

# KOLANDOTO ON CALL

DEVELOPING AN EMERGENCY DEPARTMENT  
THROUGH PARTICIPATORY DESIGN



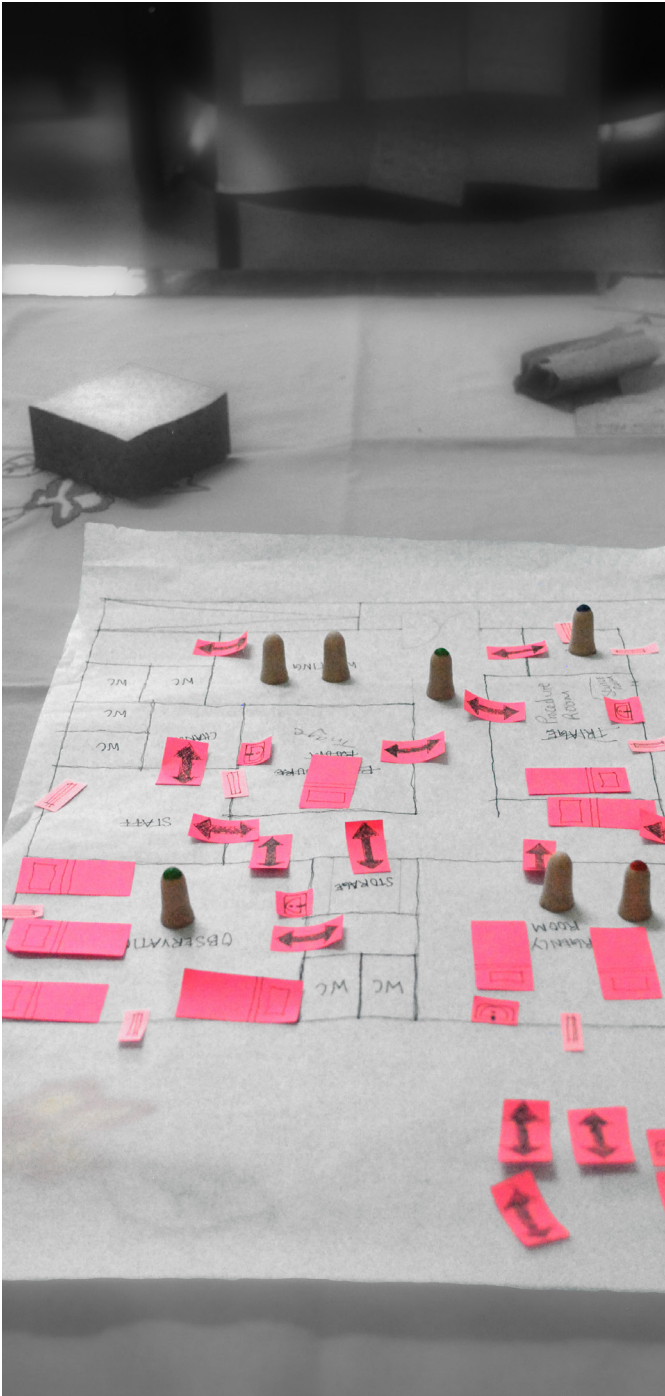
MASTER'S THESIS  
LISA BERGSTRAND  
MPARC

- SPRING 2016 -

*"Architecture is primarily about communication."*

(Gabriel & Maher, 2002)





## ABSTRACT

Good health and well-being is one of UN's 17 Sustainable Development Goals (SDGs) that came into force on 1 January 2016. One of the targets for this goal is to achieve universal health coverage and ensure access to quality essential healthcare services. As architects we can contribute by designing high quality healthcare buildings that are based on the concepts of healing design.

The research on healing design has identified a number of key concepts to consider in the design of healthcare facilities. Among these concepts are cultural identity and community involvement in design. Architects can work with these concepts by using a participatory design method to include users as co-designers of their future environment.

The objective of this master's thesis is to explore how a participative design approach can be used to develop a design proposal for a new emergency department at Kolandoto Hospital, Tanzania. This is done through a series of workshops conducted with a group of medical staff at the hospital during an eight-week field study. The design of the workshops is based on a literature review of the field of research concerning participatory design.

The result of the field study shows that, in an international development context, a participatory design approach can be particularly useful in the early stages of an architectural design project. An important experience is, however, that it can be time consuming to introduce this method in a new context. For projects with a limited time frame it is therefore advisable to continuously evaluate the added value of a participatory design process compared to a, often shorter, conventional process.

## ABOUT THE AUTHOR



### LISA BERGSTRAND

I began my architectural studies in 2009 and I have a bachelor degree in architecture from Chalmers University of Technology. During my master studies I've followed three studios with focus on healthcare and housing. I've also completed a preparatory course for my Master's Thesis as well as a course in Nordic Architecture and the courses "Sustainable Development and the Design Professions" and "Architectural Competitions".

The last 1.5 year I've been doing an internship at Semrén och Månsson with a focus on healthcare projects. I have gained a lot of experiences especially regarding communication with clients and users. The idea for this master's thesis have a starting point in my personal experiences of architectural work.

## MY WORK



*Housing project (2013)*



*Senior Housing (2012)*



*Hospital Project (2013)*

## COLLABORATIONS

This thesis is part of the project “Kolando Healthy Hospital Phase 2” which is a collaboration between Kolando Hospital in Tanzania, and the three Swedish NGOs I Aid Africa (IAA), Architects without Borders (ASF) and Engineers without Borders (ISF). The project aim is to rehabilitate the facilities and infrastructure at Kolando Hospital.

The thesis work has been carried within the framework of the Minor Field Studies Scholarship Programme, MFS, which is funded by the Swedish International Development Cooperation Agency, Sida.



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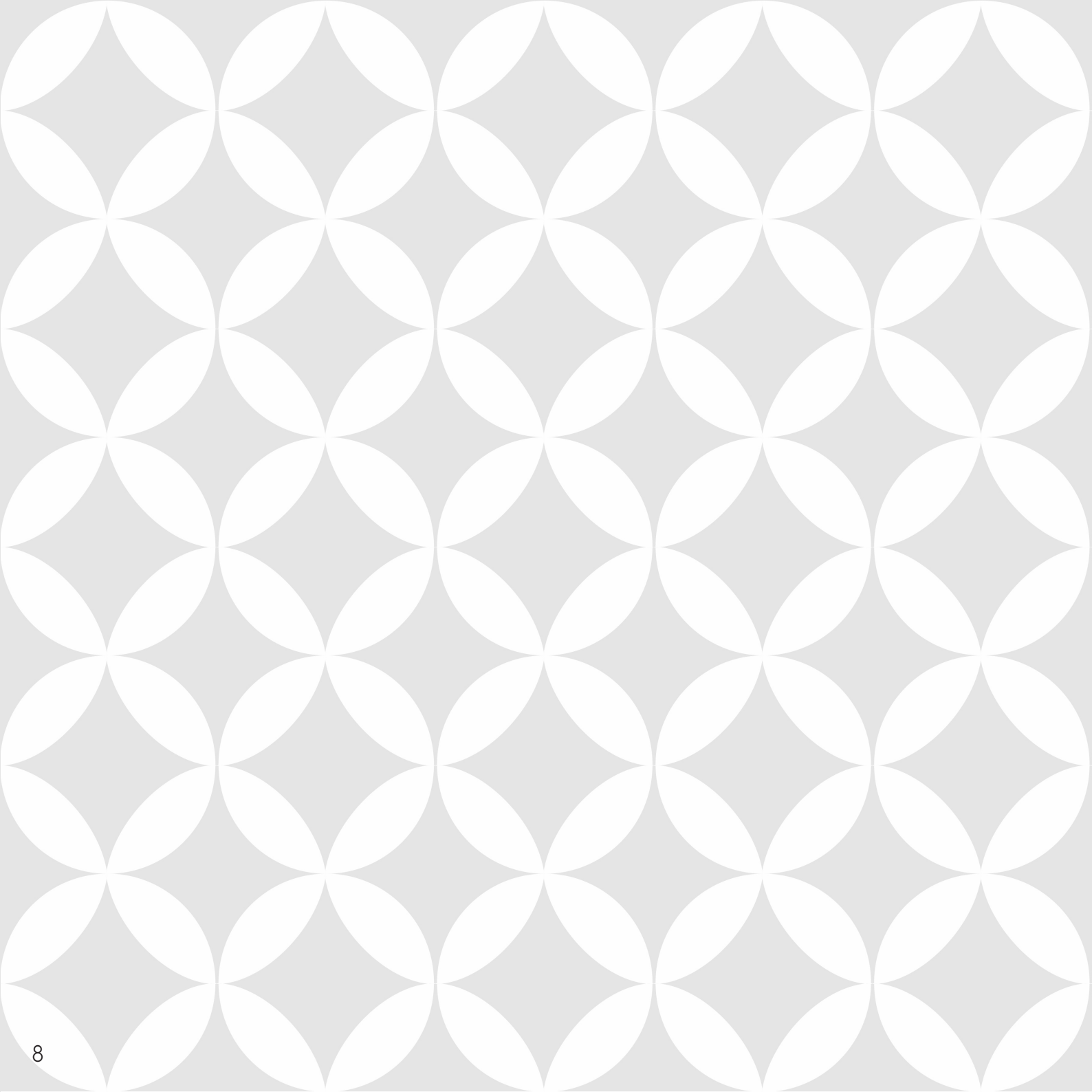
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# CHAPTER 1

PRESTUDY





## 1.1 INTRODUCTION



## PREAMBLE

Architecture is primarily about communication. It is the art of communication both as a process and end product. (Gabriel & Maher, 2002) (Norouzi, N. et al 2015) This is the foundation on which this thesis is built upon.

If architecture is about communication it must mean that the process of architecture has to be a collaboration, where the architect and stakeholders have an ongoing dialogue from the initial idea to the final proposal. The success of an architectural product must thus be heavily influenced by the success of this dialogue.

The importance of a good dialogue with stakeholders is particularly evident in projects with a complex program and projects that are set in a context that the architect has little to no experience with. Projects within the field of healthcare often have complex programs and the dialogues with nurses and doctors are of utmost importance for a good end result. The unknown contexts can be geographical but also cultural. Architects, designers, engineers and doctors, all who travel to new contexts to work in a new setting, face similar problems and I believe that at the core of the success of all our work lies **communication**.

Participatory design, an active research field during the last decades acknowledges that direct user involvement in the design process has a positive influence on the end product. The view on participatory design has developed and it is now considered to reflect design as a social process, meaning that the “sphere of the design activity extends beyond the designer.” (Luck 20013) The idea is that users become co-designers.

## PROJECT BACKGROUND

Kolandoto Hospital, founded in 1913, is run by the Africa Inland Church Tanzania (AICT) as an educational hospital, with approximately 180 beds. The hospital is located in the village Kolandoto close to Shinyanga town, a regional capital in the north west of Tanzania.

This master’s thesis is part of a second phase of the collaboration project “Healthy Hospital” between Kolandoto Hospital, and the three Swedish NGOs I Aid Africa (IAA), Architects without Borders (ASF) and Engineers without Borders (ISF), with the long term objective of Kolandoto Hospital fully becoming a Council Designated Hospital (CDH). To fulfil this goal it is necessary to rehabilitate the facilities and infrastructure at Kolandoto Hospital to improve the quality of healthcare and increase the amount of patients.

The project is divided into phases with the first phase of the project carried out during 2015 by three master’s thesis students at Chalmers University of Technology. The first phase included a full survey of the infrastructure at the hospital and short term engineering solutions. The problems that were defined involved inadequate access to quality water and an unreliable power supply as well as insufficient facilities for emergency care. These problems are the basis of the second phase of the project which this thesis is part of.



## PURPOSE AND GOALS

The purpose of this master's thesis is to explore and evaluate different tools and methods of participatory design and architectural communication within an international development context.

The main goal is to, in collaboration with the stakeholders at the hospital, design a proposal for a new emergency department at Kolandoto Hospital in Tanzania.

# PROBLEM STATEMENT

## CO-DESIGNING

When the people who are being served by architectural design are brought into the design process it is to ensure that the designed environment will meet their needs and dreams for the future. (Sanders 2012)

While user participation can seem rather straightforward at first glance there is one particular problem that may prevent the participatory process from being successful, the problem of communication. This problem can be categorized as technical and social (Norouzi et al 2015), where technical problems typically evolve around the lack of an appropriate design language where the nonexpert and the expert can fully understand one another and communicate ideas efficiently. The drawings, images, models and verbal language used by the designer are not developed to be suitable for dialogue with persons without formal architectural training. The communicative material that, to the architect, is full of potential and possibilities remain mute to the outsider. (Blundell 2005)

On the other hand we have the problems categorized as social communication problems, cultural clashes for example. These are normally solved by using a socially oriented approach, for example by developing methods that allow the users to participate in all steps of the design process. (Norouzi et al 2015)

By developing a set of workshops, with different approaches and physical artefacts, we can create a common language where both the designer and the future user can imagine and express their ideas and feedback. The first step is to become conscious, the second to find a set of methods that work. The thesis is that problems can be solved by exploring different forms of communication rather than focusing on more communication.

## A NEW EMERGENCY DEPARTMENT

Kolandoto hospital is in the process of becoming a true Council Designated Hospital (CDH) which will make the hospital more financially stable and make it possible for them to exempt many patients groups from fees. This also means that the flow of patients will increase and it is therefore important to develop the facilities to meet the growing demand.

Emergency patients at Kolandoto Hospital are currently treated in the outpatient department or arriving directly to the wards. There is no designated building or specialized staff to take care of casualties which means that emergency patients interrupt the “normal” care and puts an extra strain on the staff.

The ministry of health has recently introduced a ‘Result Based Financing’ (RBF) program which will provide money as additional support to boost service delivery in eight regions in Tanzania, including the Shinyanga region where Kolandoto is located. Payment will be based on delivery of result, both in terms of quality and quantity. This works as an incentive to increase both the quality of care given at Kolandoto hospital and the amount of patients treated.

A new emergency department, especially equipped to facilitate and improve the emergency care will not only provide a new, important health service in the area of the hospital but also be an asset for reaching better result in the RBF program.

The emergency care also includes functions as radiology and surgery. It is important to consider all connecting functions to ensure that they can work seamlessly together.

# RESEARCH QUESTIONS

## MAIN QUESTION

What participatory tools and methods can be used to support the development of a sustainable architectural healthcare project in an international development context?

## SUB-QUESTIONS

How can essential skills and knowledge of different stakeholders, and especially architects, be applied for successful participatory design process?

What tools and methods can be used to facilitate the communication between client and architect?

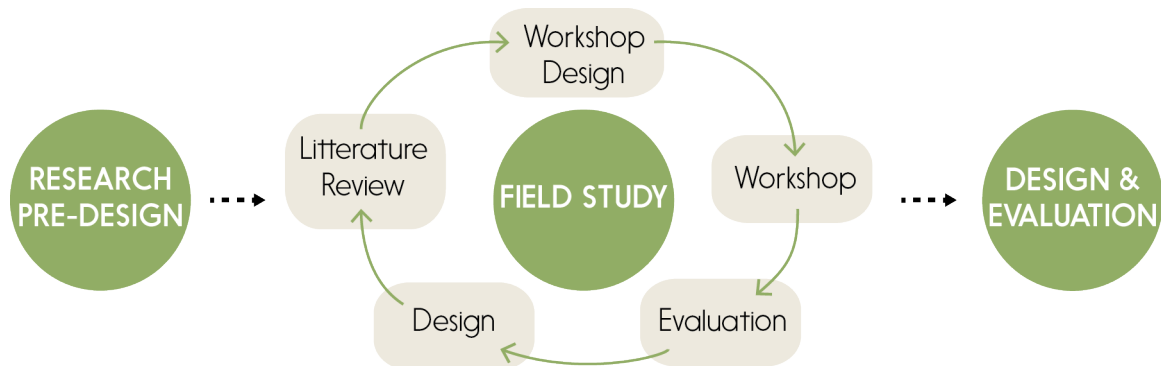
Which are the main challenges of introducing a participatory design process in an international development context?

# DELIMITATIONS

The project is carried out as a field study with a limited time frame which means that not all steps of the design process have been equally explored. The final design proposal has been refined after the field study which means that the participatory method has been used mainly in the early stages of the design process.

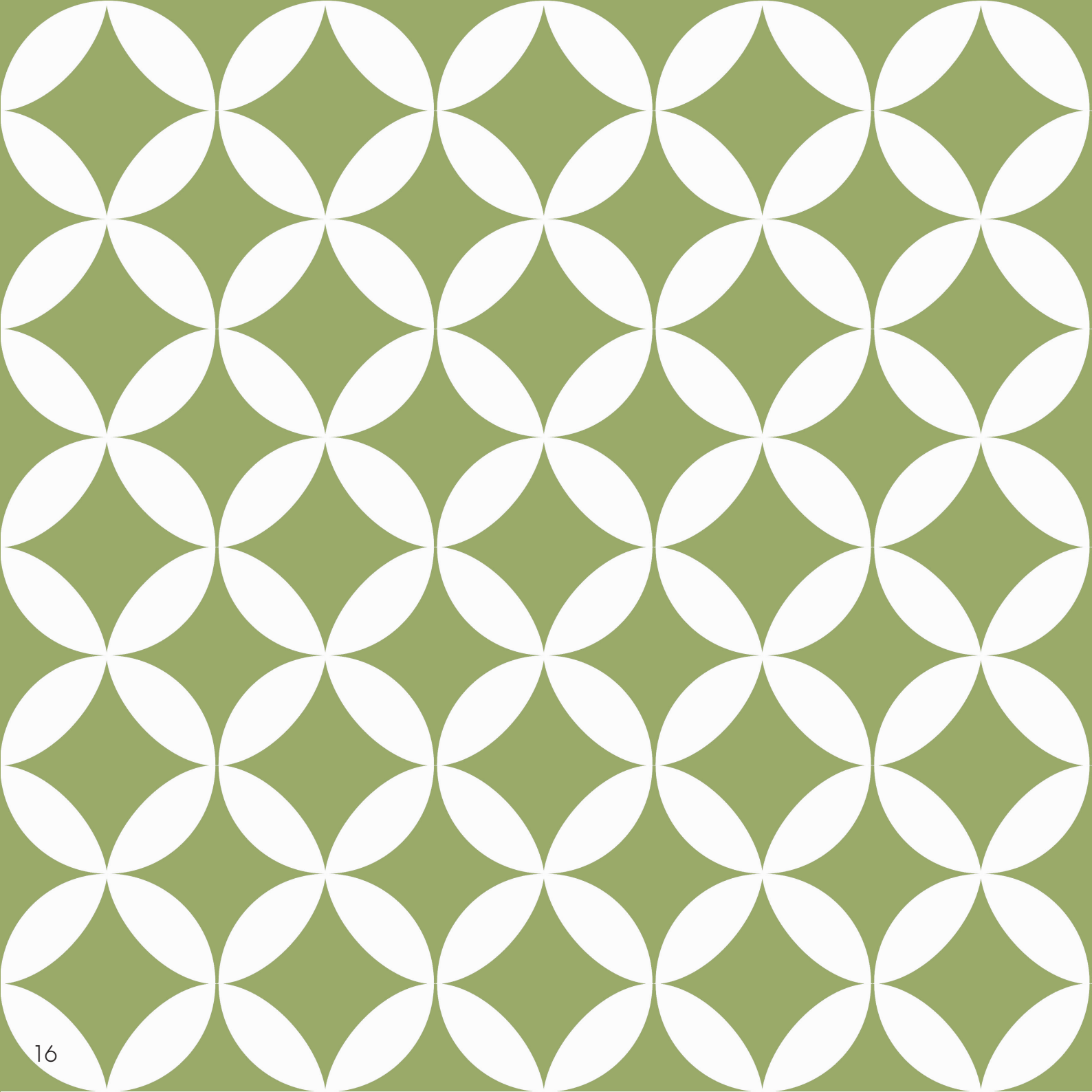
# METHODS

The overall approach is to use Kolandoto hospital as a case study to study a participative process of an architectural healthcare project in the international development context. This is done in a iterative “research-by-design” manner combined with a literature review on the field of research concerning participatory design and architectural communication.











# CHAPTER 2

RESEARCH &  
CRITERIA





2.1 THEORY



# DEFINITIONS

*In order to discuss the benefits and challenges of participatory design it is important to define some of the most used concepts.*

## **PARTICIPATION**

Participation can be defined as the act of taking part or sharing in something.

Participation should not be seen as an absolute term or concept. In all participatory processes there are degrees of involvement ranging from symbolic participation to full citizen control. (Blundell Jones 2005) The key is to find the optimal level of participation for any given process.

According to Granath (2001) participation of users in the design process can be understood as architecture designed to support participation in the use of architecture - participation through design. It can also refer to participation of users in the actual design process - participation in design. The latter is the definition which this thesis is based upon.

## **COMMUNICATION**

Communication originates from the Latin word *communicare* which means to share or “to make common”. Broadly speaking communication can be defined as the transmission or exchange of thoughts, messages or information from one person to another. (Norouzi et al 2015a) It can be seen as a “cognitive and social process by which messages are transmitted, and meaning is generated.” (Maier & Thalmann 2008)

## **WORKSHOP**

A workshop is a seminar or meeting which emphasizes interaction and exchange of information. In a participative design process workshops are the social sessions where the users become part of the design process and play an active part in issue/problem raising, discussion and decision making. (Luck 2003)

## **DESIGN GAME**

The game metaphor can be seen as a way of understanding and organizing participation in a design project. (Brandt 2006)

Design games are used as a type of workshop where the participants are given an assignment to achieve a certain design goal. The games consists of pre-defined tools and elaborately developed rule sets which are design to let non-designers take part in the design process. (Garde & Voort 2013) The overall aim of design games is to improve the communication between different stakeholders early in the design process. (Brandt & Messeter 2004)

Conventional leisure games usually consists of a competitive element which is decided by skill, strength or chance. The competition normally results in winners and losers. In design games the ultimate goal instead is to explore various design possibilities within a game setting and the players therefore rarely compete to win a specific game scenario. (Brandt 2006)

# PARTICIPATORY DESIGN

*To design the process itself can be equally important as designing the artefact. (Brandt 2006) Participatory design is a method that acknowledges that direct user involvement in the design process has a positive influence on the end product. It explores the social process of design and has a clear focus on process design.*

## BACKGROUND

User participation in the design process was introduced in the Scandinavian countries during the 1970s as part of what became known as the workplace democracy movement. It was used for the design of information and communication technologies with the goal of representing the interests of future users in the design process. (Robertson & Simonsen, 2013) Since then, participatory design approaches have evolved and is used both in Europe and the US, especially in information system design. (Puri et al 2004)

The field of research concerning participatory design (PD) has been growing since the 1970s but still most of the studies focuses on projects carried out in Western countries and cultures. Few studies are focusing on the challenges of adapting these methods to design projects in the context of developing countries. Participatory methods are, despite the lack of research, often encouraged in design projects for economically or socially marginalised people in developing countries. The inclusion of the future users is thought to increase the understanding of the user's needs and thus bring a better result. (Hussain et al 2013)

## METHOD

There are currently a wide range of goals to which participatory design is put to use, with different mind-sets and in varying contexts. PD can be used in different ways in different phases of the design process.

According to Sanders (2013) participatory design can be defined as being one or all of the following; a collection of tools and techniques, a set of methods and a mind-set. Sanders describes that the three perspectives can be useful in different stages of the design process. PD as a mind-set is most useful in the front end of a design process where it has the most potential to have a positive influence on people's lives. PD as a method is most effective in the design-focused phases while PD as a collection of tools and techniques is most useful in the tail end of the design process.

## PURPOSE

The main purpose of actively involving users in participatory design processes is to get better insights into future use situations and to help ensure that the design meet the users' needs. (Garde 2013; Hussain et al 2012) In a PD process the boundary between the 'designer' and the 'user' becomes blurred as the users take active part in the discussion and decision making. (Luck 2003) The users are no longer only seen as consumers or costumers but instead they are brought in as experts in their field. (Sanders 2013) In a PD process the future users are included with the purpose to create a democratic decision making process where the people affected by a project get an opportunity to influence the design outcome. The participants are often from different backgrounds and with various competencies and the strength of this design approach is that it has the possibility to cut across traditional boundaries, professional and cultural. (Hussain et al 2012) To achieve this, however, it is as Hussain et al (2012) points out important to find successful ways of involving and engaging people in PD activities.

Sanders & Stappers (2008) explain that the user's ability to become a co-designer depends on the level of expertise, passion and creativity of the user. In order for the users

to take on the designer role they must be given the appropriate tools and guidance for their “creativity level”. They acknowledge four levels of creativity in people’s lives: doing, adapting, making and creating. People who have a high level of knowledge and passion in a certain domain are able to become co-designers. For example, healthcare professionals can take part in the design of new healthcare systems and environments since it’s their field of expertise.

### **WESTERN PERSPECTIVE**

The underlying assumptions deriving from the literature with a western perspective are that of the democratic workplace, or other community, high literacy rates and the existence of a reasonable infrastructure. Even though these assumptions can also be questioned in Western projects it is, as Puri et al (2004) notes unrealistic to make any such assumptions in the context of developing countries. It is important to not only theorize about how PD approaches can be applied in developing context but also to conduct real-life projects to make empirical analysis.

The traditional model for PD is for designers to team up with both users and other selected stakeholders to do co-creation. When applying the concept in developing countries however, this model doesn’t always describe the full situation. Hussain et al (2012) discovered, through a field study project in Cambodia, that the traditional model was too simplified to describe the complex context they were working in. They explain how they never managed to achieve true co-creation where all participants worked together at an equal level. Instead the designer had to lead the participatory design activities. The traditional model assumes that all participants are at the “creating” level of creativity if they have a high level of knowledge in the field. This theory derives from a western perspective is

not necessarily true in a developing context where literacy levels may be lower and a strong hierarchal structure may affect the communication and participation.

### **COMMUNICATION**

Many have emphasized the importance of successful communication in PD projects (see for instance Bødker, et al. 2004; Garde 2013; Norouzi et al 2015; Smulders et al 2008) It has been argued that to reach genuine user participation, where the project is a mutual learning process for both users and designers, it is important to reach a common understanding of the produced results. (Bødker, et al. 2004) In order to achieve this the designer has to consciously develop a communication strategy bearing in mind that ordinary drawings, images and models might not be suitable for a dialogue with unexperienced participants. The lack of an appropriate design language is, according to Norouzi et al (2015), one of the most challenging factors in process design. According to Sanders & Stappers (2012) a key characteristic of the PD concept is the use of physical artefacts as thinking tools. These thinking tools have the opportunity to function as a common language within the project group since they have been created collectively with a common goal. The participants are engaging in the design process of the visual artefact and this has the possibility to not only create a meaningful connection to the design discussion but also to connect the different participants to each other. (Fröst 2004) The design group is in a way creating its own common design language.

There is however a risk involved in developing what Bødker, et al (2004) calls “insider reasoning”. The project group cannot possibly include all who will be implementing or using the project’s vision in the future and it is thus important for the work group to inform about the project result to other stakeholders. In the

## WORKSHOPS

literature regarding participatory design this is often referred to as “anchoring”. A target group is informed about the goals, visions and plans of a design project to be able to give feedback about and backing for the proposal. (Garde 2013; Bødker, et al. 2004) In a healthcare design project the target group can consist of, not only the hospital management and staff, but also future patients. The physical artefacts can be hard for the target group to understand since they are the result of a longer discussion. When anchoring the project it is therefore important to present information in a pedagogical manner.

### IN SUMMARY

Participatory design or participation through design is thought to increase the designer's understanding of the user's needs. The increased knowledge makes it possible to reach a better end result. The method can be used in all phases of the design process but have most impact in the early stages. An important factor in the participatory design process is to find communicative methods that bridge the gap between the designer and the user and facilitates a mutual understanding. This can ensure that the project becomes the mutual learning process it has the potential to be. Though the research field has been active since the 1970s it still is lacking when it comes to the context of developing context.

*What happens when the concepts of PD are applied in cultures that have much stronger social hierarchal structures than Scandinavian countries?*

*Can a PD be equally successful as a design method in developing countries?*

In a participative design process it is common to work with a number of workshops or participatory design sessions where a combination of tools and techniques is strategically put together to serve a specific purpose. The interest for PD is growing rapidly and has resulted in a wide variety of tools, techniques and methods. Sanders et al (2010) proposed a framework in order to categorize all currently documented tools and techniques. This framework primarily divides the tools and techniques into the three categories of making, telling and enacting.

### MAKING

Making refers to tools and techniques that are used to create concrete things like the physical artefacts that are often used as thinking tools. This includes for example collages, maps, models, mind-maps and mock-ups that are created by the non-designer participants.

### TELLING

Tools and techniques that focuses on verbally oriented activities fall under this category. This includes activities such as writing lists, diaries as well as talking and explaining.

### ENACTING

Enacting refers to tools and techniques that are used in activities of acting and playing scenarios. This includes for example role playing and improvisation. Enacting sessions can also make use of props or puppets. (Sanders 2013)

As stated by Sanders et al (2010), “PD tools and techniques are best used in combination and the ideal situation is to create a workshop or research plan by drawing upon all three types of activities: making telling and enacting.” In *Chapter 3* I describe how I have explored these activities in five different workshops.

# DESIGN GAMES

Several authors have argued that designing is a social activity which involves communication and negotiation as well as the creation of proposals for the future. (Habraken & Gross 1987; Luck 2003; Fröst 2004; Brandt 2006; Brandt 2014) Habraken & Gross (1987) develop the reasoning further by stating that the work of designing more or less is about agreement- and rule-making. From here, the game metaphor is not far away and it is commonly used as a way to understand and/or organize participation. (Brandt 2006) The philosopher Wittgenstein introduced the term “language-game” as a way of explaining how the language is shaped by the specific situations where it is spoken and is part of an activity which gives it meaning. Ehn (1988) talked about the meeting of language-games between designers and users as an important part of a design process. Ehn (1988) and Brandt (2014) both argues that participatory design through games can help designers and users communicate.

Design games have the possibility to be used both as tools for research and tools for design depending on their setup. Vaajakallio & Mattelmäki (2014) identifies that design games also can be used as a tool for empowering users and for engaging a variety of stakeholders. They conclude that design games can appear different depending on the role of the person experiencing them, a tool for the designer, a mind-set for the player and a structure for the design game designer.

Constructing and using scenarios is a common part of design games and is seen as powerful way of exploring a future possibilities. The strength of the scenario being that it can be both clear and flexible by representing a concrete situation but still give room for negotiation and change. (Brandt & Messeter 2004) When using scenarios in design games the participants literally can touch the future.

When used in a PD process the design games, fundamentally, are a method for structuring and organizing a collaborative design work. It is an approach applied to engage both designers and non-designers through a playful mind-set and structure.

## THE HEAD GAME

Garde (2013) has presented a research project regarding the development and use of a design game called the HEAD game in two real world design projects in the Netherlands. The game materials consists of a task-flow and a miniature environment, including playing figures, as game board. In a game session a group of users is asked to solve a design assignment by using the game materials to develop, modify and reenact use scenarios. The aim is to provide the participants with a holistic overview of a future work environment and matching task-flow. Garde (2013) concludes in her dissertation that the HEAD game is a useful set of tools and techniques for healthcare design projects, both regarding new environments and work processes. The participants in the research project were generally positive towards the project and the approach. The participatory method made it possible for the participants to have influence on the project and to learn about other stakeholders/departments.

Garde (2013) also concludes that the composition of the participants have an impact on the outcome of the game sessions. In sessions where trained designers without practical experience in healthcare the outcome can be highly innovative but not very detailed. In contrast the sessions with healthcare experts resulted in very in-depth design but not very innovative design results. This shows, once again, that designing the process is a vital part of a successful participatory design project. The designer has to understand what result can be expected.

# EVIDENCE-BASED DESIGN

Evidence-based design (EBD) is a rapidly growing field of research which describes how the quality of care and satisfaction of patients and staff can be improved by the physical design of healthcare environments. (Clancy, 2008; Ulrich et al., 2008)

Mkony (2009) summarizes some of the key concepts to consider when designing healthcare environments as follows:

- "Patient oriented design - noise level and privacy, single room occupancy versus multi room occupancy;
- Spatial orientation - way-finding, external building cues and location information;
- Access to nature and positive distractions - viewing nature garden, works of art, light exposure, interior finishes and music;
- Cultural identity - family social support;
- Environmental sustainability - protection of natural environment and health of surrounding community, energy and water efficiency; and,
- Community involvement in design"

## DESIGN RESEARCH IN DEVELOPING CONTEXTS

The research on EBD has, just as the research on participatory design, almost exclusively a western perspective. Many of the recommended design solutions include advanced technology and/or layouts that increase the building costs and may not be applicable in economically challenged countries. (Shepley and Song, 2014; Mkony, 2009)

In order to find suitable design applications it is important for the non-local designer to be familiar with the context and culture where the projects are set. It can also be important to understand that design research can be seen as an unaffordable luxury in contexts where designers

main focus is to meet the basic requirements of the indigent populations. Initial funding for design research in these contexts can instead come from other countries and collaboration between researches from both contexts is advisable. Shepley and Song (2014) concludes in their review of healthcare design research that more research is needed regarding the design of healthcare environments in developing contexts. They emphasize that the *"design research must be focused on specific design objectives (e.g., infection control) rather than specific solutions (e.g., private patient rooms).."*

## 2.2 THE PROJECT







# CONTEXT

## TANZANIA

Tanzania is situated on the east coast of Africa, just south of the equator. The country is more than twice as large as Sweden and has population of more than 50 million people. The largest city is Dar es Salaam which is located by the coast to the Indian Ocean. The official capital Dodoma is located roughly in the middle of the country. The second largest city is Mwanza, situated along the shoreline of Lake Victoria in the northwest.

Despite receiving substantial aid and loans for decades, Tanzania remains one of the poorest countries in Africa. The weak economic growth in combination with a rapidly growing population is putting a lot of pressure on the healthcare system and the infrastructure of water and electricity.

## SHINYANGA

Shinyanga region is one of 26 administrative regions in Tanzania and is situated in the northeast part of the country. It has a population around 1,5 million people.

## KOLANDOTO VILLAGE

Kolandoto Village is located 15 km from Shinyanga town, and around 150 km from Mwanza. The village is located in Shinyanga Urban District and has a population of about 10 000 people. The village is centered around the hospital and which is run by the African Inland Church Tanzania (AICT). In connection with the hospital is Kolandoto College of Health Sciences.



Google Maps (2016)

## KOLANDOTO HOSPITAL

Kolandoto Hospital, founded in 1913, is a private educational hospital run by the Africa Inland Church Tanzania (AICT) and currently has around 180 beds.

Kolandoto Hospital provides a number of healthcare services including departments for outpatient care, inpatient care, and surgery. The hospital also has a special leprosarium and an eye department. Eye patients from the whole region are referred to Kolandoto Hospital. In addition to the on site services the hospital also runs an outreach program for a number of neighboring villages. It consists of a mobile clinic which does vaccinations, health education and family planning (Danielsson 2015).

The hospital consists of many buildings connected with outdoor, roofed pathways. During phase one of the "Healthy Hospital" project Annika Danielsson assessed the state of the different buildings and analyzed the flows and zoning. She concluded that several patient flows were spread out and unclear, including the flow of emergency patients which can be seen on the map to the right.

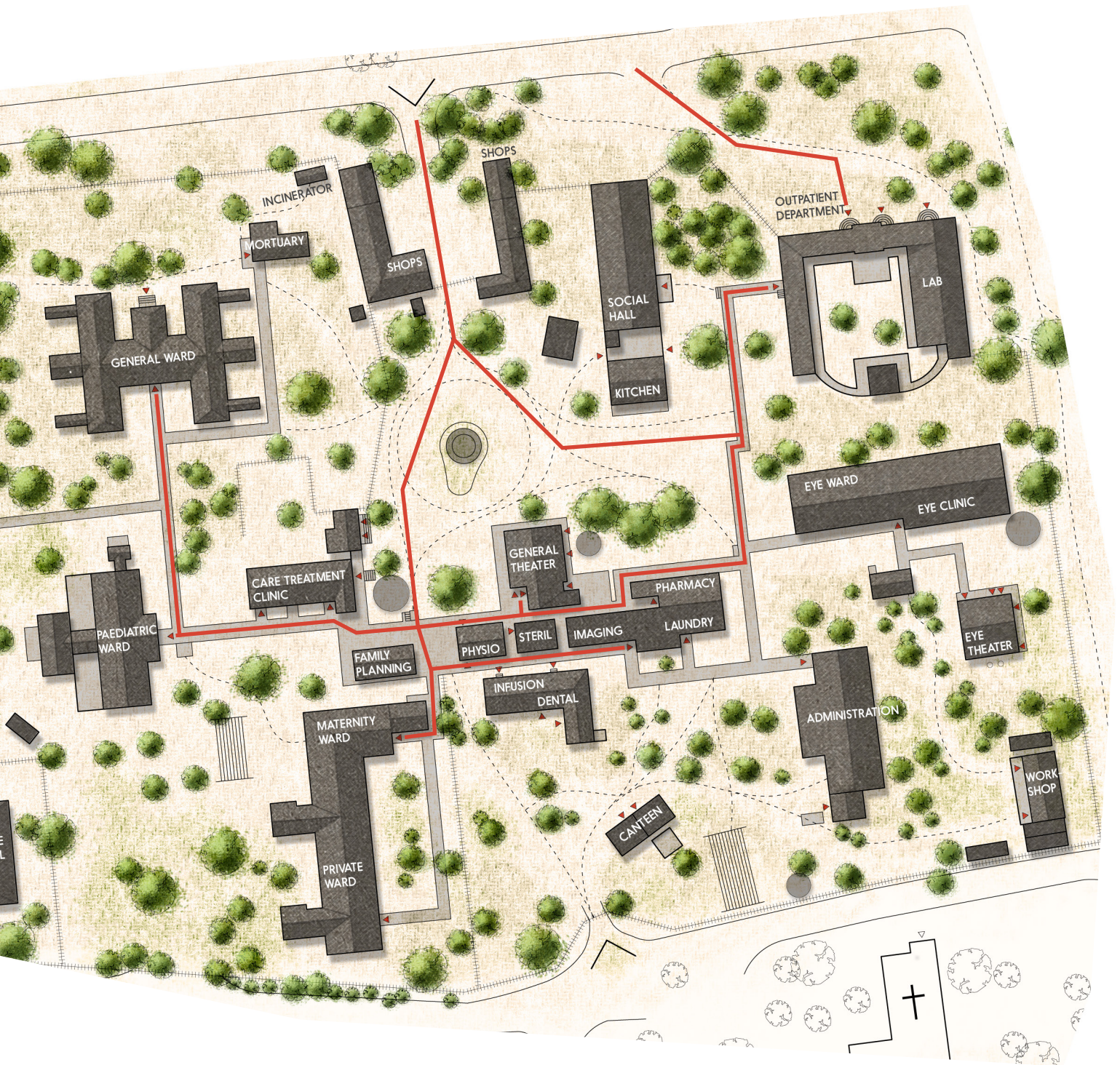
## EMERGENCY CARE

Since the hospital doesn't have an emergency department it is often unclear where the patients should arrive. As of today, depending on who they first talk to and the health status of the patient, the patient may be treated either in the outpatient department or be directly admitted to a ward. This puts an extra strain on the staff and interrupts the normal care of these departments. With a new emergency department all emergency patients could get a quicker and more equal assessment. The goal is also to reduce unnecessary transportations and reducing the stress both for patients and staff.



EMERGENCY FLOW TODAY







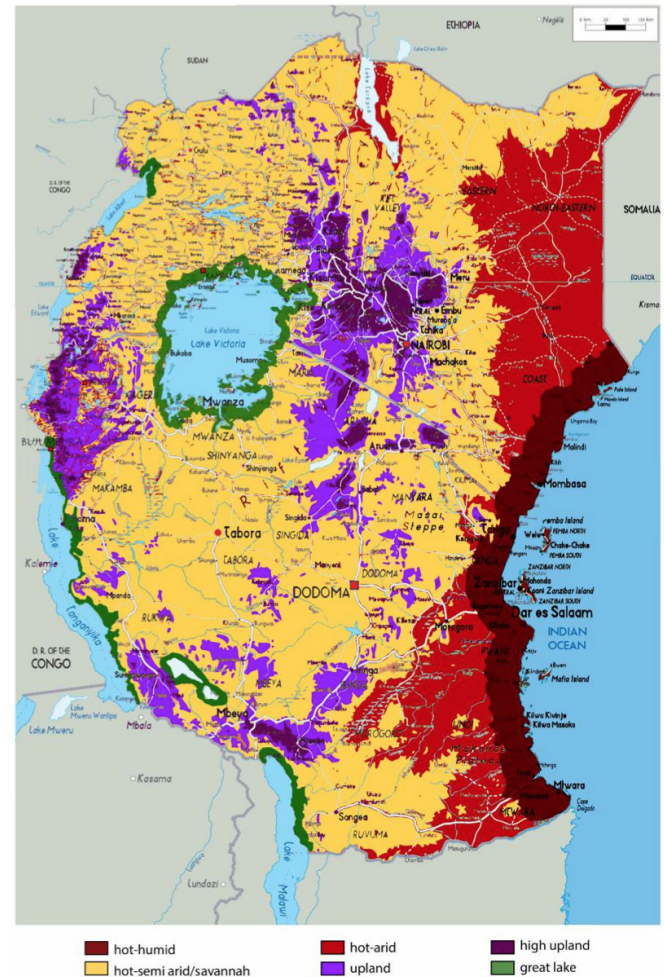
## CLIMATE

UN-Habitat (2015) states that buildings need to be climate responsive to be sustainable and energy efficient. In order to achieve this the features of the buildings must be climate dependent.

The East African Countries (EAC) can be divided into six climatic zones for energy efficient building design: (1) Hot-humid, (2) Hot-arid, (3) Hot semi-arid/savannah, (4) Great lakes, (5) Upland and (6) High upland. The Shinyanga region and Kolandoto is located in the hot-semi arid/savannah zone which covers the widest area of the EAC. This zone is characterized by small daily temperature swings and the mean temperature is 20-22 °C. During summer the temperatures are about 29-31 °C and peaks at 33 °C in semi-arid areas. The average humidity is about 65%, but can be as low as 40% in parts of the savannah areas. The small temperature swings and relatively low humidity are the key characteristics to consider when choosing building materials and features.

## PASSIVE BUILDING STRATEGIES

In the western context, where a colder climate is common, many strategies sustainable building include advance technologies. Instead of applying the same solutions in the hot climates of EAC one can improve the thermal comfort in buildings by using a number of passive strategies. In the hot-semi arid/savannah climate the most effective passive design strategies are natural ventilation, semi-high thermal mass and solar shading. (UN-Habitat 2015)



UN-Habitat (2015)

## 2.3 DESIGN CRITERIA

## OVERVIEW

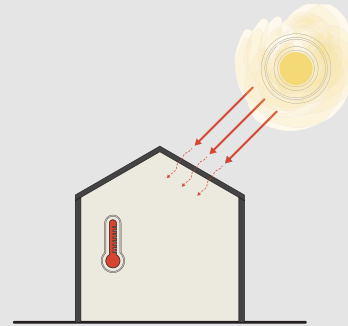
Developing a design proposal for a healthcare building in the context of Kolandoto demands the designer to be well aware of the climatic conditions as well as the cultural context of the project. In addition it is also important to ensure that the proposal addresses the requirements for sustainability and provides an environment which facilitates high quality healthcare. To achieve this I have chosen to divide the design requirements into two groups: (1) Sustainable building strategies and (2) Evidence Based Design Strategies.

### SUSTAINABLE BUILDING STRATEGIES

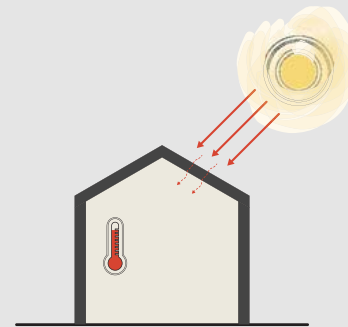
The most efficient sustainable buildings strategies differ between different climate zones. Heating is the main cause of energy consumption in the cold climates where many of the developed countries are located. The efforts made to minimize this is however resulting in an increasing need for air conditioning. In East African Countries (EAC) air conditioning and cooling of buildings are the main issues. Indoor climate in hot climates is mainly improved by reducing solar heat and facilitating natural ventilation.

Choosing building materials are an essential part of sustainable building due to thermal performance and from an environmental impact perspective. There are often many advantages from using traditional and local materials such as low cost, good supply and low environmental impact. Local labour are often familiar with these materials and have experience in both production and repair of traditional constructions. (UN-Habitat 2014)

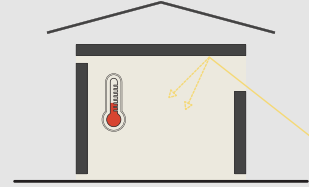
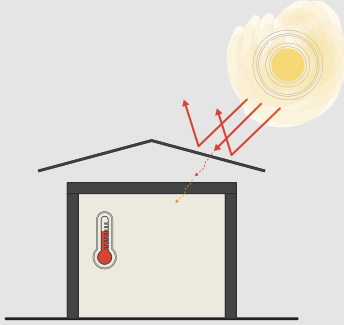
## SUSTAINABLE BUILDING STRATEGIES



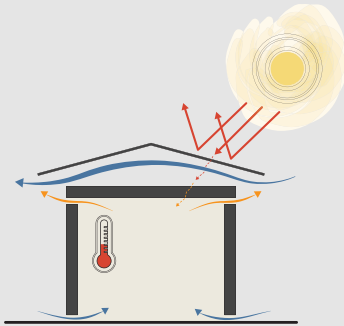
A low thermal mass structure is quickly heated by the hot sun and will result in an uncomfortable high interior temperature.



Thicker walls and using heavier material such as stone or soil bricks results in a building that is heated slower. When the structure has been heated it will however take longer to cool. In contexts with small temperature variations between day and night, which is the case in Kolandoto, it is most advantageous to use a semi-high thermal mass structure.



A ventilated double skin is the most effective roof type for the hot climate zones. The inner layer is shaded by the outer skin. A highly reflective material should be used for the outer skin to minimize the solar heat absorption.



The size and placement of window openings will also affect the indoor climate. Larger openings can increase the natural ventilation but proper solar shading is essential. Due to the glaring nature of the light it is better to direct the view towards the sky. The light which is reflected from the ground or buildings outside will be reflected on the ceiling and generate a comfortable indirect daylight.

The space between the roof and ceiling should be ventilated to increase comfort. The openings are most effective if facing the prevailing breeze. Openings both at floor and ceiling level will also facilitate natural ventilation. The hot air, which has lower density, will rise towards the ceiling. If the air outside is cooler the it will flow in through the lower openings.

# EVIDENCE-BASED DESIGN STRATEGIES

The goal is to focus on strategies that do not rely on advanced technology and/or add significantly to the building cost. Sustainability, both environmental and economical, is important and all the design criteria should guide the design development towards a sustainable design proposal.



## EASY WAYFINDING

The project is rather small in size which naturally makes the building easy to navigate but it is nevertheless an important factor. The new emergency department has the opportunity to become "a new face" of the hospital and be the first department arriving patients meet. The goal is to work with the building in such a way that it can work as a guide for arriving patients and visitors. Wayfinding should be easy and accessible for all.



## DISTRACTING VIEWS

Being at a hospital is often a stressful experience for many people. Studies have shown that the view of nature have the possibility to decrease pain by reducing stress and evoking positive emotions. The theory is that pain requires conscious attention and if the patient is distracted from focusing on their pain and instead focus on something pleasant the experienced pain will decrease. (Ulrich et al. 2008)



## VENTILATION

Ventilation is important due to two main reasons: (1) having a frequent air exchange is a key factor in reducing transmission of airborne diseases and (2) in hot climates proper ventilation increase comfort. (Ulrich et al. 2008; UN-habitat 2014) The project should focus on facilitating natural ventilation as described in the sustainable building strategies but additional mechanical air conditioning may be added to rooms where the air quality is extra important.



## PROMOTE HANDWASHING

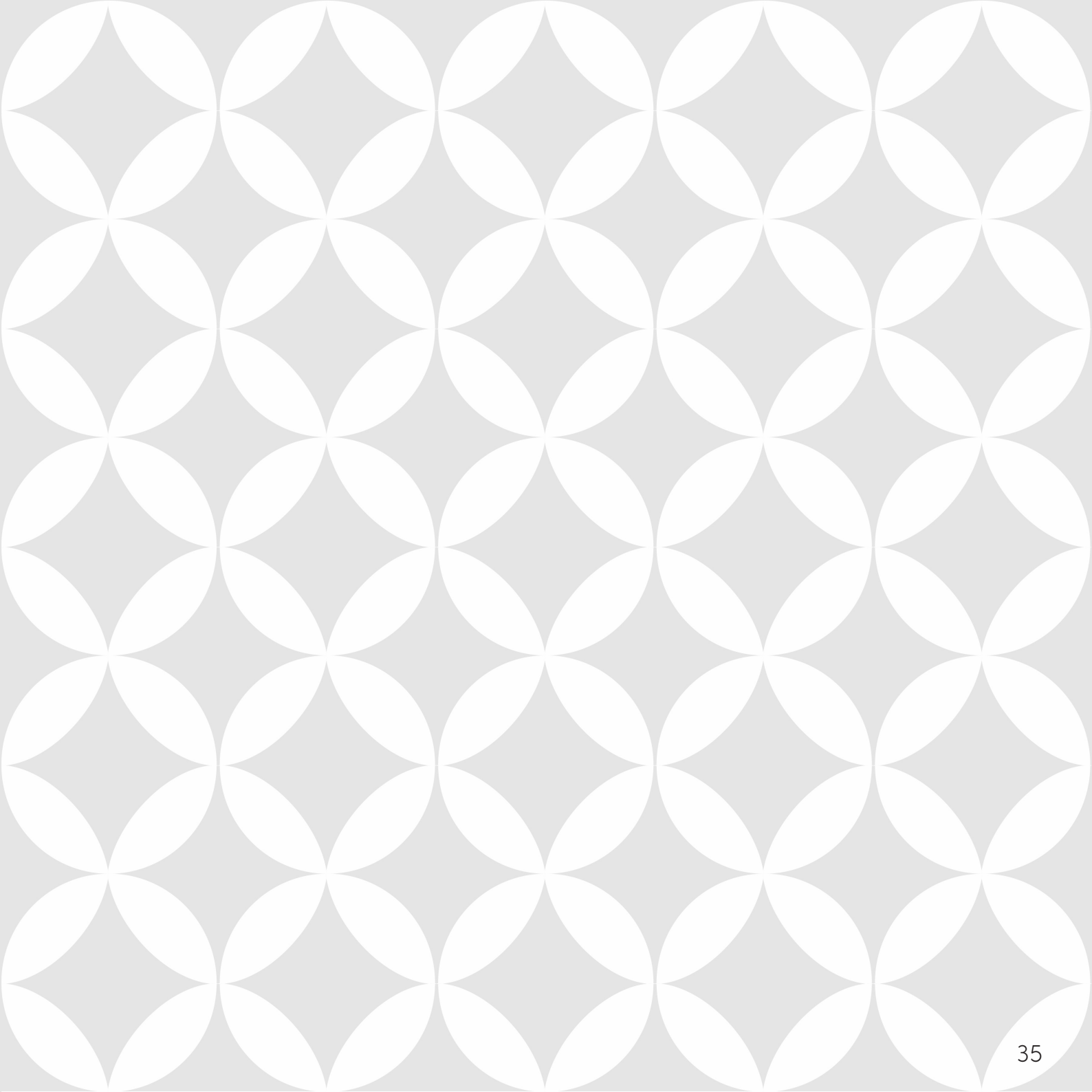
Staff hand hygiene plays a key role in reducing both direct and indirect transmissions of infectious diseases. Studies have shown that the number of, and accessibility to, hand-washing units impacts the infection rates. Installing alcohol-based dispensers next to the patient beds have proved to be efficient in combination with educational programs. (Ulrich et al 2008)

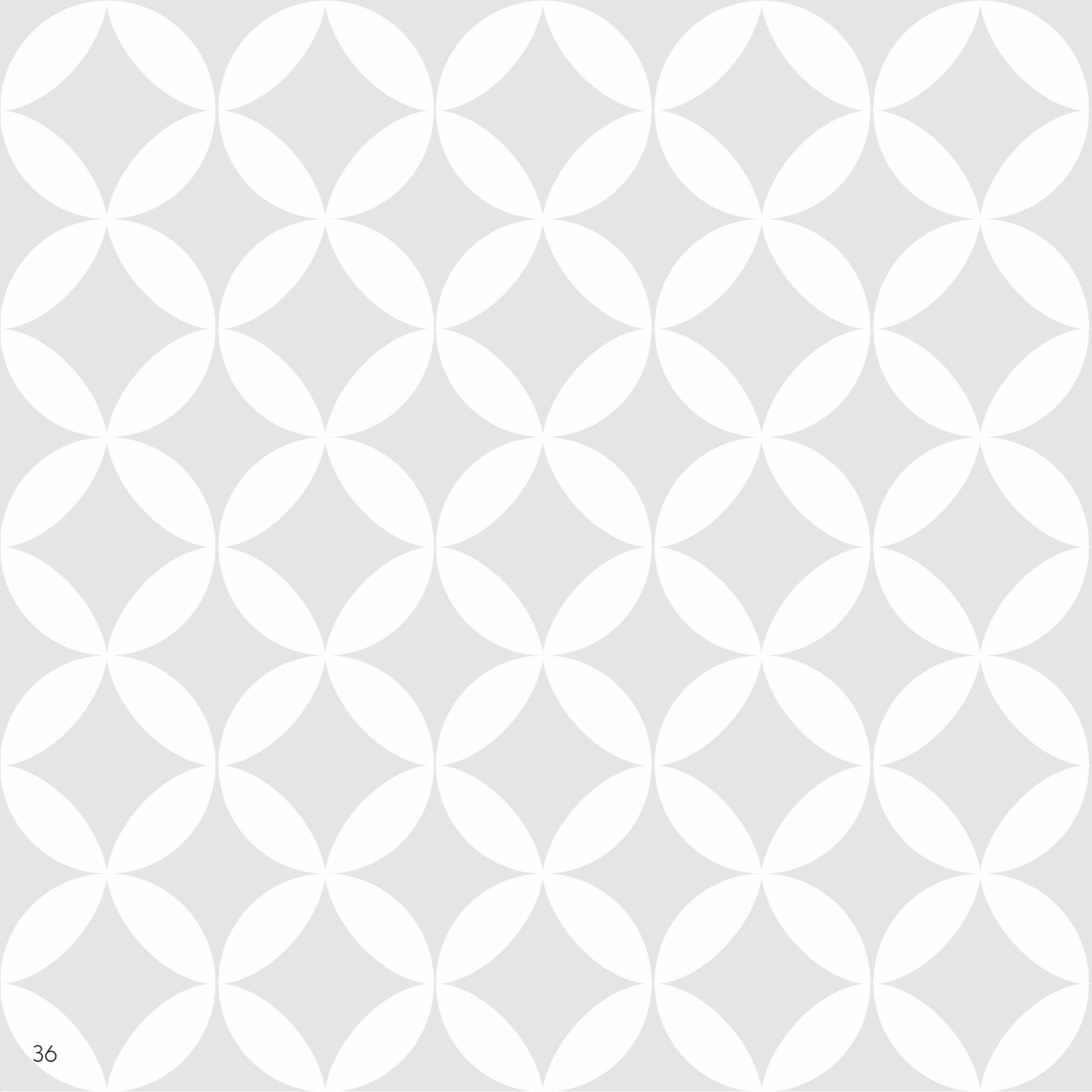


## COMMUNITY INVOLVEMENT

Communication and social support is an important factor for satisfied patients. Making room for accompanying family members in examination/procedure rooms and patient rooms can facilitate social support. The project and process can also be used to educate and empower the community and staff. Involving staff in the process can ensure that the project achieves the set goals. (Joseph, A., Keller, A., Gulwadi, G B. 2009).









# CHAPTER 3

PROCESS &  
PROPOSAL



# TIMELINE FIELD STUDY



The main part of the research has been carried out during a eight week field trip. Approximately, one workshop was conducted each week. The result from one workshop was evaluated and processed to be the base for the next workshop. To achieve the desired result, the process and the workshops had to be flexible yet clear and well designed. The communication with the work group was essential and the major focus was to try out different approaches and evaluate the outcome. The workshops were designed to ensure that the needed information for the design project was gathered and understood correctly.

The main purpose of the project was to develop a design for a building for the new emergency department. It was soon clear that to successfully design the building for the emergency department it was important to also design and discuss the department itself and the work future work processes. The design process includes briefing, program and design. The limited time frame and the need to investigate the program extensively delayed the

design work. The refined proposal has therefore changed substantially since the end of the field study.

## READING INSTRUCTIONS

In the following chapter I will describe the different parts of the process in a chronological order starting with defining the way I have interpreted the briefing process. After this follows a detailed description of each of the workshops including evaluation and results. In 3.2 I present the evolvement of the final design proposal and how the design criteria have been applied.



# BRIEFING PROCESS

Traditionally the briefing process is seen as something that takes place before the design process starts. The result of the briefing process is a set of documents that contain the client requirements for the building design. The users are usually mainly involved as data sources and don't take active part in formulating the final documents. The briefs are written by experts who meet the users to collect the needed data. (Anker Jensen 2011) The aim of the briefing documents is to give architects, and others involved, a clear overview and understanding of the needs and ambitions of the client. Additionally the briefing documents can be used as a "touchstone" against which design proposals can be tested and evaluated. This means that the brief can be a framework for the discussions about the quality and value of design proposals between the architect and the client. Furthermore the brief is a way to get an initial idea of the required budget. (Bogers et al 2008)

The briefing is thus an important part in the process of a project and both the clients and the architects spend a lot of time writing and studying the brief. What is interesting is that neither the architect nor the clients seem to be satisfied with the briefing process or the use of the documents. The architects often find the documents inadequate or limiting and the client, on the other hand, sometimes have the impression that the architects aren't reading the briefs thoroughly enough. (Bogers et al 2008)

There has been quite a lot of research on briefing during the last decades but most publications focus on the client. The architect is not given much attention which according to Bogers et al (2008) can be seen as a big gap since the brief essentially is a tool for communication and thus should focus both on the sender and the receiver of the communication.

According to Anker Jensen (2011) a new way of looking at briefing is emerging which suggests that it is a dynamic process of dialogue with all stakeholders. This process should be iterative, reflective and interactive and design and briefing are both integral parts of the same project process.

Projects in developing contexts do not always have the finances or the time to conduct a thorough briefing process neither before the start of the design nor during the design process. This can mean that the architect has to lead both processes simultaneously in order to succeed with the project. This is the case for the project that is presented in the following chapters. The requirements of the project are defined during the design process. The method of participatory design workshops is used to facilitate the integration of briefing in the process.

# INTRODUCTION

## WORK GROUP

The work group originally consisted of four people: three nurses and one doctor. During the process the size of the group changed and different people participated. This was not optimal but I decided that it was more important to conduct as many of the planned workshops as possible instead of waiting for the same people to be able to attend. In total ten different persons attended the workshops, two of them were women.

## BUILDING TRUST

Before starting the workshop series I had a short presentation of myself and my experiences in healthcare architecture. After this I let the participants introduce themselves and a similar way. I asked specifically if they had any experience with emergency care and emergency departments. The introductions was a way for me to get to know the group and to start a dialogue on equal terms.

## PARTICIPATION

I tried to be clear about the participatory process I wanted to carry out. I described that the process was part of my thesis research and that I thought that collaboration was important to come to a good design proposal. I presented a time plan for the weeks to come, with one workshop every week. I also described that the workshops would have varied focus and what kind of results I expected to achieve.



# WORKSHOP 1

## WORKSHOP PURPOSE

To understand the participant's experiences in the field and get to know their visions for the future. To prepare the workgroup to participate in participative design process.

## RESULT

Empathy, trust in the process and creative co-designers. Building the basis for the development of a concept program for the future emergency department.

## ORIENTATION

Past, present and future.

As a starting point it was important for me, as an outsider, to understand what an emergency department meant in the context of Kolandoto, Tanzania. To initiate a discussion about the emergency care at Kolandoto Hospital I started with a 3+3 workshop. This is a simplified version of a SWOT analysis where the participants are asked to write down three good things and three bad things about a given topic. I asked the participants to write six post-it notes about the emergency care today and then present them to the group. Secondly, the group collaboratively picked out three of the good things and three of the bad things as the most important ones.

The problems for the emergency care today revolve mostly around the lack of an emergency room, inadequate equipment and not enough specialized staff. On the plus-side the participants felt that they, despite the lack of resources, are able to provide quick responses and immediate care to casualties. Another positive factor was the connection to the medical college where new staff can be trained.

## PRESENT GOOD/BAD

To train  
nurses

Provision of  
immediate  
care to casu-  
alties

Quick response  
to health pro-  
viders in emer-  
gency care

No trained  
personnel

No  
casualty  
room

Less/few  
equipment &  
supplies for  
emergency  
care

## FUTURE GOOD

Higher  
quality  
of care  
↓  
Patients are  
satisfied and  
become am-  
bassadors

Save  
more  
lives!

Higher  
salaries  
for  
personnel

In the second part of the workshop the participants were asked to write three more notes about positive things that can be the result of a new emergency department. To get the discussion more flowing I decided to be the one to write the ideas down on post-it notes and guide the discussion to give all participants opportunity to speak their mind. The ambitions were high and the participants hoped that they, in the future, will be able to help more people and rise the quality of care and increase the salaries for the staff.

## CONCEPTUAL PROGRAM

The result of the introduction workshop was used to develop a conceptual program for the new emergency department. This is a guideline document to be used as the backbone of the future process to develop both the building itself but also the future working methods.

Kolandoto hospital is planning to build new environments especially equipped to facilitate the emergency care given at the hospital. Today, casualties are treated directly in the outpatient department and wards. This interrupts the “normal” care and puts an extra strain on the staff. With a designated building for achieving and treating casualties the flow of patients can be optimized and more patients can be treated.



## OVERARCHING GOALS

The emergency department should have an environment which **promotes**:

- ▶ High quality care
- ▶ Quick and competent responses to casualties
- ▶ Efficient and clear flows of patients, staff and goods
- ▶ A good and safe working environment
- ▶ A good and safe patient environment

### And supports:

- ▶ Continuous development of the facility
- ▶ The training of nurses and doctors

## THE FUTURE EMERGENCY DEPARTMENT

The future emergency department shall ensure a safe, 24/7, health care service with emphasize on hygiene and minimal spreading of infectious deceases. It is important that the environment facilitates the possibilities to do right and minimizes the risks of making errors. This can be achieved with a clear structure and by ensuring that the right competence is available at the right time.

Furthermore the emergency department should comply with the Mission Statement and Vision of Kolandoto Hospital;

### The Mission Statement

*To render affordable, quality and sustainable health services to the community through the love of Christ.*

### Vision

*To have sustainable health services that significantly contributes to more equitable, accessible health services to the community.*

One of the problems the hospital faces today is the lack of skilled staff. To come to terms with this it is important to have an ongoing dialogue with the government to make sure they assign staff with emergency care background to the hospital.

The new emergency department will introduce a new triage system, a process to sort patients according to their need for care. New documents and policies will also be developed, such as a Mass Casualty Plan, a list of casualty equipment and drugs as well as a Kolandoto Hospital Emergency Protocol and Emergency Chart.

The emergency flow is thought to increase in the years to come, especially when the hospital has a designated emergency department and trained staff. This should be taken into account when planning the initial building as a type of future proofing. The emergency care at the hospital not only includes the future emergency department but also the radiology department and the general theatre. It is important to consider all connecting functions when planning for the future emergency department to ensure that all functions works seamlessly together.

The new emergency department is a big step in the development of making Kolandoto Hospital an attractive workplace which attracts qualified staff and raise the quality of health and the reputation of the hospital. The reputation is an important factor in attracting both staff and patients which in turn can have large impact on the financial situation of the hospital. More finances will help the hospital fulfilling the Vision and Mission Statement and ultimately make it possible to **save more lives**.



## WORKSHOP 2

### WORKSHOP PURPOSE

To start up the design process by developing the program and discussing the connections between different functions.

### RESULT

Knowledge about future working methods and functions.  
More experienced co-designers.

### ORIENTATION

Future.

The second workshop, the first design workshop, was designed after the introduction workshop. During the first workshop it became clear that the participants in the work group did not have much previous experience with workshops or group discussions. The second workshop was therefore designed to be more guided than the first one. The workshop material consisted of two identical work sets. The group was divided in two parts to let the participants work together, discussing in their own language. The aim was to minimize my influence on the discussion. The work set included a paper with a large heart and post-it notes with names of different functions. The functions derived from a trip report written by a nurse who had an initial meeting about the emergency department during a visit in December 2015. Additional post-it notes to write missing functions were also part of the kit.

### PART 1

The first task was to organize the functions on the paper and to drawing lines or arrows to show which functions were connected. The participants were asked to pick out one function as the “heart of the department” and put it in the middle of the big heart on the paper. They got 20

minutes to finish the task and they were encouraged to speak in their own language during their discussions.

The result of the first task was presented in English to the other group and the workshop leader. There were similar arguments from both groups but their maps showed variation. One of the groups put three functions inside the heart with the argument that several functions were equally important.

The other group had put the “red room” in the heart but without any connections to other functions. Their argument was that this function can be the most important one even though it might not be at the heart of communication. The presentation sparked a discussion about what is most important in an emergency department. One of the participants commented that the triage room might be the “heart of the department” since that is where the patients are first assessed and it is decided if they are in need of emergency care or can be referred to the outpatient department or sent home.

During the presentation it became clear that there were some confusion regarding certain functions, one example being the reception. This would need to be further explored in the following workshop along with the size of rooms.









## WORKSHOP 3

### WORKSHOP PURPOSE

To begin looking at layouts on the specified site. Discuss entrance alternatives and see the connections from workshop 2 in relation to the site. To initiate a discussion about patient focused care/environments and to specify the program more in detail.

### RESULT

Deeper knowledge about future functions, new ideas for the layout and more experienced co-designers.

### ORIENTATION

Future.

### "DESIGN WORKSHOP"

The intention with the third workshop was to use cut-out functions to try out different layouts together with the group as a design task. Since the workshop was postponed from Friday to Monday and had to be shortened I felt that we needed to speed things up a bit to get the result I required to develop the layout further until the next session. This meant that I had to skip the design exercise. Since the previous workshop I had created three schematic layout proposals. I presented them and asked the participants for input, especially regarding the placement of entrance to the building. The group unanimously thought that alternative 1 was best, see appendix 1 for sketches. They argued that the reception should be clearly visible when arriving from the main entrance.

After this we went ahead and started specifying the different functions by doing mind maps. In order to determine the size of the rooms we needed to specify what they should include. Since we had limited time I decided to take charge. It would have been more interesting to let the participants do the mind maps on their own but due

to the limited time I decided not to go through with that.

### PROGRAM SPECIFICATIONS

The mind maps of the different functions was used as base for the following specified program.

#### RECEPTION

The reception is a strictly administrative function where the patients are received and it should be open 24/7 and always be manned. The staff here do not need to have medical skills. The reception is the hub of communication at the emergency department and should be equipped with a telephone. Temporary patient files are to be stored here.

#### WAITING ROOM

The main waiting room should have seating for up to 20 persons if it is the place for relatives to wait. The seating can be benches but it is important that they have backrests. The main waiting room should be equipped with a TV. Toilets, male and female, should be close to the main waiting area. It is important that the staff in the reception can overlook the whole waiting room to keep an eye on the waiting patients. Some sort of queuing system is probably needed.

#### TRIAGE

This is where the patients are first assessed by medically trained staff and categorized according to an international triaging standard. The proposed categorization is built on a system of colors like START or SATS. The triage room is to be equipped with an examination bed where the patient can lay down while the nurse take the measurements for the vital signs. The room needs to have a sink for hand washing. There is need for 5-6 sockets for the electrical equipment like, oximeter and machine for measuring pulse and blood pressure. Information charts about the



triaging system should be displayed on the walls and there should be shelves for storage of medical equipment.

#### PROCEDURE ROOM

After triaging many of the patients will go to the procedure room to get their treatment. The procedure room should be equipped with an examination bed, trolley for equipment, suction machine, drip stand, an adjustable examination light, oxygen, mini-autoclave for sterilizing equipment, canisters for medical supplies and shelves for storage of medical equipment. There is need for 5-6 sockets for the electrical equipment. There is also a need for water, both for cleaning patients and for washing hands. A floor drain is required. The procedure room is also the room where the relatives can come in and say goodbye if a patient is beyond saving. Since this room is used for almost all treatments it should be considered if it is possible to fit two procedure rooms or a separate viewing room.

#### OBSERVATION ROOM

The observation room should have room for at least 4 beds, 4 drip stands, a blood pressure machine and lockers for the patients' personal belongings. No staff will be permanently assigned to this room which means that it's important to get a quick overview from the door. The observation room is for patients who have been treated but need to stay for a couple of hours to make sure there isn't any complications. Patient WC, separated for male and female should be connected to the observation room. The need for a shower should be further discussed.

#### STAFF ROOM

The staff room is a multi-room which serves as meeting room and break room and contains spaces for changing. It should be closely connected to the observation room and the procedure room. The staff room should be equipped

with at least one table with six chairs for meals and meetings. The room will be used when there is a change of working teams for the different shifts for transferring information. Spaces for changing for female and male staff should include lockers and showers. A place to heat water and prepare tea is requested. A staff WC should be connected to the staff room.

#### STORAGE

The hospital has a large storage in connection to the pharmacy but a small storage is still needed inside of the department. The storage should have cupboards for emergency drugs, clearly labelled with colors for quick finding. There should be shelves for bed linens and other medical equipment. A table or surface for preparation of drugs is suggested.

#### EMERGENCY ROOM/"RED ROOM"

The emergency room is the most technically advanced room in the emergency department. The room should have room for at least two adjustable stretchers, trolleys for equipment, drip stands, a suction machine, two adjustable spotlights, defibrillator, two machines for monitoring pulse and blood pressure, oxygen and shelves/cupboards for storing the most needed supplies. The emergency room should be equipped with a separate air conditioner.

#### PATIENT ORIENTATION

My intention was to end the workshop by mapping out the most important things about an emergency department from the view of the patients. This turned out to be much harder than anticipated. The doctor who first spoke up after my introduction stated that the only important thing is that the patient receives the right care at the right time and that they should feel that everything is done on their behalf. After this statement the group fell silent despite several tries from my part to spark the discussion.

# GAME WORKSHOP

## WORKSHOP PURPOSE

The third workshop was initially supposed to be a design workshop with a game method but due to shortage of time that wasn't possible and the game workshop had to be re-designed to fit later in the process.

The head game workshop had a focus on sanitation and working methods.

## RESULT

More experienced co-designers. Transparency of my design process and new ideas for the design. Conclusions about working methods and patient flows.

## ORIENTATION

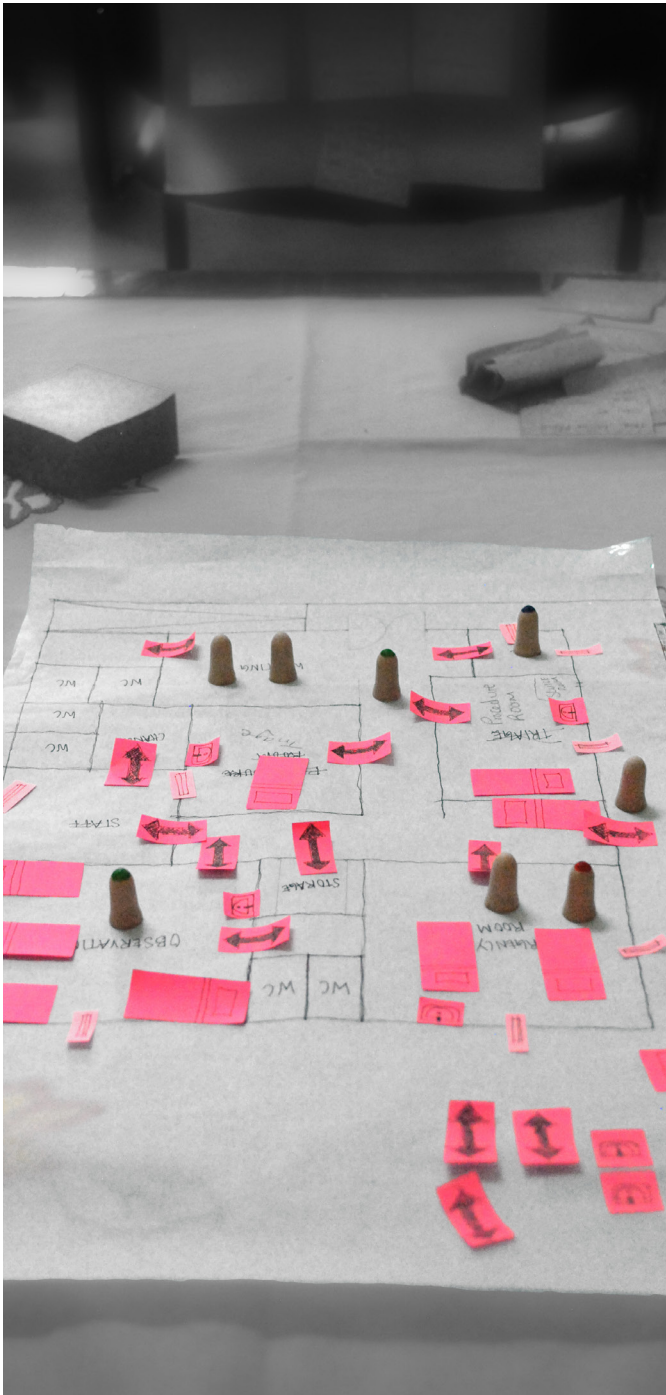
Future.

## THE HEAD GAME

The HEAD game was developed by Julia Garde at the University of Twente in the Netherlands. HEAD is an abbreviation for "Healthcare Environment and Activity Design". It is a tool for generative workshop sessions where a group of users is asked to solve a design assignment by using the game materials to develop, modify and reenact use scenarios. The aim of the game is to provide the participants with a holistic overview of a future work environment and the matching activity task-flow. To accomplish this the HEAD-game uses (1) a miniature environment including playing figures, (2) a task-flow.

## EXECUTION

1. **Opening** – The game workshop starts with the workshop leader giving an explanation of the goals of the session. The use scenarios should be described and the agenda of the workshop presented.

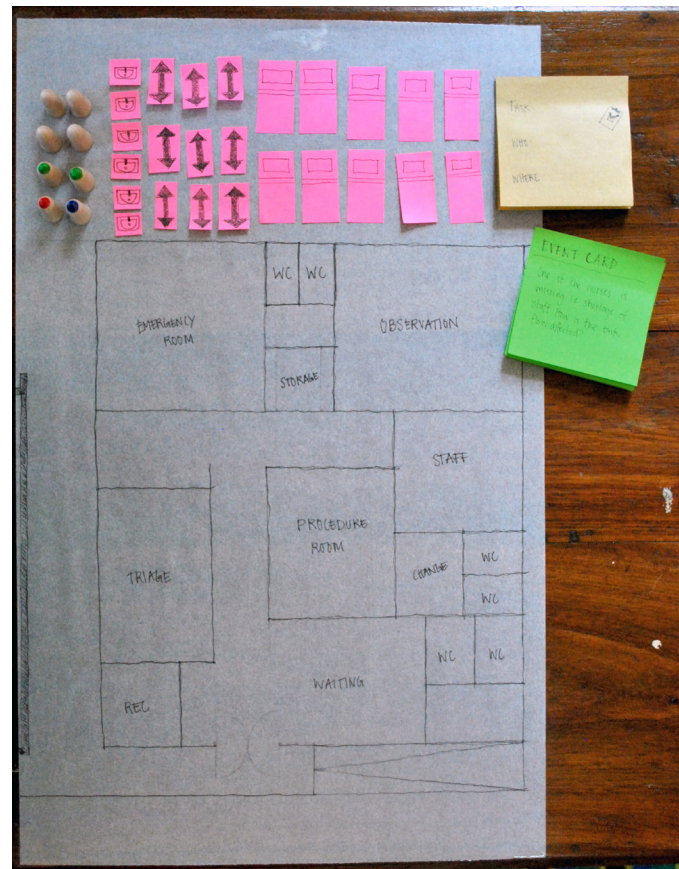




2. **Presentation of the game board** – especially important if the design/layout is new to any of the participants. The participants can also design their own game board, partly or fully.
3. **Playing out current task-flow** – not applicable if the method is completely new to the participants.
4. **Step by step determination of a new scenario**  
This can be divided into several scenarios in order to be more playable. Guiding questions can help the participants on the way.
5. **Introduction of Event Cards.** The final game step consist of confronting the participants with event cards with challenging situations. If the design and task-flow fail these test events the design has to change.
6. **Conclusion** – the game session is concluded with a brief review of the result and the group is informed about the next steps in the project. It is important to show appreciation for the group's participation.

## GAME MATERIAL

To the right is an overview of the game material I prepared for the HEAD-game workshop. The game board was a further developed layout in scale 1:50 of the evaluated proposals from workshop 3, without doors. The game pieces consisted of player figures for patients, nurses, doctor and receptionist. In addition there were symbols for sinks, arrows as a symbol for doors and also beds. These were going to be placed by the participants as a way of co-designing the layout. The brown cards were task cards to be filled out during step 4. The green cards were



event cards for step 5. Additional papers, a pair of scissors and pens were also part of the kit.

## GAME SESSION

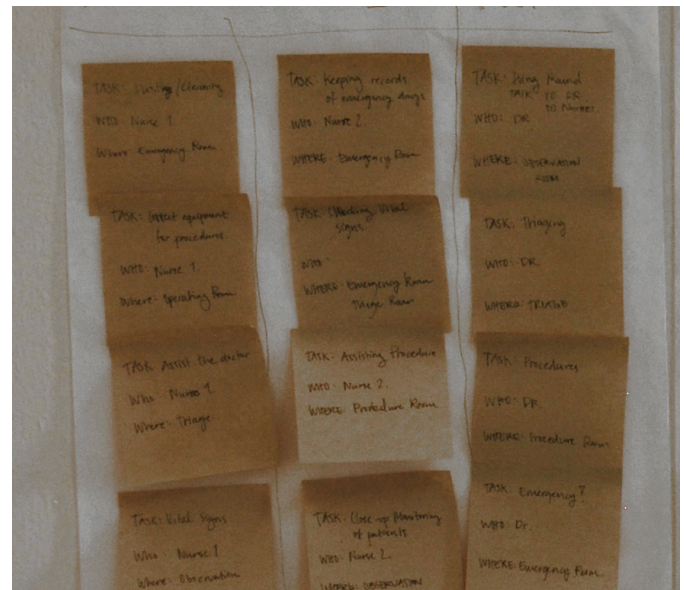
The work group was partly new this week which meant that I started the session by describing the project and what we had done previously. I presented the game workshop and described that we would explore how a potential work flow would function in the proposed layout. I explained that

the participants would take the roll of one of the player figures throughout the session. After this I presented the game board layout. Since it was new to some of the participants a short discussion followed and I explained what the different rooms were and some of the basic arguments for the design. I tried to keep my descriptions and comments as neutral as possible. After this discussion it was time for the group to place beds, doors and sinks on the board to make it playable. The group gladly started discussing and I heard comments like “I like this”, “This is fun”. This part of the workshop took approximately 30 minutes. When the group was satisfied I asked them to place the player figures where they thought they had their “home base”. This resulted in another discussion, it was not obvious where the nurses and doctor should be based. There was a slight confusion about the function of the triage room and the emergency room so I jumped into the discussion and showed a triage information chart on my computer to explain how it would work. In the end it was decided that one of the nurses should be based in the observation room. The doctor should either be based in the emergency room or the procedure room and the second nurse should be based in the triage room.

## TASK-FLOW

The next part of the session involved the creation of a task-flow. Each participant was assigned one role and was asked to write down tasks for one work shift. The number of staff the department, 1 doctor, 2 nurses and 1, receptionist, had been discussed in a previous session. I stressed the fact that the emergency department would be open 24/7 which means that each shift takes over from a previous one. The task cards were filled out and then put in a chronological order, one axis for each participant. After this the task-flows for the nurses were discussed and optimized. The group agreed that would be good if the

nurses took turns in assisting the doctor and observing patients. There was a discussion about who should be having the handover with the previous shift. The group concluded that would be better if the doctor talked to both the nurses and the doctor of the previous shift since the nurses often knows more about the status of the patients than the doctor.



When the group was satisfied with the task-flow it was time to try it out on the game board. The group was asked to play out a normal day at the department. They soon discovered that with only one doctor it can be difficult to treat a steady flow of patients. They discussed the possibility of a nurse being in charge of triaging when the doctor is busy in the emergency or procedure room. One participant thought that a nurse especially trained for emergency care should have the skills to be able to manage the triaging. The group agreed and one of the

nurses was moved into the triage room. Since, according to the task-flow, one of the nurses often supported the doctor it meant that if the other nurse was doing the triaging there was not anyone left to observe the patients in the observation room. The group concluded that if the doctor needed assistance when treating most of the patients there would be a need for more staff to ensure that the flow of patients was not interrupted.

### EVENT CARDS

When the discussions were slowing down it was time to introduce the “Event Cards” which were formulated to test how the work flow and design could adapt to difficult events. The event cards for this session had been prepared beforehand. The first event which was discussed was how the department would work if one of the nurses were missing, i.e shortage of staff. Since the discussion of shortage of staff already had come up the group immediately argued that the department could not work smoothly with only one nurse. The group concluded that a team of 1 doctor, 2 nurses and 1 receptionist is the minimum of staff needed for the department. It would be better if the team could be expanded with another doctor or at least an extra nurse.

The second event involved an accident with 15 victims that arrive at the same time to the emergency department. The group explained that the doctor and nurses would go to the waiting room to make a first quick assessment of the patients to see if anyone had to be taken directly to the emergency room or to operation. If that was the case, the doctor will be busy with these patients and there would be a need to call for another doctor to assist the nurses. The receptionist would be the one to call for more staff. I asked the group what they would do if some of the patients in the waiting room needed to lie down while waiting to see the doctor. They say that it would be good if one or two extra



stretchers could be placed somewhere in the department. They would also be needed when transporting patients from the emergency room to the observation room since the beds in the emergency room will be fixed.

### DISCUSSIONS

In the end of the session I asked how the placement of sinks could help the staff to remember to wash their hands between each patient. The group was asked to change the placement of sinks to be optimal. The team concluded that it would be optimal if the sink was placed just opposite of the door to be clearly visible when entering the room. One participant added that it would be good to have a clear sign as a reminder to wash hands and maybe also a lamp next to the sink.

The next question for the group to discuss was about how the waste management would work in the department and how the design can facilitate a good waste management. The group immediately started discussing and pointed at the procedure room. They conclude that the procedure room will produce more waste compared to the triage room and would benefit from an adjacent sluice room

## FULL SCALE WORKSHOP

where the waste can be sorted. The sluice room should be placed at the façade but the current placement of the procedure makes it impossible. The solution to this could be to swap the procedure room and the triage room. The group added a new sluice room inside the old triage room and a new door to the outside.

Lastly, the group was asked if they could think of any changes to the design that could optimize the waiting time for the patients. After a quick look at the game board they conclude that they think that the design is good but the number of staff is problematic.

### WORKSHOP PURPOSE

To give the participants an opportunity to understand the size and possibilities of the new building in a new way. Using the full scale plan as a game board to act out the same scenarios as in the HEAD game workshop. To bring back the concept program and discuss how the design lives up to it. To show the layout on site, to the public.

### RESULT

Deeper knowledge about the site and the design proposal. Community awareness of the project.

### ORIENTATION

Future.

The last workshop was carried out in full scale on site as an attempt to show the project to the community and to give the participants an opportunity to picture how the department could work in real life. We used thick yellow rope to lay out the floor plan on site and it was immediately clear that presenting a sketch in full scale can bring the discussions to a whole new level. Suddenly the participants really understood the design and they walked from one room to another, with the paper drawing in hand, getting a sense of the layout. Full scale also made it easier to discuss design decisions, like why it was better to place the observation room in a new direction so that all of the beds could be placed to give the patients a possibility to have a view out through the windows. I took the opportunity to describe how the research on healing design has been able to prove that patients who have a view towards nature recover faster than patients who don't.

I stayed on site for a few hours after the work group had left to answer questions from people passing by. Dr. Katani, the medical officer in charge, came by and got



a walk-through. He suggested that a place for nurses to carry out administrative tasks. We also discussed the possible addition of a fully accessible WC as the hospital does not have one today.

A group of students came by and was curious about the project. I explained the project, the paper sketch and the full scale representation. When asked they said that the most important aspects of an emergency department is that the building is well ventilated and that patients are allowed privacy. I explained the concepts of healing design and that increased privacy and 1-patient rooms have been proved to improve the recovery and well-being of patients. The students had never heard of the term healing design before but thought that it was *wonderful*.

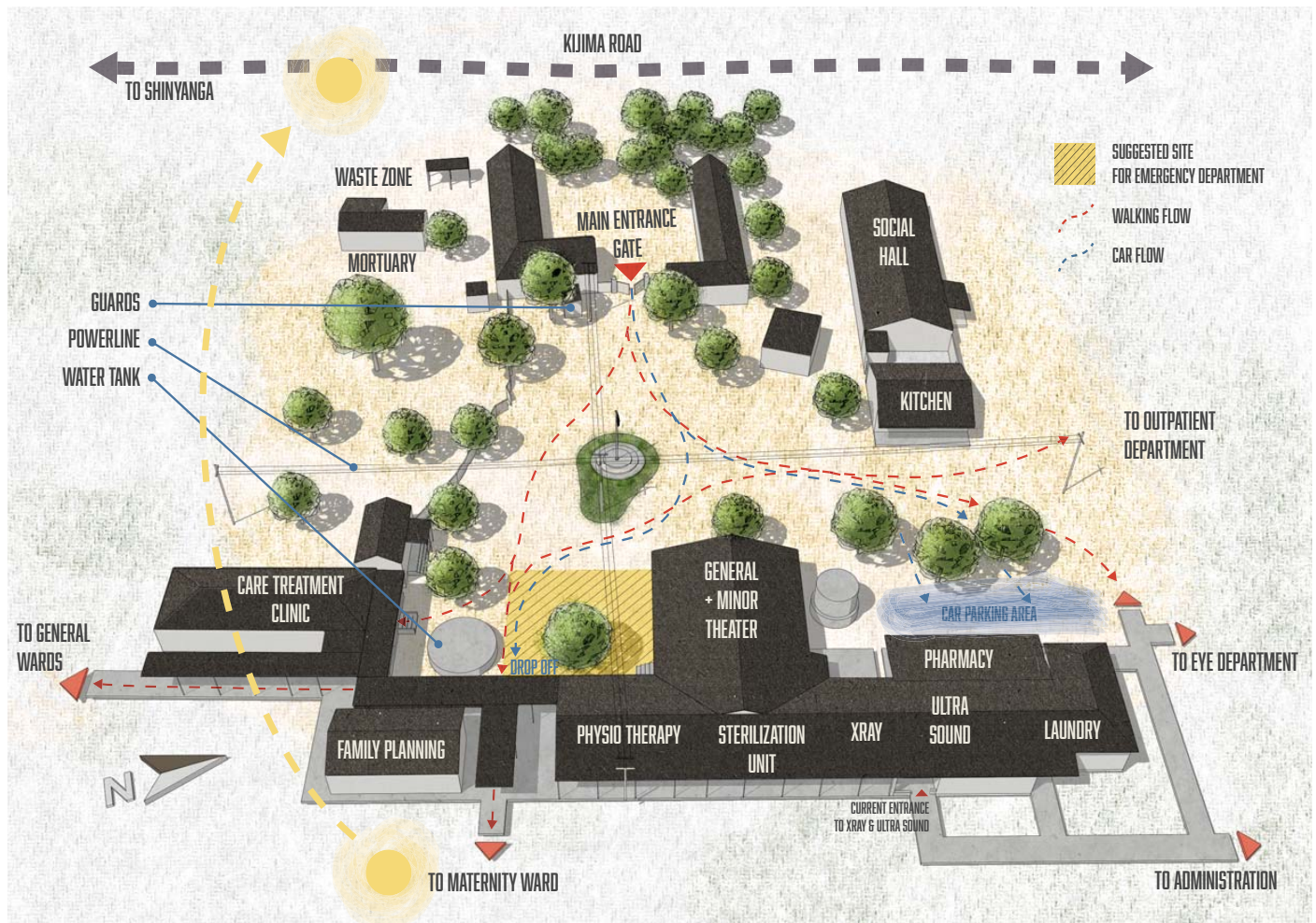






## 3.2 DESIGN PROPOSAL





## SITE ANALYSIS

A site for the new emergency department was identified in phase one of “Healthy Hospital”. It is conveniently located next to the general theater and close to the x-ray department, the two functions which will be closely connected to the emergency department. The site is also clearly visible from the main entrance gate which is important from a way-finding perspective. The hospital today lacks a main reception where patients and visitors can get information and directions. The guards placed at

the main gate has partly taken on this roll but it’s not an optimal solution. With the new emergency department arriving patients and visitors will be met by a welcoming and modern building that acts both a communication and information node. There are a few drawbacks of this site however. The water tank just left of the site limits the width of the building and the power line crossing the site must be moved. The entrance will be facing west which means that sun shading will be extra important.

## EXISTING BUILDINGS

The hospital is characterized by a cluster of one story plastered buildings, mostly in light colors. The general theater which is just next to the site is painted in a greyish brown color. All the surrounding buildings have saddle roofs of corrugated metal. The buildings are modest in their expression and rather anonymous. The conditions of the buildings varies from the very old physio therapy building which is partly demolished to the rather well working general theater.

## WIND

The prevailing wind, illustrated in the section below, blows from east to west. Due to the hot climate of Kolan-doto it is important to take advantage of the

## SLOPE

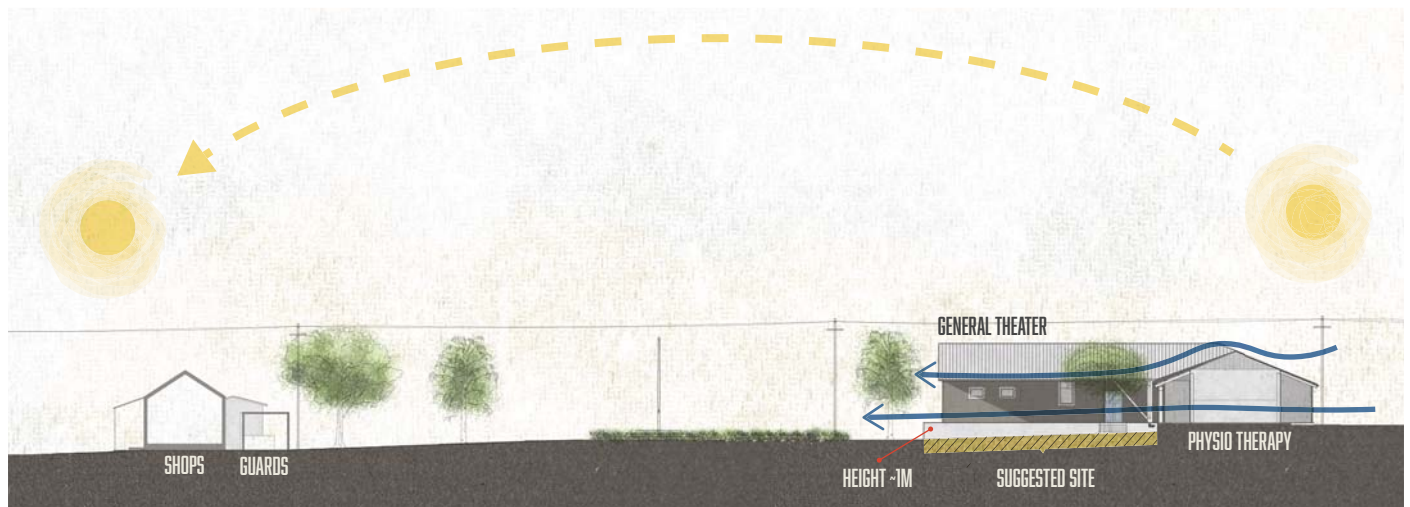
The ground is sloping down towards the main entrance. There is a 1m height difference at the end of the current foundation. The new building will attach to the existing foundation. A ramp is needed to create an accessible entrance.



MAIN ENTRANCE GATE SURROUNDED BY SHOPS

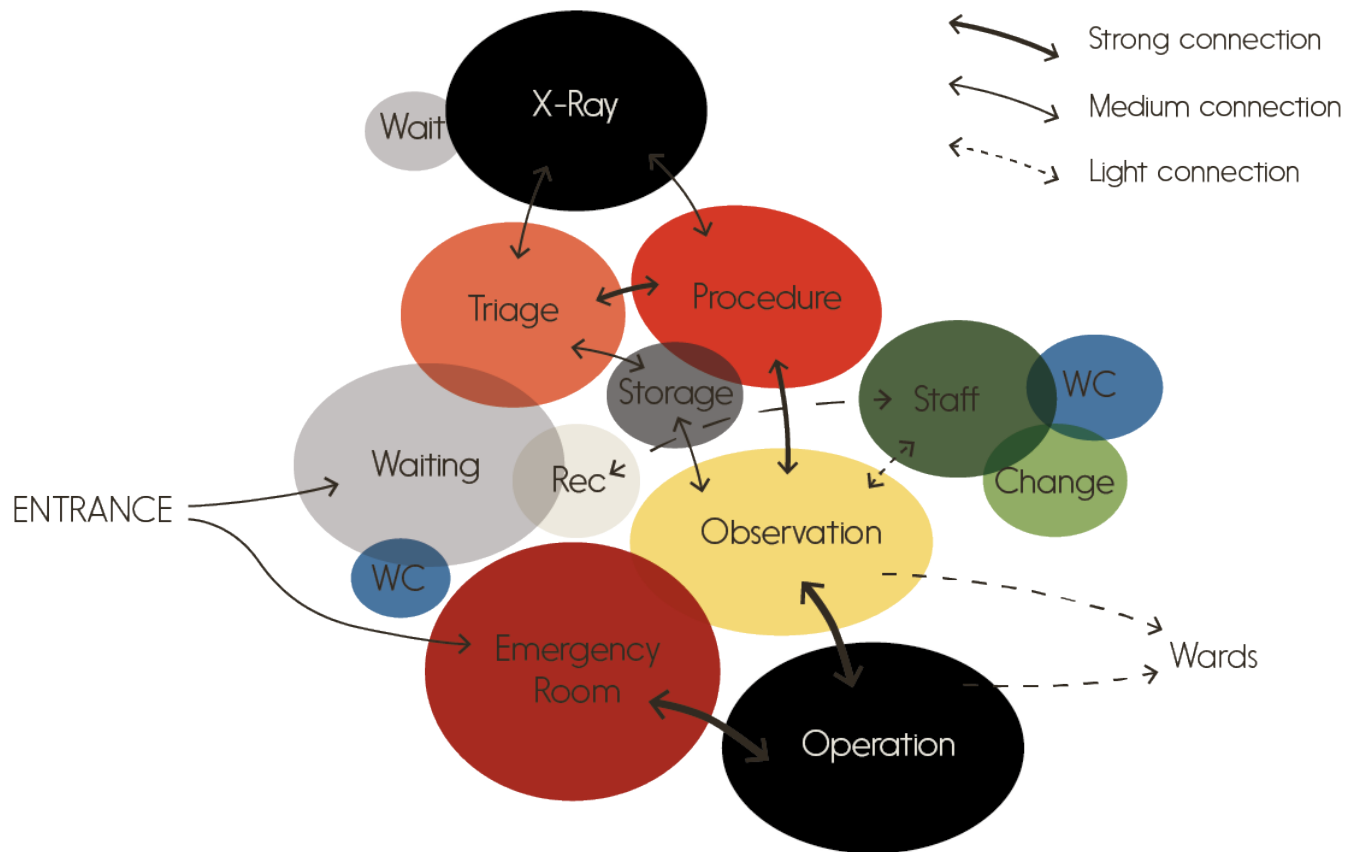


VIEW OF THE SITE FROM THE MAIN GATE



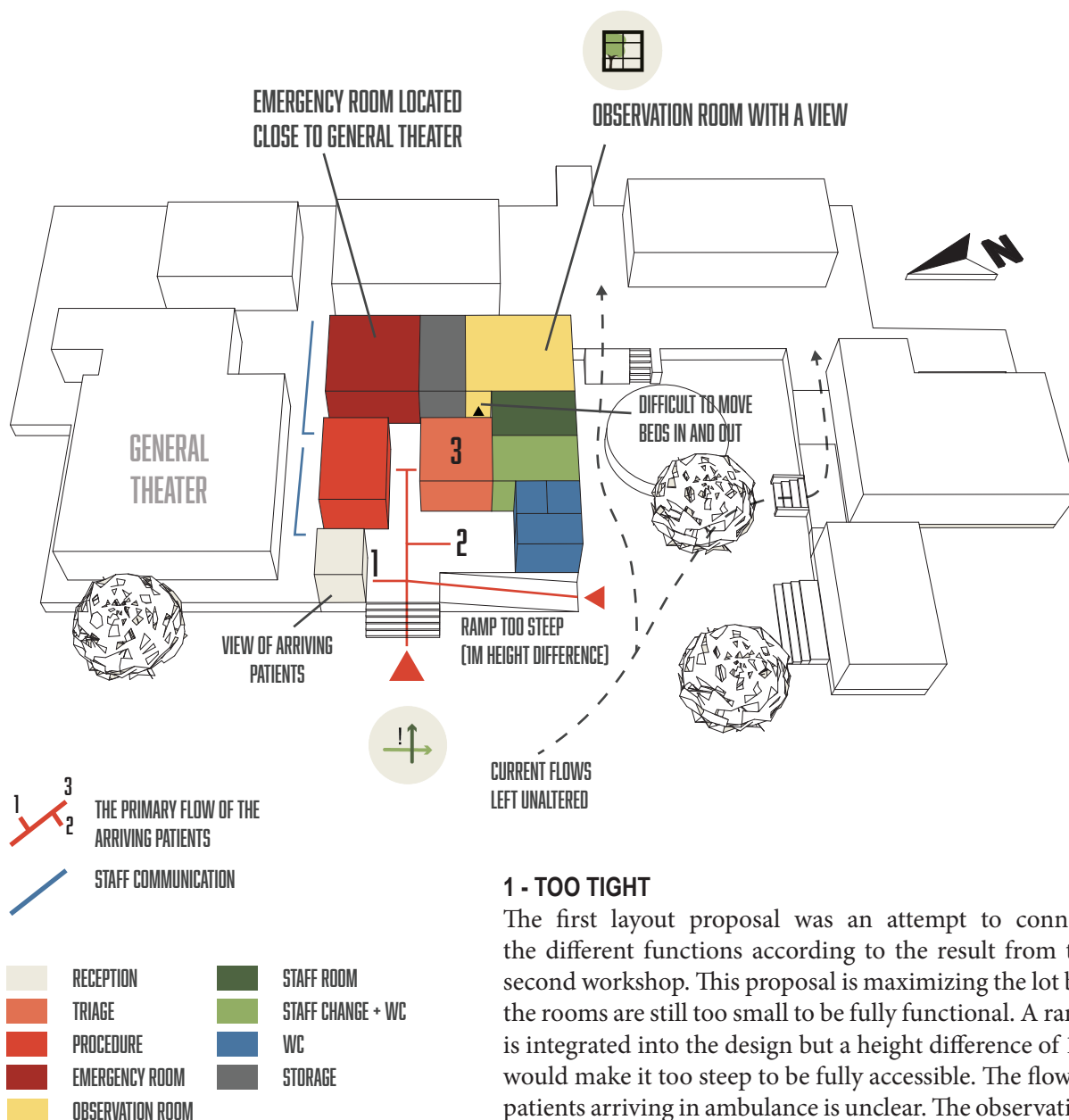


# DESIGN DEVELOPMENT



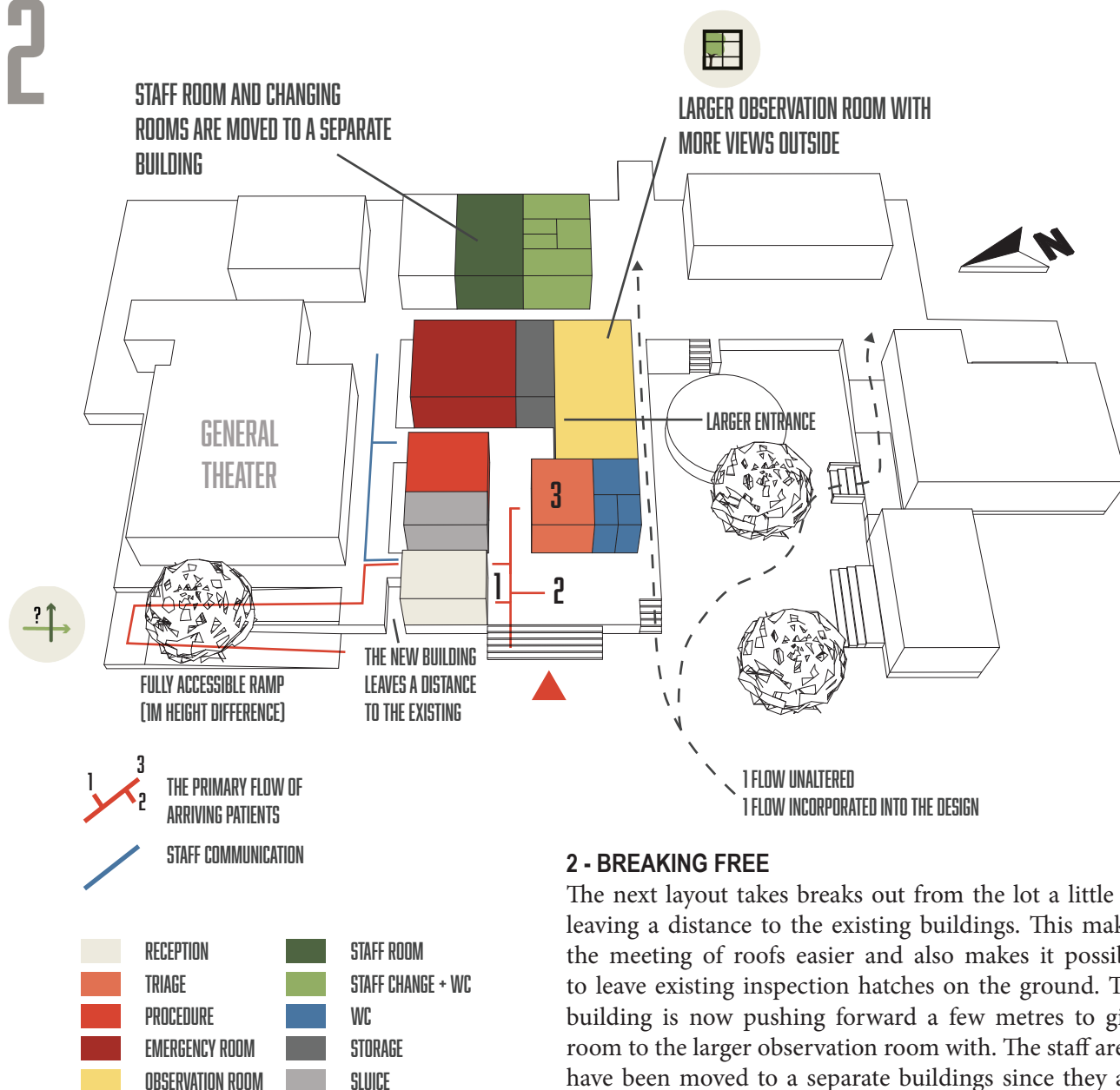
## WORKSHOP RESULTS

This diagram was first developed from the results of the second workshop but has been updated throughout the process. It shows the most important connections. Worth to notice is that the emergency department seems to have two main patient flows: (1) the patients that are well enough to wait in the waiting room for their turn and (2) the patients who are severely ill or injured and are transported either directly to operation or to the emergency room. These flows may sometimes overlap in the observation room.



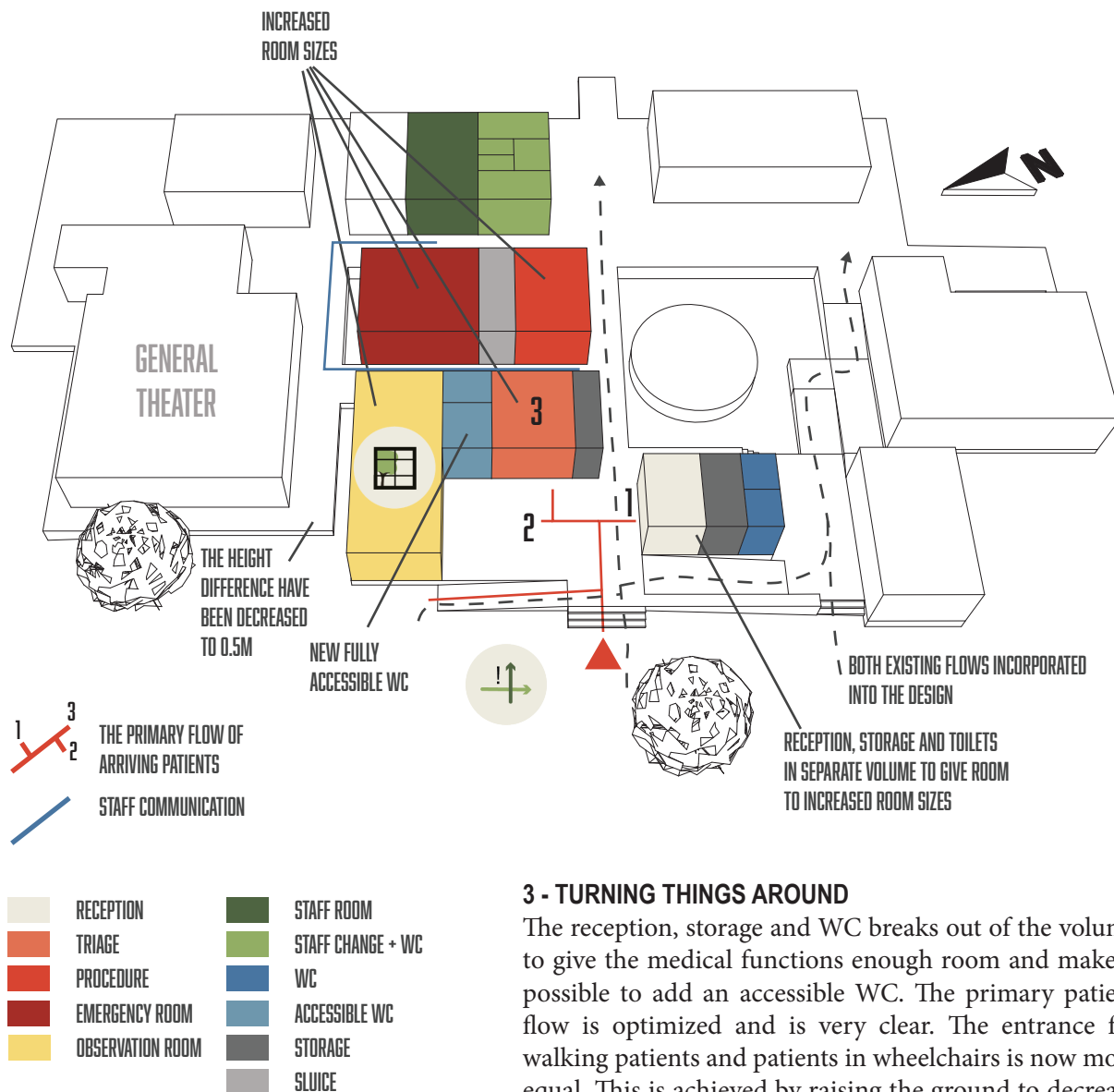
### 1 - TOO TIGHT

The first layout proposal was an attempt to connect the different functions according to the result from the second workshop. This proposal is maximizing the lot but the rooms are still too small to be fully functional. A ramp is integrated into the design but a height difference of 1m would make it too steep to be fully accessible. The flow of patients arriving in ambulance is unclear. The observation room is well placed to give the patients a view outside but the entrance to the room makes it difficult to move beds in and out. Connecting to the adjacent roofs will be difficult if the site is used this way.



## 2 - BREAKING FREE

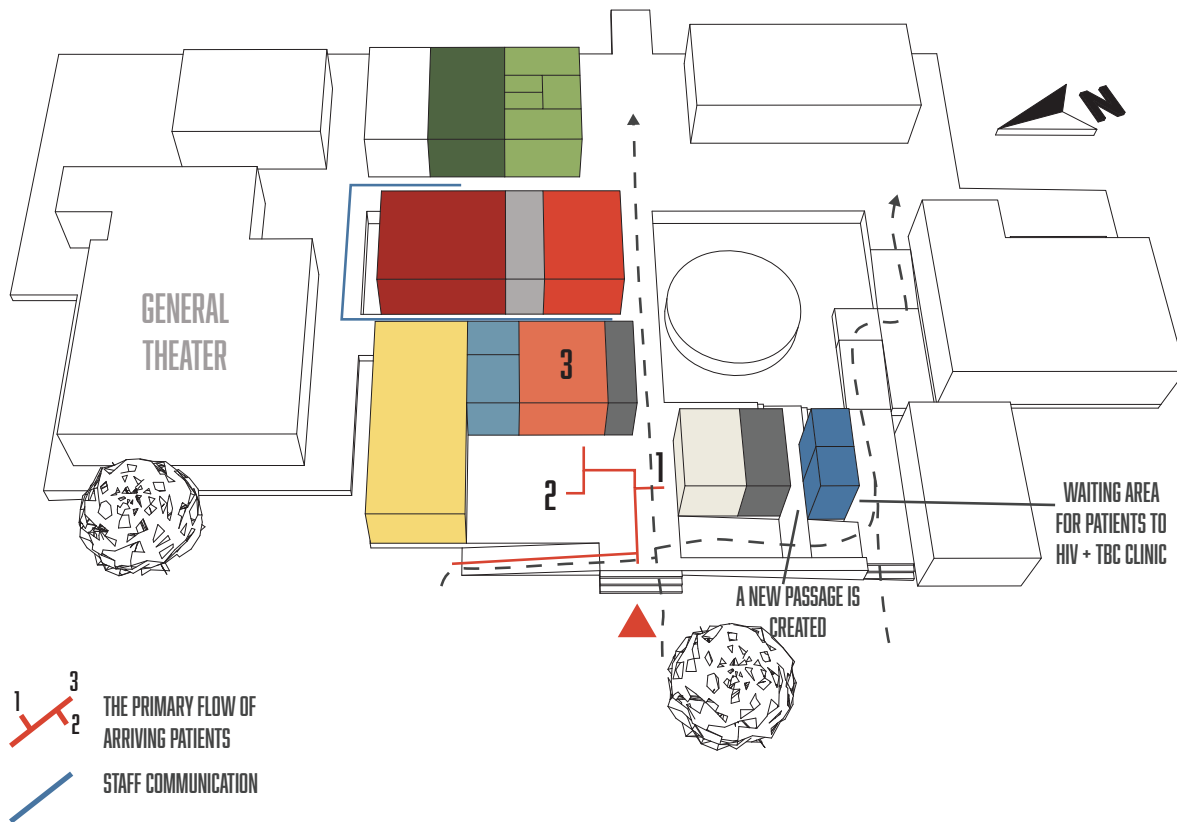
The next layout takes breaks out from the lot a little by leaving a distance to the existing buildings. This makes the meeting of roofs easier and also makes it possible to leave existing inspection hatches on the ground. The building is now pushing forward a few metres to give room to the larger observation room with. The staff areas have been moved to a separate buildings since they are not crucial parts of the department. The new room next to the procedure room works as a sluice for goods and waste. The bathrooms are now closer to the observation room. The rooms are still too small to be fully accessible.



### 3 - TURNING THINGS AROUND

The reception, storage and WC breaks out of the volume to give the medical functions enough room and make it possible to add an accessible WC. The primary patient flow is optimized and is very clear. The entrance for walking patients and patients in wheelchairs is now more equal. This is achieved by raising the ground to decrease the height difference to 0.5m. The sluce room is now placed in between the procedure and emergency room to be used by both. An extra place for storing an extra wheel chair and bed is located next to the triage room.





#### 4 - A FINISHING TOUCH

In order to create a less exposed access to the toilets I decide to mirror the toilets and create a passage between them and the storage room. This also creates a new area for waiting patients to the adjacent HIV + TBC clinic and results in a more neutral path for the existing visitor flow.

# EXTERIOR









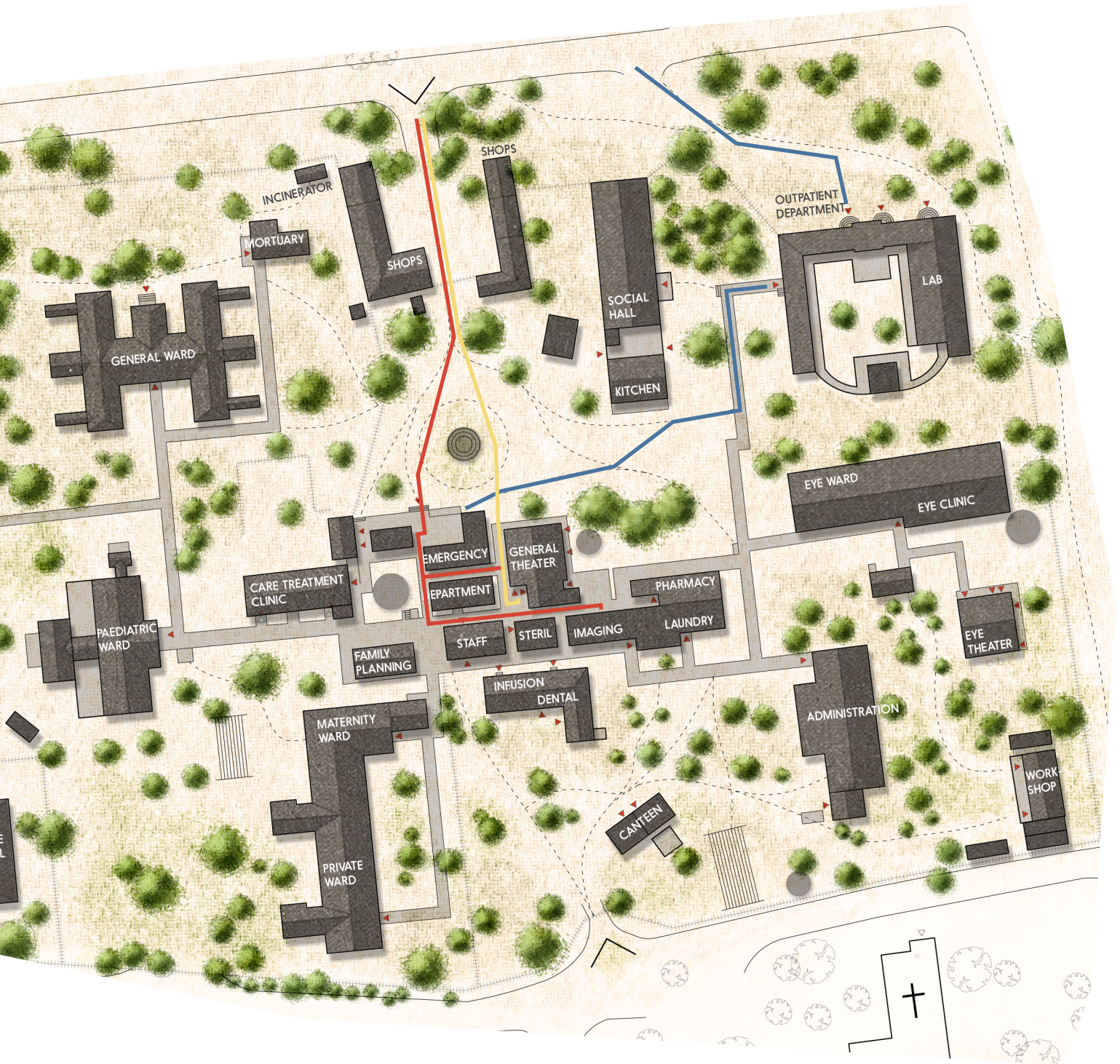
# OVERVIEW



The new emergency department will completely change the emergency flow at Kolandoto hospital. The new building welcomes all patients who arrive through the main entrance gate. If it is clear that the patient is not in need of emergency care the reception at the emergency department may direct the patient to the outpatient department. It is likely that some emergency patients will arrive at the outpatient department when the system is new. These patients can now be directed to the emergency building which is clearly visible from the outpatient department. The front of the building becomes very important and the emergency department has the opportunity to be "the new face" of Kolandoto hospital.

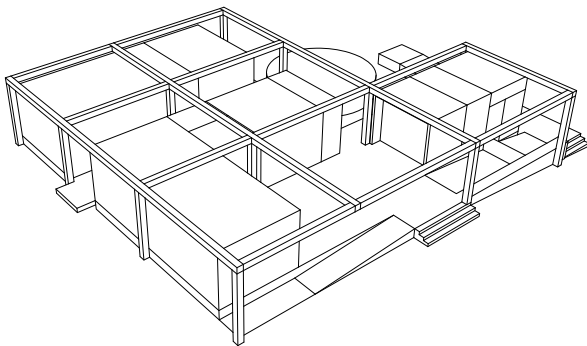
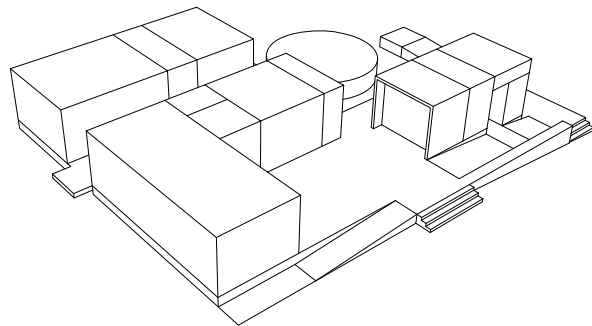
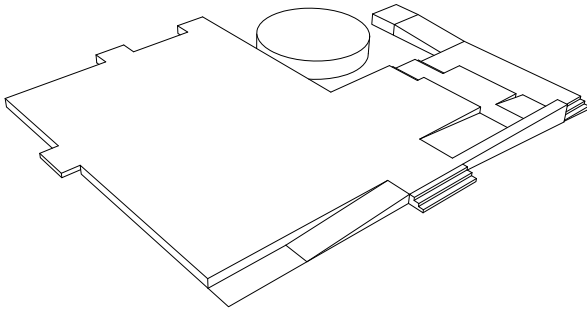








# BUILDING CONCEPT



## FOUNDATION

The base of the building is cast in reinforced concrete on site. It blends in with the foundations of the surrounding buildings and will, if carefully executed, stand the test of time. In rooms with high demands for hygiene an epoxy floor is poured on top of the concrete. This is a non-permeable, continuous floor finish that provides a surface free from joints.



## ROOMS

The rooms are built with stabilized soil blocks using the local soil, which eliminates shipping costs. This material is a sustainable alternative to burnt clay bricks which only uses only a fraction of the energy needed for burning bricks. Earth building is also a traditional building technique in East Africa and Tanzania and the medium mass bricks are well suited for the climate.



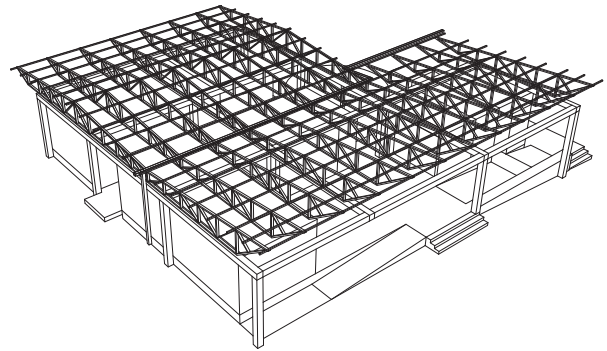
## ROOF STRUCTURE

The load bearing structure for the roof is separated from the rooms. This makes it easier to alter the layout of the department in the future without demolishing the whole building. Long term flexibility and future proofing. The load bearing structure consists of beams and pillars made of reinforced concrete.



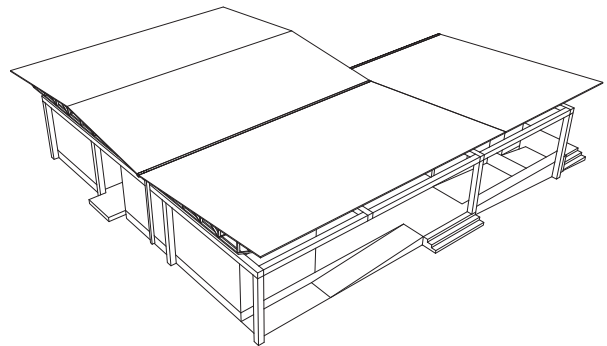
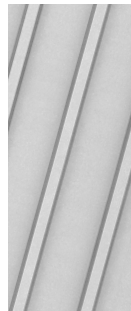
## TRUSSES

Metal roof trusses lift the roof and enables the prevailing winds to ventilate between the roof and ceiling. The double skin roof design is optimal for the hot climate. The insulation layer is moved to the ceiling of the boxes beneath. The metal trusses are quite expensive but they are a long term investment and an opportunity to learn about the construction technique.



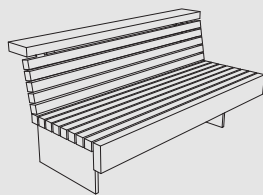
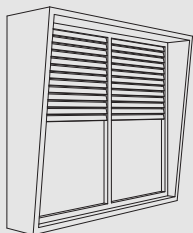
## ROOF

A thin aluminium sheet roof shades the building from the hot sun and protects it from rain. Gutters are integrated into the roof design and some of the rainwater is collected in a tank to be used for flushing the toilets.

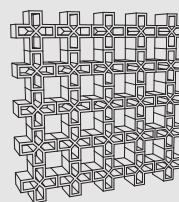


## DESIGN COMPONENTS

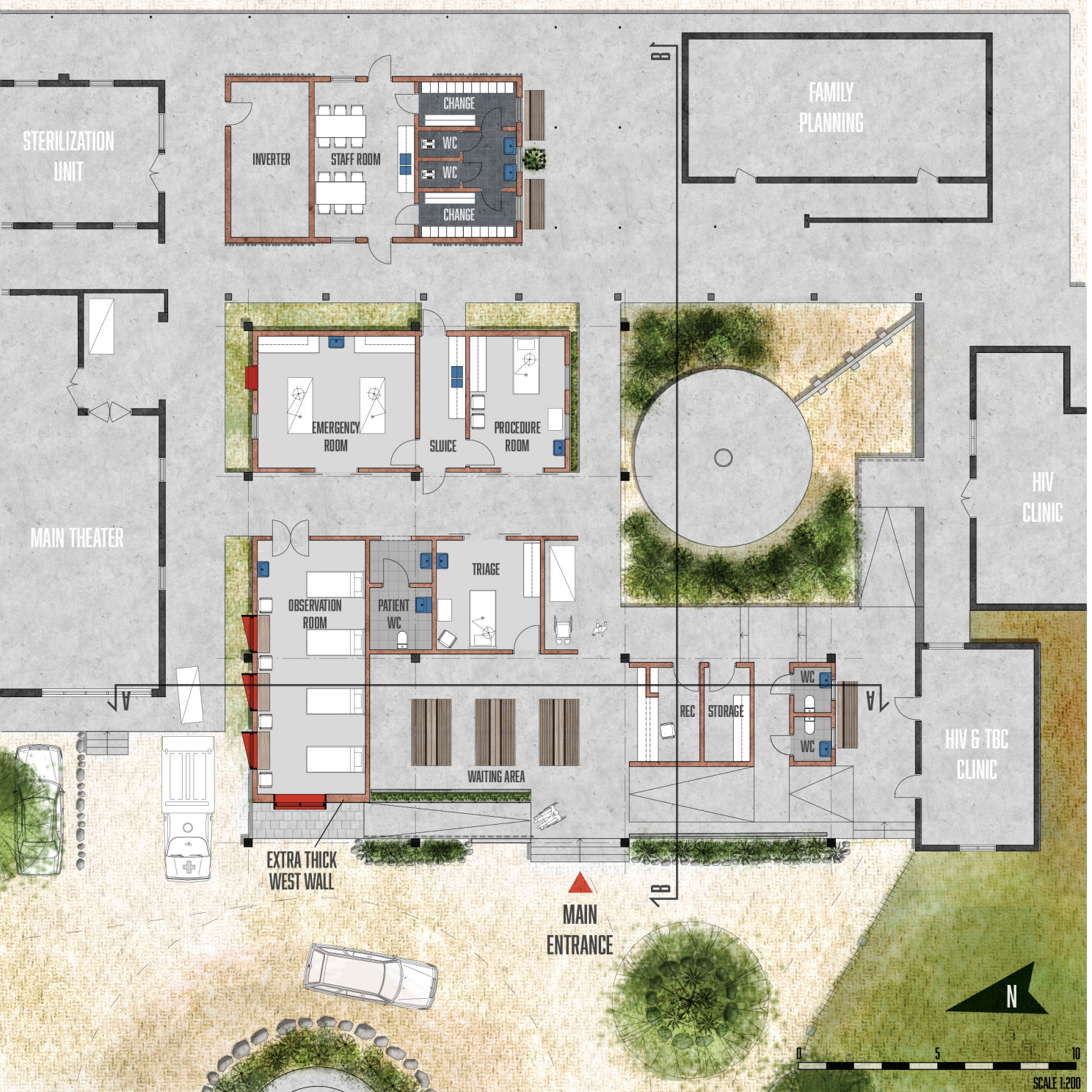
The building is characterized some carefully chosen components. The windows of the observation room are painted bright red and the boxes works as sunshade and reduce direct views into rooms.



Wooden benches softens the waiting area while the concrete raster filters the sunlight but provides view towards nature. The stabilized soil bricks are exposed in the shaded waiting area and has a warm red color.





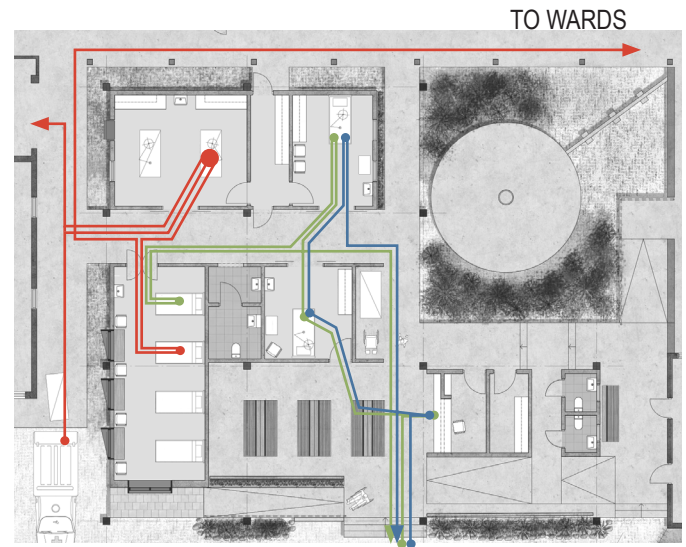




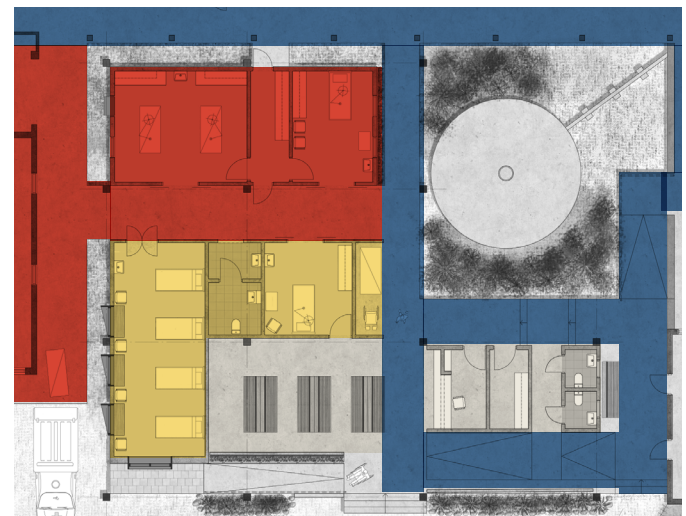
## DESCRIPTION

The new emergency department has a clear and structured layout. Easy wayfinding have been one of the key elements in the development of the design. The building opens up towards the entrance and the reception is clearly visible when you approach the building. Greenery surrounds the entrance as a soft contrast to the concrete foundation and load bearing structure. When you arrive at the reception you have a clear view towards the family planning department and even though you have just entered the emergency department you can easily continue further in on the hospital area by following the corridor straight ahead. The original site for the emergency department has been expanded but the additional area is kept neutral and the existing flows of visitors and staff have been integrated into the design. The toilets are placed to be accessible for both visitors and patients.

As the picture of the flows suggest the critical patient flow is mostly separated from the other flows. Short distances between ambulance drop-off, emergency room and general theatre have been an important factor. The observation room is located in the northwest corner of the building to ensure that the patients can get a glimpse of the nature outside the windows. An accessible WC is part of the department, it is the first at Kolandoto hospital and is therefore accessible from the corridor rather than from the observation room directly. The triage and procedure room are generous in size to allow for relatives to accompany the patient. The proposal consists of four different zones as described by the picture to the right. The most technical advance rooms and are located at the back of the building.



- Minor
- Medium
- Critical



- Treatment zone
- Observation and assessment zone
- Neutral communication zone
- Neutral zone

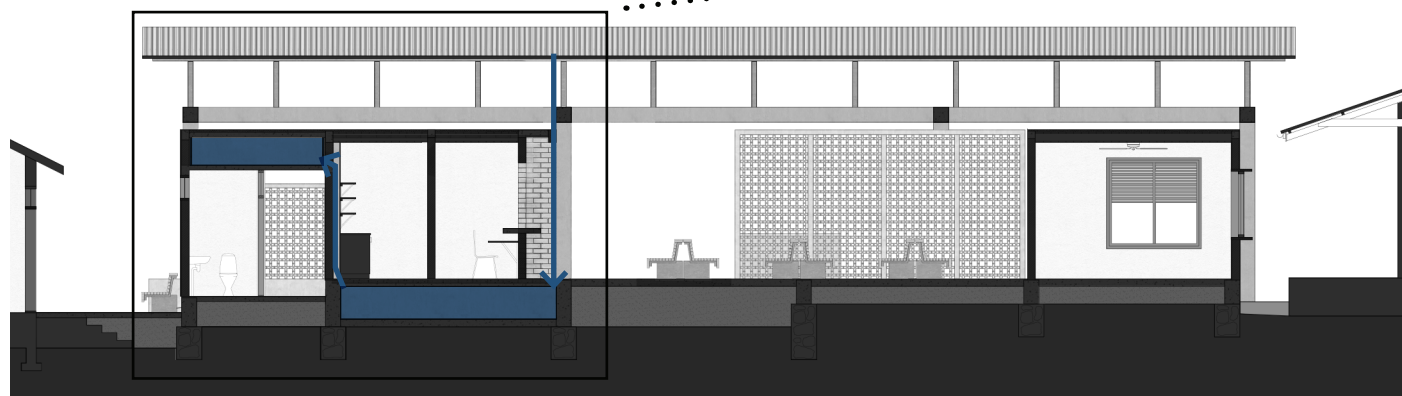


Sinks are available in all rooms where patient and staff interact to promote handwashing. The placement of the sinks was discussed during the fourth workshop and though the layout has gone through significant changes since then the strategy remain the same: sinks should be visible when the staff enters the room.

The staff room and changing area are located in a separate building. These functions are not crucial for a functional emergency department and it is possible to divide the project into two phases if needed. Physio therapy is located in that spot today but the existing building is in a very poor condition, partly demolished, and the department would benefit from a location closer to the outpatient department.

To ensure a fully accessible and equal entrance for people in wheelchairs and to facilitate the access for a future ambulance the ground level has been raised by 0.5m. This adds to the building cost but the advantages compared to keeping the 1m height difference are significant enough

## SECTION A-A 1:150



to be worth the cost. There is also a height difference between the foundation level of the new building and the existing HIV & TBC clinic. The new building takes advantage of this by using the extra space for a water tank where rainwater can be gathered and used to flush toilet. The principle can be seen in the section below.



The double skin roof is designed to optimize the natural ventilation through the structure, see section B-B on page 76. Additional mechanical fans are added in the large observation room to ensure a frequent exchange of air. The windows are operable and shaded from the hot sun.

The building leaves a distance to the roofs of surrounding buildings to not interfere with the existing system for gathering rainwater. This water is used for sterilization in the sterilization unit and in the general theater.

## SECTION A-A (ZOOMED IN) 1:50

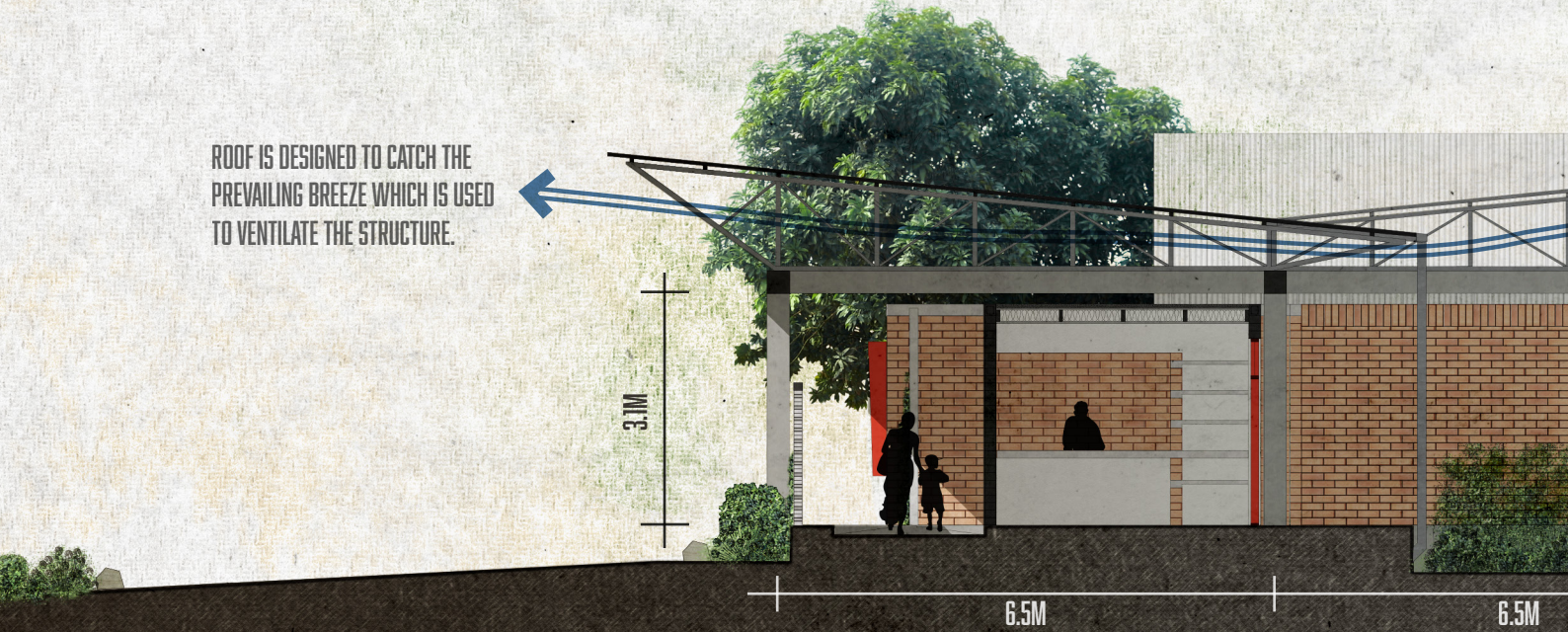


The rooms are constructed with stabilized soil blocks. The blocks are plastered on the exterior walls that are exposed to wind and rain to prolong their lifetime but left exposed on interior. The exterior walls that are covered by the metal roof are left natural to show the true nature of the building. There is a long tradition of earth building in the area but it has not been used at the hospital before. The

ceiling is insulated to keep the rooms comfortable. There is space for small technical installations in the ceiling.



ROOF IS DESIGNED TO CATCH THE  
PREVAILING BREEZE WHICH IS USED  
TO VENTILATE THE STRUCTURE.



SECTION B-B 1:100



WEST ELEVATION 1:100





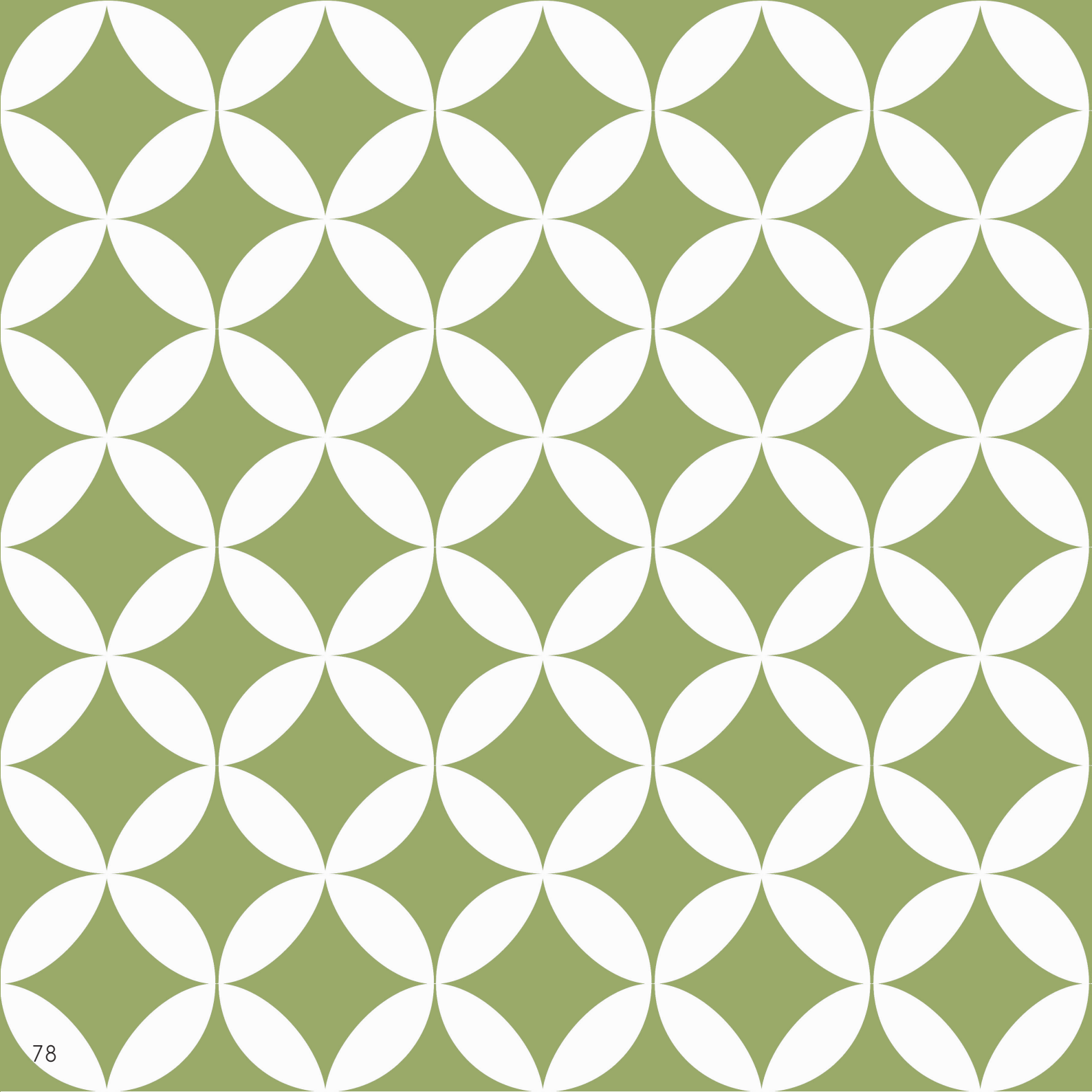














# CHAPTER 4

## CONCLUSIONS

## 4.1 DISCUSSION



# PROJECT SUMMARY

In this chapter the conclusions are subdivided into two main categories; project evaluation and personal reflections. The project evaluation includes a discussion about the process and context of the research and design project, recommendations for future projects with similar conditions and a discussion of the result in relation to the initial research questions. The second part of this chapter includes personal reflections of doing a project in the context of Tanzania and in close collaboration with stakeholders.

## PROCESS

This thesis has been carried out in a three-step process where the first step involved field study preparations including initial research regarding participatory design and setting up a time line for the field work and workshops. The second part of the process was the field study itself where all the workshops were conducted. In terms of design process the second part included briefing, program and first presented design proposal. The third and final step included evaluation of field study and finalization of design proposal.

Throughout the field study I worked in an iterative manner by developing each workshop after analyzing the outcome of the previous one. I found that this gave me some opportunity to reflect upon the challenges of applying the participatory design approaches in this context.

## CONTEXT

Participatory design has its roots in the western society and most of the existing research is based on projects conducted in Europe and North America. A core element of participatory design is that all participants partake on the same level, a fully democratized process. Tanzanian culture have a much stronger hierarchal structure than

Scandinavian societies and this greatly affects the possibilities for co-creation. I found that, just as Hussain et al (2012) concludes, instead of facilitating true co-creation where all participants work together on an equal level, I had to take the lead during the design activities. In addition to this I also experienced that I was seen as an expert not only in the field of architecture but also in the field of emergency care. This was probably due to the fact emergency departments are rare in this area and only a few of the participants had previous knowledge its purpose and possibilities. I do not have any medical training, and at the beginning of the project had very little experience of healthcare in Tanzania. I tried to be humble in my approach and explain that, to me, the staff at the hospital were experts in their field. The key to my success, as I felt it, was to create an environment where the participants felt that they had the same right to express ideas and opinions as I had. I would not say that I fully succeeded in that matter. Throughout the workshop sessions I had to guide the participants both through the different tasks but also through the discussions. I believe that this was due to two main reasons (1) the participants were unexperienced when it came to group discussions and working in groups with abstract questions and (2) it was not possible for the same people to partake in all workshops. I believe that if I had got the opportunity to work with the same persons each week, we could have reached further as a group and built more capacity.

## RESULT

The conclusion from this project is that participatory design as a mind-set can be of great use in developing contexts, especially in the early stages of design projects. This mind-set promotes equality when exploring the visions and dreams of the design project. It is important to understand, however, that to carry out a participatory

design method all the way through in a developing context is a difficult task. A key factor is to teach the method before applying it. The participants might be unexperienced in working in groups and/or have difficulties in understanding the questions or tasks due to language barriers. It is also advisable that the designer(s) get to know the participants before starting the process. This can be a way of showing interest in their lives and culture and may contribute to developing a more equal environment.

Hussain et al (2012) concluded that designers who carry out participatory projects in developing countries not only should aim at designing the product or service. The purpose should also be to build local capacity to ensure that future design projects can be carried out without help from a foreign designer. This is something I strongly believe in, to empower people and give them the tools to develop new methods. Building capacity can also be to give the participants experience in partaking in participatory workshops which can make the next project more successful. I think that it takes more than one project to build the amount of capacity that is needed.

Time is also a very important factor. Most projects have a limited time frame and it is therefore advisable to continuously evaluate the importance of the participative process in relation to the final design result. In this project the ultimate goal was to make a full design proposal. I found that the participatory methods worked best in the visionary early stage of the project and decided to use the field study to explore that and to develop the final design when I had left.

I evaluated the process by interviewing two participants that had attended most of the workshops. Both of them were satisfied with the process and the project at the time

of the interview. They thought that the participatory method was interesting and rewarding. One of them described that, at first, they did not understand what was happening but it became clearer and clearer throughout the process. Both of them explained that it would be easier for everyone to be actively participating if they had equal skills in English. When asked which workshop they liked the most both of them answered that the full scale workshop was best. It was unexpected and made it much easier to understand the proposal.

## DESIGN RESULT

The final design proposal is very different from the last one presented during the field study. The end result is a building that makes a statement, that stands out from the surroundings. At the same time the building aims to be true to the scale of the hospital and use local building techniques, materials and design elements. The traditional and new concepts are mixed to create a new, modern building that can be the new face of the hospital. The design is a compromise between affordable, local materials and more expensive imported materials. The aim is to find a balance between the two and that, for example, the introduction of metal trusses can be positive from the perspective of building capacity and knowledge.

## RESEARCH QUESTIONS

### A PARTICIPATORY DESIGN APPROACH

In order to successfully develop a sustainable architectural design proposal in an international development context a designer must be familiar with the cultural and contextual conditions. Through the research I have found that working with a participatory mind-set in the early stages of briefing and program can facilitate a mutual learning process between the designer and users. The participatory mind-set when presented to the work group, can be a way of showing a humble approach towards an unfamiliar culture and context and to build trust. The most effective participatory methods were those that were easily understood by the participants. Successful communication definitely is crucial when carrying out a participatory process. During my workshops I experienced that the language barrier was a significant issue that hindered some of the participants from actively participating in the workshops. The 3+3 method in the first workshop proved to be successful. It was quick and easy to talk about since it did not include a design, something the participants were unexperienced in. This was the workshop where I felt that we were most equal. The game workshop was very interesting for me as a designer and yielded more design input than any of the other. The full scale workshop was also successful in that it helped the participants to understand the proposal on a whole new level. It truly facilitated the communication about the proposal.

From a sustainability perspective I believe that taking time to fully understand the context and creating a common vision for the project is key. A sustainable architectural project should build on the local context and achieve the vision of the project by creatively combining new and traditional design solutions.

## RECOMMENDATIONS

This project has shown that full scale representation of a building proposal is an effective method for communicating with people that have limited experience in reading architectural layouts. Using a game method can facilitate active participation since the design tasks are clear and the game environment also have the possibility of slightly reduce a strong hierarchy among participants.

In a future project it could be interesting to use a combination of full scale and game method to evaluate if this could increase the active participation.



## 4.1 REFLECTIONS

## PERSONAL REFLECTIONS

Carrying out a real project is challenging but incredibly rewarding. Having the opportunity to collaborate with stakeholders to design a building that has the possibility of being realized is a great experience for any architecture student. This thesis has been part of a large collaborative project which of course gives certain conditions. Many stakeholders are involved and the project continues after this thesis is presented. The goal is to find funds to build the emergency department next year. Knowing this has of course affected the process and the design. I would like to think that it has mostly been for the better. I found it challenging to take the step from researcher to architect because I wanted to get a deep understanding of the program and the requirements before I began designing. This was probably also a reaction to working in a completely new context.

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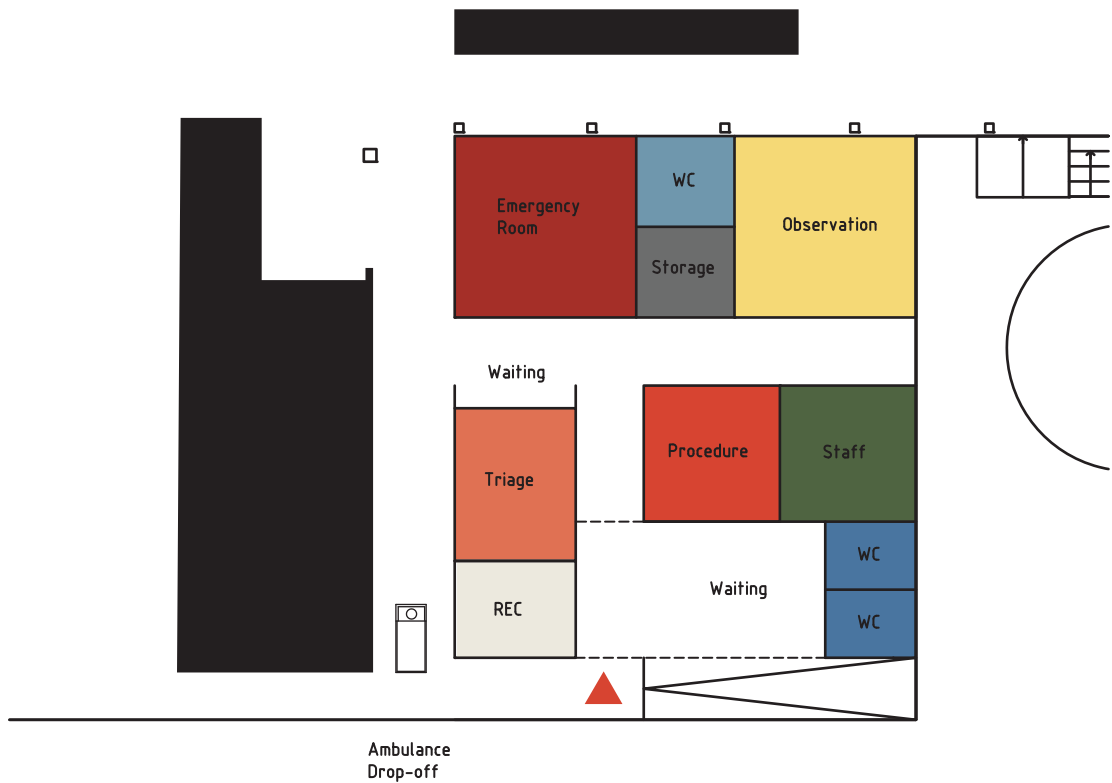
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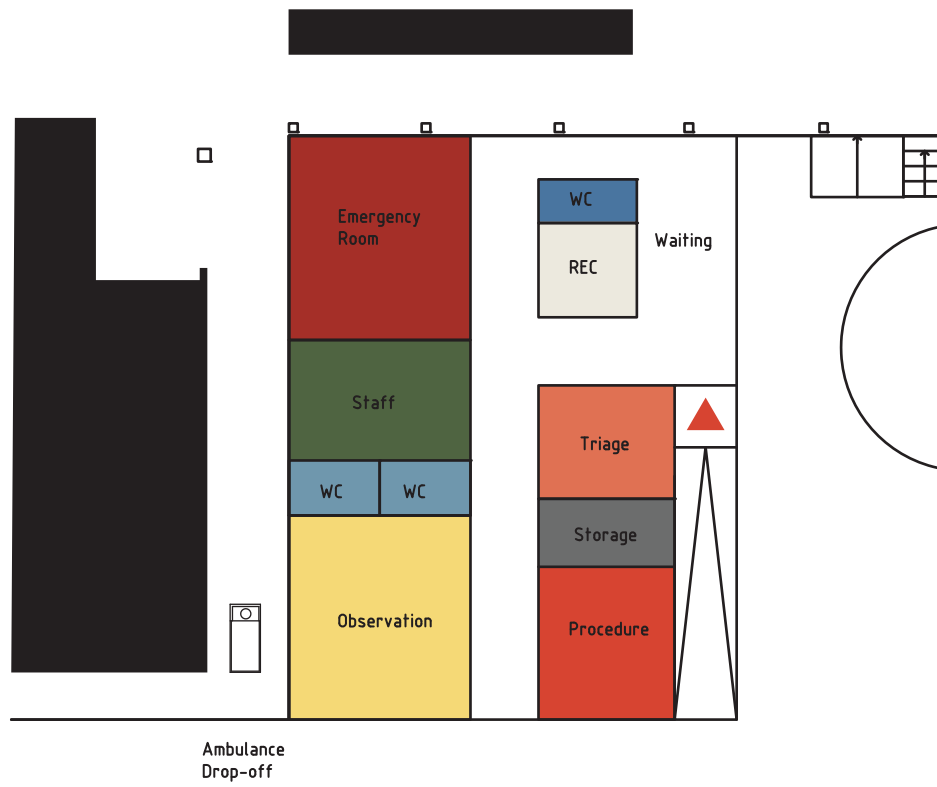
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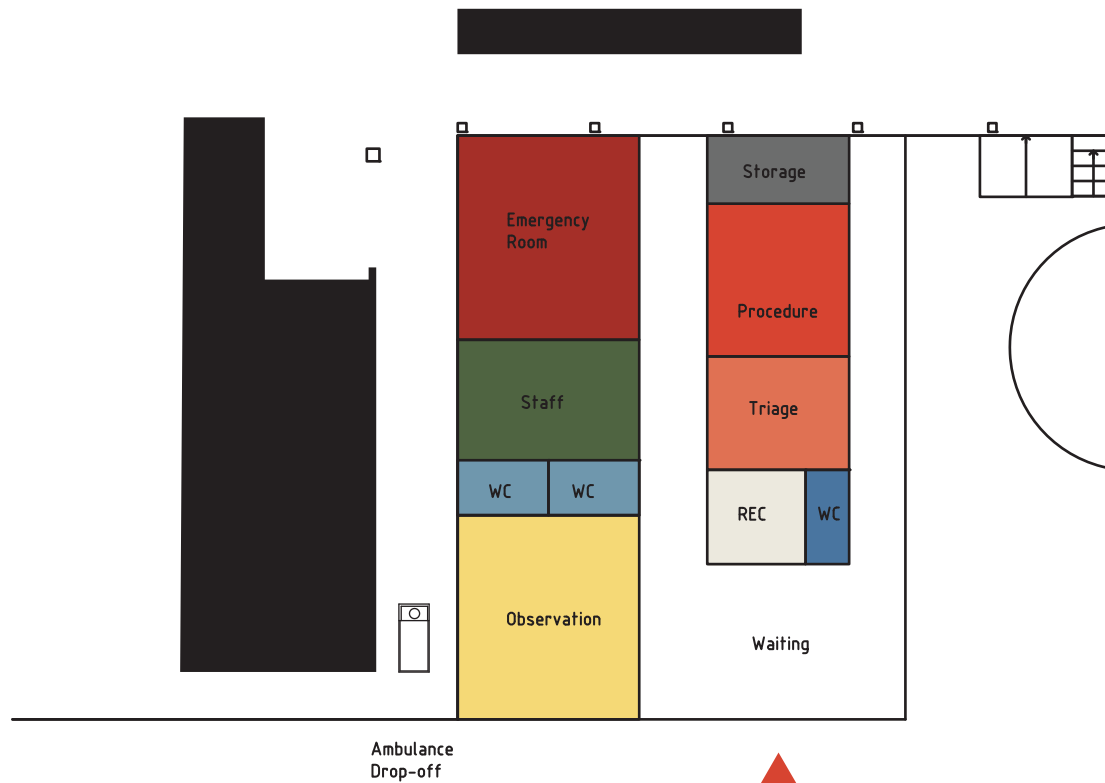
APPENDIX 1



ALT 1



ALT 2





*"Architecture is primarily about communication."*

(Gabriel & Maher, 2002)

Master's Programme Architecture and  
Urban Design  
Department of Architecture,  
Chalmers University of Technology  
Gothenburg, Sweden 2016



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