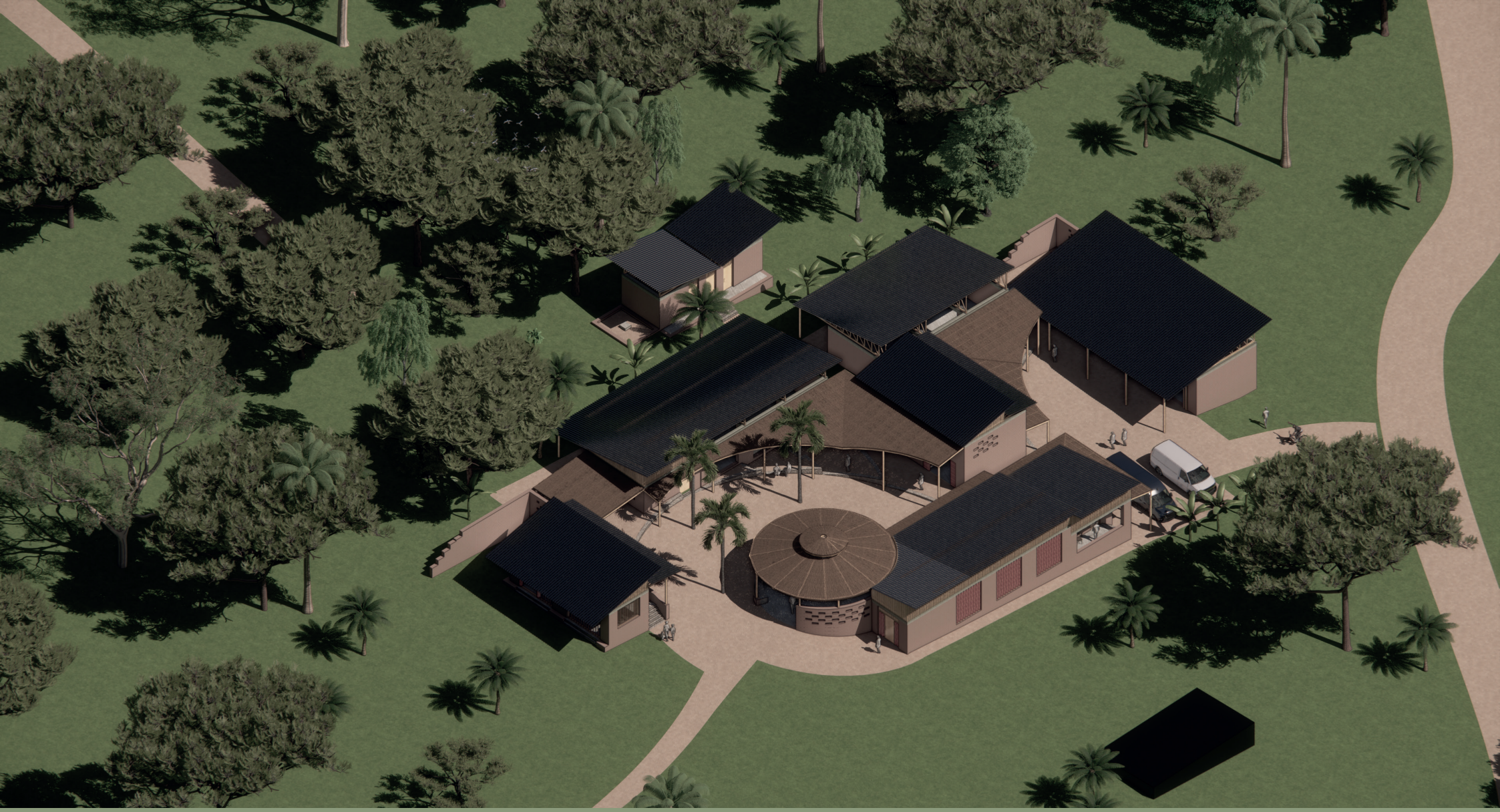

Multi-Purpose Women Center for a Community in Kisarawe - Tanzania

Enhancing social resilience through architecture

Architectural Master Thesis, Lund University
Katharina Frank
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Multi-Purpose Women Center for a Community in Kisarawe - Tanzania

Enhancing Social Resilience through Humanitarian Architecture

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1 Introduction

Fig. 1: Section perspective lecture and study space

1.1 Aim and Method

Architecture greatly influences people's lives regarding health, stability, and education and is crucial for economic and social development. This architectural thesis project aims to improve the living conditions of a marginalized community in a rural Tanzanian village, Kisarawe, through a design proposal. It analyzes the potential of humanitarian architecture from the international, European, and local Tanzanian perspectives, focusing on gender issues and women's empowerment in lower-income countries.

Tanzania is not only located on a different continent, climate and time zone, it additionally has a whole different history that shaped it into the country it is now. What is the social and economic background, and what are the area, the culture, and the people like? Which importance has humanitarian architecture and women empowerment in rural Tanzania?

For the project to be feasible, it is essential to learn about construction in lower-income countries, traditional building methods and materiality in Tanzania, and study building methods in hot and humid climates to explore an efficient and economical way to design and build. The gained knowledge is set together into a design proposal that aims to empower the women of Kisarawe. The result is a multi-purpose women's center that develops over time while providing space to feel safe for exchanging knowledge, community work, and the production of building materials. Starting with the manufacturing of cement-stabilized soil blocks as an income-generating opportunity, it grows into a construction shop that provides knowledge, tools, and materials to accomplish much-needed housing improvements for the community in and around the village.

The goal is to reduce poverty, strengthen the independence of Kisarawe's women within and around the village, and thus the resilience of the whole community.

The local Tanzanian NGO TAWAH (Tanzanian Women Architects for Humanity) acts as the local contact organization during the research phase. Interviews, meetings, and online calls are carried out with people who live in Tanzania and, or visited the country, TAWAH, and its project. The content of the research part is a sum of literature, interviews, and other materials.

1.2 Structure of Thesis and Central Question

The thesis is split into a research part and a design part. The research covers four main categories. First, it starts with a background about Tanzania's history, population, and housing situation (2.1), followed by Humanitarian Architecture (2.2) in general, as well as the role of humanitarian architecture in rural Tanzania. It also discusses its potential dangers and challenges. The role of women (2.3) in lower-income countries, focusing on the women of Kisarawe, forms the second part of the research. It discusses why and how to empower women through architecture and explains TAWAH's role. The last part emphasizes construction in lower-income countries (2.4) and what should be considered. This includes the process of designing, traditional construction methods, local materiality, architectural Swahili elements, climatic design principles in a hot and humid climate, and affordability and sustainability.

The second part of this thesis includes the design project, explained in text, diagrams, and drawings. This part is divided into a site analysis, an explanation of the concept, and the construction methods.

The overall aim is to explore what opportunities humanitarian architecture gives to improve the living conditions of lower-income groups. The main question the project is trying to answer is:

What kind of architecture can promote the **existing soil block production** as an **income-generating** activity for the women of Kisarawe, make use of their **unused potential** for an **economic contribution**, with the **GOAL** for them to have a more **self-sufficient and secure way of living**?

2 Research

Background
Tanzania

Humanitarian
Architecture

Gender Issues in Lower-
Income Countries

Construction for
Lower-Income Groups

The research part is divided into four main subcategories. It begins with background information about Tanzania's history, culture, and population, followed by a foreword on humanitarian architecture in general and the role of humanitarian architecture in Tanzania. The second half of the investigation is about gender issues in lower-income countries, focusing on the preservation and life of women in Kisarawe. Finally, it ends with how to construct in lower-income countries, showing techniques and materials that are utilized and can be applied to the design proposal.

2.1 Background Tanzania

Fig 2: Tanzania with its bordering countries in Africa

2.1.1 Numbers and Facts

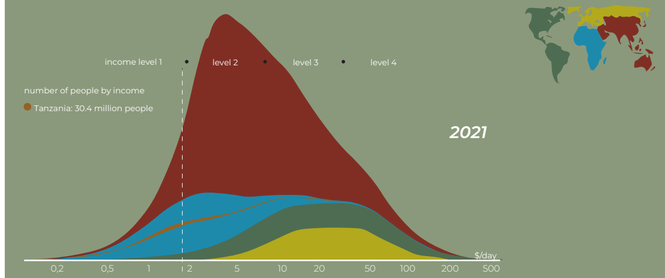
Tanzania is an East African country situated just underneath the equator. Its capital is Dodoma, and the largest city is Dar es Salaam. It borders Kenya to the North, the Indian Ocean to the East, Mozambique and Malawi to the South, and Burundi and Rwanda to the West. Tanzania had about 60 million habitants in 2020, with an increase of almost 3% per year (World Bank, 2022). The official national language is Swahili, and about 15% of the population has at least some knowledge of English. The country hosts over 100 ethnic groups and the top 3 religions are Christianity (63,1%), Islam (34,1%), and traditional faiths (1,2%).

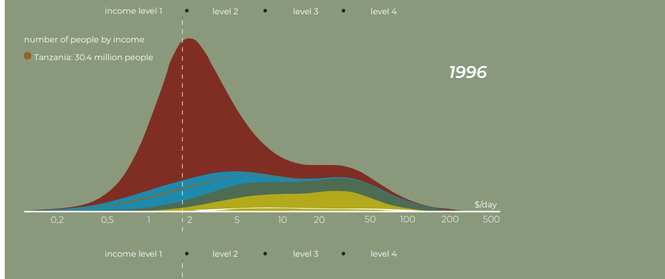
The government is a Unitary dominant-party presidential republic. The 6th and first female president of the country, Samia Suluhu Hassan, was elected in 2021. The country has gained its independence from the United Kingdom and the German empire since 1961. (CIA, 2022) Due to steady economic growth, Tanzania developed from a low-income country to a lower-middle-income country in July 2020 (World Bank, 2021). Lower-middle-income countries have a GNI per capita between $1,046 and $4,095. GNI is the total amount of money earned by a nation's people and businesses and measures the nation's wealth from year to year. In comparison to that, Sweden had a GNI of $56,270 in 2020 (World Bank, 2022). Despite that improvement, the country still faces many challenges that the government cannot always bear on its own. Due to its surrounding conflicts, Tanzania has been host to many refugees, especially Burundi.

Additionally, vulnerable Tanzanian communities still miss access to basic services, unemployment is an issue, and because of more minor, artificial crises, poverty reduction attempts have been slowed down. (International Rescue Committee, 2022). 82% of Tanzanians working population work in vulnerable employment. Sweden, in comparison, has 6,1% of vulnerable employment (United Nations Development Programme, 2020), which by definition means that they either are self-employed workers without employees or unpaid family workers. (Worldbank, 2022)

2.1.2 Tanzania Population

Figure 3 shows Tanzania's income compared to the world in 1962, 1996, and 2021. Despite the development and national poverty rate falling from 34.4% to 26.4%, 8% out of the 60 million habitants still live beneath the extreme poverty line. Living beneath the poverty line means that the people have less income than what is needed to fulfill their basic needs. (Worldbank, 2022)





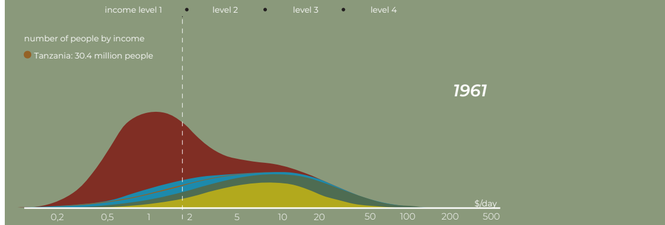


Fig. 3: Number of people by income in 1962, 1996, and 2021 (Gapminder, 2022)

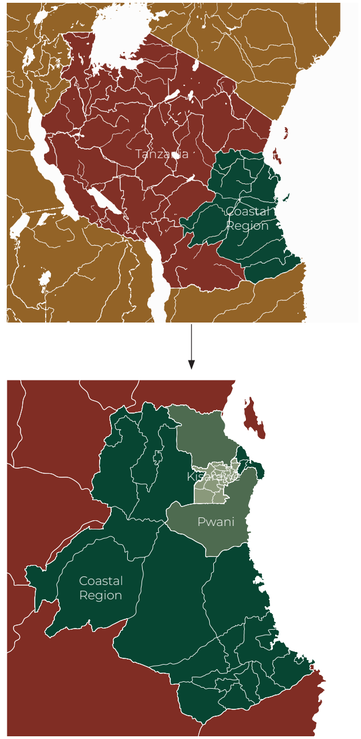


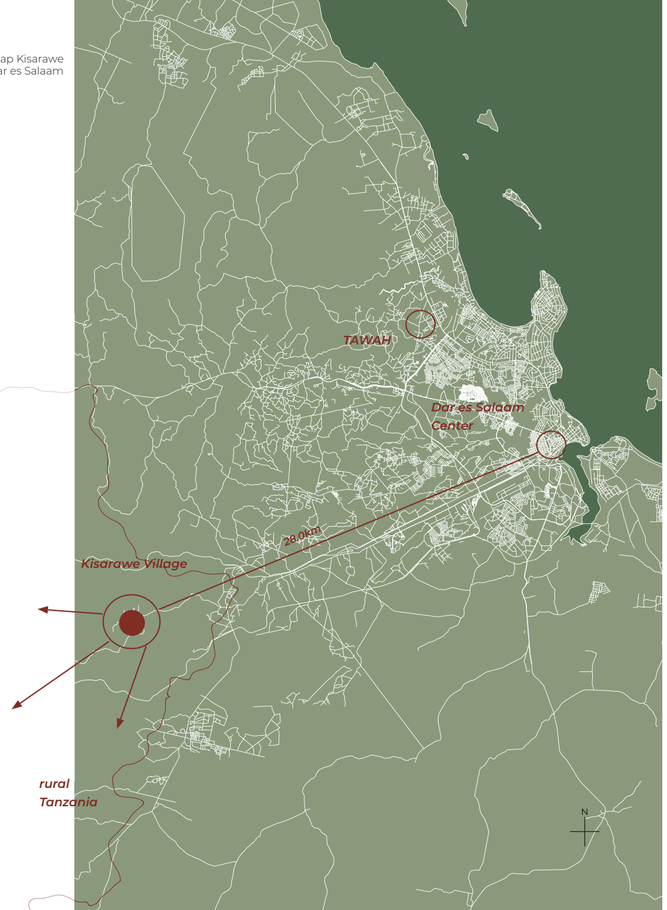
Fig. 4: Coastal Region, Pwani Region, Kisarawe District on the East side of Tanzania

2.1.3 Site Kisarawe + Pwani Region

This research focuses on the small village Kisarawe in the Kisarawe District and Pwani region. The Pwani (=Coast) Region is one of the 31 regions in Tanzania and consists of 6 districts. The regional capital is Kibaha. One of the Districts is the Kisarawe District which borders the West of Dar es Salaam. The district is divided into 18 wards and had a population of 95.614 people in 2002 and 101.598 in 2012 (Tanzania National Bureau of Statistics, 2012). By the time of the thesis, the national Census 2022 is not published. In 2012, 61% of the population over five years spoke Swahili, 9% Swahili and English, and 29% were analphabets. 2020 there were 87 primary schools, 21 secondary schools, one hospital, three health care centers, and 31 pharmacies in the region. The landscape is hilly with three nature reserves (Kazimzumbwi, Pugu Hills, Ruvu South). (Tanzania National Bureau of Statistics, 2012). Kisarawe village is 25km away from the outskirts of Dar es Salaam, which counts as the commercial center of Tanzania, and a 15 minutes drive from the international airport Julius Nyerere. (Kisarawe District Council, 2022)

The Municipality of Kisarawe District aims to provide `*quality service and a conducive investment environment through efficient and effective use of available resources, community engagement, and good government for sustainable livelihood*´ (Kisarawe District Council, 2022). Kisarawe is home to many ethnic groups, including Wazaramo, and different cultures and religions. The predominant labor is farming (vegetables, cereals, roots, crops, fruits), pastoral (cattle, chicken, fish, rabbit, goats, sheep), and mining (karoline, sand, kokoto). The municipality provides the distribution of water infrastructure, advice for wells drilling, and infrastructure maintenance. The last architectural projects mainly concentrated on schools and education for children and health centers. (Kisarawe District Council, 2022)

Fig. 5: Map Kisarawe Village - Dar es Salaam



2.1.4 Surrounding

Although infrastructure makes it challenging to travel quickly from place to place in Tanzania, Kisarawe is pretty close to Dar es Salaam. However, the city will be described more precisely in the next paragraph because of its importance in the accessibility of building materials, whether locally fabricated or imported. Dar es Salaam, which means Haven of Peace, is located at the coast of the Indian Ocean. The city was established in 1862 as a port and trading center to support the new caravan routes and open them up to inner Africa and thus evolved around the harbor (UN-Habitat, 2009). Due to its potential, it grew fastly. The German colonial government moved the capital from Bagamoyo to Dar es Salaam in 1891. (Maurus Baruti, 2022). Dar es Salaam had a land area of 1590km^2 and a population of 4,3 million in 2012, with a population growth of 5% per year. The history of this city is divided into three eras before the time of independence. The Arab era (1862-86), the German colonial era (1887-1923), and the British colonial era (1916-1961). It gained its independence in 1961 and unified with Zanzibar in 1964. (UN-Habitat, 2009) TAWAH's office is situated on the outskirt, of Dar es Salaam, a two-hour drive away from Kisarawe village.

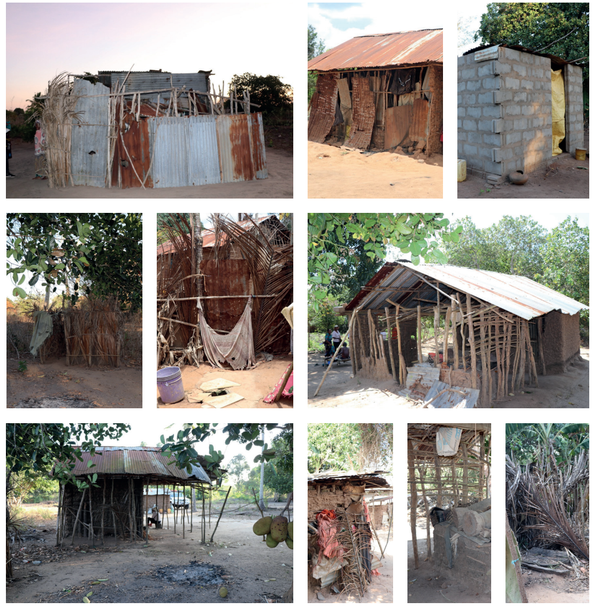


Fig. 6: Pictures of Kisarawe Village taken by TAWAH

2.1.5 Tanzania Housing Situation

The country has a massive shortage of affordable and good-quality buildings in rural areas and cities, where over 70% of the population lives in informal settlements. Although Tanzania's poverty rate dropped, inequality, especially in rural Tanzania, has increased. Poverty directly impacts housing, which leans to be less durable, made out of mud and thatch without proper ventilation, indoor plumbing, or sanitary facilities (Julius Bär Foundation, 2020). Vise Versa, the quality of housing has a direct impact on poverty.

Only 18.8% of the rural population has access to electricity (United Nations Development Program, 2020), which is not to be underestimated. Electricity is overly vital for a path out of poverty. It provides the opportunity to study even in the dark, charge devices, and more time for the population to carry out income-generating activities. Due to the closeness to the equator, the sun rises at around 6 am and goes down at around 6 pm throughout the year. Therefore, natural daylight is limited to that timeframe. While 139 out of 100.000 people struggle with ambient air pollution in the household, 38,4% have unsafe water, sanitation, and hygiene services. (International Rescue Committee, 2022).

The dwellings in Kisarawe are no different from that. The images show the living conditions of the population of Kisarawe. The housing has a low and often dangerous standard. The kitchen space is often not separated from the sleeping room and is on the ground. The walls are often built out of mast tree construction and mud walls, with wood structures holding tin roofing or walls. Some higher-standard homes have brick walls, which is something the people wish for. Most women live with their children and husbands in two or three rooms.

2.2 Humanitarian Architecture

2.2.1 What is Humanitarian Architecture?

Architecture has the power to influence people's lives regarding physical and mental well-being and economic stability. It can provide and promote development in almost any respect. In this context, it is beneficial to explain the thought behind humanitarian architecture by explaining humanitarian aid in general. Humanitarian aid often rises out of the thought to give resources, time, and knowledge to people and communities less privileged to improve their lives. In the words of Ruth Bader Ginsburg: ‚*To make life a little better for people less fortunate than you (...) One lives not just for oneself, but for one's community.*' (Ginsburg, 2017) Humanitarian aid often starts with imagination to make the world a better place on a personal scale. Imaginations like that led to the emergence of organizations of all kinds. Whether local or global, all of them have the means to do good in common. One example of many is the United Nations (UN). The UN is classified as an Intergovernmental Organization (IGO) that rose after World War II out of the thought of connecting the world and operating closely together with the result of social improvements almost everywhere. (Gapminder, 2022). The UN describes itself as a place where nations can gather together, discuss common problems and find a shared solution. It now has 193 Member States, which means that almost the whole world is connected through the organization. (UN, 2022) Big non-governmental organizations (NGOs) that work amongst others in the field of architecture, such as Habitat for Humanity, Shelter Global, or Architects for Peace, often work together with the United Nations Agency UN-Habitat, with the notion of making the world a better, more collaborative, and connected place. In addition, local and global humanitarian organizations often work together to combine and exchange knowledge, experiences, and financing. Nevertheless, there are a lot of global challenges that still need to be faced. For that reason, the UN member states developed the worldwide Sustainable Development Goals, which serve as indicators of issues that need to be addressed locally and sometimes globally. For instance, one enormous challenge worldwide is population growth, which offers opportunities but introduces challenges that often are hard to overcome by local governments alone. Humanitarian aid reduces the impact of possible crises on communities, supports recovery and development, and improves resilience for the future. Here the building sector plays a significant role in improving living conditions for poor communities. It provides employment opportunities and toughens socially disadvantaged groups and communities by creating spaces to live and work. Its goal is to improve living conditions for a more sustainable and healthy existence.

2.2.2 Humanitarian Architecture in Tanzania

In order to explain the role of humanitarian architecture in Tanzania, it is helpful to look at global data that gives a good insight into the humanitarian situation in a country. One figure here is the Human Development Index (HDI). The Human Development Report uses The HDI to measure a country's development through life expectancy, education, and per capita income. While it only shows the maximum potential of development and does not consider inequality within a country, it thus does not mirror the actual situation. On the other hand, the IHDI (Inequality-adjusted Human Development Index) is a more accurate indicator of the current development. (United Nations Development Programme, 2022) Figure 8 shows the improvement of the HDI in Tanzania over the last 220 years. Life expectancy has more than doubled while income is more than five times high. Figure 9 summarizes a few relevant data about Tanzania from the 2020 Human Development Report. The HDI in 2020 is 0,529, with a world rank of 163. In comparison to that, Sweden is ranked 7 with 0,945. The HDI in the Pawani region is even lower (0,506). The IHDI, however, lies far beneath (0,397), which is very low and shows the weight of inequality in Tanzania. There is 27,0% of inequality in education and 22,4% in income. Furthermore, the poorest 40% hold only 17,4 % of income shares (2010-2018), and the wealthiest 1% hold 16,2%, which is almost the same amount. Life expectancy for Tanzanians is 65,5 years and the expected years of schooling is 8,1. (United Nations Development Programme, 2020) Most of the women of Kisarawe went to school for formal education, which means seven years. (TAWAH, 2022)

In Tanzania, international and National NGOs work together to achieve the Sustainable Development Goals (SDGs). The following list and figure 7 show the SDGs. The marked ones show which ones are addressed in the thesis design project.

1. No Poverty
2. Zero hunger
3. Good Health and Well Being
4. Quality Education
5. Gender Equality
6. Clean Water and Sanitation
7. Affordable and Clean Energy
8. Decent Work and Economic Growth
9. Industry, Innovation and Infrastructure
10. Reduced Inequalities
11. Sustainable Cities and Communities
12. Responsible Consumption and Production
13. Climate Action
14. Life Below Water
15. Life on Land
16. Peace, Justice and Strong Institutions
17. Partnership for the Goals

Fig 7: Sustainable Development Goals (United Nations, 2022)

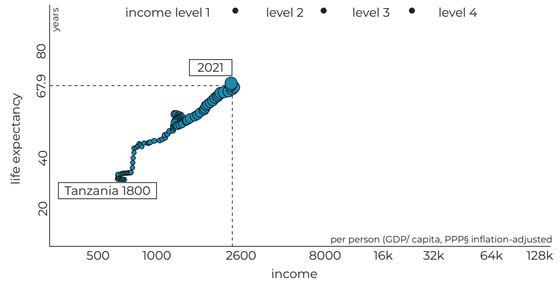


Fig. 8: HDI measured in Life expectancy and GDP Capital (Gapminder, 2022)

	Tanzania	Sweden
HDI (Human Development Index)	0.529/ World Rank: 163	0.945/ World Rank: 7
Life expectancy years	65.5 years	82.8 years
Expected years of schooling years	8.1 years	19.5 years
IHDI (Inequality adjusted Human Development Index)	0.397	0.882
Coefficient of human inequality	24.9	6.5
Inequality in education	27.0%	3.7%
Inequality in income	22.4%	13.0%
Income shares held by (2010-2018)	Poorest 40%: 17.4% Richest 10%: 33.1% Richest 1%: 16.2%	Poorest 40%: 22.5% Richest 10%: 22.3% Richest 1%: 9.0%
Gender development index	0.948/ World Rank: 3	0.983/ Rank: 1
Gender inequality index	0.556/ World Rank: 140	0,039
Population with some secondary education (age 25 and older, 2015-2019)	Female: 12.0% Male: 16.9%	Female: 89.3% Male: 89.5%
Vulnerable employment	82.7%	6.1%
Household and ambient air pollution (per 100.000)	0,139	0.007
Unsafe water, sanitation and hygiene services	38.4%	0.2%
Gender inequality index (development/ year)	-0.5	-0.2
Overall loss in HDI value due to inequality	-1.5	-0.2
Income share of the poorest 40% (development/ year)	-0.2	-0.3

Fig. 9: Human Development Report 2020 (United Nations Development Programme, 2020)

2.2 Humanitarian Architecture

One of the organizations working in Tanzania is UN-Habitat. Their goal is to enhance the impact's coherence, efficiency, and effectiveness, emphasizing leaving no one behind. In 2018 they started the Zanzibar Joint Program with a significant focus on gender equality split into seven areas: Youth and women's empowerment, violence against women and children, water, sanitation and hygiene, agriculture, health, HIV, and nutrition. (United Nations, 2022) Doctors Without Borders has also been active in Tanzania for a few years, with the main focus on the large Nduta refugee camp, hosting over 70.000 Burundian refugees.

Other NGOs like Deswos, Engineers without Borders, and others have been active in the country. Despite the means of international NGOs, the participation of local NGOs is crucial. A local NGO being responsible is much needed to achieve successful projects in the long run (Johansson & Pering et al. 1990). For this project, the local NGO that is being focused on is TAWAH, founded by Victoria Marwa Heilman and others. They are situated in Dar es Salaam, focusing on improving the living conditions for marginalized communities in rural areas around Dar es Salaam. The organization will be explained in detail further on.

2.2.3 Process of designing in lower-income countries

It is essential to follow some principles when designing with and for a marginalized community in a lower-income country. In all of the steps, it is necessary to be sensitive and open-minded, and to be as empathetic as possible. Maintaining a flexible approach can eventually lead to a more sustainable and successful outcome of the project, encouraging development and initiative for an enhanced and sustainable social resilience. (Sandman & Suomela, 2021)

Empathy in that matter means identifying social and economic factors and honoring local architectural features. Right at the beginning, it is crucial to define the priorities and needs of the user. A starting point from where the project can develop with a bottom-up approach. (Sandman & Suomela, 2021)

A strong feasibility and research study helps close the gap between different perspectives as much as possible. Preparations include understanding the local culture, religion, social patterns, and economic and traditional building methods. The goal is to determine the local population's needs and wishes and why and where the lacks and problems are, intending to adapt the design to local conditions (Johansson & Pering et al. 1990).

The architect's role is to appreciate uncertainty along the way and have an ongoing empathetic dialogue with the stakeholders. Some information might be hidden initially and will only appear during the process. Often poor communities tend to have a greater optimism for development. Another essential principle at the beginning of the project is the choice of standard, which is based on a balance between durability and affordability and is very much dependent on the existing local standard, resources, and economic situation. The destination is to have sufficient quality at a price that is still reasonable (Åstrand, 1996).

Furthermore, the project should not only be designed at a low cost but affordable in the long run. The maintenance should be easy and cheap, and the population should want to maintain their buildings. (Åstrand, 1996)

Working with the population's labor input can be an ideal option to solve that issue. Additionally, guaranteeing this security of tenure and creating continuity will help a project succeed. (Johansson & Pering et al. 1990)

2.2 Humanitarian Architecture

2.2.4 Danger of Humanitarian Architecture

The challenge is to find the right balance between what the population wants and needs. It is crucial to understand what is required for development and why. Even if it might be against what the population or part of it wants, working closely with local stakeholders could minimize the risk of a project not working out or even being harmful in the long run, and the participation of the community is crucial. Implementation in an exploration phase can be interviews, surveys, and other participatory rural appraisal methods (PRA). PRA-Methods incorporate the knowledge and input of rural locals in the development context. (Coghlan & Brydon-Miller 2014)

Those will give important information to the architect and raise awareness for the population and make them reflect on their surroundings, spaces, and social life (Sandman & Suomela, 2021).

2.3 Gender Issues in Lower-Income Countries

2.3.1 Introduction

Gender equality is still far from being given everywhere, and women yet miss opportunities to work. They can thus not exploit their potential nor contribute to ecological development or improve their own lives. Women often experience significant gender inequality and lower socioeconomic status in lower-income countries than men. Moreover, they have lower access to paid employment, lower access to information, and less control over assets and economic resources.

Despite women's significant role in humanitarian response and peace-building, it has been receiving very little funding (only 1% of finances according to OCHA's Financial Tracking) while focusing on closing the gender gap. The HPN action work operates to improve gender-sensitivity humanitarian action in that matter. (Subhashni & Laboukly et al., 2019) Anita Larsson (2001) argues that from the gender perspective, spatial development is still undeveloped. An essential step along the way is to identify women's specific needs and interests individually in each case. Despite this, it is essential not to see women as the victims but as the driving force in development who actively shape their everyday lives and even challenge their borders. Instead of isolating them from society, they should be put in relation, considering both men and women. A practical approach is to let women and men work together and ensure that gender is the concern of both men and women. (Larsson, 2001)

In order to reach a clear understanding of why the women of Kisarawe act the way they do, it is important to acknowledge that women and men act to secure their well-being in that exact moment, and men are not a single category as well. (Badstue et al., 2021)

2.3.2 Human Development Report

According to the Human Development Report 2020, females have a lower (0,514) development index than men (0,542) which does not even include inequality. The Gender Inequality Index in Tanzania is 0,556, whereas, in comparison, Sweden has a Gender Inequality Index of 0,039. Women in Tanzania are expected to earn about 750USD less per year than men on average. Only 12% of the female population who are 25 years and older have some secondary education, whereas the male population has 16,9% between 2015-2019. (United Nations Development Programme, 2020)

Although those numbers make it easier to put Tanzania in a context and to get a feeling about the conditions in the country, they do not show the whole truth about women living in rural Tanzania or, more precisely, living in Kisarawe. For example, according to a questionnaire from TAWAH, 90 of 120 women have had seven years of schooling, whereas 19 have no education at all, and none of them have a secondary education. Nevertheless, there is an improvement made every year in Tanzania because the Gender Inequality Index has an annual change of -0,5%, which tends in the right direction. (United Nations Development Programme, 2020)

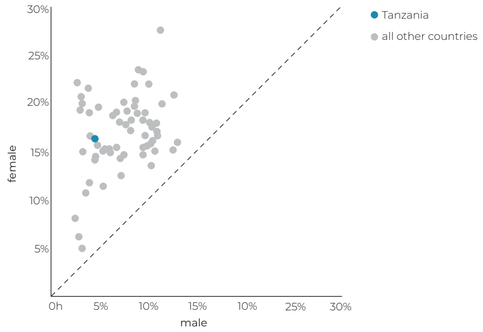


Fig 10: Proportion of time spent on unpaid domestic and care work, by sex (% of 24-hour day). Tanzanian women spend 3.9 times as much time on unpaid domestic and care work than men. The data measures the average time spent on domestic work for own consumption in 2014 (Worldbank, 2022)

2.3 Gender Issues in
Lower-Income Countries

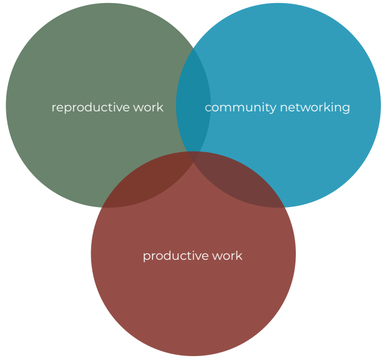


Fig. 11: Triple Role of women, divided into reproductive work, community work, and productive work

2.3.3 The Women's Triple Role

Women often fulfill a triple role, especially in lower-income countries (Moser, 1993). This triple role includes reproductive work, community work, and productive work. The reproductive work encloses childcare and household maintenance, and the productive work encloses work mainly in vulnerable employment. The community work includes managing issues like water, healthcare, education, and resolving community problems. The amount of responsibilities often makes women struggle to manage due to time constraints. (Larsson, 2001)

Taking this into account when designing to empower women is very important as it can be harmful to the community or the women themselves. The article *Continuity and Change, Performing Gender in Rural Tanzania* (Badstue et al., 2020), published in The Journal of Development Studies, analyzes gender and the performance of gender in four rural communities in Tanzania. It talks about cases where women were exposed to increased domestic violence if they did not manage to fulfill their household duties because they spent time in a job. Sometimes it was also the case that even if they earned their own income from a non-farming activity, the expenditure decision was still only up to the husband or a male relative.

Another matter is the `domestication´ of women, who, when spending most of their time at home, doing reproductive or productive work, do not participate in the public sphere as much as men do, which leads to insecurity and un-self-conscious behavior within the community. Being interested in their living conditions makes them feel worthy and respected (Larsson, 2001)

2.3.4 Lived Low - Official Low

Hirdmann argues that gender preservation can be split into three levels. The first is through institutions, legislation, and municipal regulations. The second is through ideologies and culture, its traditions and norms. The third is the personal level, meaning family and work. (Hirdman, 1991) Despite the legislation change, traditions and norms tend to stay the same for a while. Likewise, it is the case in Tanzania, where women's role has been largely suppressed throughout history, although there has been much improvement in legislation. After the independence in 1961, the first president Julius Nyerere introduced the society model *Ujamaa*, which offered rural women a chance to become aware of their unused potential and gave them official access to land. In 1997 the constitution invariant prohibited discrimination against women. (Badstue et al., 2020)

Even if legislation kept changing for women, the situation in rural Tanzania is very different from national legislation. Man-dominated traditions made it hard to translate laws into reality. Badstue argues that in the case of the four rural communities, women's success can challenge men's position. Women who earn money tend to suffer because they do not have the power over assets, they are more likely to be exposed to domestic violence, and they have to care about the household in addition to work. (Badstue et al., 2020)

There is a perception of what society considers to be male and female. Traditional norms are rooted in the patriarchal system and still influence people's reflections. This puts women, sometimes more and sometimes less, in a disadvantaged position. For that reason, women face financial constraints. For instance, they do not have cash savings due to domestic work and unemployment, making it harder for them to get a loan or buy a property. (Badstue et al., 2020)

That is one of many reasons why families headed by women tend to be poorer than families headed by men, and women often fall into poverty after separation. (Larsson, 2001) Badstue draws the comparison to Judith Butler, who argues that gender is performative. She talks about the problem in rural Tanzania, often being the *‚wrong'* performance of gender. Specific behavior by men or women is expected, and the unfulfillment leads to direct or indirect punishment from society or the family. (Badstue et al., 2020)

A similar thing can be seen in the current Kisarawe Vocational Center project, which will be described more precisely later on. Men were reaching out to the town leader because they were complaining that the women did not spend enough time on household work anymore and thus were neglecting their domestic duties due to work at the site.

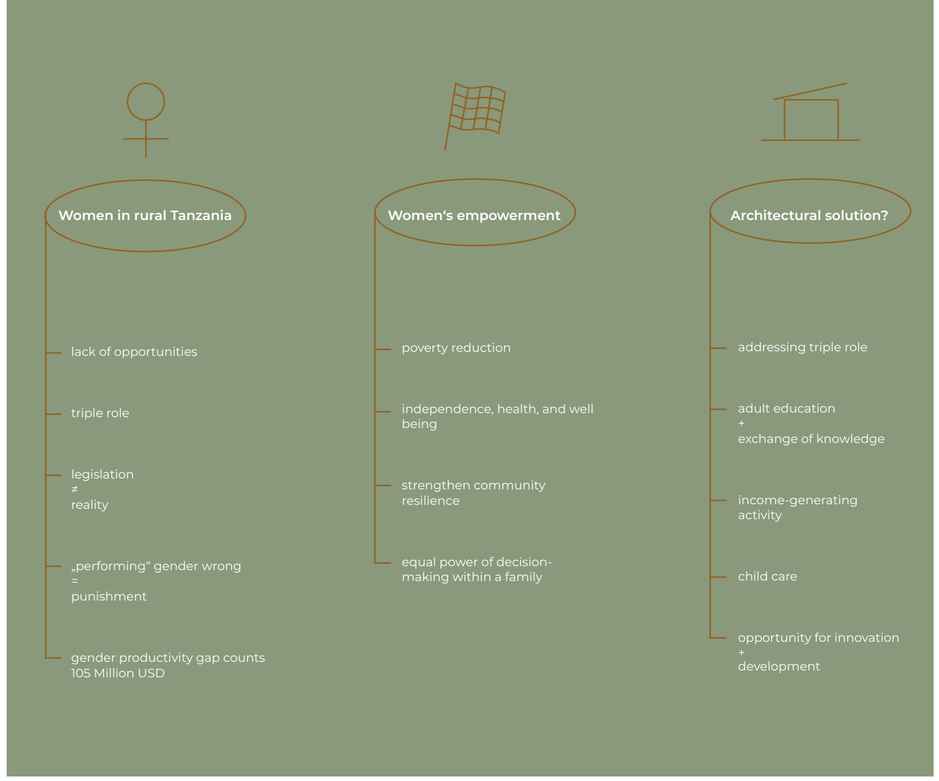


Fig. 12: Why and how to empower women

2.3.5 Why to empower women

The empowerment of women and their full and equal participation in political, social and economic life, the improvement of health and the eradication of poverty are essential to achieving sustainable human settlements.

-Habitat Agenda 21. 1992, UN Conference on Environment and Development in Rio de Janeiro

Women's empowerment is crucial to achieving equality and sustainability in society for many reasons.

At the personal level, strengthening women leads to an independent and secure way of living and an upturn of confidence, regardless of living in separation, widowed, or in a marriage. It raises the quality of life and creates a future with more possibilities for the family, especially children. Regarding the community level, women usually know their communities better than men. They know who is the most vulnerable and what is needed and often act as essential peace agents. Empowering them to participate in the public sphere, decision-making, and leadership actively makes them feel safer and seen in their communities. Their participation additionally creates more resilience and sustainability within the neighborhood. That boosts human health, well-being, affordability, and cultural preservation. (Sandman & Suomela, 2021)

When women own land, they are independent of their men and are treated differently (Larsson, 2001). Therefore, promoting income-generating activities raises women's socioeconomic status, improves the lives of themselves and their families, and contributes to the country's economic development. For example, closing the gender productivity gap in Tanzania, which amounts to 105 Million USD (0,46% of GDP/year), could raise 80.000 Tanzanians out of poverty per year (World Bank, 2022).

Additionally, raising women's socioeconomic status can reduce excess mortality among women after crises. (Subhashni & Laboukly et al., 2019)

2.3.5 How to empower women

So how can the empowerment of women be achieved? The first step should be to remove legal and administrative blockages as much as possible and establish information and support centers for legal counseling and assistance. The women must be aware of their rights and have a space to exchange possibilities and knowledge among themselves to speak freely. That is sometimes not the case in their homes. Awareness and education are the fundamental aspects that lead to women's empowerment in rural villages (United Nations Human Settlements Programme, 2021).

In order to support women in the field of housing and planning, it is essential to give women access to housing, increase women's participation in the planning process, and look at women's needs and priorities in the design of dwellings and spatial planning. It starts with professional training and workshops for women-only support networking among them. Income-generating can be the deployment of space for self-employment, and analyzing local production needs can also be beneficial in finding a suitable, income-promoting project. (Anita Larsson, 2001)

Projects that enable them to improve their economic situation and strengthen networks among themselves will positively affect their lives and ability to make decisions. (United Nations Human Settlement Programm, 2021)

The UN Humanitarian Development Peace Nexus contains goals to increase women's access to justice, improve land administration and women's access to credit, and strengthen women's rights to land, housing, and resources. (United Nations Human Settlement Programm, 2021)

The focus in everyday life and international projects, local or global, should lie on gender awareness and being more gender-responsive. That way, the development has a chance to free itself from local norms and traditions faster.

However, some dangers should be kept in mind, and the main question should be how to support women without putting them at further risk. This is an important aspect but needs to be looked at individually, considering all the local factors.

resilience = seeing a village as a unity to enhance both the economic and social situation, enabling human health, well being, affordability, and cultural preservation

Fig. 13: TAWAH´s focus areas: Housing, sanitary and educational facilities (TAWAH, 2022)

2.3.6 TAWAH - Tanzanian Women Architects for Humanity

Tanzanian Women Architects for Humanity (TAWAH) is a local NGO in Dar es Salaam established in 2010. One of the founders is the architect Dr. Victoria Marwa Heilmann. The organization works primarily in rural areas and on remote projects. Their main goal is to build an adequate shelter for poor communities around Dar es Salaam. Principles include cooperation with marginalized communities, developing a path to work opportunities, self-help, and ownership while engaging in sustainable, cost-efficient design and building practices. To provide social inclusion and advocate tolerance and diversity. They believe that it is necessary to strengthen and include all groups of people to fulfill the vision of a well-educated, peaceful, steady, united, and economically compatible country. TAWAH´s core values are learning, teamwork, innovation, transparency, and accountability. The organization has great experience in all stages of construction, design, fabrication, building construction, and project management. (TAWAH, 2022) Having TAWAH as a local contact NGO and talking to Victoria helped to get an understanding of the local perspective of gender in Tanzania. The design project explores a way to strengthen women and provide an income-generating activity.

2.3.7 Women of Kisarawe

The women of Kisarawe, similar to what is discussed earlier on about women in lower-income countries, likewise need to fulfill a triple role. They are responsible for the household and the childcare while their men, if they are not living alone, usually go to work farming. In many cases, they also help with the farming work, which most of the time does not provide them with any own income, which falls in the definition of vulnerable employment. Additionally, they often look for charcoal to sell or use or produce market items like woven baskets.

TAWAH started a project two years ago to make the women in a village called Mhaga in Kisarawe District participate in building a new Women´s Vocational Center. Before starting the project, they were asked to name their current living standard and their wishes for their housing improvement. Because the living standard in Kisarawe is deficient (see figure 6), significant housing improvements and revisions in the standard can already be reached with comparatively easy interventions. Almost all of them wished for walls made out of brick or cement and an improved roof. Some wished for their own electricity supply, flooring, and new sanitation. The central message was to have a more stable and durable building that was safer and more protective. Among the wishes for housing improvements, the women named their general expectations in working on the project. Many of them answered that they were expecting to gain more knowledge to build and increase their income by having a reliable job or better job opportunities.

Some issues ought to be addressed when talking about the project. For example, occasionally, it was hard to make the women work and gain the knowledge themselves because at this right instant, it was easier if the men took over. It was TAWAH´s responsibility then to remind the workers what the project was about and that the women should be part of every construction step. Furthermore, some complaints were reaching the town leader that the women should stop working and that they should not neglect their household duties.

Fig. 14: TAWAH´s focus areas: Housing, Sanitary, Educational facilities, pictures taken by TAWAH

2.3.8 Manufacturing the compressed soil blocks

The focus of the knowledge in the project of the vocational center was for the women to be able to manufacture the soil blocks themselves. The blocks are made out of compressed soil reinforced with cement. The soil from the site can directly be used, which saves expensive transportation costs. The cement is imported and ordered from Dar es Salaam. Guided by TAWAH, the women learned, step by step, how to produce the blocks themselves without additional help. The project's goal was not only to have a Vocational Center in the end but to provide the women with an income-generating activity, block production, which will give them the needed knowledge and a pathway to own an independent income. Eventually, that will lead to a self-reliant and healthier way of living with an increased standard.

Furthermore, it would give them the knowledge to work on the improvement of their housing situation. That would be especially valuable for women-headed families or alone living women, who tend to be the most vulnerable.

2.4 Construction with Lower-Income Groups

2.4.1 Introduction

When a thorough background study has been carried out, and it comes to designing and construction, it is of the same importance to respect and know about local building methods and materials as it is to know about the culture and people. Analyzing should be done open-minded, looking for advantages and disadvantages and reflecting on why that is. For instance, is a specific material only used because it is cheap or local, or does it have advantages that are not obvious at first glimpse? It can be said that materials available on the spot have the significant advantage of contributing to a low-cost building, which is vital in lower-income countries.

Local NGOs play a considerable part in transmitting knowledge about organizing, planning, and construction and are responsible for planning, financing, and construction (Johansson & Pering et al., 1990). In addition, social development promoted by the government is often essential for the project's feasibility. For example, the Kisarawe municipality promotes women's empowerment and adult education, which will be necessary for the project (Kisarawe District Council, 2022). In a successful housing project in Tanzania called TARDEP (Tarime Rural Development Project) in 1979, 600 houses were improved through the transfer of knowledge where an NGO functioned as a link between authorities and inhabitants. Tools to build were provided, and materials were sold. Through the production of materials and own labor, input costs were held low. More people were engaging in the project when hearing about the use of local materiality. Motivation, materials, transport, knowledge, and finance were essential questions that needed to be answered for the project to be successful. (Johansson & Pering et al., 1990)

In order to comprehend what is needed to improve housing, it is crucial to look at the existing conditions and work out the most efficient, local, sustainable and low-cost but good quality option for improvements. As already described, the housing standard in Kisarawe is low, which is why improvements can be made with the use of relatively simple materials such as soil blocks, local bamboo, and corrugated steel for roofing. Climate plays a vital role in local techniques. Design principles need to be adjusted accordingly to build at a reasonable cost and be energy efficient and affordable in the long run. One part of it is to keep costs for maintenance work low. Ultimately, there should be attention to all perspectives in deciding which method and material to choose.

2.4.2 Construction Methods

When it comes to construction methods, the knowledge about techniques and local materials within the community is not to be underestimated. Local labor input, local materials, and easy maintenance can save much money before, during, and after the building process. Part of the Vocational Center Survey was about whether the women of Kisarawe had any knowledge and experience in constructing. Only 31 people out of the 120 answered that question with yes. There is a demand for modern materials and techniques, as seen by the women's wish for modern buildings. However, a suitable solution can only be a balance between traditional and modern methods for the project to be durable and sustainable. Esthetics is also crucial, as beautiful buildings are better maintained and used. (Åstrand, 1996) Some services are particularly critical to consider in lower-income countries and will be described in the following, starting with Tanzanian construction methods and continuing with local materials.

Fig. 15: Foundation and Wall Construction, image was taken by TAWAH

Fig. 16: Concrete Foundation picture taken by Julia Kasparek

Foundation

Foundations can traditionally be made out of local stones or reinforced concrete. Building the foundation with local stones and mortar is more time-consuming but local and therefore cheaper. However, high transportation costs are not to be underestimated.

Therefore, where the stones come from and how far they need to be transported is important. Casting concrete for the foundation is fastly done, but as the cement and the reinforcing steel have to be imported, this would be the less sustainable and more expensive option.

Wall

Masonry walls in lower-income countries are traditionally made out of adobe bricks, compressed and reinforced soil blocks, natural stone, or burnt clay bricks. Non Masonry walls often are made out of wattle and daub, rammed earth, and, if affordable, rendered to increase the durability. (Åstrand, 1996)

Tanzanians often use concrete walls in newer city buildings, as those often are the most modern option in their perception. In Kisarawe, however, people wish for brick walls which might have to do with the soil block manufacturing that is going on at the site of the Vocational Center.

Roof

Roofs are traditionally made out of thatch. More commonly in the area today are tin roof structures as it protects from sun and rain very well and does not need the knowledge to be constructed. If a roof is not built in a good way, which means that the ceiling, for instance, is closed and too low, the room climate can be highly affected in the wrong way. Other possibilities in lower-income countries are burnt tiles or clay domes and brick roofs in vaults or flats. While the flat roof is quite flexible and easy to build, the vaulted roof is more challenging to build. Pitched roofs can be held by roof trusses and covered in clay tiles or concrete tiles. (Åstrand, 1996)

Floor

The floor is traditionally made out of stone paving, concrete, timber, or earth. The last option is a destructive and unhealthy solution and is probably primarily used because of the lack of alternatives and money. It is dangerous and unhygienic as it can not be adequately cleaned. It must be considered that flooring in lower-income countries is often washed with a lot of water. Depending on stone shape and size, stone paving can be accomplished with quite a small effort. Concrete might lead to a more healthy way of living for the inhabitants, which is very much dependent on the function of the building. It is very fastly casted but least sustainable and expensive but durable. (Åstrand, 1996) Timber floor is an option, but due to deforestation problems in Tanzania, the use of timber should be kept as low as possible.

Fig. 17: School Project Guinea, RWTH Aachen (RWTH-Aachen, 2022)

Fig. 18: House Kisarawe, picture taken by TAWAH

Fig. 19: Kitchen on the ground, Kisarawe picture taken by TAWAH

Fig 20: Solar energy (World Bank, 2022)

Kitchen

The kitchen space needs to be prioritized, particularly regarding gender-sensitive building design. As mentioned before, the women in Kisarawe mostly had the kitchen space on the ground level and not separated from the main living space. Kitchen spaces are often neglected and dirty, thus ensuring a bad indoor environment that is unhealthy for the user. According to the SDG 7 tracking, only 4% of the population in Tanzania has access to clean cooking (Energy Sector Management Assistance Program, 2021).

When planning, it is crucial to think about space and hygiene and preferably move the kitchen space to the outside or create good ventilation. The space should be separated from living spaces not to increase the heat indoors. The right stove is more energy-efficient and has a lower cost. Raising the operational level from the ground to a standing level is vital for improvement as it keeps dirt and animals away. (Åstrand, 1996) The supply needs to be stored sheltered from insects and animals.

Electricity

Only 18% of rural Tanzanians have access to electricity (Worldbank, 2022), whereas over 80% of the world's population at least has some access to electricity (Energy Sector Management Assistance Program, 2021).

Nonetheless, electricity is crucial for development in many ways. It provides safety for women and space to study even when it gets dark for both children and adults. Installing lights and providing power independent of the village initiates the possibility of supporting income-earning production, social activity, and education. This also counts for Kisarawe because power cuts are widespread even if electricity is accessible. In addition, as stated in the women's questionnaire by TAWAH, more than 80% of them have phones that need to be charged, which is not to be underestimated because they connect them to the outside world and with each other.

Sanitation

Kisarawe Municipality has done many projects to increase the standard of sanitation in the area. However, it has often been neglected in the past.

Inadequate sanitary facilities or none are often a cause of poverty and can lead to diseases easily. One of the UN's sustainable development goals calls for clean water. Having access to good sanitation could, for instance, reduce diarrhea diseases in Tanzania by 36%. (Unicef, 2022)

Standard options for sanitation in lower-income countries that often lack a steady water supply are pit latrines, composting latrines, septic tanks, or sewage ponds. (Åstrand, 1996)

To be taken into account is always the question of maintenance and emptying latrines when they are full. A not identified responsible could lead to a sanitation facility that is not used anymore when it is full.

Water

Water supply operates quite similarly to electricity. Often there is only restricted access to water, and transport is expensive. However, access to clean water is one of the most fundamental things for good health. According to the Human Development Report 2020, 38.4 out of 100.000 people in Tanzania are still harmed because of unsafe water, sanitation, and hygiene services. (United Nations Development Programme, 2020) Rainwater collection is a good option,but there is the danger of disease-carrying mosquitoes and dirt and dust from collection surfaces such as roofs. (Åstrand, 1996)

Simple filtration systems can be a manageable solution. However, some other methods can be applied to be independent of expensive transportation. The Kisarawe municipality even promotes drilling well (Kisarawe District Council,2022).

Fig. 21: Sanitation facility for a school project Guinea, RWTH Aachen (RWTH-Aachen, 2022)

Fig.22: Example of a well in Tanzania (WTWT, 2022)

Fig. 23: School Project Guinea, RWTH Aachen (RWTH-Aachen, 2022)

Fig. 24: Primary School in Ulyankulu, Tanzania (Borkowicz, 2022)

Other Methods

Other methods include using on-side produced elements, such as wooden windows and doors, as done in the Primary School, Ulyankulu. That saves costs and resources and uses the knowledge of local traditional crafting. (Borkowicz, 2022) Another important thing is that openings need to be covered by mosquito nets, especially for spaces to sleep in.

2.4.3 Materials

Local building traditions and the combination of local materials and local labor often result in a low-cost building with easy and affordable maintenance. While building modern with traditional methods may be challenging, it is crucial for sustainable development. The aim should be an economically and ecologically sustainable design that is largely maintenance-free. Solutions have to be regarded as some work, and some might not. After that, the decision can be made on which non-local materials must be added. When it comes to choosing materials, different aspects have to be considered. Some are durability, production, manufacturing, importing, local, labor, and maintenance. (Astrand, 1996)

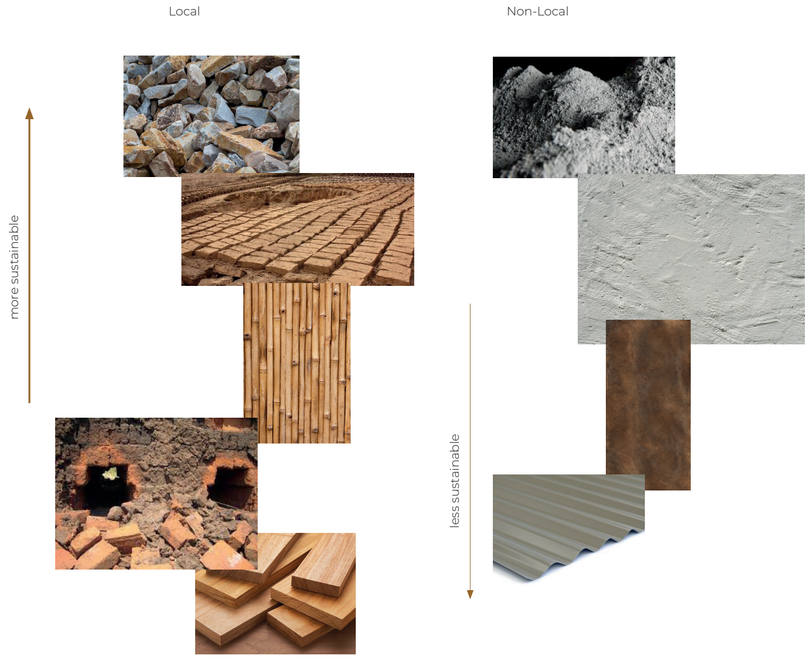


Fig. 25: Materials used in rural Tanzania

2.4 Construction with Lower-Income Groups

Fig. 26: Concrete

Concrete

Concrete is usually used for foundations, walls, columns, beams, floors, and roofs. It has high compression stress but low tensile strength when reinforced, both. Concrete is a mixture of cement, air, water, gravel, and sometimes other supplements. Crucial is the knowledge of how to mix. Getting water is an issue that needs to be taken into account, and so is the transportation and price of cement.

Fig. 27: Cement

Cement

Cement works as a binder for concrete and mortar and for the compressed earth bricks made on-site in Kisarawe. Cement is quite expensive and needs to be bought in Dar es Salaam and transported to the site. Despite these disadvantages, it ensures a more durable construction which can save money in the long run. Finding a balance in the amount of cement used is assumably a good idea.

Fig. 28: Burning of clay bricks

Burnt Clay Bricks

The clear advantage of burnt clay bricks is that they are much more stable and load barring due to their compressive strength than unburned soil blocks. They retain their dimensions even by modifying moisture and temperature and are relatively resistant. The used soil can be found almost anywhere, and the production is rather simple. The problem is the use of energy and wood in the burning process and thus the increase of deforestation. Deforestation is an issue in the Pwani region. Two regions in Pwani were responsible for 57% of all tree losses between 2001 and 2020 in Tanzania (World Resources Institute, 2022) An alternative is to use local agriculture waste for burning (Astrand, 1996).

Fig. 29: Adobe

Adobe and Stabilized Earth

The law in Tanzania does not support unburned clay bricks, but that is known as being mostly ignored. Adobe is soil shaped into blocks (40x40x10), and straw, cement, or lime is used for reinforcement to be more water-resistant. The clear advantage is that no extra energy and burning materials are needed, but the bricks are not as resistant and durable. (Astrand, 1996)

Fig. 30: Compressed soil blocks

Reinforced compressed soil blocks

Compressed soil blocks are unburned but compressed in a manually used compressing machine. This is the method that the women in Kisarawe have learned how to do. Cement is used as a binding material and increases its compressive strength. When building with compressed soil, it has to be protected from rain and moisture for more durability. The cement helps to make the blocks more water-resistant. The foundation should be raised to 50cm above the ground for splashing water and wet soil. Exposed walls can be rendered to be more protected and durable.

Fig. 31: Natural stones

Natural Stones

Natural stones are a sustainable option and can be used for non-load-bearing or low walls to save resources and transportation costs. They can also be used for the foundation. However, depending on the locally found stones, they have to be more or less worked on to function as a building material.

Fig. 32: Thatch

Thatch/ Straw

Thatch and straw are used in traditional roofing. The disadvantage of these natural materials is that they have a short life in areas with termites. On the other hand, the upside is that it is a cheap and local material and can last up to 30 years when treated right. Another advantage is that it is pretty flexible in shape, locally produced, and the local population knows how to build and exchange the material if needed. In addition, it is water repellent and provides intense shade.

Fig. 33: Bamboo and timber

Timber/ Bamboo

Bamboo and other similar plant materials such as branches and masts are traditionally used in Tanzania as they are easily found. However, non-treated bamboo is not very durable. Its lifetime can be efficiently extended through treatment. Timber is often used for roof substructures in Tanzania. It is not the most sustainable option because of deforestation, and termite attacks can be a problem. Whenever bamboo can be used, it should be prioritized. However, when treated and used at a low amount, it can be a cheaper and more sustainable alternative to steel structures.

Fig. 34: Render and plaster

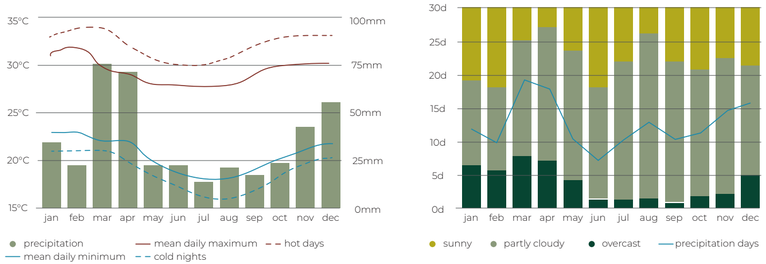
Render/ Plaster

The use of render and plaster should be well thought-through. It has the big advantage of protecting the wall from direct rain exposure and thus increasing its life span. This is very important when using non-burnt bricks that are not sufficiently reinforced to be water-resistant. Additionally, a plastered, white wall reflects solar radiation away from the building and increases the indoor comfort in a hot and humid climate where the wall does not need to save heat for the night.

Fig. 35: CorTen steel and corrugated steel sheets

Metal

Corrugated iron sheets are often used in Tanzania for roofing. A clear advantage is that they can be used with unskilled labor. Additionally, it is very water protective and provides space for PV. On the other hand, it has bad thermal and acoustic properties and is therefore often used in combination with a lower, inner thermal mass ceiling. The production is very energy consuming and expensive.



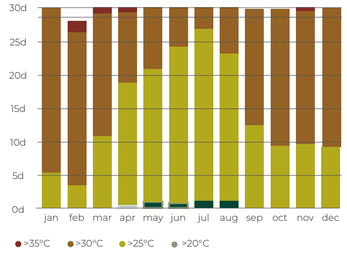


Fig. 38: Weather Data (Metablue, 2022)

2.4. Climate

The Pawani region has a tropical, hot, and humid climate. Figure 38 shows the weather data of Kisarawe based on 30 years of hourly data. The almost constant temperature only varies by 3.7°C during the year, with an average temperature of 29.0°C. The coldest nights are in July and August, with a temperature of 16°C. The hottest days are in February and March, with a temperature of 34°C. The seasons are the dry season, the short rainy season, a dry and hot season, and a long rainy season. April has the highest humidity (84.69%) and the most rain days (25,1 days). The sunniest days are in June. The sun rises every year around 6 am and sets around 6 pm. Figure 39 shows the wind rose for Kisarawe. The wind mainly comes from South to South-East and rarely from North-West to the South-West. (Metablue, 2022)

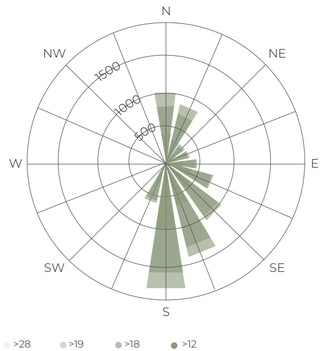
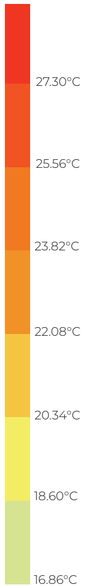


Fig. 39: Wind Rose (Metablue, 2022)



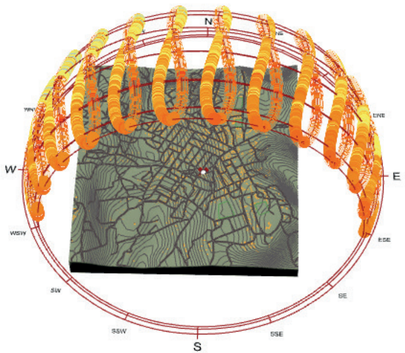


Fig. 40: Sunstudy Dar es Salaam:
Dew Point Temperature (C)
city: Dar es Salaam Nyerere International Airport
country: TZA
time-zone: 3.0
source: ISD-TMYx

2.4.5 Climatic Design

Characteristics of a low-energy house are described in the following. The correct orientation of the building is essential, as the wrong orientation will significantly impact decisions about shading and lighting. The form should be as compact as appropriate for the climate and function. The use of white or very light-colored surfaces should be prioritized. Insulated walls and ventilation are substantial, and windows should be correctly oriented and shaded. Passive solar space heating, solar thermic, high-efficiency devices, and PV should be used. (Lechner, 2015)

When starting to design, four aspects of climate are essential to be considered in general: Temperature, precipitation, wind, and humidity. It is also noteworthy to look at microclimates. Finally, it is crucial to look for passive and energy-efficient technologies often found in local construction techniques. (Åstrand, 1996). Buildings in hot and humid climates should be light with extensive openings, roof overhangs, and verandas. Seasonal changes such as the two rainy seasons in Tanzania need to be considered. Comfort is subjective; a comfort zone is defined by where 70-80% feel satisfied, whereas it is a question of affordability. (Lechner, 2015).

Climatic design in hot and humid climates can be split into four main principles; passive ventilation, opening the building to the outside, protection from solar sun, removing moisture and avoiding creating additional humidity. The goal is to have a resilient design: One is designing a building to sustain the planet and sustain the occupants in case of emergency, whether artificial or climate-based. Resilient means they must survive passively, operate at least for a while without water or energy supply and withstand storms and floods. Sustainable and self-sufficient buildings are much more resilient because they do not require extra energy and function through efficient, passive design, self-reliant energy, and water supply. (Lechner, 2015)

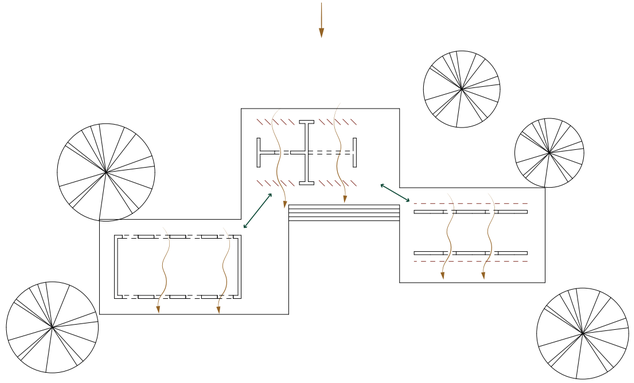


Fig. 41: Example of how to passive ventilation in a building in floorplan

Climatic Design Principles - Passive Ventilation

It is vital to have immense and vertical openings on the opposite side facing, ideally North and South but most importantly, luv and lee. A doubled layered roof helps draw the hot air out, and a high ceiling enclosures for vertical air movement because of the stack effect. The orientation of the building needs to be decided according to the direction of the wind. Likewise, the wind needs to be directed towards the building, which should be far enough away from each other for high access to wind. Trees that have a high canopy should be used or planted. The floorplan should be non-compact for maximal connection to the outside with finnwalls to support air movement. (Lechner, 2015)

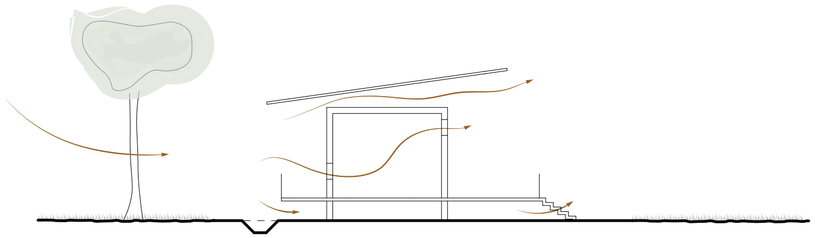


Fig. 42: Example of how to passive ventilation in a building in section

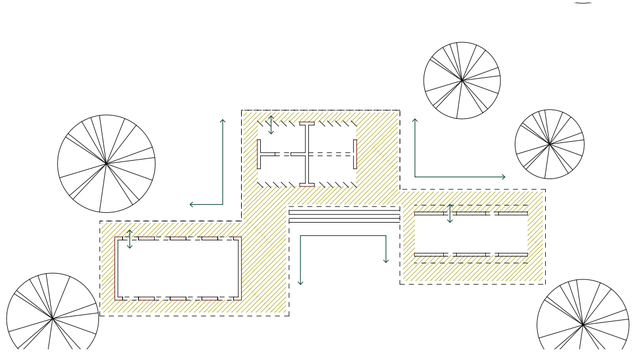


Fig. 43: Example of how to open the building to the outside in floorplan

Climatic Design Principles - Open the building to the outside

Opening the building to the outside is the second classification. This is achieved by having a very open floor plan with many extensions, wings, canopies, and verandas. This way, the exposure of exterior walls is kept to a minimum. Supportive are large measurements of windows, doors, movable walls, and wing walls. It could be an option to integrate trees with high canopies to design spaces that provide well acclimated shaded outdoor areas. Movable wing walls open the room to the outside. Pavilion-like buildings with few interior partitions help create outdoor spaces with different day uses and access to wind and sunlight. (Lechner, 2015)

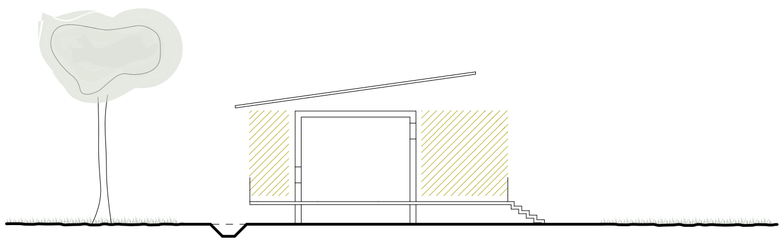


Fig. 44: Example of how to open the building to the outside in section

Climatic Design Principles - Protect from solar sun

The third principle is protection from solar radiation. The most important aspects are to shade outdoor spaces, all openings, and Wast and West walls as they are most exposed to the intense sun. Grass around the building can be used to absorb solar radiation without heating the air and prevent it from reflecting sunlight into the building. Outdoor yards should be placed on the South sides, and there should be different spaces for different uses during the day, according to the sun angle. A highly reflective building material helps to reflect the heat away from the building; white is the best option. Movable shading devices help react to the different hours of the day, and buildings that shade each other minimize exposed walls to direct sunlight. A double-layered roof creates a buffering layer and ensures a better indoor climate during the day if it is high enough. The use of louvered shading devices on the exterior and interior help additionally to stop hot air from entering. (Lechner, 2015)

Fig. 45: Example of shading devices on a wall and over openings and perforated movable wall element

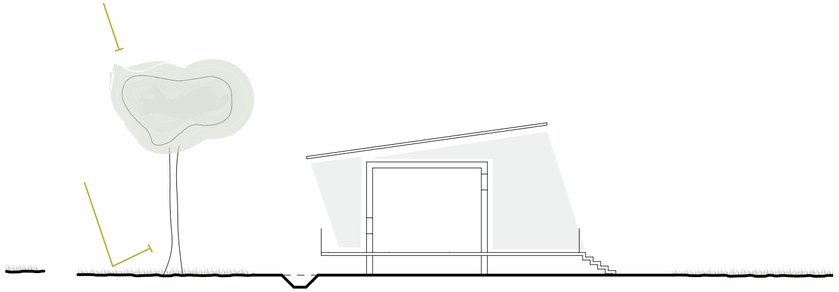


Fig. 46: Example of how to protect from solar radiation in a building in section

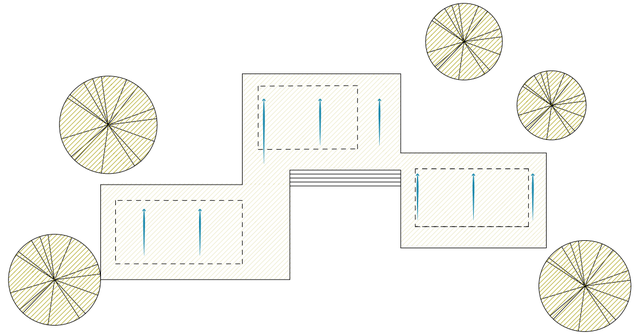


Fig. 47: Example of how to remove moisture in floorplan

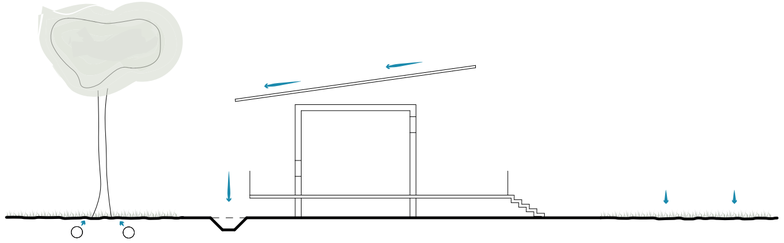
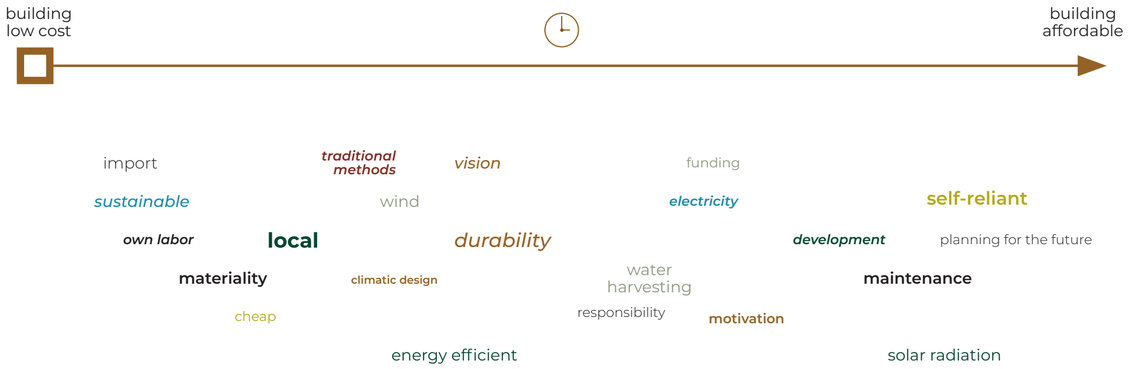


Fig. 48: Example of how to remove moisture in section

Climatic Design Principles - Remove moisture

The last category is to remove moisture and avoid creating additional humidity. This is executed by elevating the main floor from the ground or elevating the start of the wall from the ground, avoiding plants and open water sources by drainage properly around the building. Ground material should be as permeable as possible, and irrigation should be underground. Fans in the kitchen, sanitation, and laundry rooms can be integrated to get the humid air out of the house and avoid mold. (Lechner, 2015) The building should be situated in the right place on the plot, and the foundation needs to be protected from rainwater (Astrand, 1996).



2.4.6 Affordable, Energy-efficient and Low-cost Strategies

It is of great importance in lower-income countries to build low-cost and energy-efficient so that affordability is guaranteed in the long run. The benefits of energy efficiency in affordable housing can be perceived economically, environmentally, and personally. It reduces cost, creates jobs, enriches home value, and reduces environmental impact. Additionally, it raises awareness and improves indoor air quality, which increases comfort by avoiding moisture, humidity, and mold.

The article Energy-efficient, Low-cost strategies, written by the U.S. Environmental Protection Agency in 2011 (U.S. Environmental Protection Agency, 2011), argues that building at low cost is not the same as building affordable. Affordability decreases expenditure over time and is just as crucial as building at low cost in lower-income countries. That is why passive and energy-saving features should be used as much as possible. A good outcome can only be achieved when looking at all interactions in a building design and a home's energy system. Further, green is not equal to energy-efficient as planning green emphasizes the whole planning, design, and construction process.

Although the text is written and considered from a U.S. perspective, many points are very valid for construction in lower-income countries to be low-cost and sustainable. Green is equal to energy efficiency plus cost-effectiveness plus other features like renewable energy supply, combined heat and power, sustainable site design that minimizes stress on the local landscape, water efficiency and quality, and green materials and resources. Building green minimizes consumption and waste and improves indoor air quality.

Another significant point regarding durability and affordability, in the long run, is the maintenance which should be as easy as possible. It is vital to ensure that the local population knows how to do the maintenance. If essential or unknown materials or techniques are exploited, it could be an option to offer education on operating the home to minimize utility and maintenance costs properly. (U.S. Environmental Protection Agency, 2011)

Fig. 49: Section perspective
child care center

3 Design Project

The Design Part of the project is divided into three main chapters. The first chapter introduces the site in Kisarawe village and the relation to the area of Kisarawe District. The second one continues by explaining the concept of the final design. This chapter contains the program and why the building is divided into three construction steps. Finally, the last chapter talks about the implemented materials and building methods and what climatic design principles have been applied.

3.1 Site Analysis

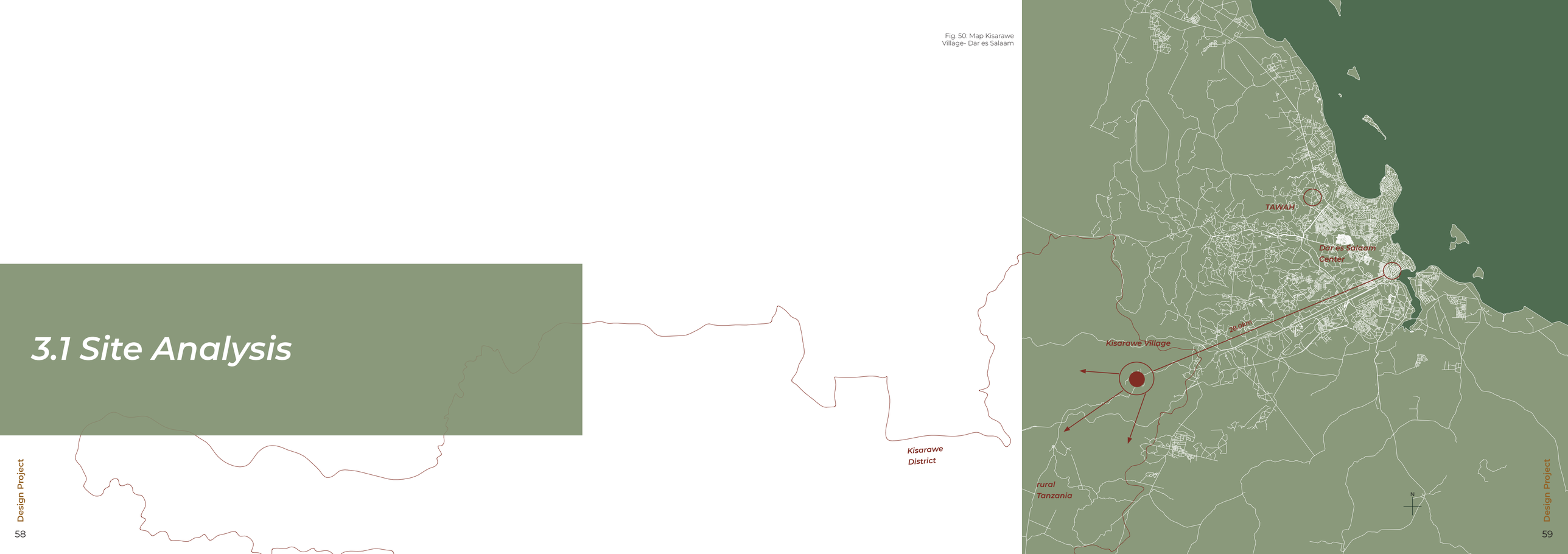


Fig. 50: Map Kisarawe Village- Dar es Salaam

Fig. 51: Africa Overall

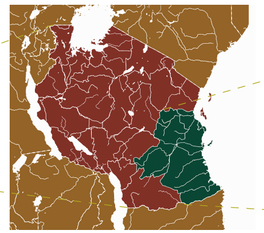


Fig. 52: The Coastal Region

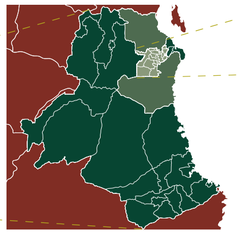


Fig. 53: Pwani Region and Kisarawe District

3.1.1 Infrastructure

Kisarawe Village is one of the four biggest villages in the Kisarawe district. It lies close to the border of Dar es Salaam, only 25km from the Julius Nyerere International airport. A few asphalted main roads are meandering through the district, from where more minor dirt roads are leading off. The villages are very widely spread. Furthermore, there is one railroad passing through the district.

The landscape is hilly, with a lot of forest and green areas. There are three nature reserves that have been affected by deforestation over the past decades. This is the reason why they have been turned into reserves. People mostly travel by car or by motorbike. If that is not affordable for the family, they walk.

Although the roads exist, it takes a while to get from point to point as the routes are not in easy driving conditions, and many times, people can not afford expensive car repairs even if they own one.

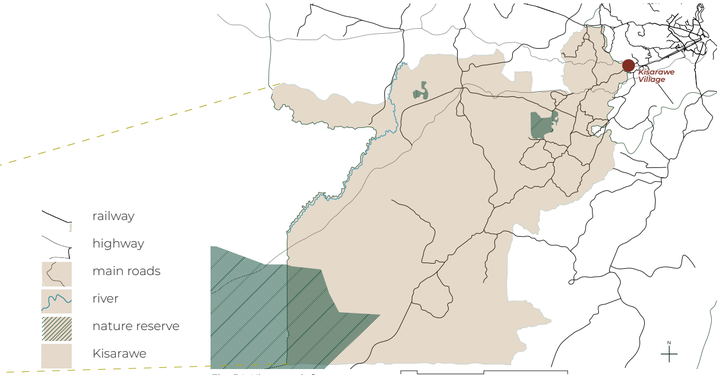


Fig. 54: Kisarawe infrastructure

3.1.2 Population

The population of Kisarawe District counted about 101.000 in 2012 (Tanzania National Bureau of Statistics, 2012). It is divided into 16 wards. Although the population rises, the number decreases in the more rural areas of the district as the people tend to move closer to the bigger villages in the East.

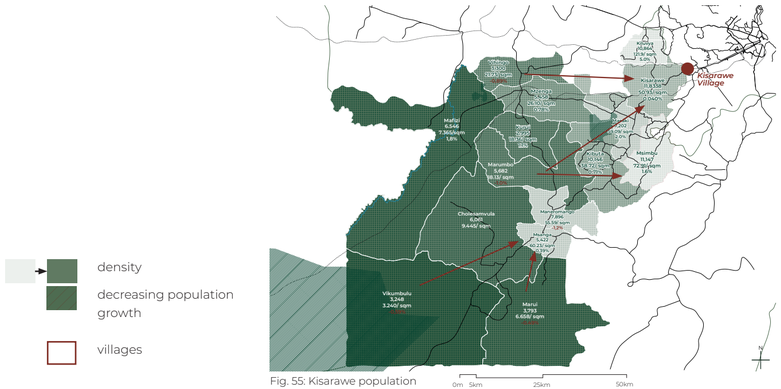


Fig. 55: Kisarawe population

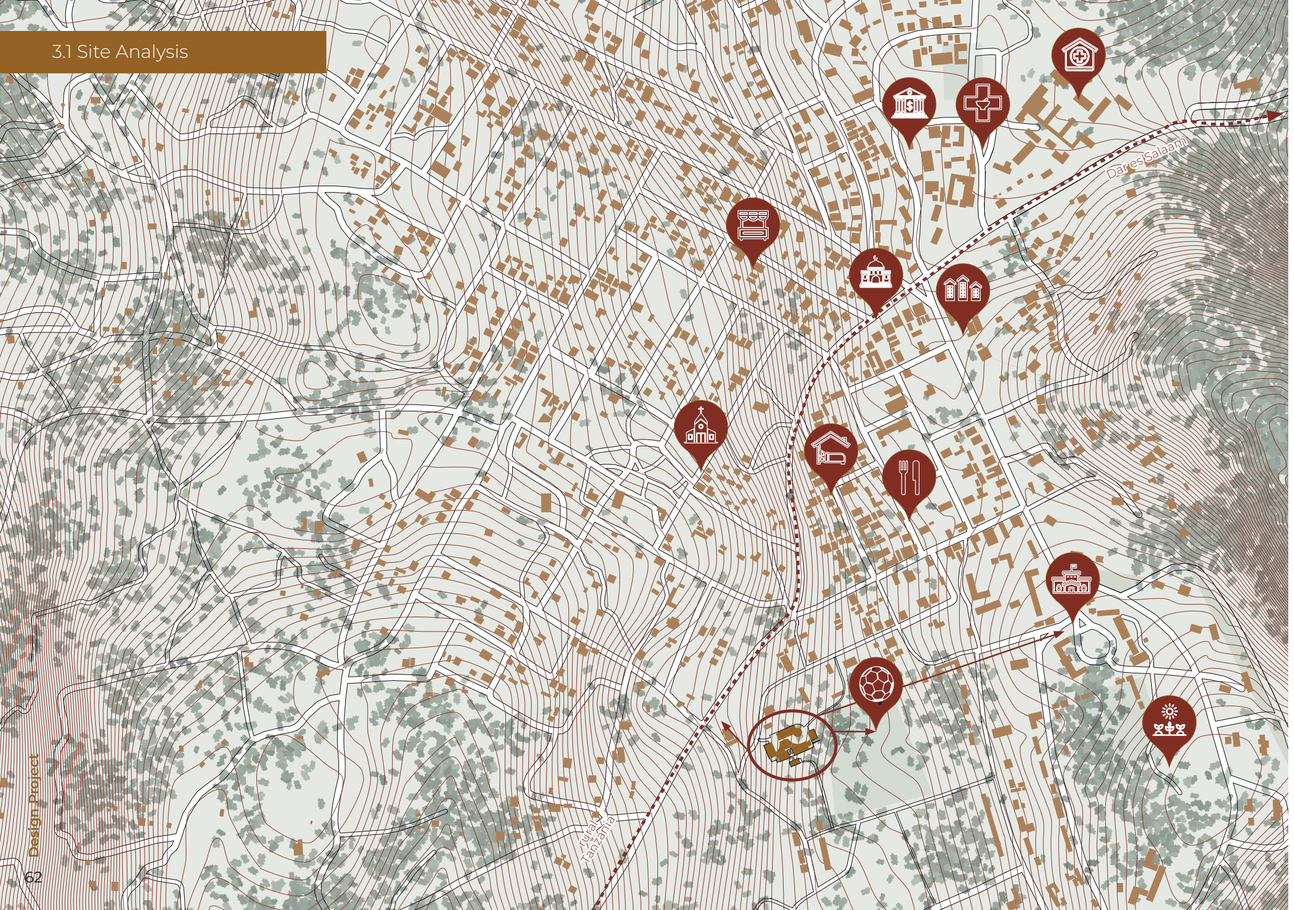


Fig. 56: Kisarawe
Village, site and institutions

football field
kiosk
mosque
guest house
church
municipality
guest house
café
farm
pharmacy

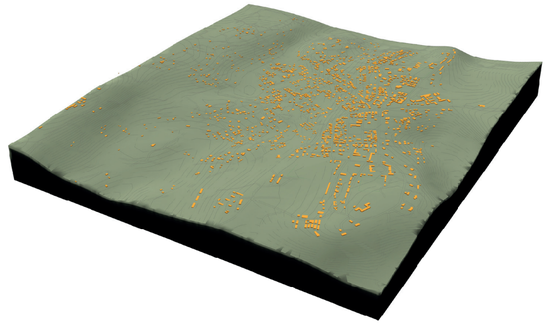


Fig. 57: Kisarawe
Village - topographie

3.3.3 Kisarawe village

Kisarawe Village is chosen as the site for the multi-purpose women's center for the following reasons:

- First, the village acts as a switch between Dar es Salaam and rural Tanzania.
- Second, the building materials (to build and resell) can be easier and cheaper gotten from Dar es Salaam.
- Third, Kisarawe has a Municipality building for legal guidance and cooperation with the center.
- Finally, the main road is directly going through the village.

3.3.4 Site

The site is chosen for the following reasons:

First, it is only approximately 200 meters from the main road leading to Dar es Salaam and rural Tanzania. Furthermore, there is a football field next to the site, which gives space to play for the older kids. The village center is not far away, about 500 meters and within walking distance. The same counts for the Kisarawe District Council. At the same time, the plot is situated quite on the outer ring of the village and on a slope which gives advantages in terms of visual references, views, and water drainage.

3.2 Final Design - Concept

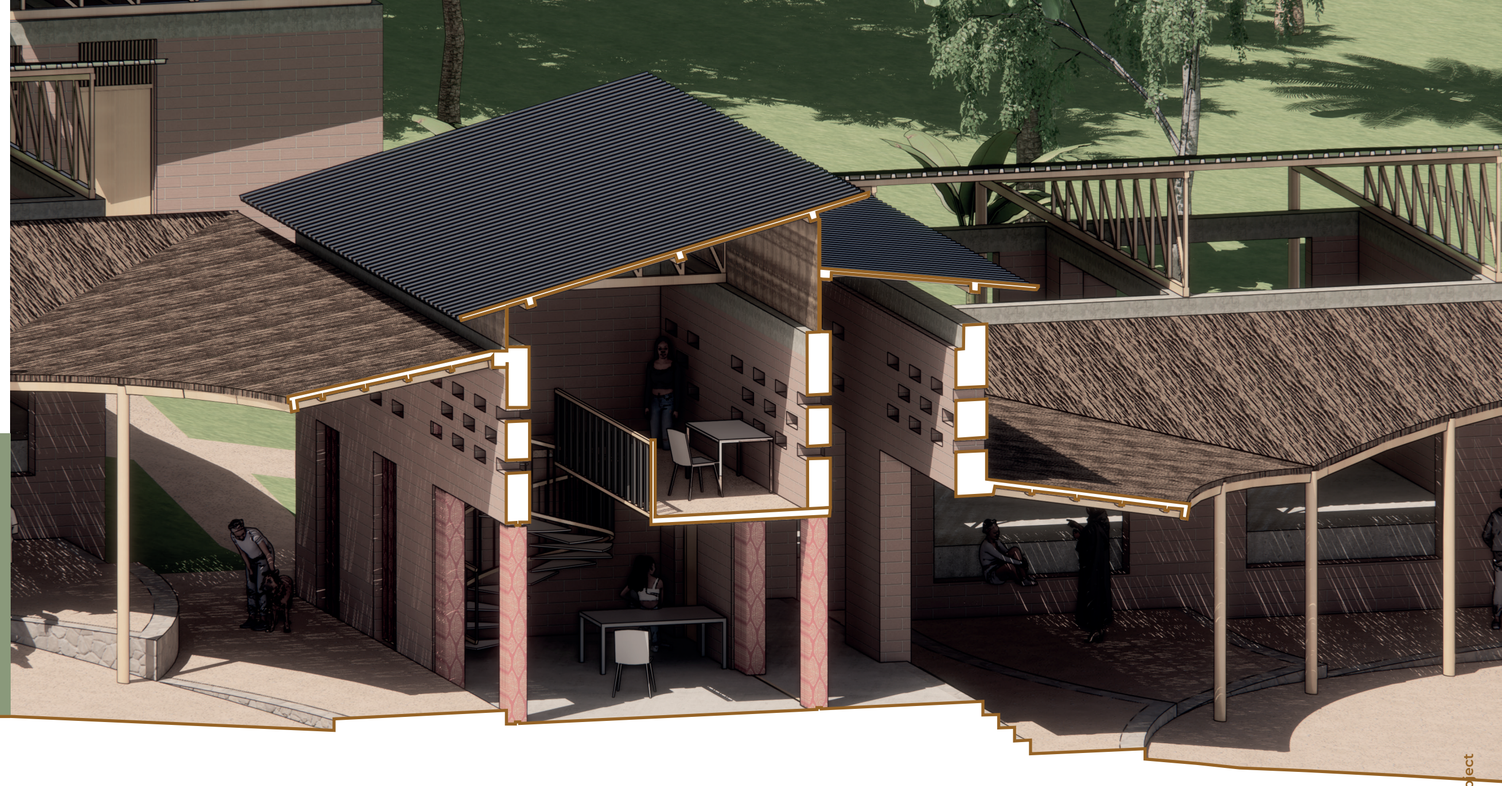


Fig. 58: Section perspective shop and guidance

3.2.1 Concept - Key Points

The main key points regarding the concept of the design proposal are described in the following:

- *Building **upon** what already exists*
- ***Adding what is needed** to achieve the next step*
- *Women's empowerment through **income-generating activities***
- ***Knowledge,** as a powerful tool in development*
- *A project developed **over time***

Building upon what already exists

The local NGO TAWAH has focused on bringing the knowledge of soil block production to the women of Kisarawe by letting them participate in every step of the current construction of the vocational center in Kisarawe. This way, the women have already gained some manufacturing knowledge. However, most notably, they already have a vision of a brighter future. In other words, they are motivated, which gives a solid foundation for the start of the design process.

Adding what is required to achieve the next step

The next step is about uncovering what is needed to turn the existing knowledge into an income-generating activity that will last and provide a stable income for the long run to empower the women of Kisarawe. In the beginning, a space to do the production and hold the sale is needed. Nevertheless, this is not enough. Time is an essential issue in women's lives in Kisarawe. They usually have to fulfill the triple role, taking care of the children and household, doing community work, and helping with the productive work at home. A way to add time is to provide a child care center. That would release the women from the care duty during the day and provide them with time to spend on the production.

Women's empowerment through income-generating activities

The production of soil blocks and the sale would give the women a steady income, which would open whole new opportunities and independence for them. It could also race the family out of poverty.

Knowlege, as a powerful tool in development

Knowledge and education are among other the most powerful tools for development and a way out of poverty. That is why a big part of the concept is knowledge exchange. This includes legal opportunities and advice, production methods, construction methods, and daily life.

A project developed over time

The Project is split into three construction phases. This way, a low-cost center, in the beginning, can generate the first income, leading to new opportunities and knowledge. The step in between promotes the exchange of increased knowledge and construction techniques, whereas the last step leads toward a construction shop, providing all the necessary building materials to make much-needed housing improvements in and around Kisarawe.

Increasing social resilience

The process will lead to the whole community's extensive social resilience. Strengthening the individual will lead to them being able to support others.

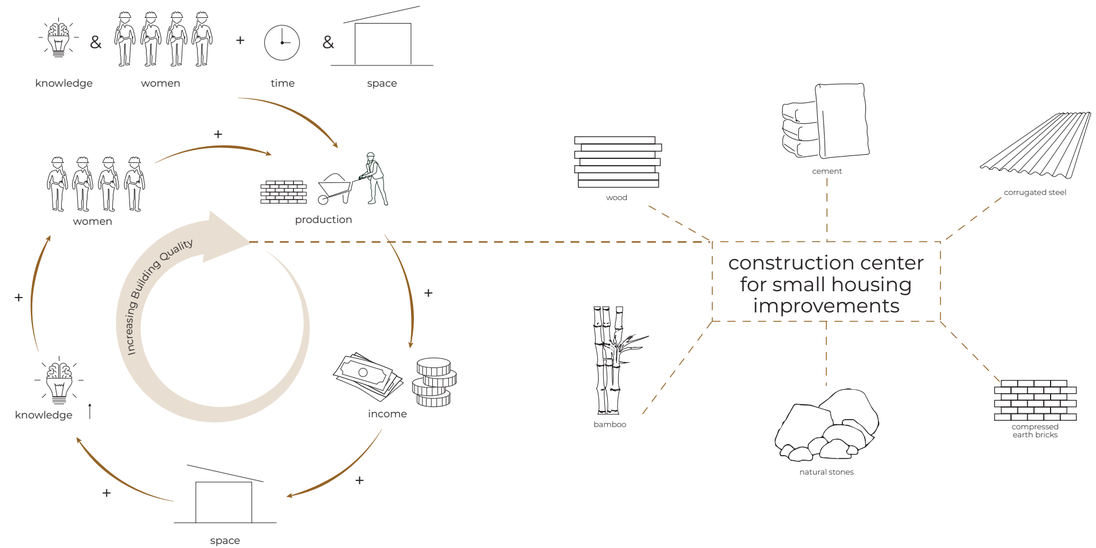


Fig. 59: Concept and basic construction shop

3.2.2 Program and Zoning

The program of the multi-purpose women's center evolved out of the idea of addressing the triple role that the women in Kisarawe have to fulfill. That is why it is divided into four main categories.

1. **The reproductive work:**
A childcare center with an indoor and an outdoor space.

2. **The Community work:**
A discussion area, a guest room, a lecture and study space and a library.

3. **The productive work:**
A soil block workshop, a shop with office space and a guard room, a wood workshop and a storage space.

4. **The Service:**
The service includes a kiosk, sanitation with toilets and showers, a well, and an electricity room.

Figure 60 shows the arrangement of the spaces on the site. The center consists of two main entrances, with one being a pathway coming from the village center, within 500 meters of walking distance. At that part of the site, the community area, as well as the child care center, are placed. The main open square offers visual contact with the shop and the productive area. The other entrance is accessible by car and truck from the main road. This is where materials can be delivered or bought. In addition, there is space for the building to be expanded.

The three construction phases that will conclude the program over time will be described in the following.

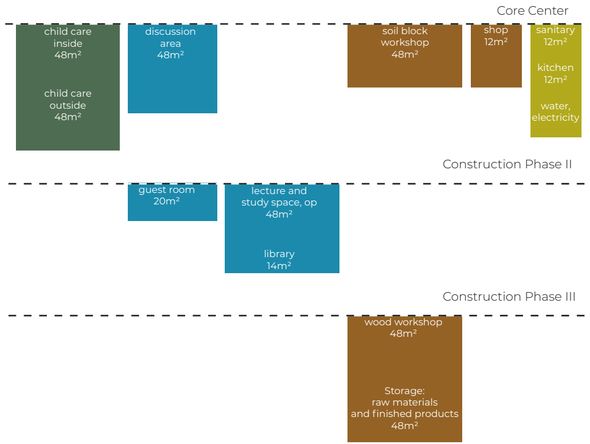


Fig. 59: Program

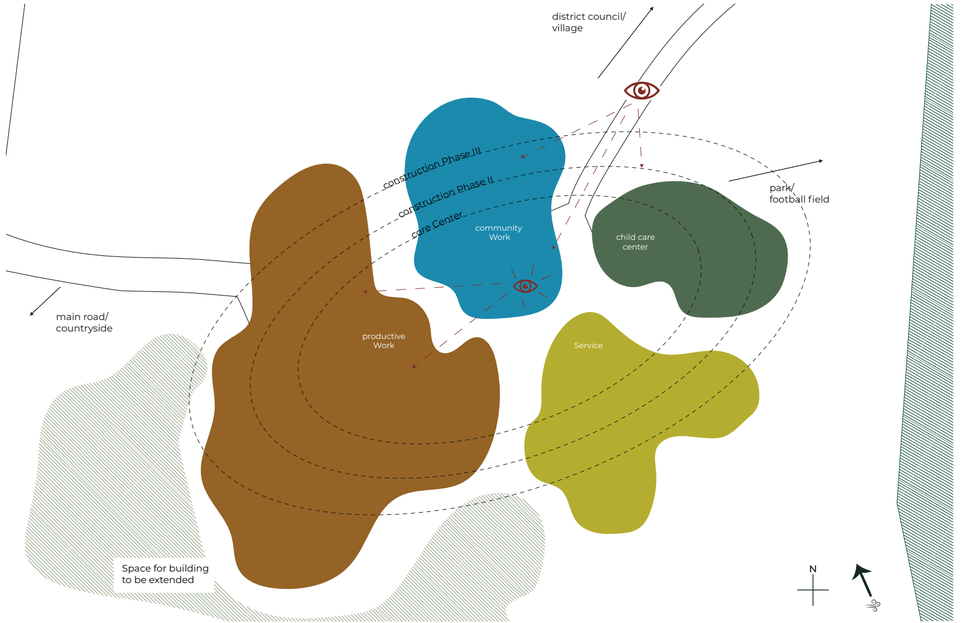


Fig. 60: Zoning on the site

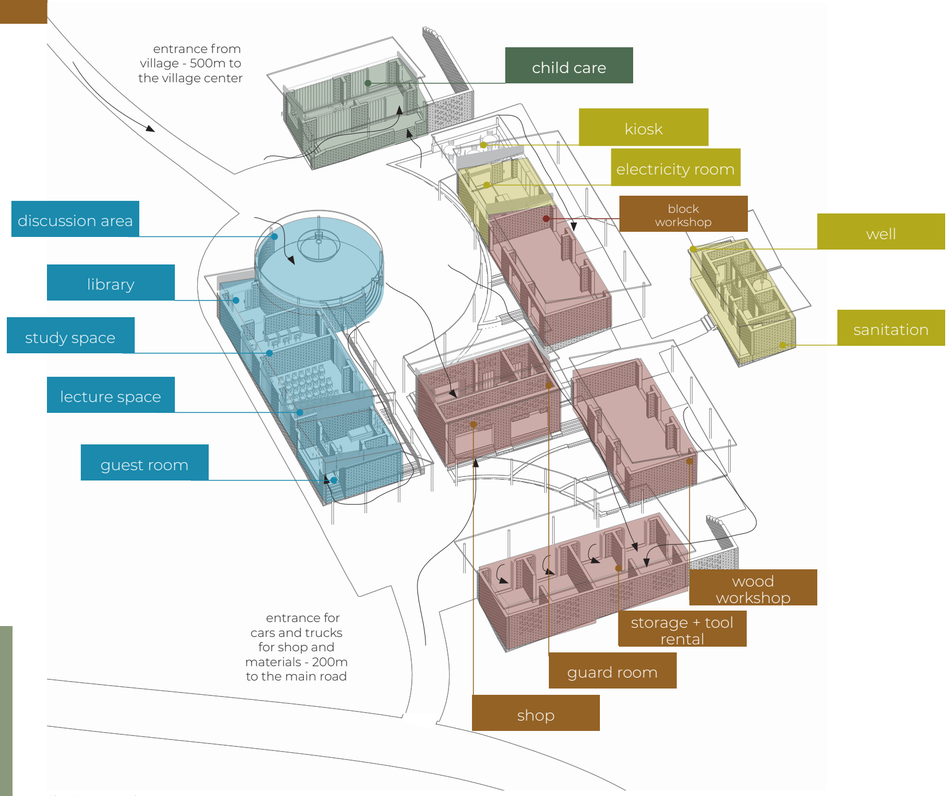


Fig. 61: Program in spaces

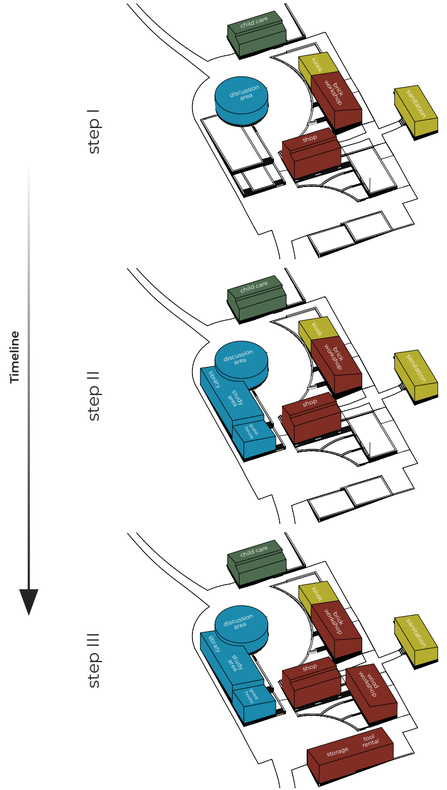


Fig. 62: Construction steps I-III

3.2.3 Step by Step

The development of the multi-purpose women's center is divided into three construction steps for the following reasons.

Building for lower-income groups is commonly a more extended process due to financial constraints. If an NGO is responsible for getting a project started, the finances need to be solved. Splitting a construction for a center like this offers time to gather the required money and, in this specific case, gives time to earn money for the next construction phase by own labor input. Furthermore, planning over time provides the community time to get used to the new topology. The people need to adjust to the building, and the building needs to adjust to the people. Therefore, it is crucial to capture the possibility of changes in planning and be flexible about shifts that might arise.

The women of Kisarawe must be guided by a local NGO, like TAWAH, and be part of every construction step along the way. This will lead them to deepen their knowledge and leave them with everything essential to know to guide housing improvements themselves. Additionally, it will make TAWAH less necessary, eventually meaning that the center can be run independently and last. How that exactly works is illustrated on the following pages.

3.2.3 Construction Phase I

The following questions are to be answered for each construction step: What is already there, what needs to be added to accomplish a specific goal, and where is that leading to?

What is there?

The women in Kisarawe have already learned how to manufacture the compressed soil blocks. They have already earned their first income and have a vision of what that can lead to. Additionally, there is guidance by TAWAH, meaning a local NGO is responsible.

What is being added?

It is essential to add the **child care center** right at the beginning. It provides the women with time to spend on the soil block production, the food preparation for the kiosk, community work, cleaning duties or sales, and administrative work.

The **soil block workshop** is based on what the women have already learned how to do. The blocks are manufactured in rain- and solar radiation-protected space with easy machines and cement as a binder. They can be stored in the workshop and the shop until sold. Additionally, the blocks needed for the next construction step will be produced ahead, which will save money and time.

The women can sell the produced blocks to rural Tanzanians in the **shop**. Because of their locality, they can be sold cheaply.

The **discussion area** provides a safe space where the women can communicate freely. They can learn new and better techniques, talk about community issues, celebrate or come together.

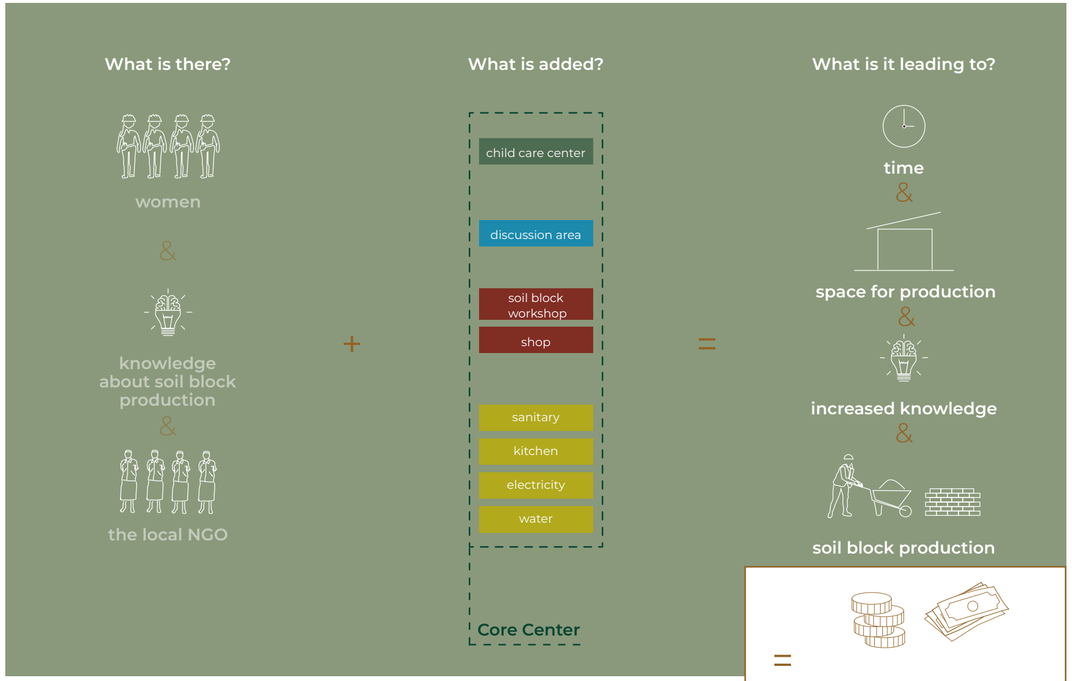
The **kitchen and kiosk** offer another income-generating work opportunity. Food is prepared for the other women to buy for a small price during the lunch break. It is a place to come together, eat, drink and recover. The electricity room is reachable from the kitchen. Being self-reliant from PV cells provides the necessary light to continue studying when it gets dark and helps the women feel safer.

Sanitation is very fundamental. Here the women have the opportunity to clean themselves after a day of work. The rainwater is harvested directly from the roof of the facility. In order to be completely self-reliant, a well is situated directly next to the sanitation.

What is it leading to?

The goal is for the women to have time to produce an income-generating material, the soil blocks. Because of the child care center, they now have time to do that. Furthermore, they have been increasing their knowledge about working possibilities, building materials, methods, and soil block production. They are earning money from the sale, which gives them the possibility to get a loan from the bank to continue with construction step II.

Fig. 63: Construction steps



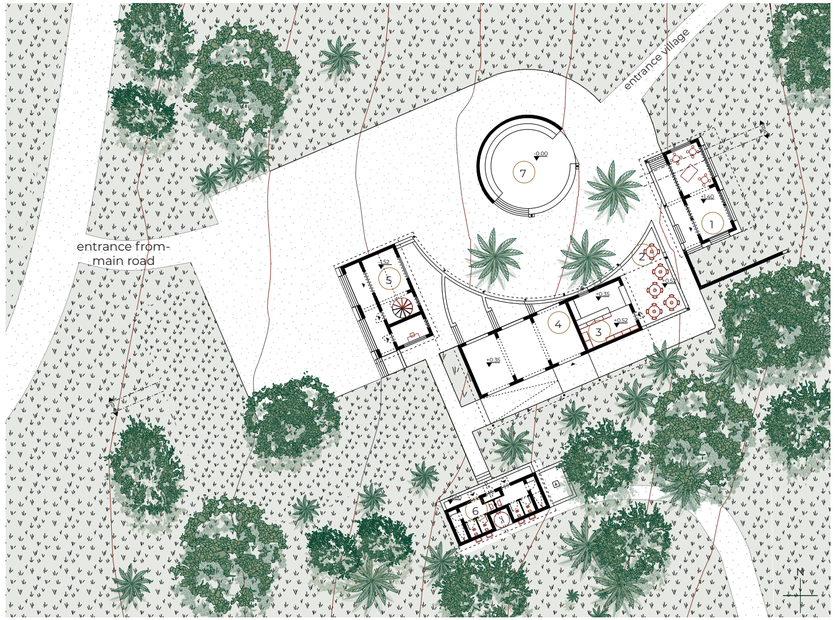
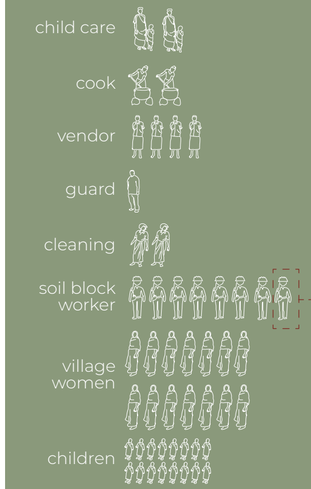


Fig. 64: Floorplan in construction step I

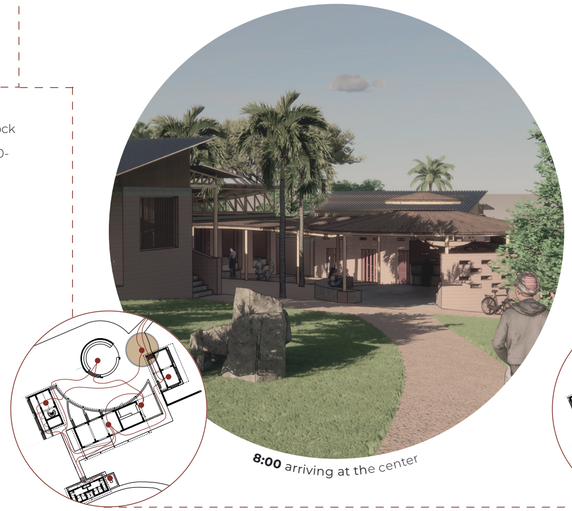
0.0m 0.5m 2.5m 5.0m

1 child care
2 kiosk
3 kitchen
4 block production
5 shop
6 sanitation
7 discussion area

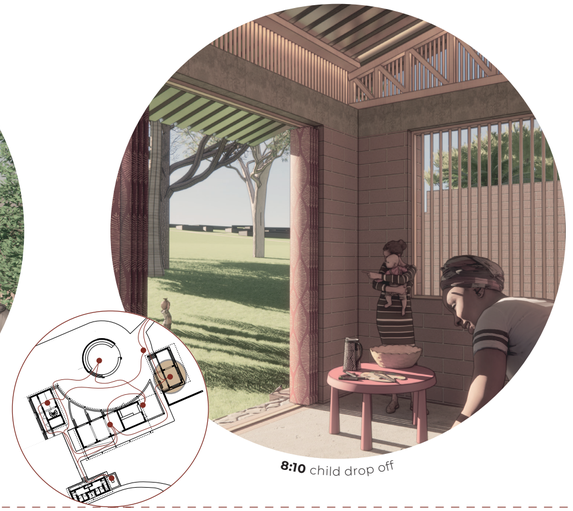


People participating in a day at the multi-purpose women's center after the construction step I

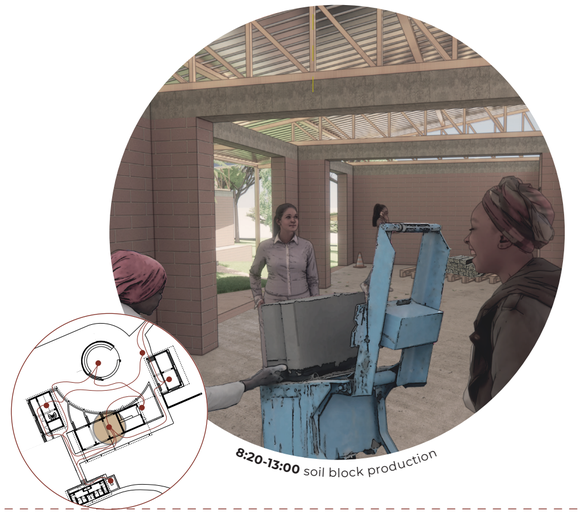
Mariam
age: 37
profession: soil block worker
working day: 8:00-16:30



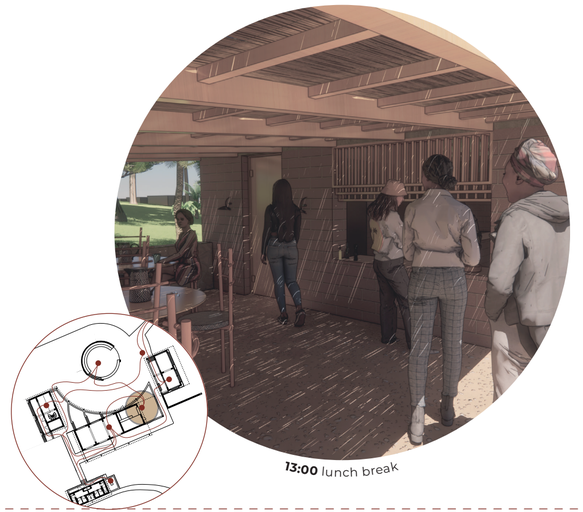
8:00 arriving at the center



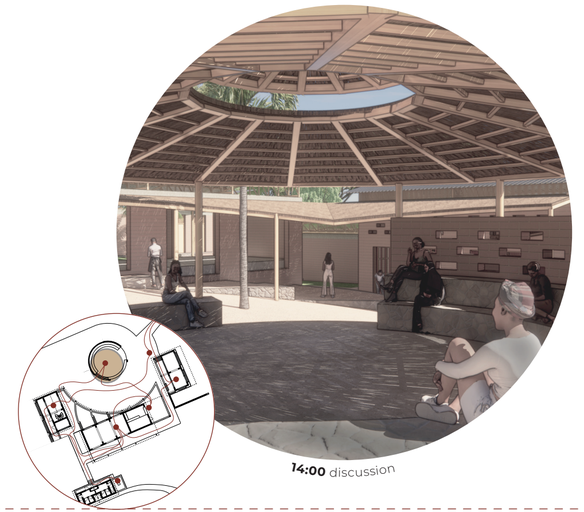
8:10 child drop off



8:20-13:00 soil block production



13:00 lunch break



14:00 discussion

16:00 water collecting

3.2.3 Construction Phase II

What is there?

This time the core center already exists, offering the women time, space, increased knowledge, and the production of soil blocks, all of this led to the first income.

What is being added?

This construction phase concentrates on expanding knowledge, working towards a construction center in step three.

A **guest house** is added in this phase. This space will provide a sleeping area, a small bathroom, and a private veranda for external professionals invited from Dar es Salaam to give workshops about other building materials such as wood and bamboo. They can be paid from the income that is now a steady resource.

A **lecture and study space** will be added for the workshops to be held and for more people to attend. The women who have not participated so far will get the prospect to learn and join the team to earn an income themselves in the third phase. The study space contains electricity for the women to charge their phones and study after dark.

An addition to the study space is a **library**. Like the other rooms, they are guarded by the center guard and open to the public during the day.

What is it leading to?

This construction step aims for the women to increase their knowledge once more and learn about other building materials next to soil blocks. The exchange of professional knowledge is in the foreground to be prepared for step three. Additionally, the income increases as the block production continues, and more rural Tanzanians comprehend that this place sells cheap soil blocks.

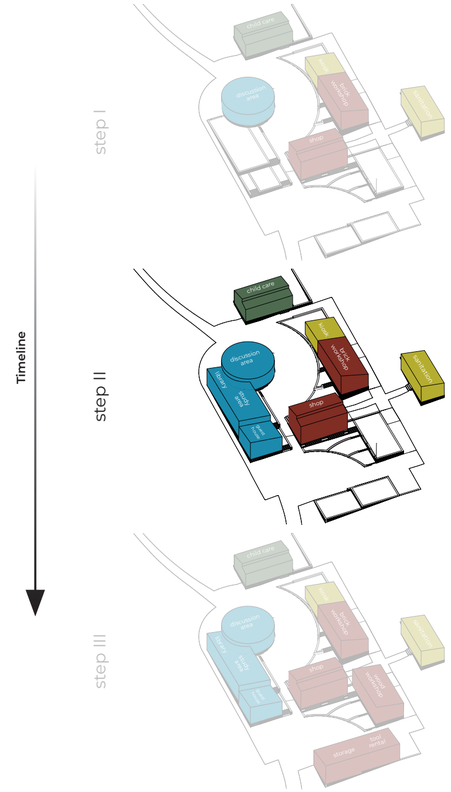
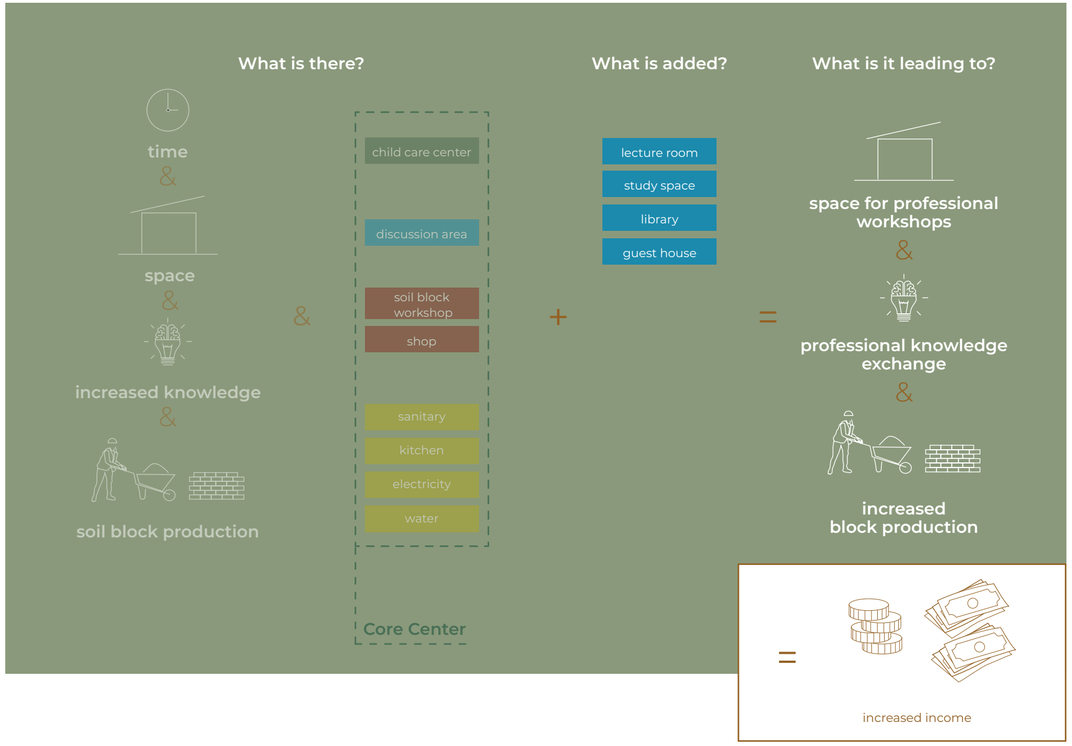


Fig. 65: Construction steps



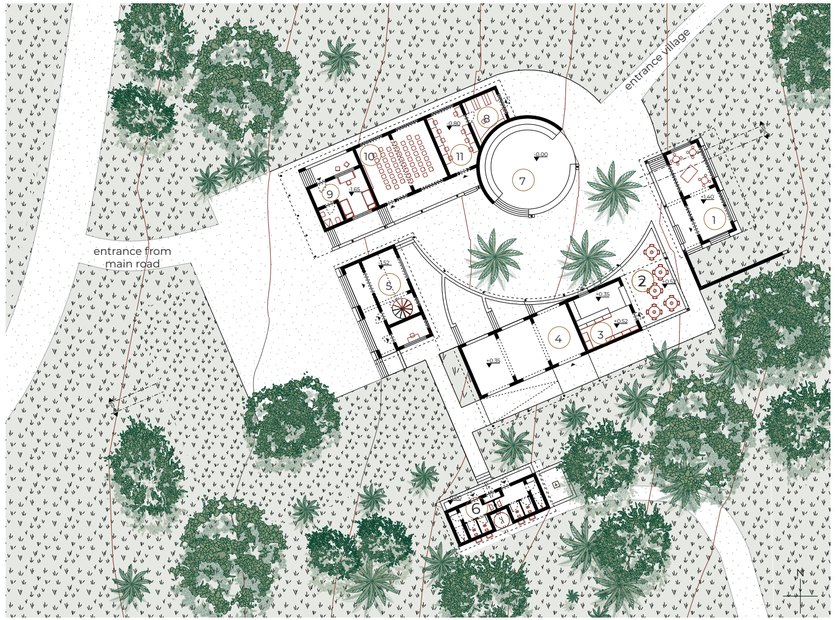


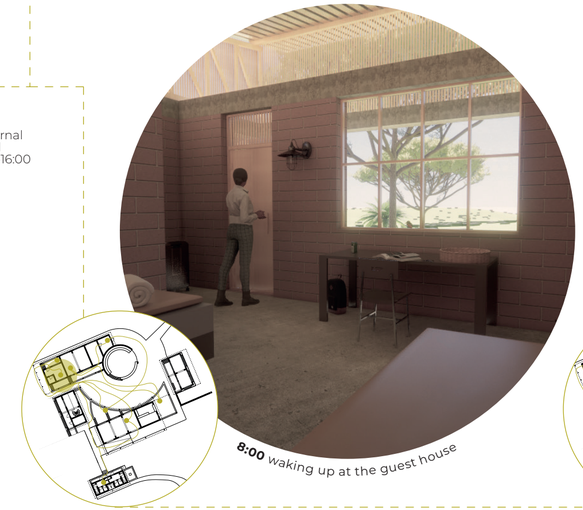
Fig. 64: Floorplan in construction step II

0.0m 0.5m 2.5m 5.0m

1 child care
2 kiosk
3 kitchen
4 block production
5 shop
6 sanitation
7 discussion area
8 library
9 guest house
10 lecture space
11 study space

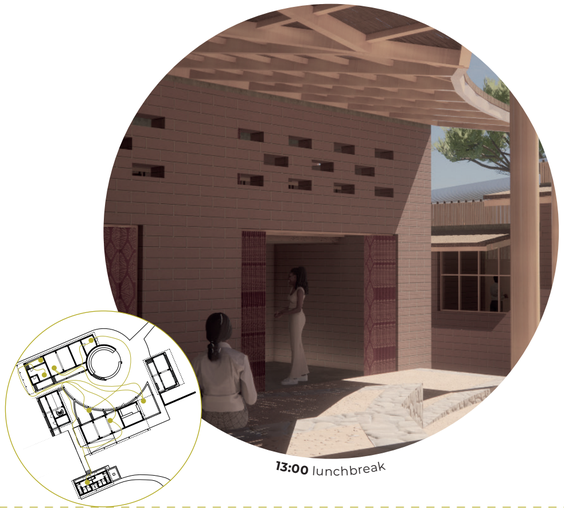
People participating in a day at the multi-purpose women's center after the construction step II

Latifa:
age: 52
profession: external professional
workshops: 8:00-16:00

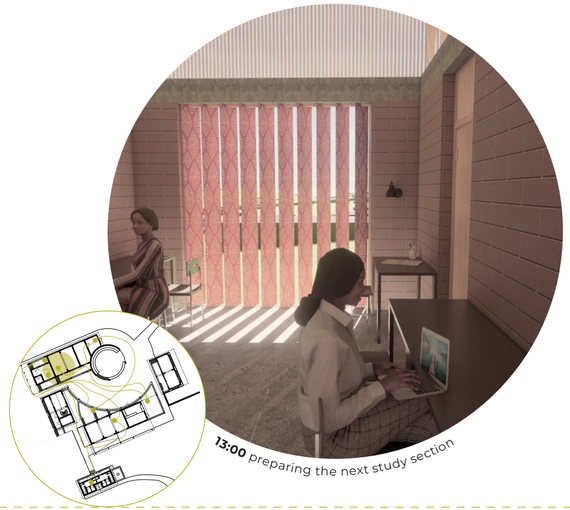


8:00 waking up at the guest house

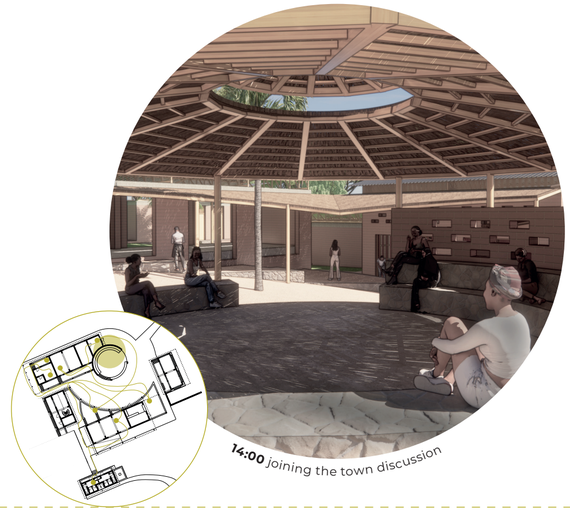
8:10 holding a lecture



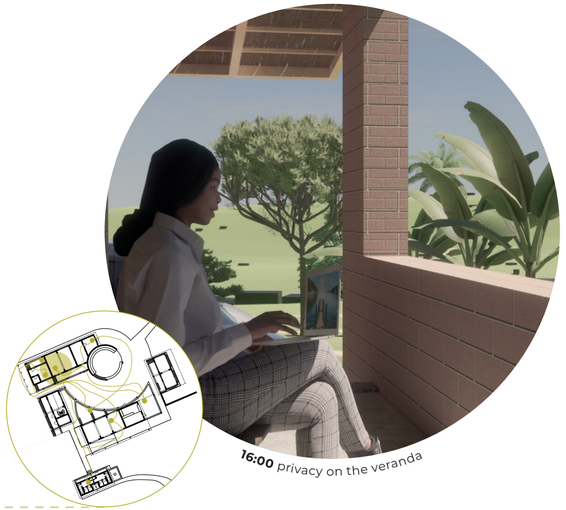
13:00 lunchbreak



13:00 preparing the next study section



14:00 joining the town discussion



16:00 privacy on the veranda

3.2.3 Construction Phase III

What is there?

Now, the Core Center, with additional space for studying and knowledge exchange and a guest house, is already there. The women have better knowledge about construction and materials. They have a steady income and can pay others, such as cleaners, guards, cooks, and external professionals.

What is being added?

In this last phase, what is being added is concentrated on what is needed to provide a construction shop. In addition, the shop is supposed to promote and advocate housing improvements in and around Kisarawe.

A wood and bamboo workshop is being added. Here women who already learned through workshops how to treat wood and bamboo can make use of their new knowledge.

A storage space provides space for the soil blocks, the treated bamboo, and wood. This space is also intended for other building materials necessary for minor housing improvements. Those materials are cement, gravel, corrugated steel sheets, and natural stones. There is too a room to store tools that can be rented out.

New buildings provide more space to put PV. The electricity covers what is needed for the center. This way, it is self-reliant.

What is it leading to?

The space for production allows more women to participate and earn income. The knowledge is now used to offer guidance for housing improvements in and around Kisarawe. This service is intended for the women themselves but also the whole community. Because of the center's closeness to Dar es Salaam and the local manufacturing of the materials, they can be sold cheaper, which opens up the possibility of improving one's house for a broader range.

The end goal is to empower not only the women of Kisarawe, but to make the whole community more resilient and lead them out of poverty, encouraging them for development and change.

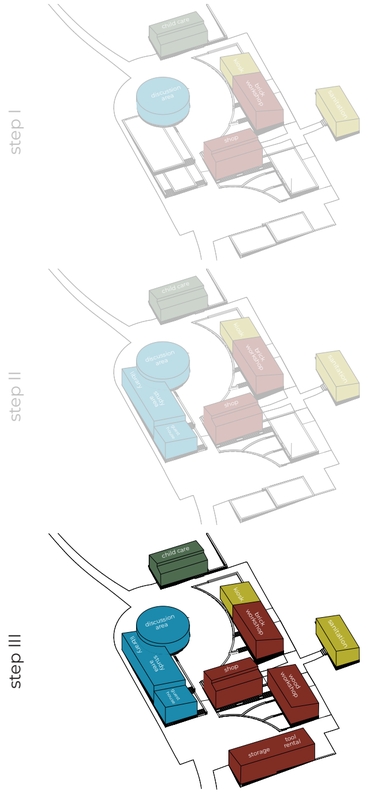
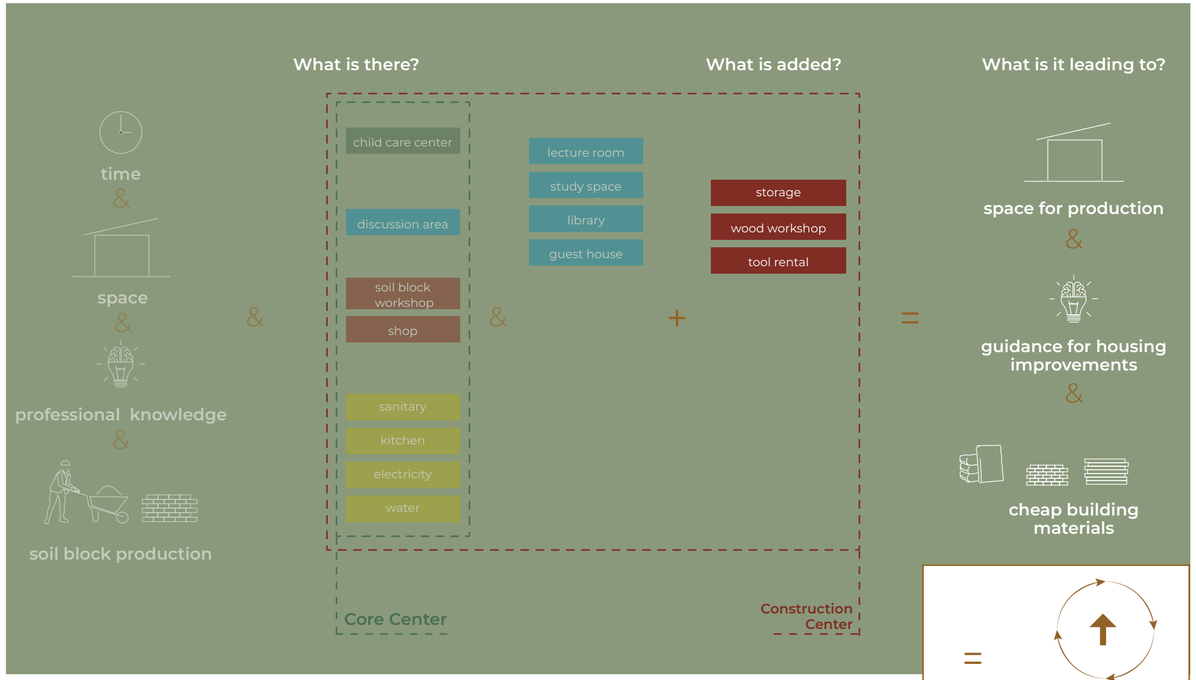


Fig. 67: Construction steps



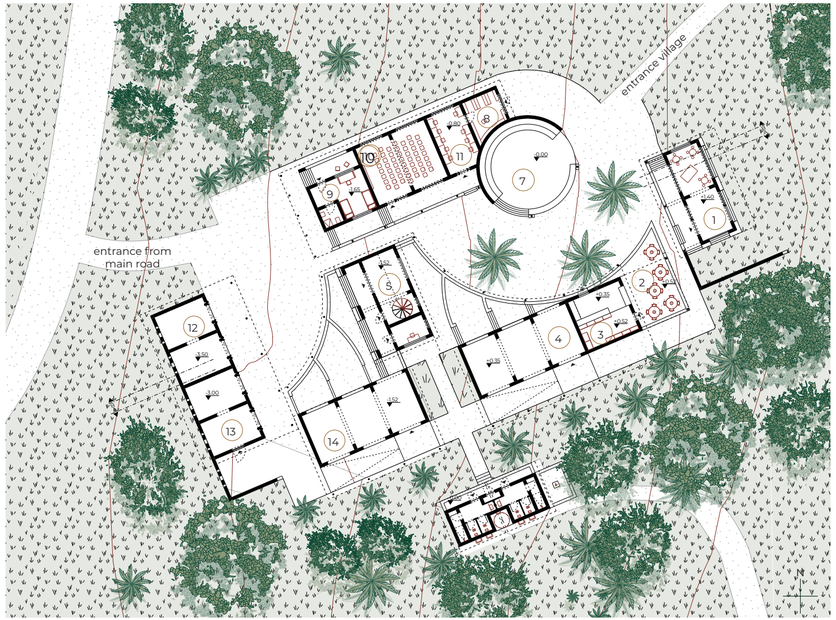


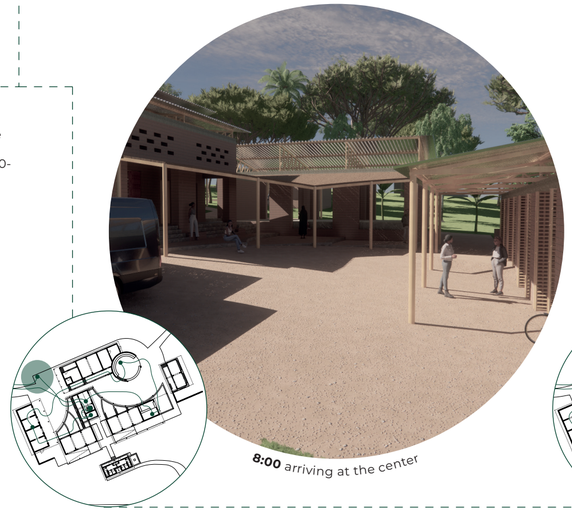
Fig. 64: Floorplan in construction step III

0.0m 0.5m 2.5m 5.0m

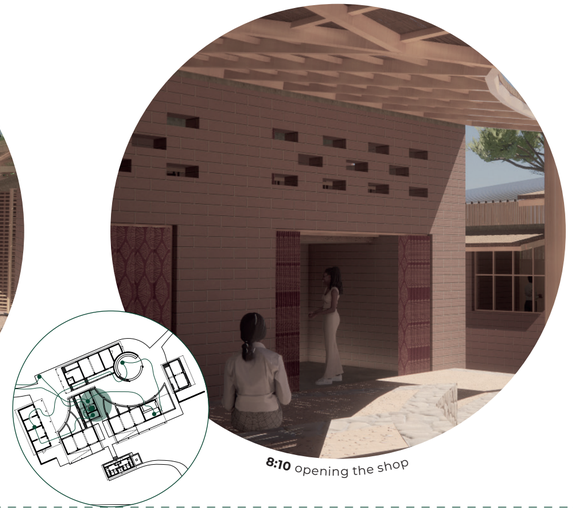
1 child care
2 kiosk
3 kitchen
4 block production
5 shop
6 sanitation
7 discussion area
8 library
9 guest house
10 lecture space
11 study space
12 storage
13 tool rental
14 wood workshop

People participating in a day at the multi-purpose women's center after the construction phase III

Masha:
age: 28
profession: sale management
working day: 8:00-17:00

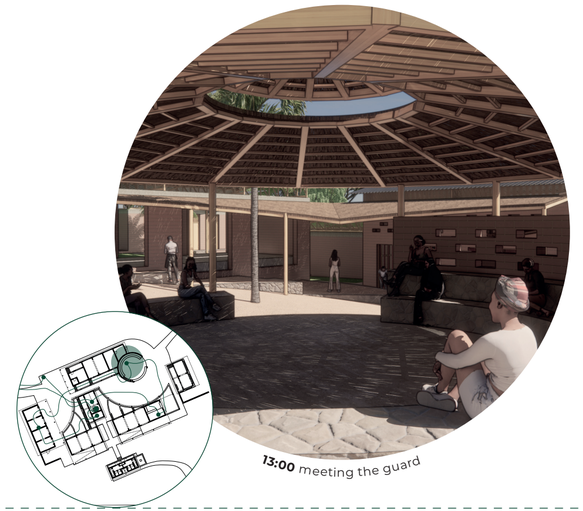


8:00 arriving at the center

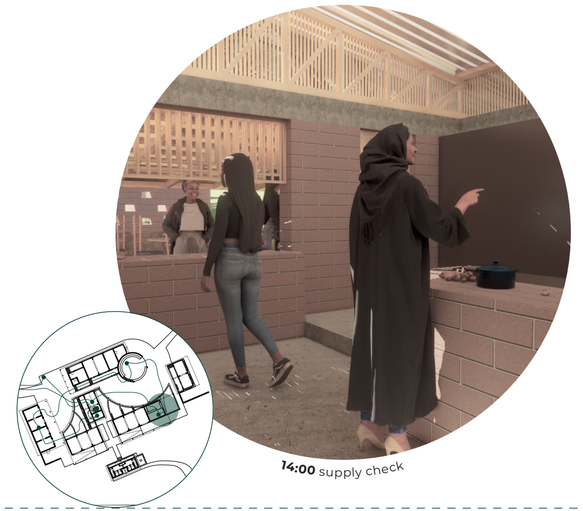


8:10 opening the shop

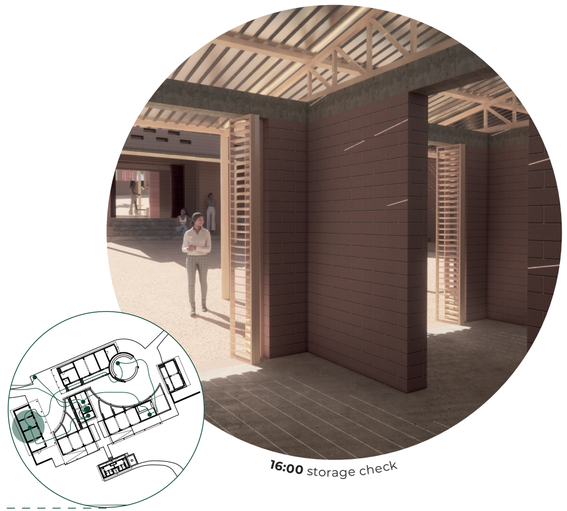
8:20-13:00 administrative work



13:00 meeting the guard



14:00 supply check



16:00 storage check

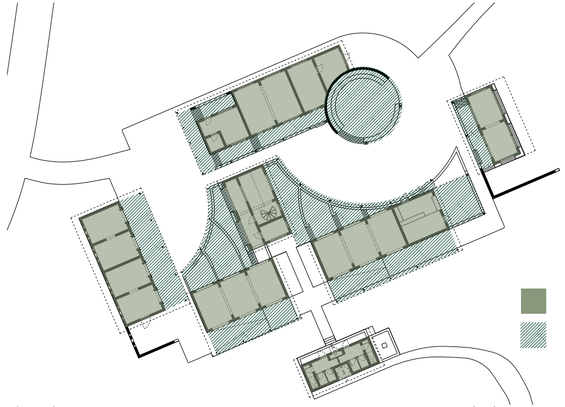


Fig. 69: Spaces outside and inside

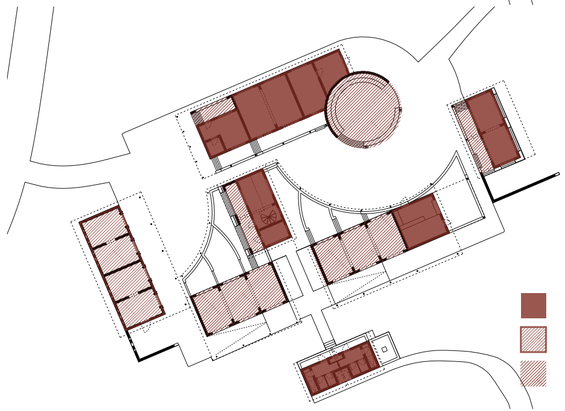


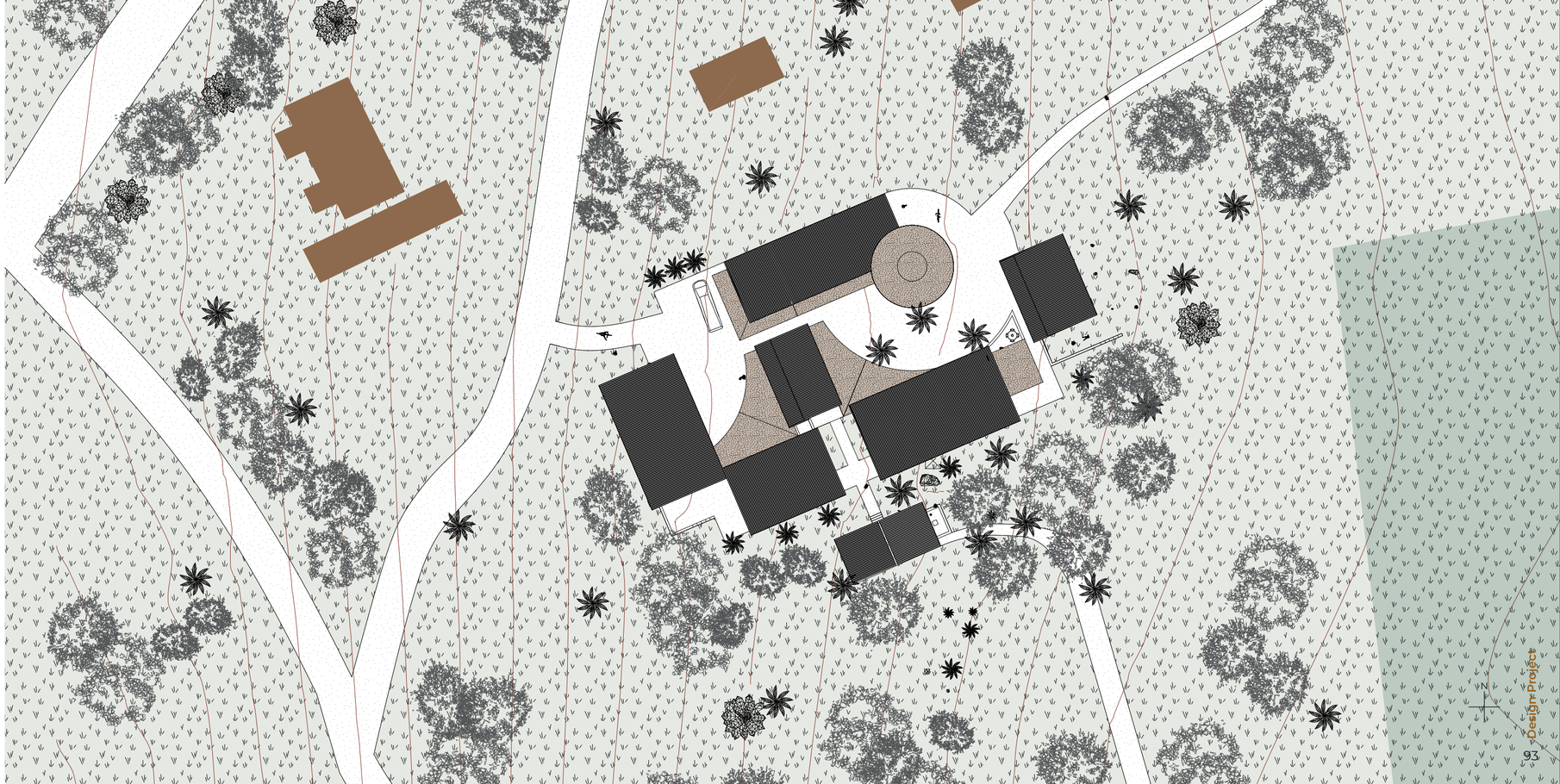
Fig. 70: Spaces open and locked

3.2.4 Spaces

Figure 69 shows the division of spaces into sun-protected inside and sun-protected outside areas. Big shading structures for an excellent outdoor climate exist around the buildings. The discussion area is the center's heart and visually inviting when coming from either the village center or the main road. There are a lot of other shaded outdoor spaces to sit and socialize. There is a veranda added to all of the buildings, referring to the traditional Tanzanian porches. They provide space to be protected from solar radiation and rain. The building is as transparent and open as possible so that visitors see what is going on and feel invited to participate.

Figure 70 shows which buildings are closed and lockable, open and lockable and open. The two workshops are open structures. This way, they are weather protective to work conveniently. The storehouse is lockable for the night but open for air movement. The lockable buildings are better protected from weather, noise, and animals. In addition, they create a type of privacy. Lockable buildings are the child care, the kitchen, the study space, the guest room, and the shop.

Fig. 71:
Siteplan, 1:500



3.2.5 Siteplan

Figure 71 shows the site plan in scale of 1:500. It shows the two main entrances, one coming from the village center, with a working distance of about 500 meters and the other one close to the main road with about 200 meters. In addition, there is a third connection to the building. A pathway reaches directly to the sanitary facilities and allows the latrines to be emptied by a truck. In the East of the site, there is a football field. Women who are not working at the center but come to the community area can be close to their children playing. They can see what is going on and eventually want to participate themselves.

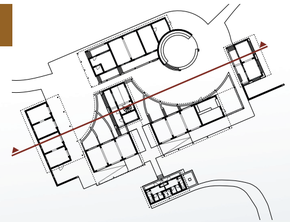
3.2.6 Section A-A

Section A-A looks towards the South of the building with the child care center on the left, the shop with a second level for administrative purposes in the middle, and the storage space on the right. At elevation, the kiosk with the kitchen, the open block workshop, and the wood workshop are visible. In the back, there is sanitation. Additionally, the section shows that the plot is on a slope with a height difference of almost 5 meters between the child care and the storage space.

Elevation A-A

Elevation A-A shows, from left to right, the child care center, the discussion area, study and lecture space, the guest house with the private veranda, and on the right, the wood workshop and storage space.

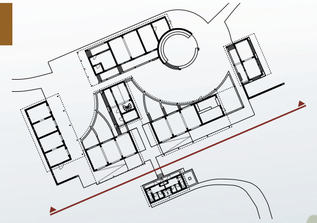
0m 1m 5m 10m

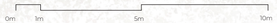


0m 1m 5m 10m

Section B-B

Section B-B shows the child care on the right, the shop in the middle, and the storage space in the section. There is the elevation of the discussion area in the back, the study and lecture space with the movable finwalls.



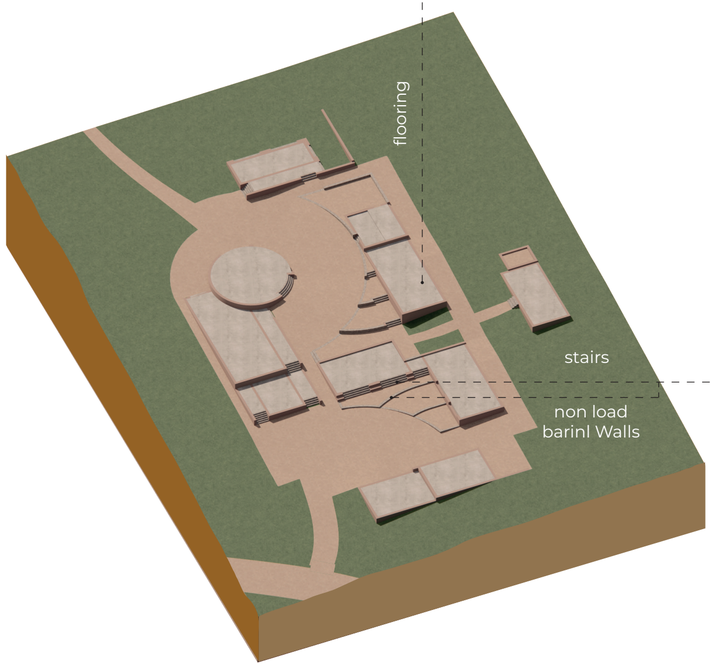


Elevation B-B

Elevation B-B shows from right to left the child care center, the kiosk and kitchen, the open block workshop, and the passage, passing the wood workshop to the storage space on the left. In the middle, there is the guard room.

Fig. 72: Birds' view of the Multi-Purpose Women Center

3.3 Final Design - Construction Methods



3.3.1 Construction Methods

Fig. 73: Foundation, stairs and non- load-bearing walls


concrete

=


water


gravel


cement

Advantages

- fastly mixed
- fastly build
- local preservation of modern material
- long duration

Disadvantages

- expensive because of the import of cement
- knowledge needed
- ecologically unsustainable


natural stones

+


cement

Advantages

- locally available
- low cost

Disadvantages

- time-consuming
- transportation costs

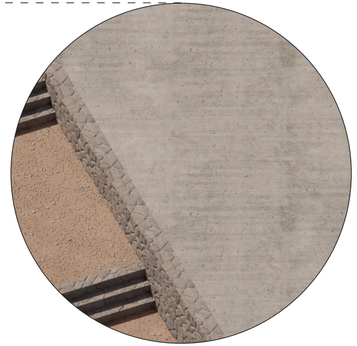
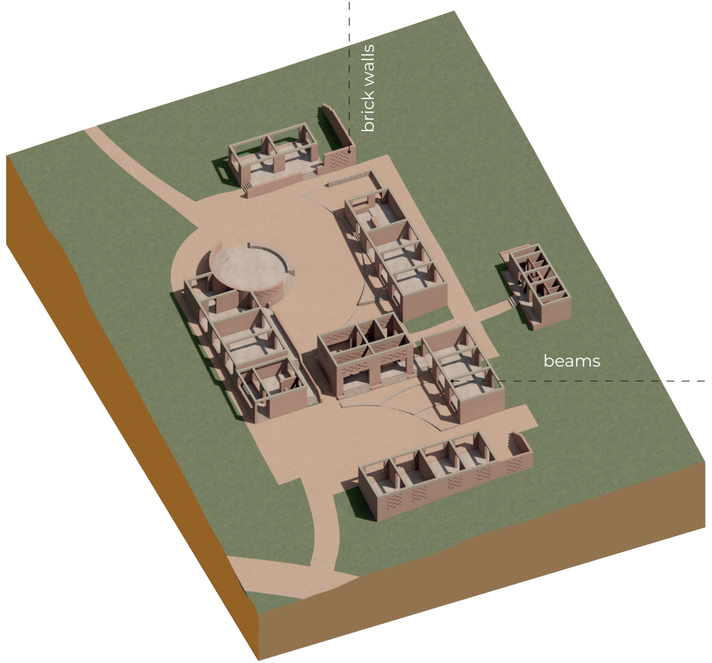


Fig. 74: Concrete floor

Fig. 75: Natural stones in non-load-bearing wall



Construction Methods

Fig. 76: Walls and Beams

compressed soil blocks

+

sometimes protected with plaster

reinforced with cement

Advantages

- materials on site: Soil and water
- production process isalrady known by the women

Disadvantages

- cement needs to be added in order for the bricks to be load-bearing
- need to be protected from water with rendering

concrete

=

water

gravel

cement

Advantages

- fastly mixed
- fastly build
- local preservation of modern material
- long duration

Disadvantages

- expensive because of the import of cement
- knowledge needed
- ecologically unsustainable

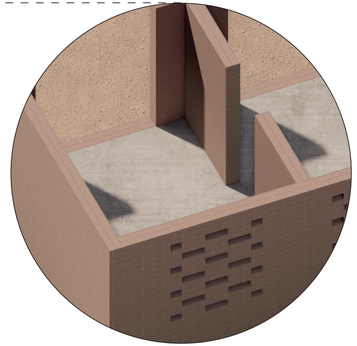


Fig. 77: Masonry walls made out of compressed soil blocks

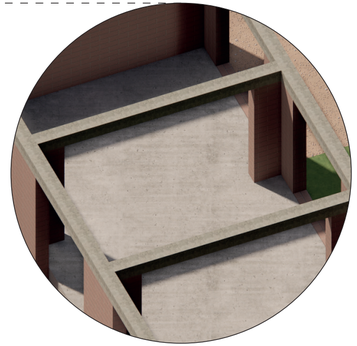
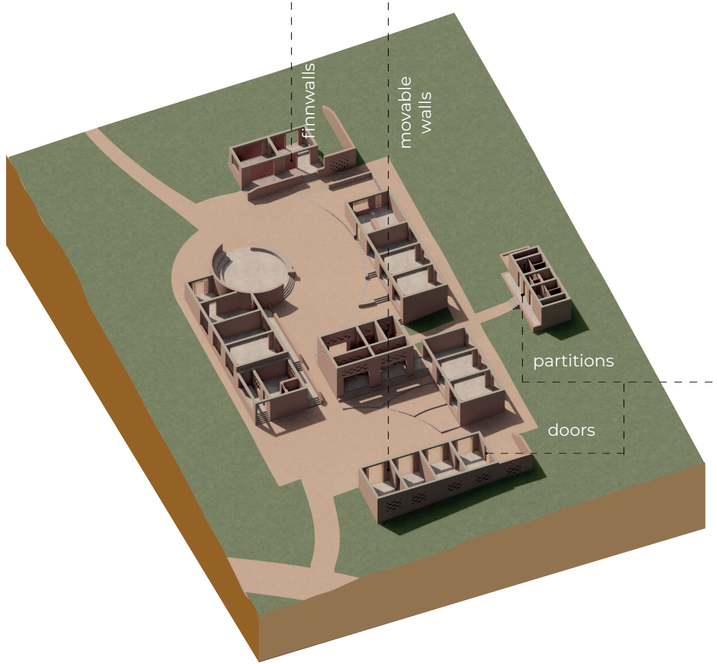


Fig. 78: Concrete beams



Construction Methods

Fig. 79: Finnwalls, movable walls and doors

wood

+

local textiles

Advantages

- local material
- can be treated on site

Disadvantages

- needs to be used in small amounts because of deforestation in Tanzania
- needs to be treated against termites

bamboo

Advantages

- local material
- cheap
- can be found on site
- can be changed by women on site

Disadvantages

- durability
- needs to be treated against termites

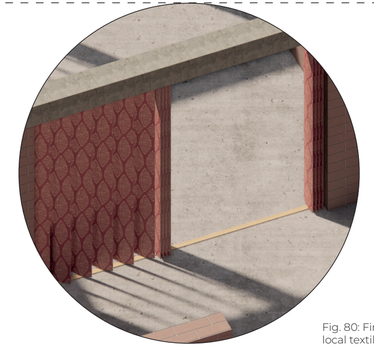


Fig. 80: Finnwalls with local textiles and wood

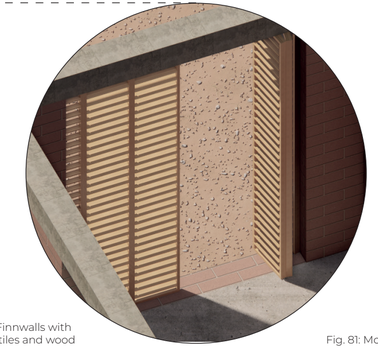


Fig. 81: Movable walls

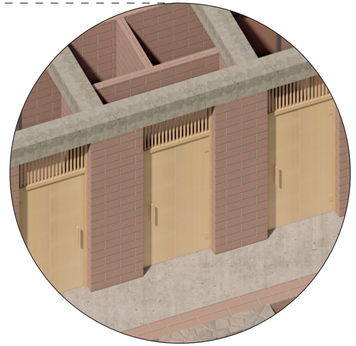
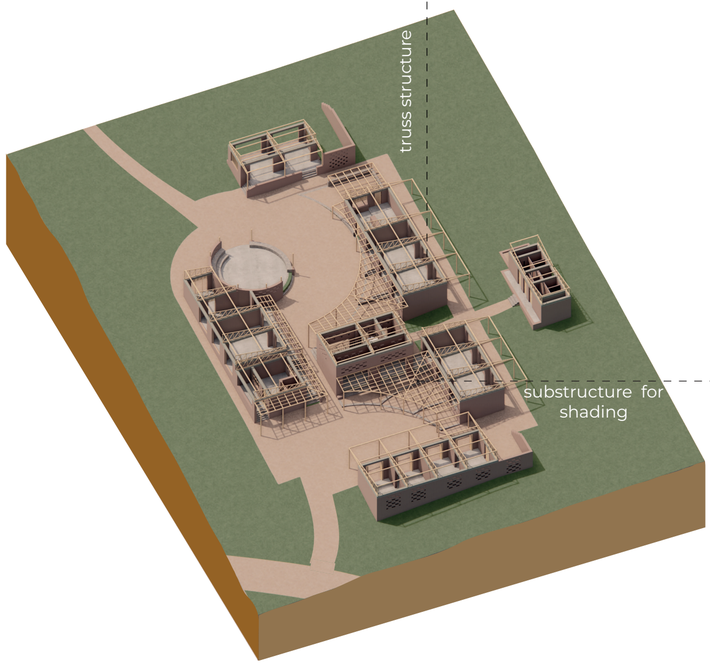


Fig. 82: Doors with bamboo wall



Construction Methods

Fig. 83: Truss structure and substructure for shading

wood

Advantages

- local material
- can be treated on site

Disadvantages

- needs to be used in small amounts because of deforestation in Tanzania
- needs to be treated against termites

bamboo

Advantages

- local material
- cheap
- can be found on site
- can be changed by women on site

Disadvantages

- durability
- needs to be treated against termites

Fig. 84: Wooden truss structure

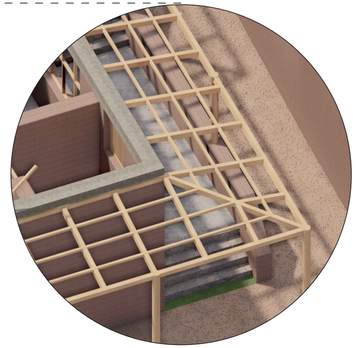
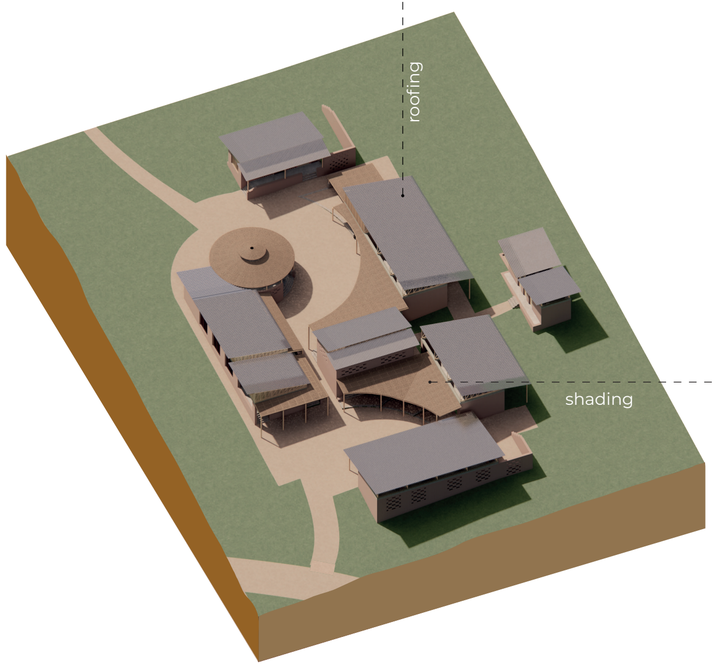


Fig. 85: Substructure for shading devices made out of bamboo



Construction Methods

Fig. 86: Roofing and shading devices

corrugated sheet

Advantages

- water resistant
- durable
- easy to cut

Disadvantages

- expensive
- unsustainable

thatch

Advantages

- local material that can be found on site
- traditional method
- water repellant
- shading

Disadvantages

- durability
- needs to be treated against termites

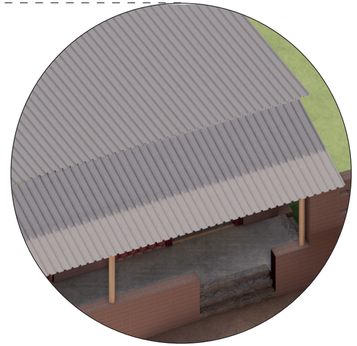


Fig. 87: Corrugated steel roofing

Fig. 88: Thatched shading devices

3.3.2 Climatic Design

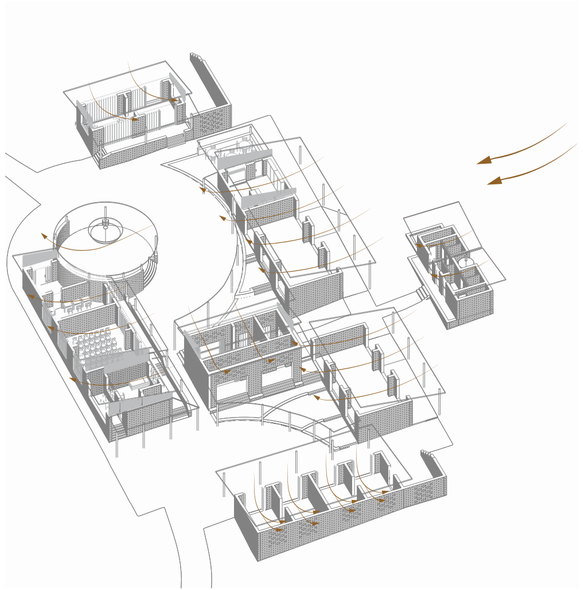


Fig. 89: Passive ventilation

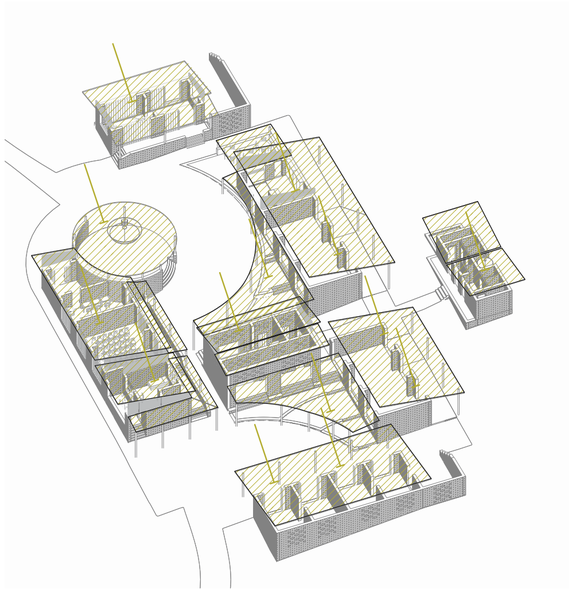


Fig. 90: Protect from solar sun

3.3 Construction Methods

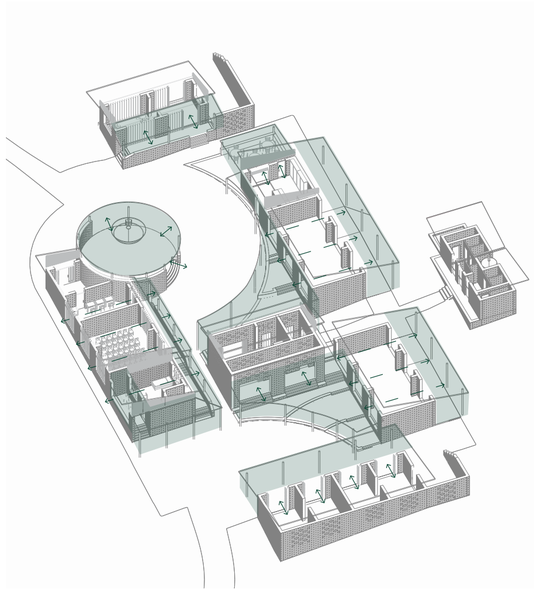


Fig. 91: Open the building to the outside

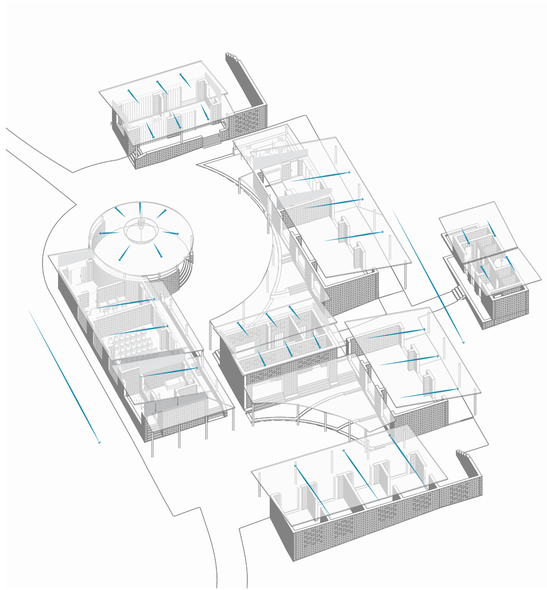


Fig. 92: Remove moisture and avoid additional humidity

3.3.3 Services: Sanitation, Water, Solar energy

Having a sufficient water supply is crucial for a center like this. The rainwater is harvested directly from the sanitation roof. Dust from the roof and dangerous mosquitoes are removed during filtration. The water is gathered in a tank from where it can directly be used for handwashing and showers. There is a well-drill next to the facilities to ensure a good supply for the whole building. The water is used for drinking, cooking, materials production, and cleaning.

Being self-sufficient with water saves much money, as transportation costs are very high. Significantly during construction, water can raise the expanses. (Åstrand, 1996)

A double-pit latrine is used for male and female sanitation. One of the chambers is used at a time and closed when full. While the other chamber is used, the content of the first can be composted. After that, it can be emptied and used again.

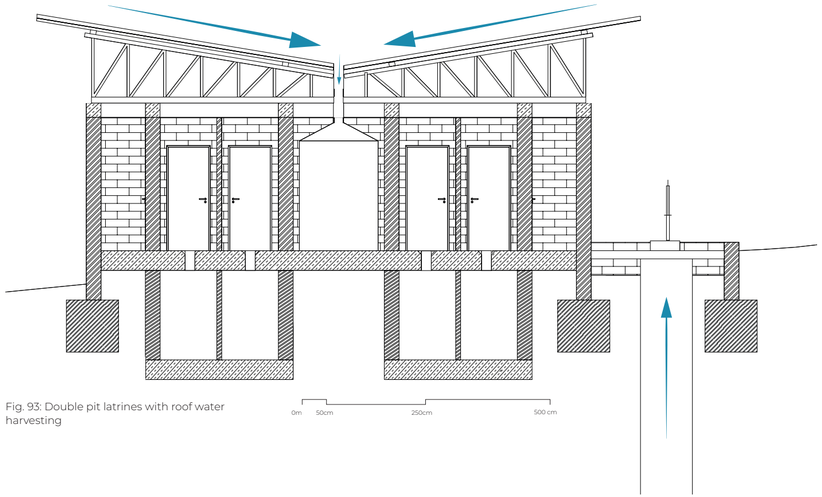


Fig. 93: Double pit latrines with roof water harvesting

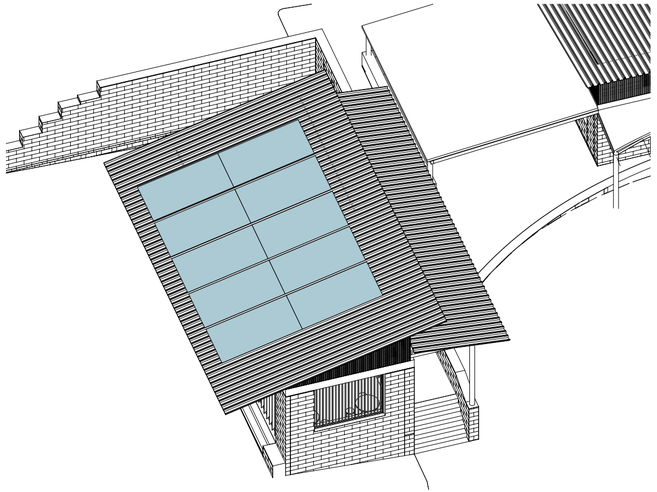
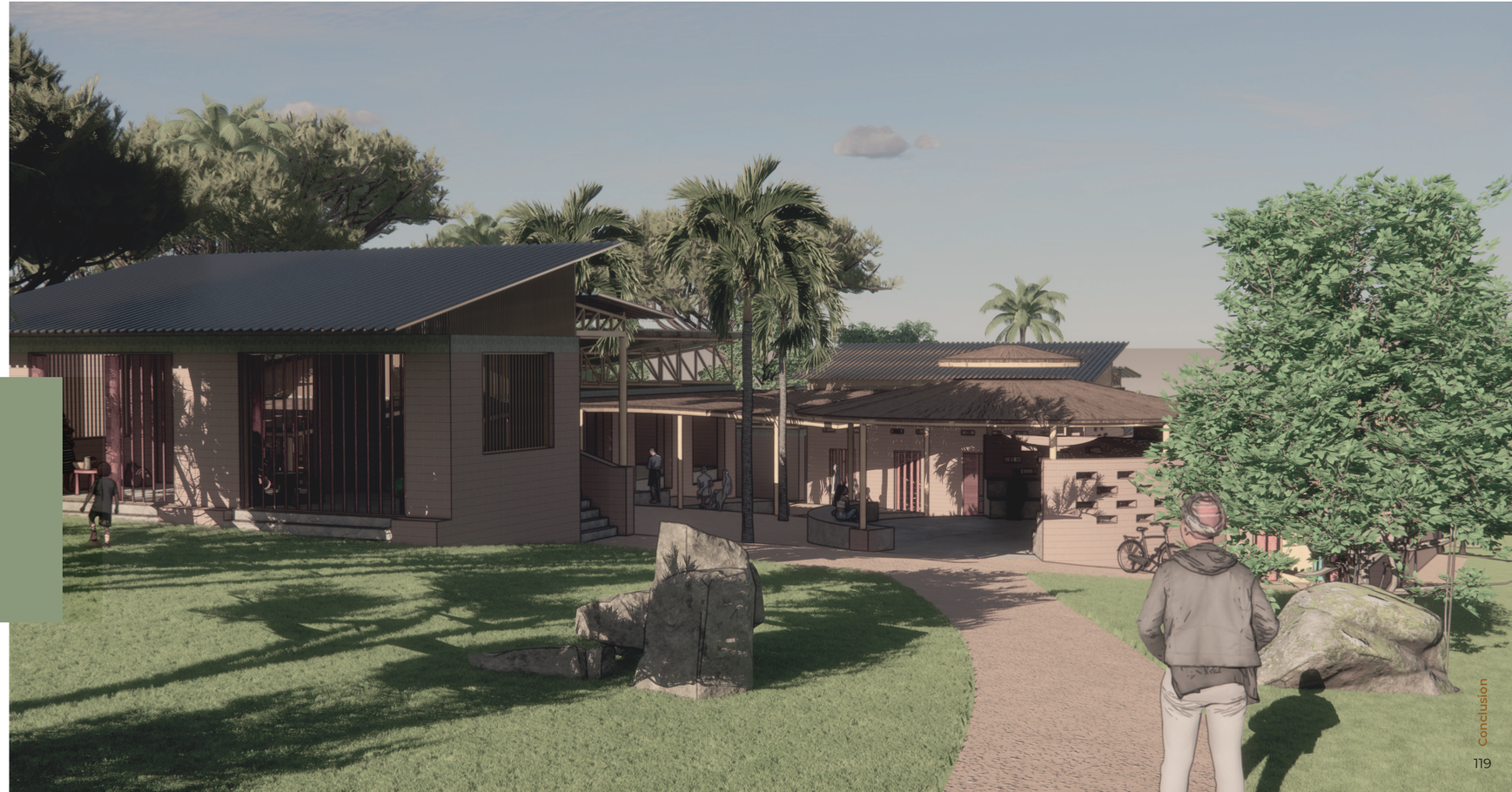


Fig. 94: Solar Panels for solar energy

Fig. 95: Direct sun hours on the roof/ year

4 Conclusion

Fig. 96: View entrance from village center



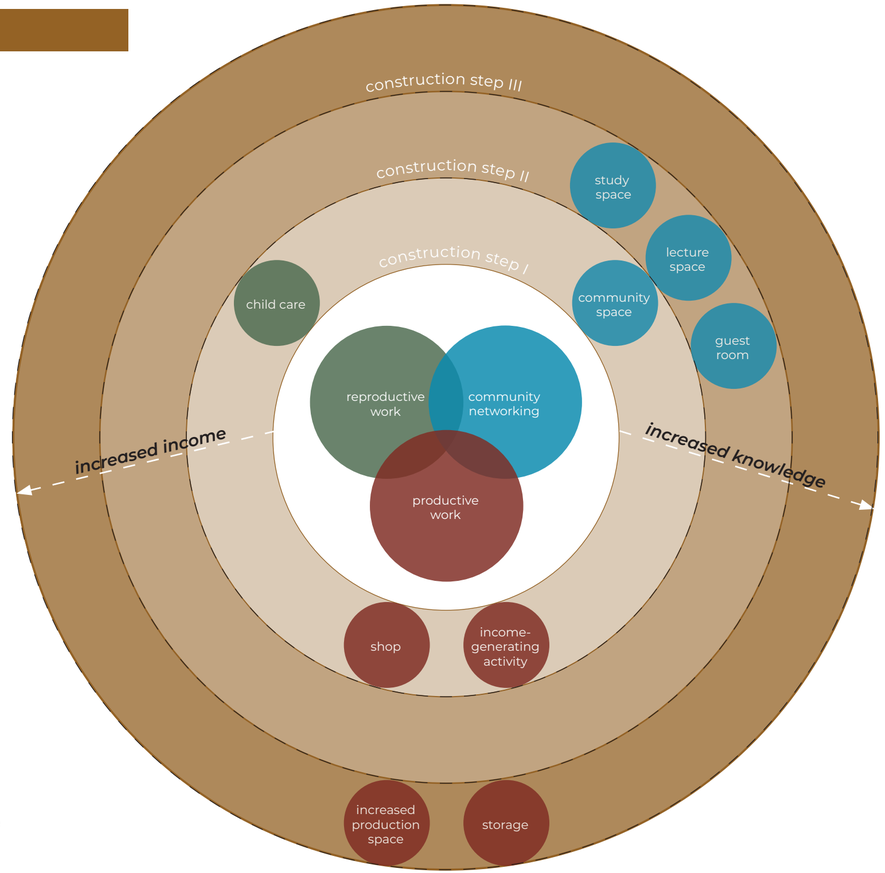


Fig. 97: Toolkit for larger scale

4.1 Toolkit for larger scale

Even though every village in this world needs to be treated individually, a toolkit can be shaped out of the multi-purpose women's center's typology. This way, living conditions can be improved not only in Kisarawe, but likewise in many other lower-income communities.

The obligation of women when it comes to child care, household, community work, and productive work is an issue that appears all over the world in lower-income areas. For that reason, the foundation of that typology is to address the triple role of women. While the solution for the reproductive and community work is clear, the productive part needs to be examined individually in each setting. It is essential to develop an income-generating opportunity that has the most potential to be accepted by the women (and the men) of a community in the long run. Nothing new needs to be encountered. Instead, what exists in a community should be dissected to find a suitable option. This can be certain kinds of market production, farming, livestock, or other needed products in the area. The best-case scenario would be to find something for what the knowledge and understanding already exist among the women in a community.

The development of the center over time is again a fundamental aspect. This works by splitting the construction into at least three steps. The first step is about building the core center to provide the women with time and space to earn their first income. The core center should always have a child care center to provide the women with time, a community area to give them space to talk and exchange freely among each other, and an activity that generates first income. The following construction step is about increasing the knowledge and motivating more women to participate. In this phase, buildings are added that advocate education and the exchange of professional knowledge, such as study zones and libraries. Most importantly, it should include a guest house for external professionals to be invited. The last step should be heading towards a greater goal that increases the living conditions of the women who participate in the center and the whole community. A side-effect of the building growth is that more women will have the opportunity to work, improve their living conditions, and eventually will be able to give back to their community.

For a project like that to be successful, a local NGO needs to be responsible. First, the organization should be a part of the planning process and find the funders for the construction phases. The local NGO then guides the process until that moment when it can operate on its own.

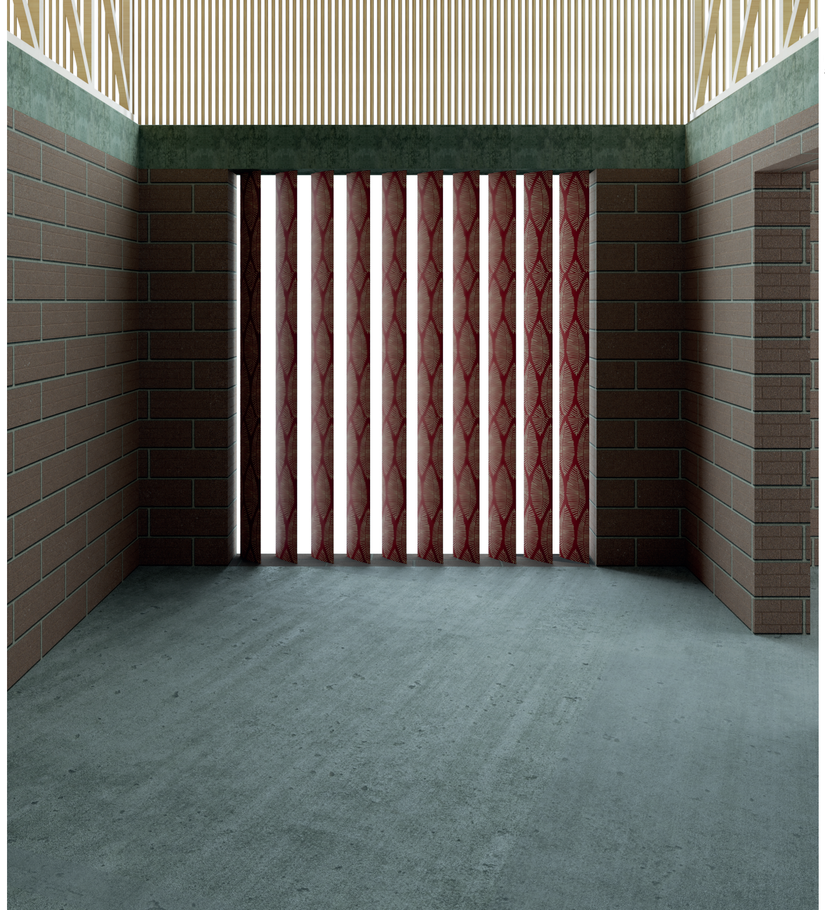


Fig. 98: Interior of the study space and use of simple materials

4.2 Final Reflections

We, as architects, have a responsibility to shape the world around us in the best possible way, and when working together, a lot can be achieved. There are many different, exciting cultures, each with other traditions and knowledge. Therefore, many things can be learned from each other. This project investigated humanitarian architecture in the context of Kisarawe, Tanzania, through a background research study. The discovered knowledge was then applied to a design proposal. The aim was to find an architectural typology that empowers the women of Kisarawe by promoting the existing soil block production as an income-generating activity, with the goal for them to have a more self-sufficient and secure way of living.

Planning with lower-income communities is a whole different matter than planning in the European context. Almost every aspect is different, which made the research and design both challenging and enlightening. The goal was to explore an efficient and realistic approach to building and planning in a lower-income area while being sensitive to the culture, people, and traditions. A thorough research study leads to a better understanding and can be the difference between a successful, unsuccessful, or even harmful project. Although every community is different, some uniform principles can be pulled out of the multi-purpose women's center's concept.

Women's empowerment always is a personal concern; how can it not be. Inequality is an issue worldwide, and fighting for women's rights is not only an issue within a community but crucial for healthy development. When resources and knowledge are used correctly, it can be fought with an effective outcome. However, every situation is diverse, and the sensitive handling of who and how to design for is crucial. One of the essential things when constructing in lower-income areas is the vision of development. Balancing between what is needed to improve a condition in a specific moment and reach a particular result over time is crucial. A solution should never be made just because it suits the moment but because it leads to improvement in the long run.

There are many dangers along the way to not make things worse for a community. When working with vulnerable or marginalized communities, staying flexible and open-minded is vital. One can learn much more from the local population than the other way around.

One big challenge during the planning of the design proposal was to keep the costs of the building as low as possible. The use of materials was a big part of that. Decisions must be made based on various factors such as transportation costs, locality, durability, and sustainability. In addition, practical decisions need to be made about what is essential to make the building work. For example, the center has self-reliant electricity and water supply. This alone can be a reason for the women to come to the center and increase a positive connection to it, eventually making it into their place.

Another goal was to make the building speak one architectural language. This was not only for simple esthetic reasons. A pleasant building is more likely to be maintained and operated adequately. However, this was challenging because complicated shapes would have raised the building costs and effort. As a solution, the main buildings are left in a rectangular shape, whereas the stairs and the thatched shading devices circulate the round discussion area, which is the heart of the center. This way, the whole center appears more organically.

Local building methods and traditional Swahili elements are used in the design. For example, all buildings have porches and shaded outside areas, leading to increased communication among the users and opening the building to the outside. In addition, the thatched roofing is a traditional building method and convenient in a design like this because the local population knows how to handle these, especially when they need to be replaced.

This project has been challenging and rewarding and tackled a personal interest in humanitarian architecture. Especially inspiring was the work of TAWAH, who did not only give a lot of important input about the local Tanzanian perspective but whose work is genuinely life-changing for the communities in and around Dar es Salaam. Looking at it from the European perspective, there are many things to learn. It was enriching and inspirational to see an organization giving time and space to improve the living conditions of marginalized communities that have much fewer opportunities and chances to do it themselves.

5 References

Fig. 99: Entrance shop and productive area

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Thank you.