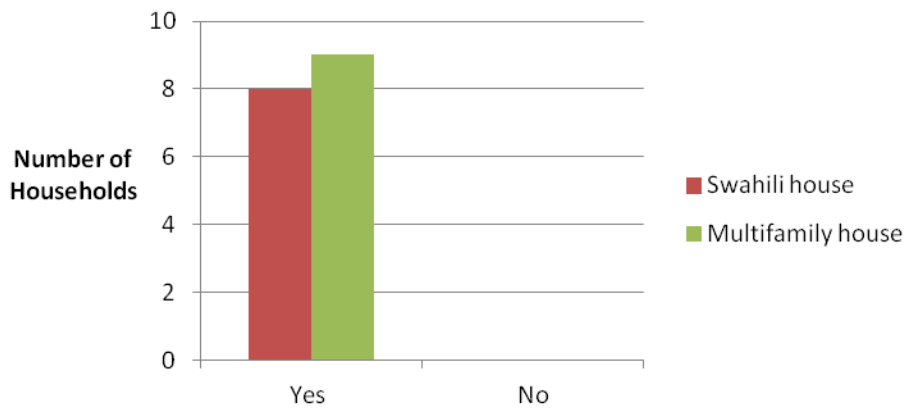
Is it important to live nearby relatives?



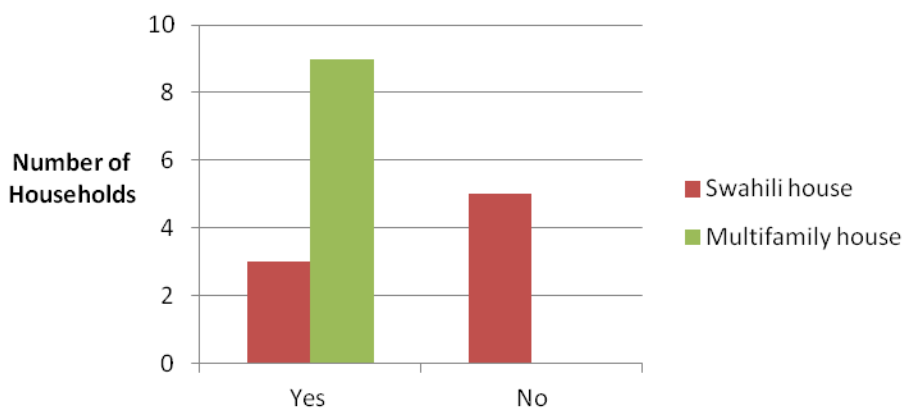
Do you live nearby your relatives?



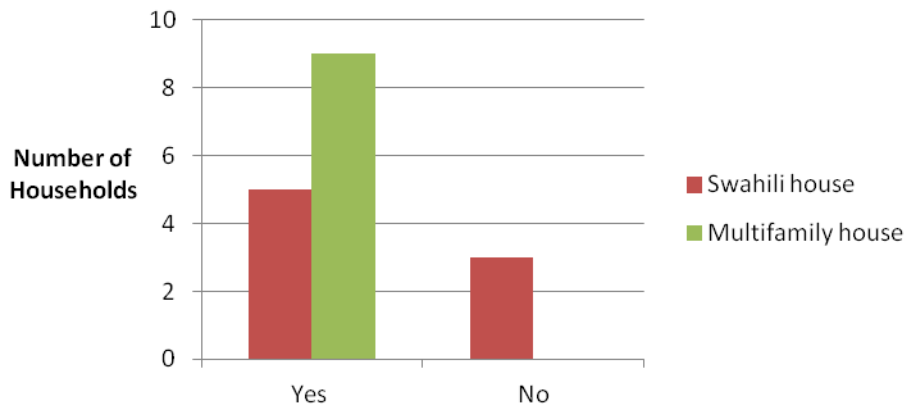
Is it important to have areas like green spaces or soccerfield?



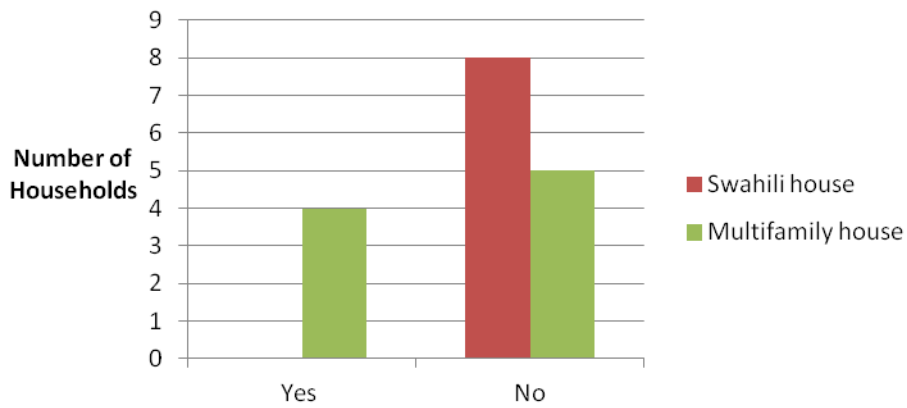
Do you have access to green spaces or soccerfield?



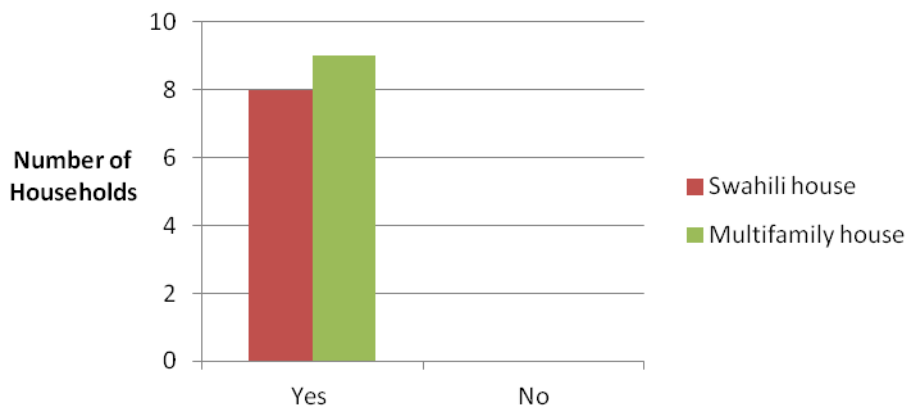
Is it important to have a nearby supermarket?



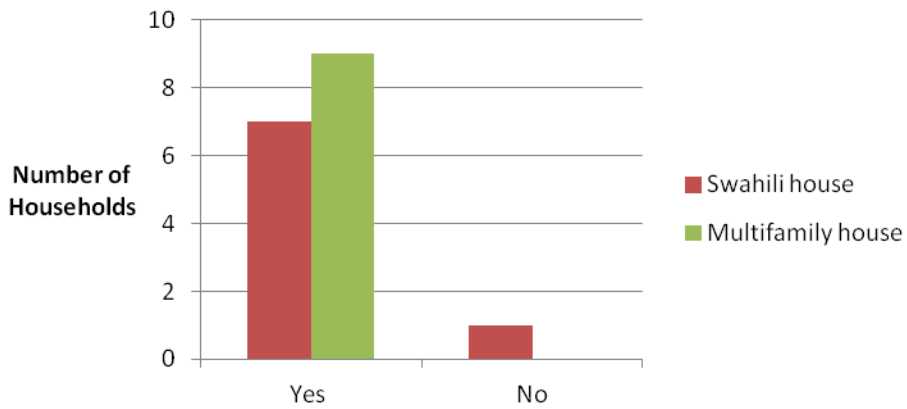
Do you have access to a nearby supermarket?



Is it important to have a nearby religious place?



Do you have access to a nearby religious place?



How is the climate in your current accommodation?

