RECOVERY AND RELIEF

Exploring architectural variables to decrease stress of patients
in an emergency and surgery unit

Yue Wang

Master Thesis work in Architecture
M.Sc. Architecture and Urban Design
Healthcare studio
Chalmers School of Architecture
Gothenburg, Sweden 2018

Examiner: Peter Fröst
Supervisor: Elke Miedema

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THANK YOU

Elke Miedema, thank you for your critique and help on the process of my thesis work . And I think I'll keep the 6 architectural domains in my further design.

Peter Fröst, thanks for your support and help to my thesis.

Saga Karlsson, thank you for introducing me your lovely project with an interesting context to me.

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Everyone in Healthcare Studio, thank you for you were here.

And Chengliang, thank you for decrease my stress when I design a stress-decreasing hospital unit for patients.

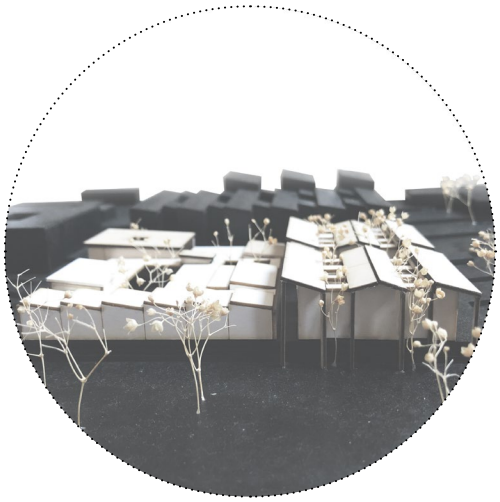


Figure 1. Photo of the final model

CONTENTS

Figure 2. The 'core' of the wards area

ABSTRACT

Research has shown that stress can have many negative effects on health, including recovery time of patients. Moreover, it has been found that both indoor and outdoor environment have an impact on the stress levels related to psychological health.

The purpose of this thesis is to explore how the architectural variables can be a tool to deal with urgent needs and functions, creat peaceful environment to decrease the stress and reduce the length of stay.

Panzi Hospital is located at the suburb of Bukavu, which is an important transport hub and gateway to eastern DR Congo. However, due to the wars and conflicts, the environment has been deteriorated. The hospital treats all kinds of patients and has become famous for treating survivors of sexual violence. Those who work there are helping people the best way they can, but limited resources make their work more difficult.

This thesis will result in a design proposal for a new emergency and surgery unit of the Panzi Hospital. This will be done by investigating environmental support for managing emotions and reactions, factors facilitated by architecture and organizing the programs in the local context, using literature studies, sketches, interviews, modelling and research by design to achieve this.

Key words: architectural variables, environmental support, decrease stress, emergency and surgery unit, Panzi hospital

CHAPTER 1

INTRODUCTION

AIM

The goal of the master thesis is to propose a design project for patients at the emergency and surgery unit, Panzi hospital, which is the second phase of the hospital infrastructure upgrade. Furthermore, the aim is to investigate architectural variables to provide calming environment during the period of treatment and recovery.

RESEARCH QUESTIONS

MAIN QUESTION:

How can an emergency and surgery unit be designed that counteracts stress of patients?

SUB-QUESTIONS:

How to arrange efficient flows in an emergency and surgery unit combining with the nature?

What're the methods to keep families nearby as much as possible when resource is limited?

How to adapt architecture languages of the emergency and surgery unit to local contexts?

DELIMITATION

Due to the ongoing conflicts and wars in DR Congo, the State Department in Sweden discourages all trips to the provinces of North and South Kivu, including the provincial capitals of Goma (North Kivu) and Bukavu (South Kivu), where the new emergency and surgery unit is intended to be built. Thus, I haven't been on site, and the background study is based on reasearch from White Arkitekter, literature, Internet and local interview.

The delimitations will be the into depth design methods on stress-decresing space in the emergency and surgery unit of Panzi hospital. By the current situation, a focus on low-tech design and low-priced building materials will be made.

TIMELINE

The master thesis project is based on a collaboration betwen Dr. Mukwege, Marie Berg(Professor of Health Science at the University of Gothenburg), Maria Högenäs(Director at Art of Life and Birth) , Peter Fröst(Professor at Chalmers Architecture, Center for healthcare architecture), White Arkitekter and WSP.

In 2017, two members of White Arkitekter visited the Panzi Hospital with the other project participants and made the conclusion for the future development in the hospital. In February of 2017, the consultancy company WSP got involved in the elaboration of the new masterplan. The masterplan proposed a development with extension in several stages during the following 10 to 12 years. The new emergency and surgery unit is the second phase of the development.

Figure 3. Masterplan for long-term development in Panzi. Adapted from White Arkitekter. Adapted with permission.

METHOD

-Reading

Investigating traditions and culture of Bukavu by literature

-Mapping

Organizing the programs in the local context;

-Interview

Conducting interviews with doctors who worked there before;

-Design

Developing design by using sketch, material, and model studies;

-Discuss

Discuss with tutor and examiner, collaborating with White Arkitekter during each design process

WORK PROCESS

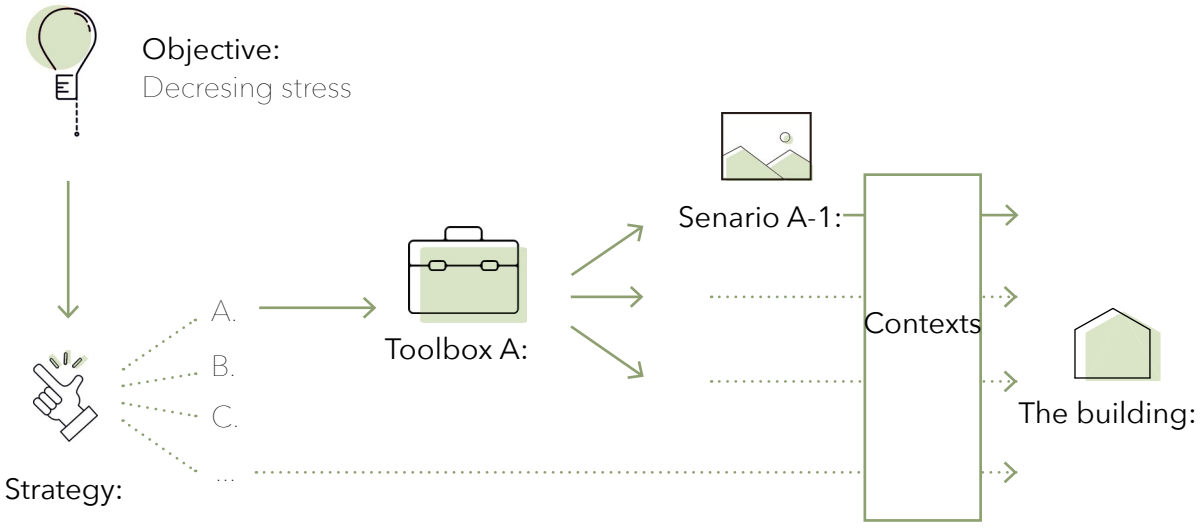


Figure 4. The stucture of work process

The work process started at the objective, decreasing stress of patients. After analysing the situation and conditions, stategies were based on the theory. Then, different ideas on each strategy would be listed in each toolbox. And, a series of senarios have been drawn by the methods from the toolbox. Finally, these senarios would form the building by local contexnts.

CHAPTER 2

THE CONTEXT

Panzi Hospital was built at the end of the 1990s, in middle of the war that is known as the Africa´s World War. Today Panzi is a worldwide famous hospital. Since the beginning, the hospital has been run by Dr Denis Mukwege, an award-winning doctor and a winner of the Nobel Peace Prize.

Panzi Hospital is a place that gives hope in a country where there are a lot of victims of sexual violence who are not received by most other hospitals nearby. There are many reasons contributing to this widespread problem in DR Congo. One of the main factors is the fact that the country is rich on many valuable minerals that different groups fight to acquire control over and profit from. It is in this conflict that hundreds of thousands of women and children become victims of sexual violence.

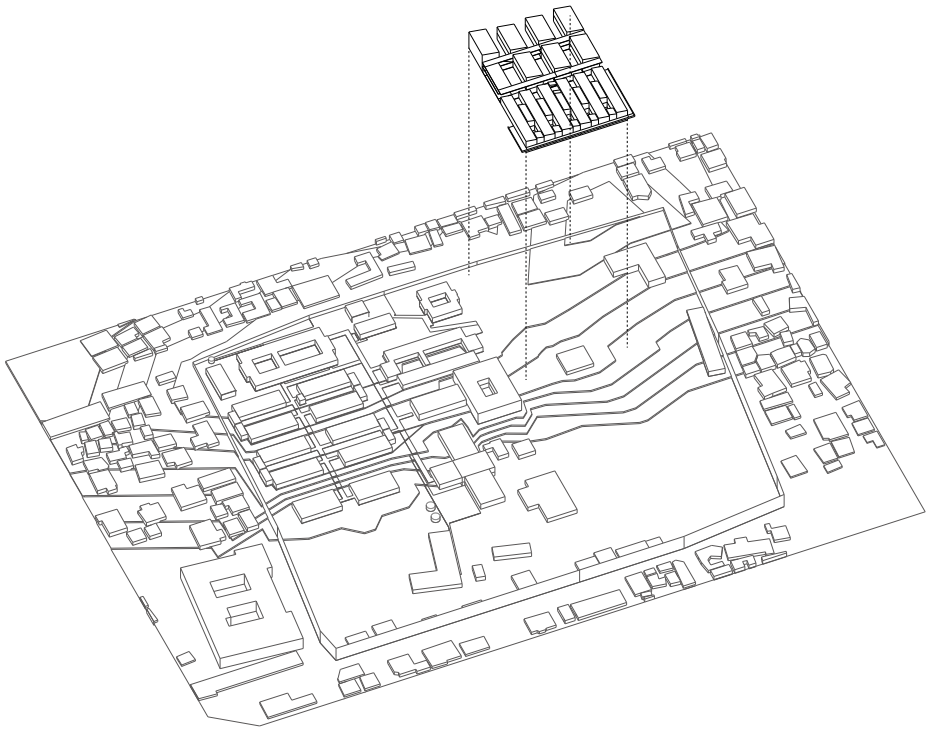


Figure 5. The first phase of the extension for Panzi hospital by White Arkitekter.

LOCATION

Figure 6. The location of the Panzi hospital.

The Democratic Republic of the Congo is located in Central Africa and is extremely rich in natural resources. However, the country is politically unstable and suffers from a lack of infrastructure.

Bukavu lies in the province of South Kivu, southern hemisphere, on the west of Cyangugu in Rwanda, and is separated from it by the outlet of the Ruzizi River. Panzi hospital is located about six kilometers south of the city center of Bukavu, around 500 meters away from the river.

CLIMATE

Figure 7. Climate in Bukavu. Based on the information from White Arkitekter.

Bukavu has a subtropical climate with annual average temprature varying between around 15°C and 27°C. The direct sunshine duration is approximately from 5 hours to 9 hours. The rainy season is from October to May, and the mixmum precipitaion in winter is 40 mm. However, their water demand is quite urgent due to the lack of rainwater collection system as well as water purification system.

The temperature is comfortable all year round, so the outdoor space should be arranged in the design. Patients could enjoy the outdoor environment even if the resources are limited. And large green area could help with rainwater collection, so the design has to be considered with more green spaces.

HISTORY

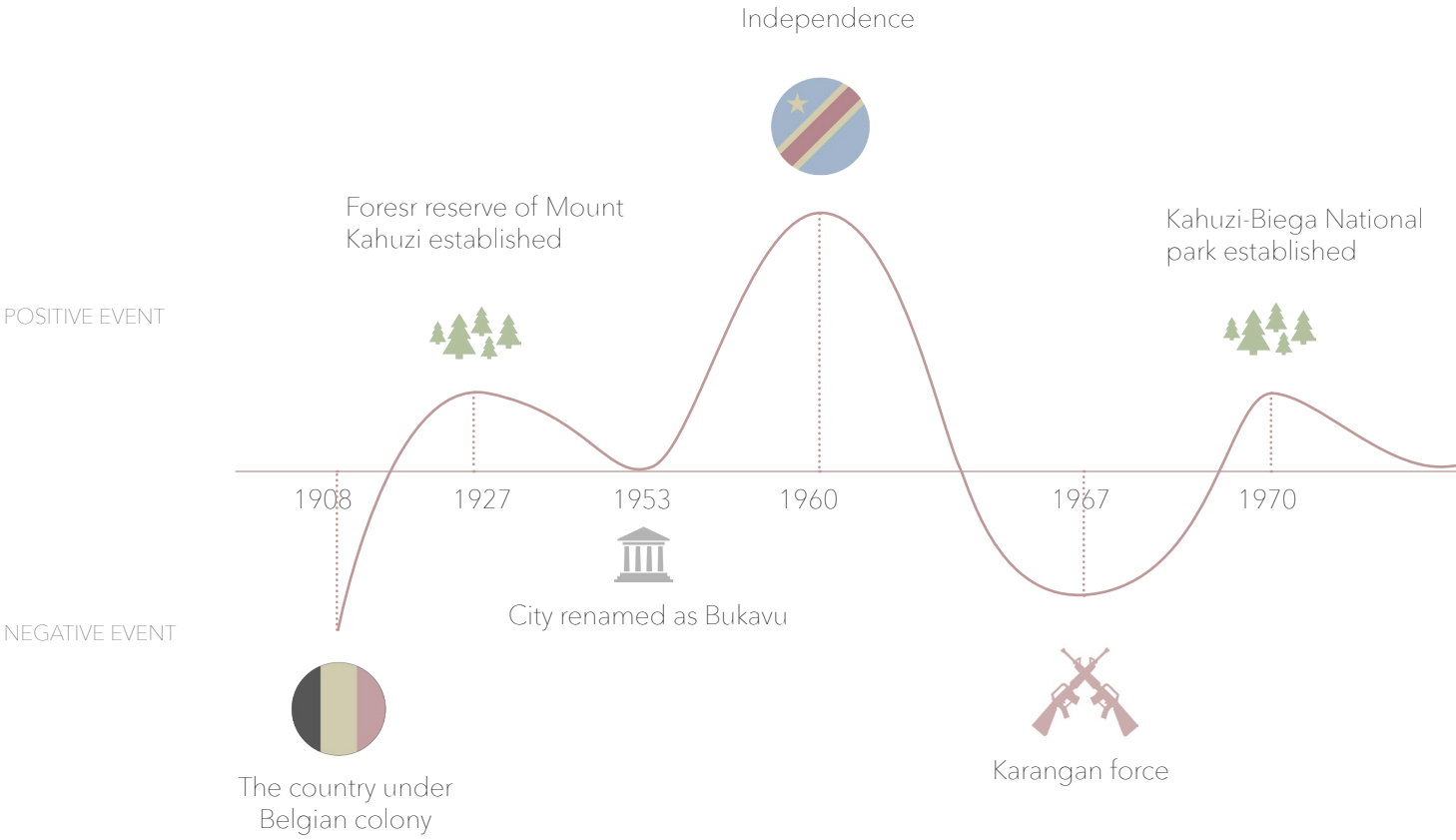
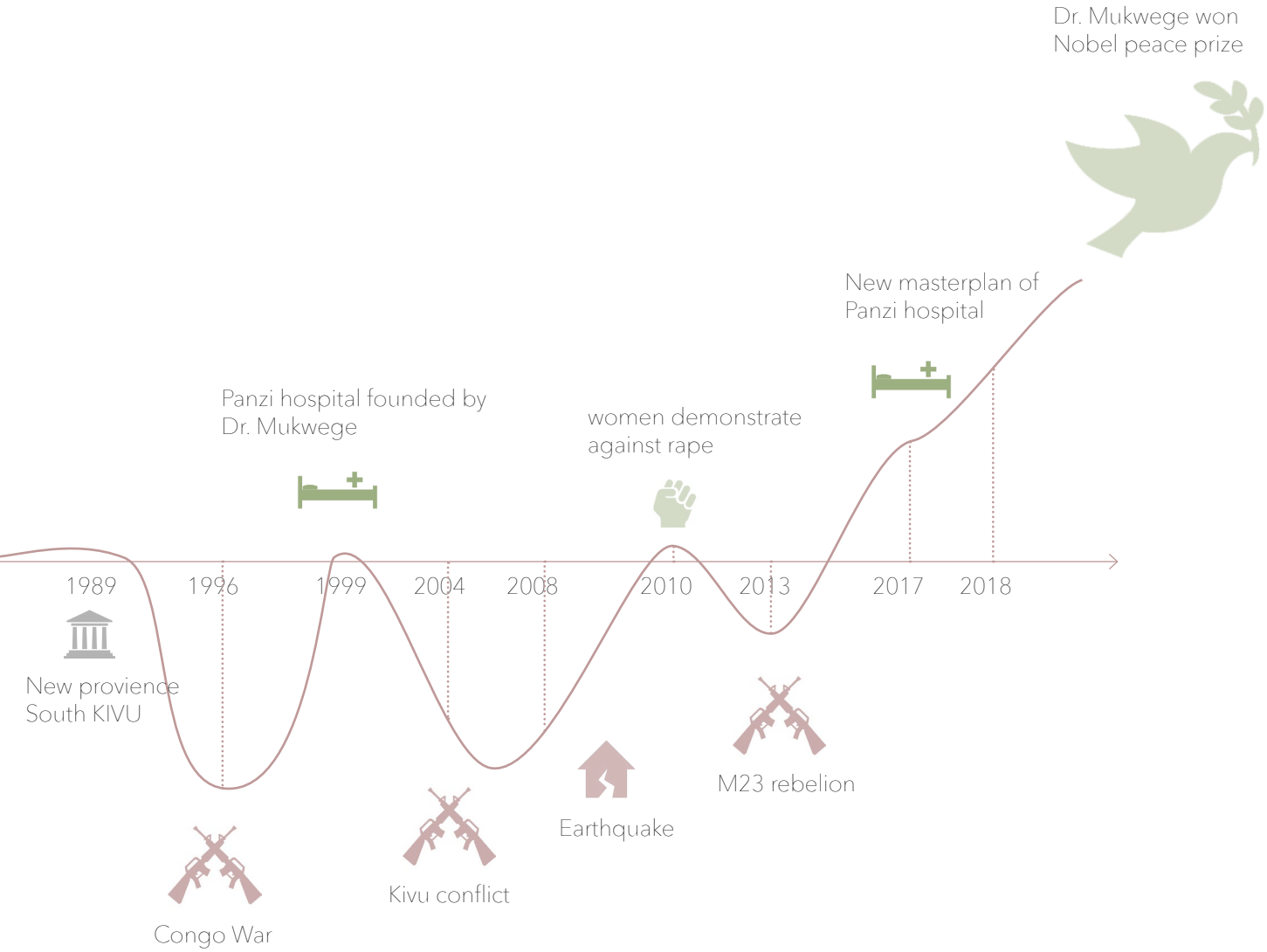


Figure 8. Timeline of the history of Bukavu and Congo.

During the past 110 years, as the timeline shows, the situation of Bukavu was turbulent. After independ
religion is located in the seismic zone. In 2008, there were 5 people dead and 149 people seriously inj
Dr. Mukwege won the 2018 Nobel peace prize, and the new mother and baby unit was designed by W



lence from Belgian colony, conflicts and wars have been breaking the peace of Bukavu area. And also, this ured. But, since the Panzi hospital was founded in 1999, many people got treatment and help. Nowadays, hite Arkitekter last year. And the further extension of the hospital is already planned.

Figure 9. Existing buildings of Panzi hospital


Vehicle entrance
Restaurant
Parking
Mammography
Hemodialysis
Villa
Pharmacy
Laboratory
Mammography
Storage
CT
Parking
Educatio
building
Electricity
Oxygen
production
Storage and
laundry
Incinerator
Incinerator
Morgue

There are some patients coming from home by bus or taxi. It would take 20 minutes form central area here.

Diffrent from nodic hospital, there are 20 beds in each inpatient wards. Except patients, their families would also stay here even at night.

Patients would wait outside before operation until nurses coming to pick them.

Huts
Outdoor waitin

Figure 10. Environment in Panzi hospital. Original source of photos from White Arkitekter.

Main Entrance

Outside corridors are one of the most obvious compoments at Panzi hospital, in which patients move among different department and wait for doctors. In addition, after operation, patients would be transfered on beds though these corridors.

This is the only one corridor with only one entrance at the surgery unit. Different flows would meet here with out organization, so it's easy to spread illness.

There are three operation theaters in 42 square meters.

ng space in green area.

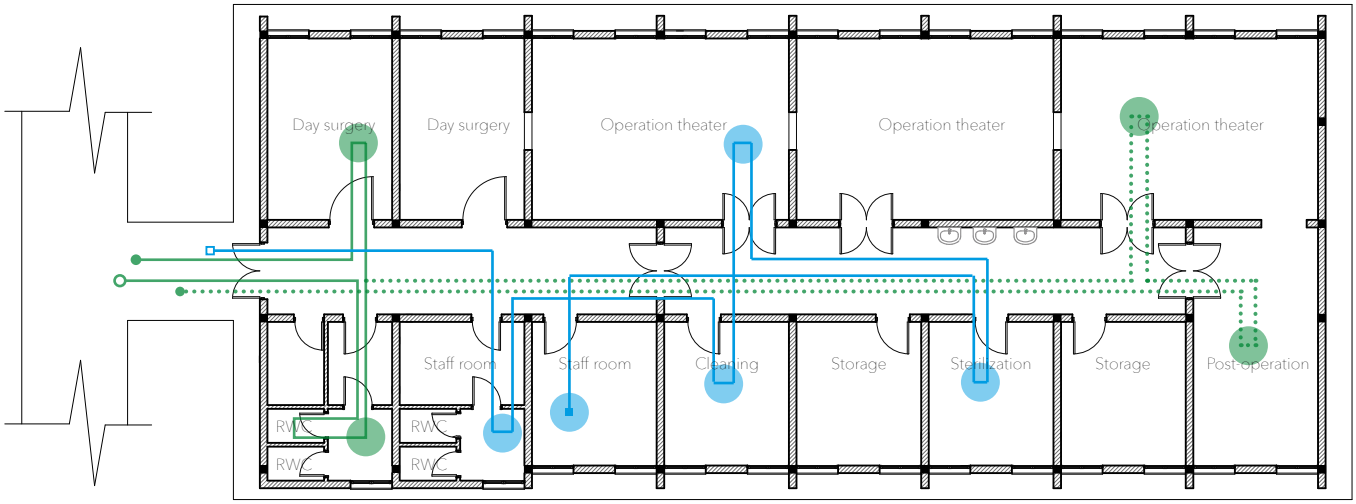


Figure 11. Flows in the existing surgery unit

There is only one entrance and one corridor, where all the patients and staffs pass by. This means dirty flows and clean flows would interact with each other. And the number of staff room is not sufficient. And when the students from medical college come here for study visit, the density of people in the surgery unit gets even higher, which would make an inefficient treatment and creat a stressful environment.

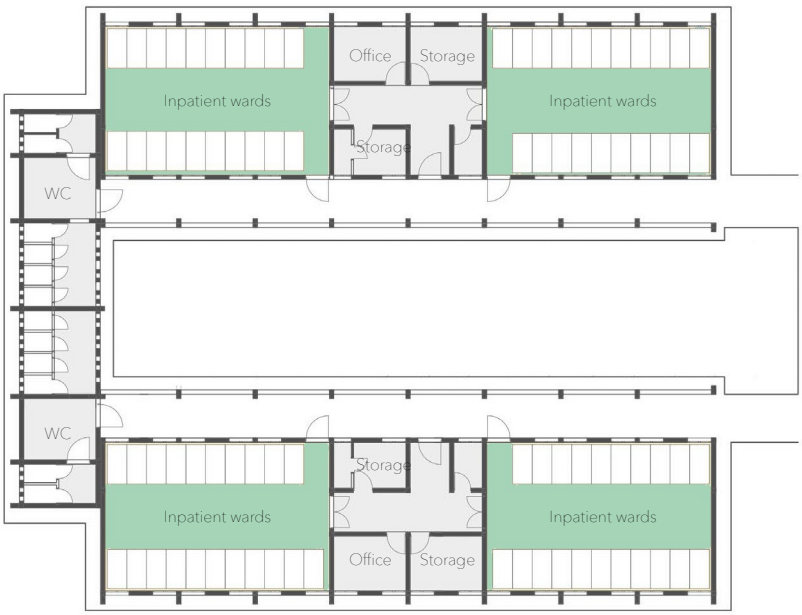


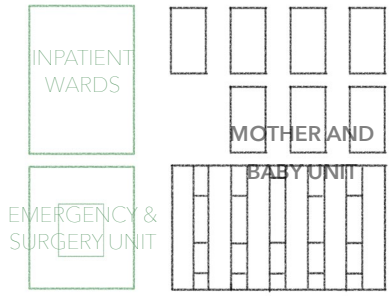
Figure 12. Rooms of inpatient wards

The wards for inpatients are located in the west part of the hospital. After the operation in the surgery unit, patients will be moved to the wards or walk themselves. On the way to the wards, there will meet the other patients right come from the main entrance. It is uncomfortable for them espacially while their surgery wounds are exposed.

When they arrive in the bed-to-bed wards, around 20 patients in different situation share the room in approximately 70 square meters, and their families have no place to stay except for the corridor area.

SITE ANALYSIS

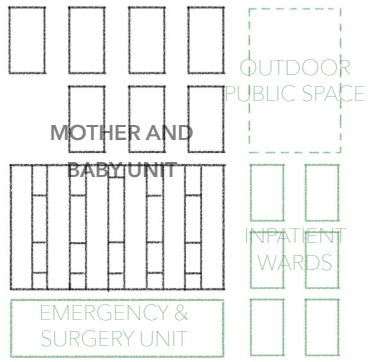
Based on the steps of future development for the Panzi hospital, the mother and baby unit will be built before the new emergency and surgery unit. Since the design of the mother and baby unit was already proosed by White Arkitekter, it is essential to consider the pros and cons about different possibilities of the location of the new emergency and surgery unit.



Option A

PROS:
- the emergency unit would be closer to the main entrance
- creat the inpatients area with wards of post-delivery
- share the way for ambulance with the maternity unit

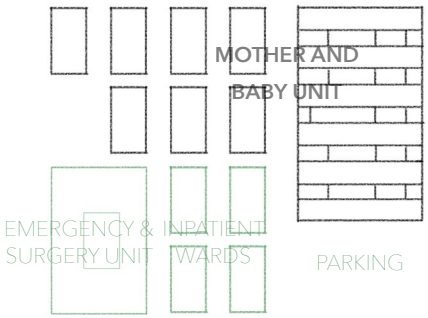
CONS:
- areas for inpatient wards are limited
- the info desk of mother and baby unit is hidden



Option B

PROS:
- the surgery unit is well connected with the emergency unit and the mother and baby unit
- leave a sharing living garden with the post-delivery wards
- keep the main concept of the mother and baby unit

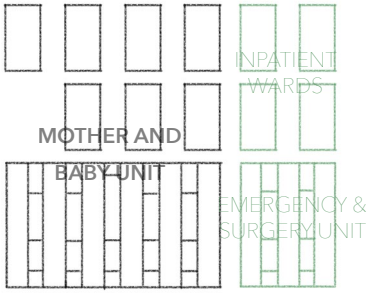
CONS:
- the ambulance flow would go through the info of mother and baby unit



Option C

PROS:
- the emergency unit would be closer to the main entrance
- keep the main concept of the mother and baby unit
- creating a large parking area

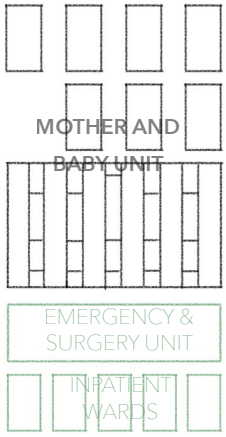
CONS:
- it is hard to make a connection between the surgery unit and the mother and baby unit



Option D

PROS:
- surgery unit is closer to the entrance for ambulance
- inpatients live at the quiet coner with a living garden
- keep the main concept of the mother and baby unit

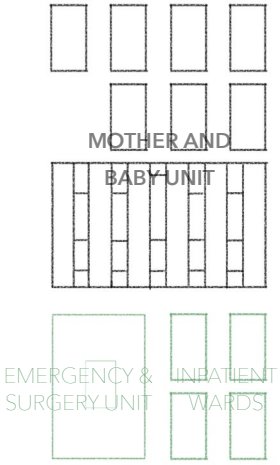
CONS:
- there is a 70-meter distance between surgery unit and emergency unit



Option E

PROS:
- keep the same pattern as the other buildings of the hospital
- the emergency unit would be closer to the lab area
- good working flows between maternity unit and the surgery unit

CONS:
- the entrance of surgery unit would be hard to find
- the way from the left part of wards area to the surgery unit would be longer
- there is hardly good view from the emergency and surgery unit



Option F

PROS:
- keep the same pattern as the other buildings of the hospital
- the emergency unit would be closer to the lab area
- good working flows between maternity unit and the surgery unit
- hide the inpatient area in green

CONS:
- long flows from the main entrance to the emergency unit

CHAPTER 3

THE THEORETICAL FRAMEWORK

HEALING ENVIRONMENT

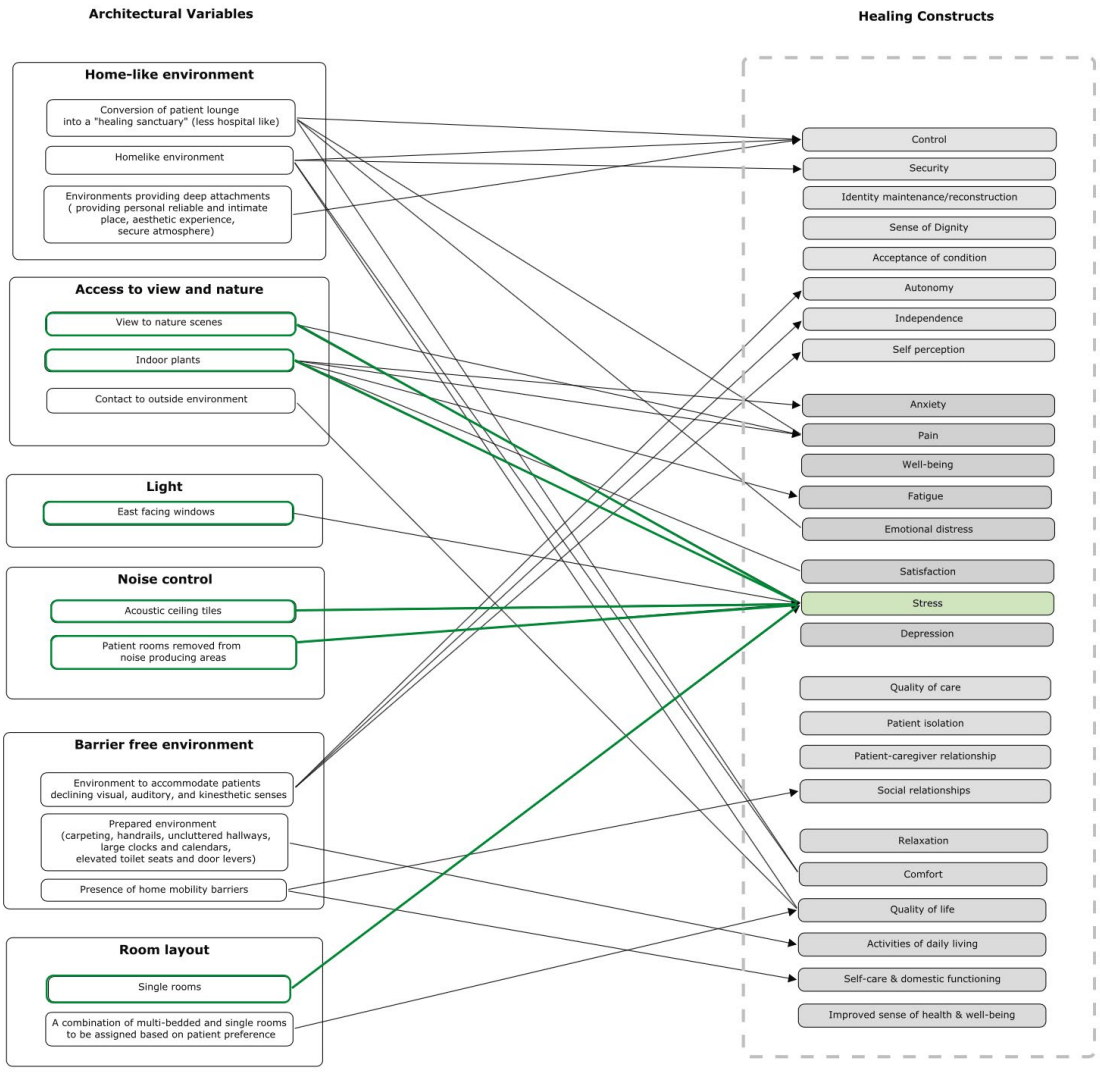


Figure 13. Relationship between architectural features and healing constructs. Adapted from "Exploring the concept of healing spaces" by J. DuBose, L. MacAllister, K. Hadi, & B. Sakallaris, 2018, Health Environments Research & Design Journal, 2018, Vol. 11(1), 43-56. Adapted with permission.

Stress is one of the psychological healing constructs, which is affected by the architectural variables like access to view and nature, light, noise control and room layout. Although home-like environment and barrier-free environment don't directly contribute to decrease stress for patients, they dose help to create a safe environemt which are the basis of stress-reduction space.

Based on the literatural research, the support from environment could be classified into six architectural variables, home-like environment, view and nature, light, noise control, barrier free, and room layout. And each variable consists of several items.

But due to the limited resources and local context of Panzi hospital, low-priced and low-tech methods would be more preferable. In addition, because of the ongoing conflicts, it is dangerous to visit there. So, the design is based on the study and research from White Arkitekter. And mainly foucuses on view to nature scenes, contace to outside, removed from nosie area, combination of multibeded and single rooms and secure atmosphere. At the same time, aethetic experience, east facing windows, acoustic ceiling tiles, prepared environment and single room are hard to reach in the thesis project.

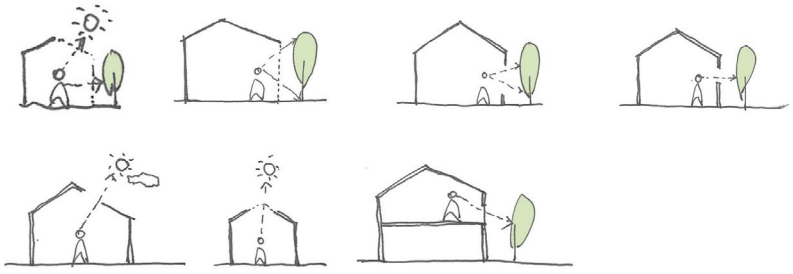
Figure 14. The dilimitation of the thesis

TOOLBOX

Strategy A:

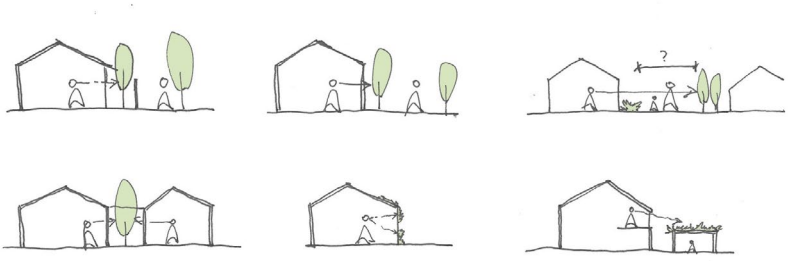
View to nature scenes

a. Size of window



b. Type of window

b. Content of nature

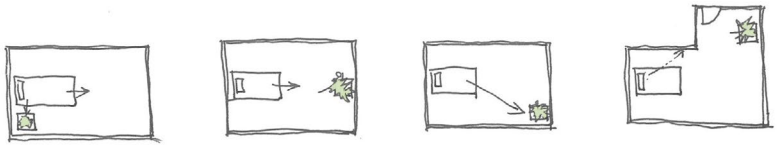


It is helpful for patients to release their stress when they view to nature scenes. The nature, with green, natural light, fresh air and birds, could bring thier mind out of their situation of illness and anxiety. The design would provide patients different ways of seeing the nature in different scale to meet unknown and various pereferences, so that these scenes would form a outdoor environment to calm down patients.

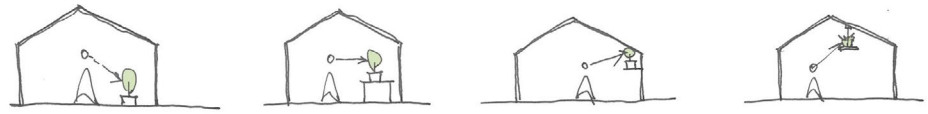
Strategy B:

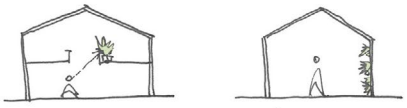
Indoor plants

a. In plan



b. In sectioin





Touchable plants could support patients in their own bubbles. Indoor plants could not only creat a green view in a close distance, but also have positive effect on improving indoor air quality. In addition, cultivation could be a option for patients to enjoy the time in hospital.

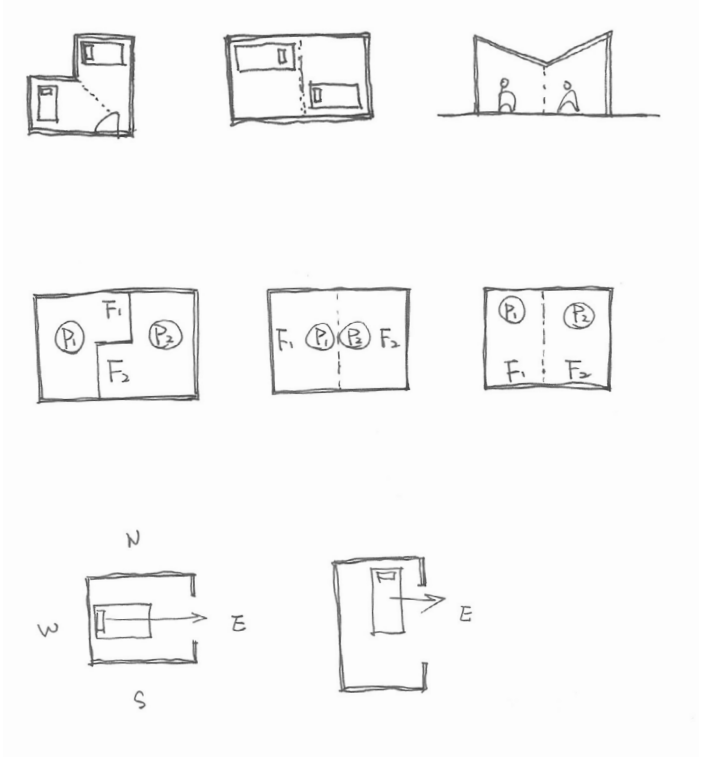
Strategy C:

Room layout

a. Private space

b. Family support

b. East facing window

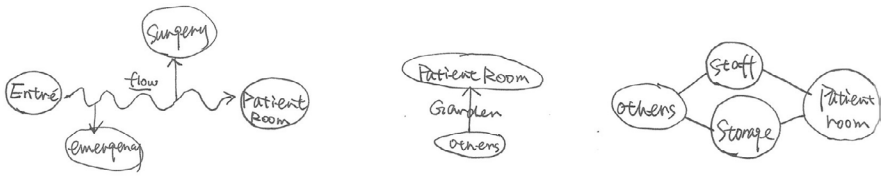


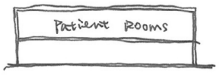
In the scale of patient rooms where they might stay after operation, to comfort them, enough private space and space for their families should be arranged. But due to the unbalance between limited resoursed and large amount of patients, the non- essential space should be designed in a flexible way, when basic needs can't be guaranteed.

Strategy D:

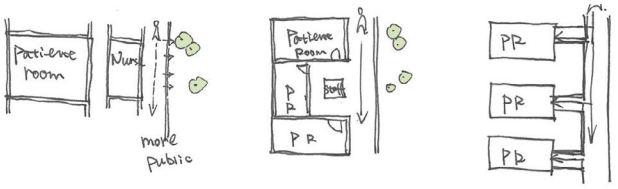
Noise control

a. General Flow





b. Unit area



c. Room design

Releasing noise away and removed from noise area could both help to creat a quite space for patients. Without the possibility to adopt advanced acoustic roof, solid-void brick walls and bamboo woven panels would be more welcome to release noise as well as keep the air circulating.

SCENARIO

After visualizing different strategies into design toolboxes, these senarios were inspired from one or several design tools as well as other reference projects, which are bits and pieces forming the whole design. Some of the senarios show how I think about the relationship among patients, building and nature, some of them tell my understanding about designable structure and material, and the others maybe the in depth thinking of the layout of inpatient wards.

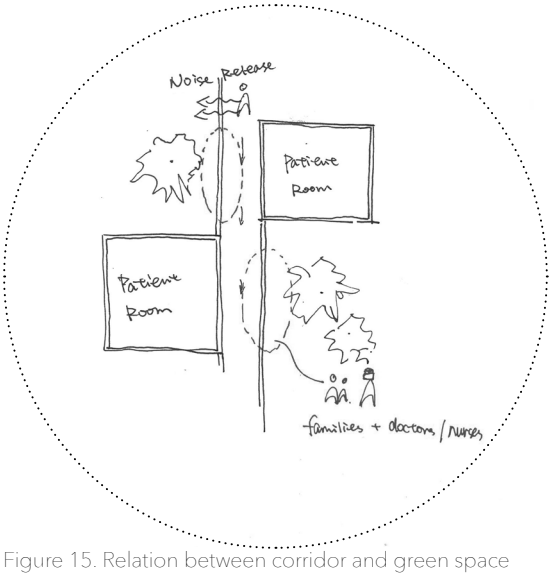


Figure 15. Relation between corridor and green space

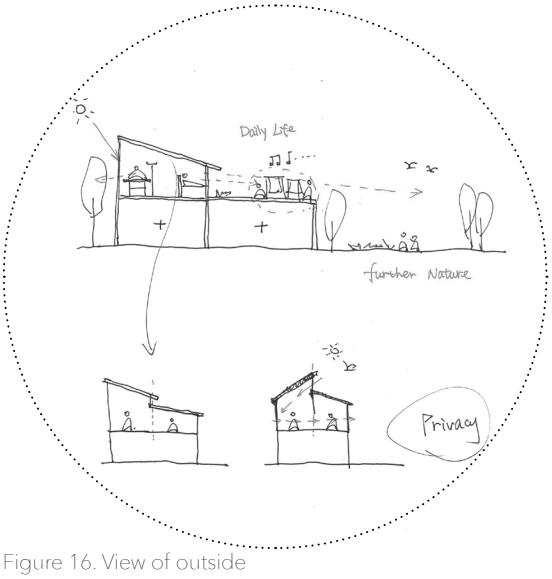


Figure 16. View of outside

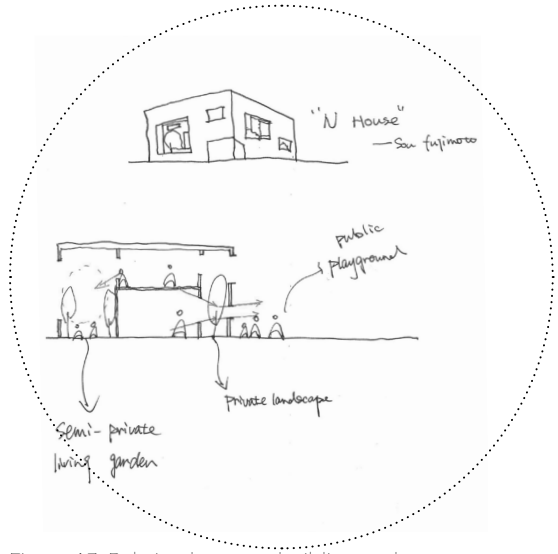


Figure 17. Relation between building and green space

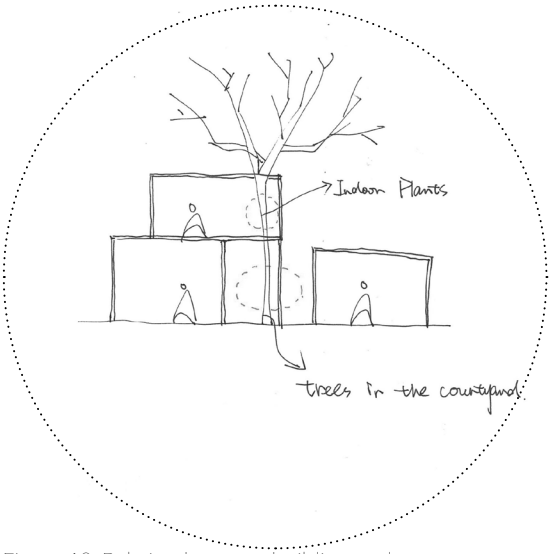


Figure 18. Relation between building and green space

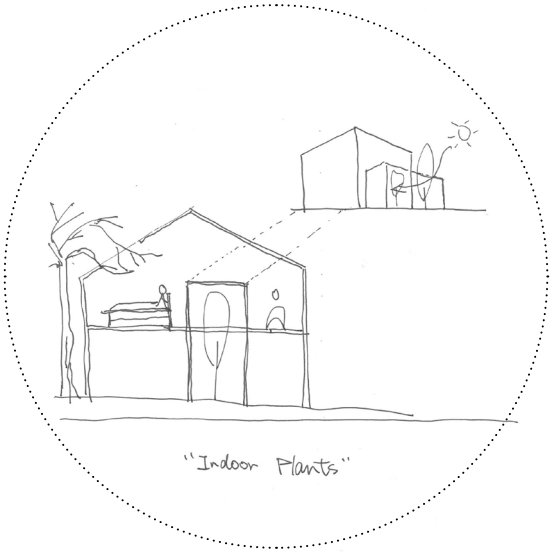


Figure 19. Relation between building and green space

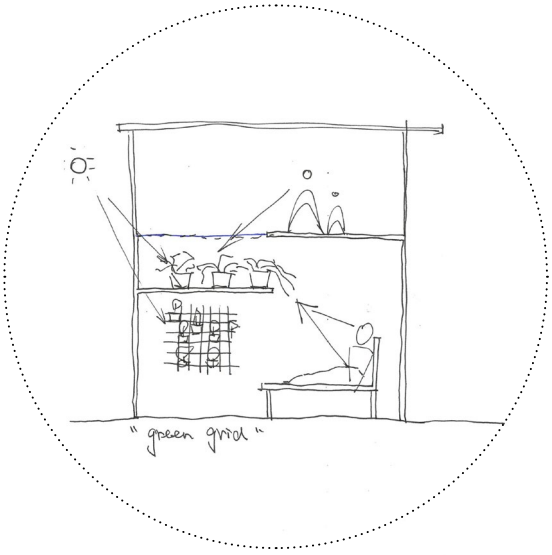


Figure 20. Placement of indoor plants

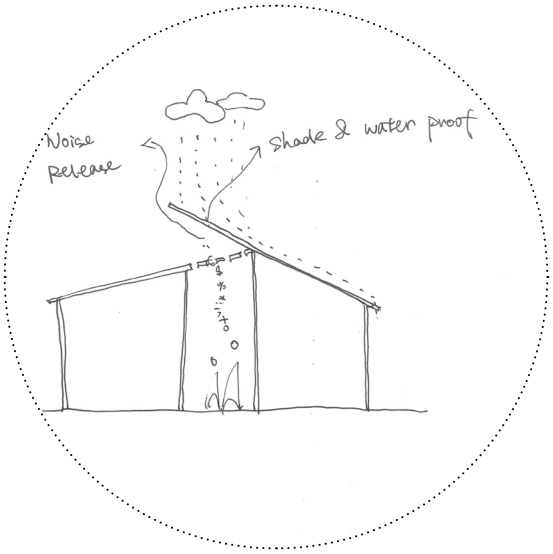


Figure 21. Noise control by climate context

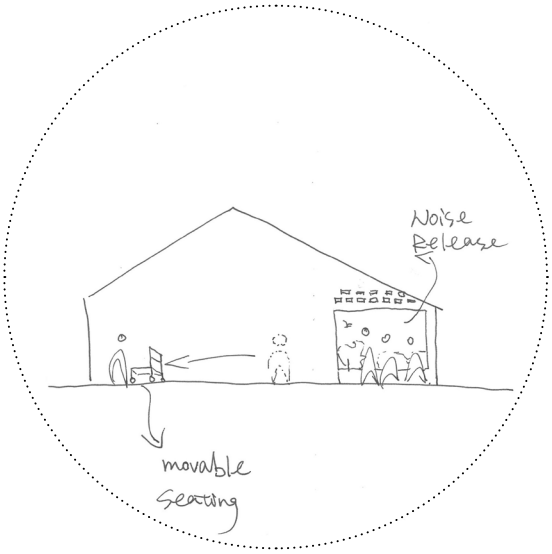


Figure 22. Remove from noise producing area

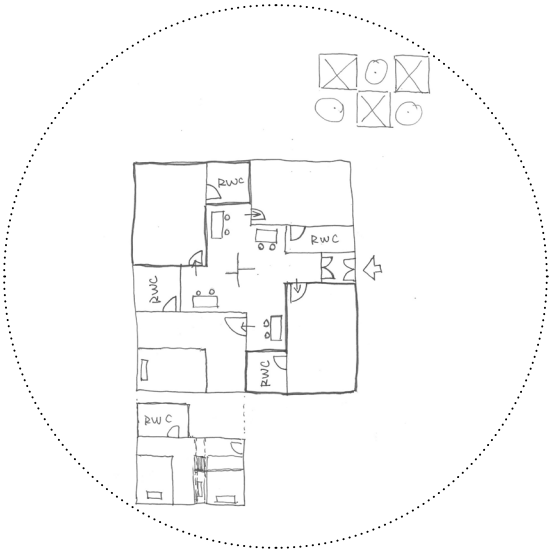


Figure 23. The unti of inpatient wards

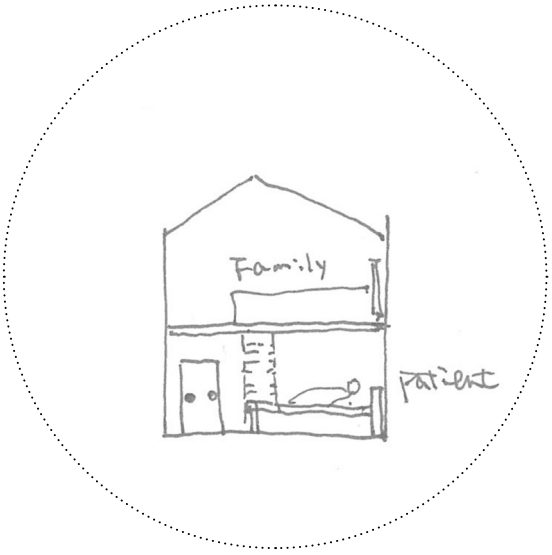


Figure 24. The place for family company

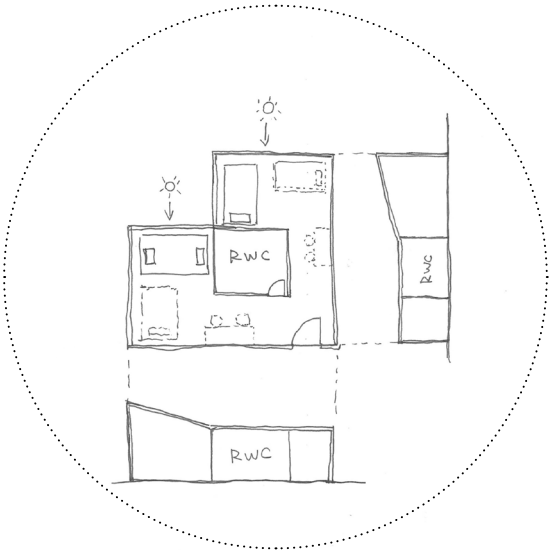


Figure 25. Layout of inpatient room

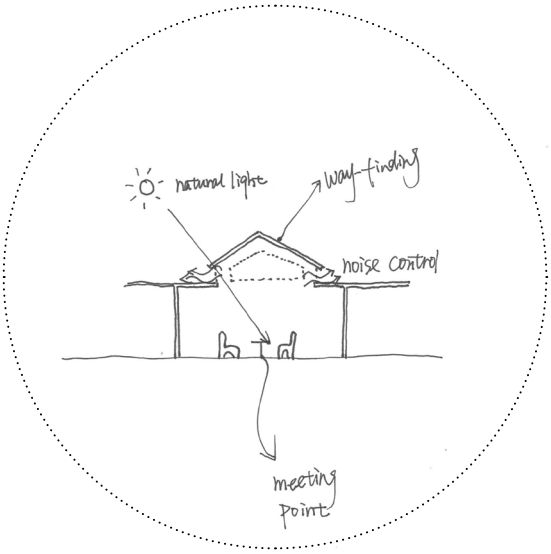


Figure 26. Noise control and natural light

CHAPTER 4

THE VISION

CRITERIA & ATTRIBUTES

The criteria and attributes are the combination of strategies and context of the project. And all of them aim to decrese stress of patients in the emergency and surgery unit.

Contact to outside

To minimize stress of patients, providing more options to reach outdoor space could create a safe atmosphere.

Noise reduction

People in stressful mood may make some noise, which may lead to spread of stress. Especially in a large public area, it is important to release noise away.

Relationship with green

Different layers of green could encourage patients in different way. And there are different qualities of green for view and touchable indoor plants.

Sense of home

Creating an atmosphere similiar with sense of home could reduce the length of stay. It is not only the building but also support from families can make it.

PROGRAM & FLOW STUDY

The programs of the emergency and surgery unit were designed by needs from doctors of the Panzi hospital. The record of interview is shown in appendix. And the laboratory unit and CT unit are well constructed with mechanical ventilation system and special construction in the other buildings of the hospital, so there is no lab and CT area in the new emergency and surgery unit.

Surgery unit

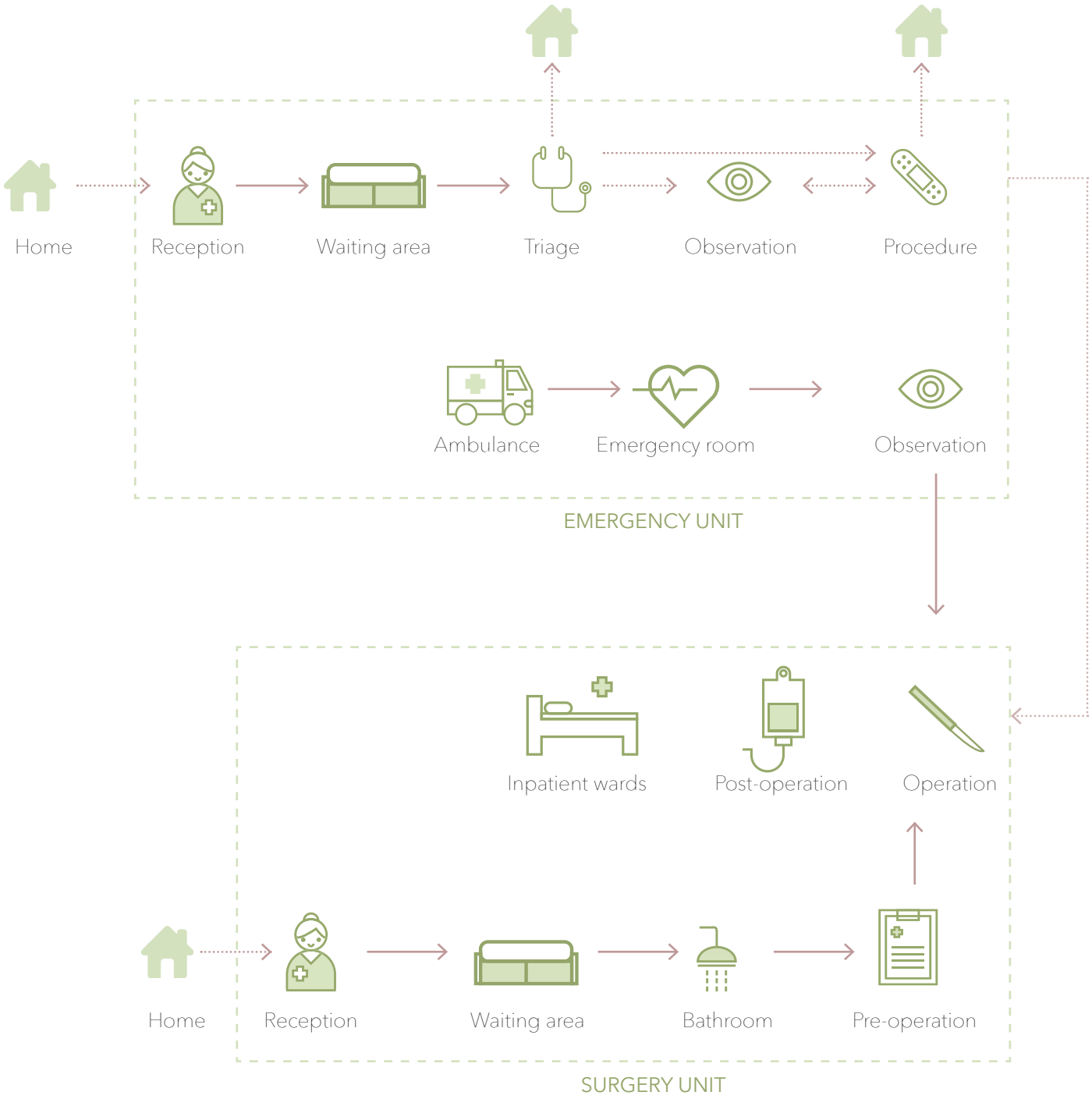
Waiting area	40m²
Reception	10m²
Cloakroom	40m²
Pre-post Op.	80m²
Prepare room	30m²
Operation room	160m²
Toilet	25m²
Office room	30m²
Meeting room	25m²
Kitchen	15m²
Cloakroom(staff)	15m²
Storage(clean cloth)	10m²
Storage(dirty cloth)	10m²
Storage(linen)	10m²
Storage(equipment)	10m²
Storage(tool)	10m²
Storage(clean tool)	10m²
Storage(medicine)	10m²
Storage(other)	20m²

Emergency unit

Waiting area	100m²
Reception	10m²
Triage	15m²
Consultation	10m²
Procedure	10m²
Observation room	100m²
Emergency room	80m²
Toilet	5m²
Storage	20m²
Office	15m²

Inpatient wards

ICU	32Beds
Ordinary wards	64Beds
Toilets	



Before flows designed for a good contact with the outside, a study of qualified flows in an emergency and surgery unit is not unnecessary. After the interview with doctors of Panzi hospital, needed function rooms were listed, and the flows is the record of discussion with Roger Johansson, architect of White Arkitekter.

MATERIAL STUDY

Figure 27. Photo of Bukavu by White Arkitekter

Figure 28. Photo of Panzi Hospital by White Arkitekter

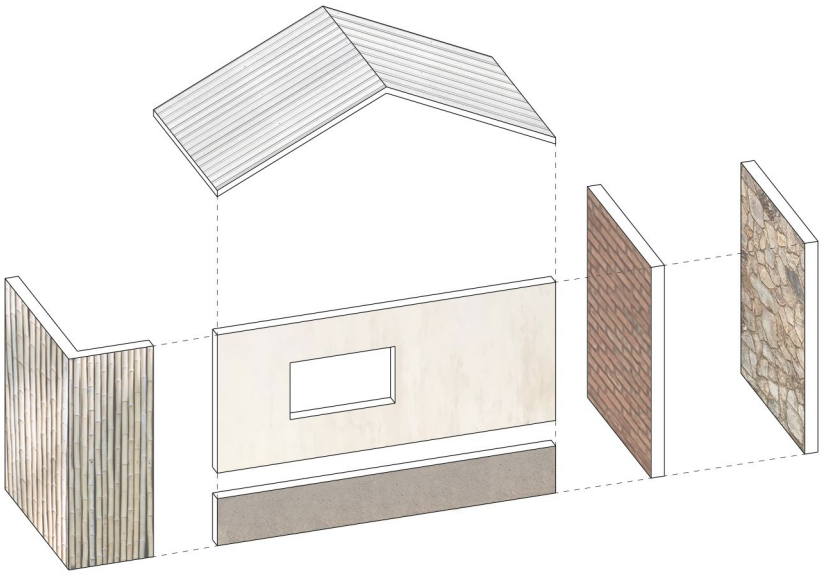


Figure 29. Impression of building materials in the Bukavu area

After the study of the local materials, metal pitched roofs are most common in this region. Bricks, plaster, rocks, concrete are widely used on the facade of buildings. Because of flexibility and low price, bamboo is a preferable choice to build temporary constructions there.

CONSTRUCTION STUDY

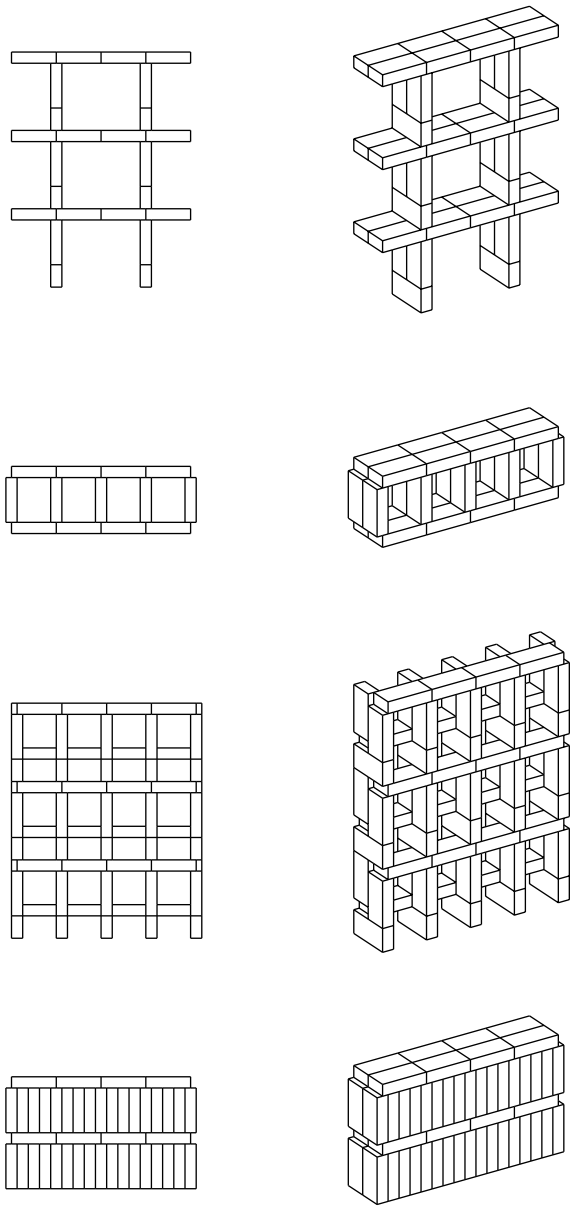


Figure 30. Frontal view and perspective of brick walls

Because of limited resourses, natural ventilation system would be adopted instead of mechanical ventilatior. Bricks walls with void in different sizes offer a series of options for different rooms and spaces.

Figure 31. Bamboo woven panels

One of the main advantages of building with bamboo is that it is a natural and renewable resource. Its capacity to absorb energy and the higher bending strength makes this bamboo an idea material for seismic-resistant constructions.

CHAPTER 5

THE DESIGN

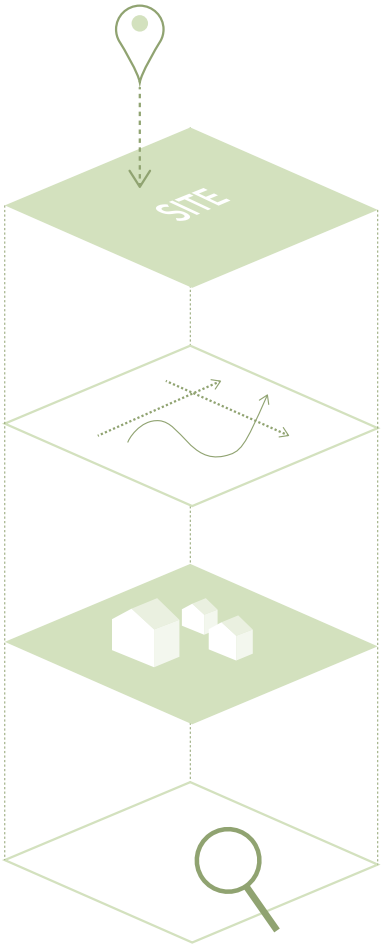
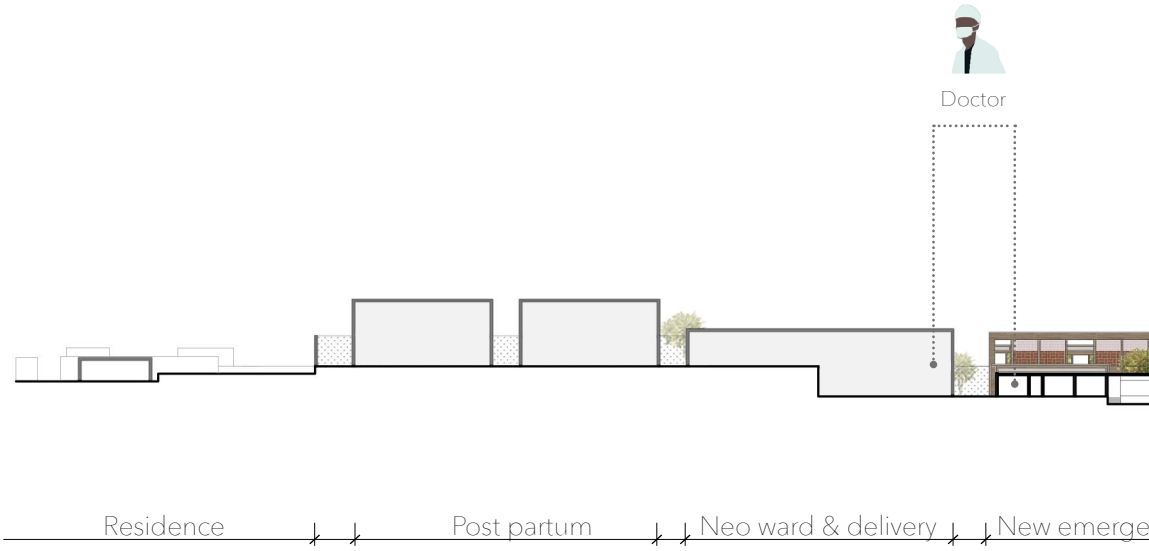


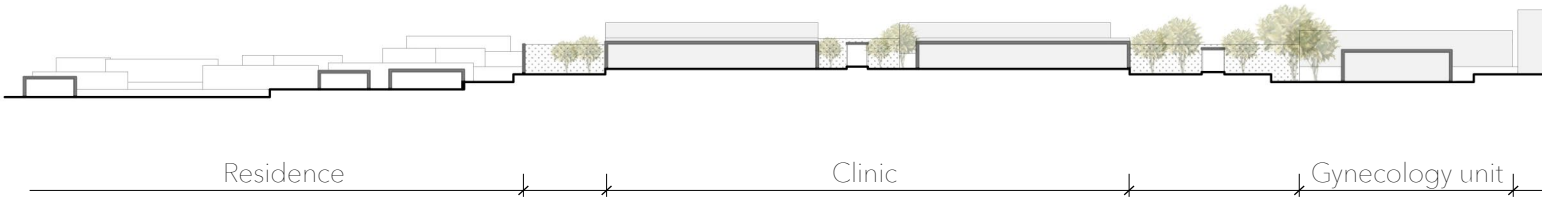
Figure 32. Design process

The design of the project was arranged into four steps, site location in the hospital context, flow arrangement with needed program, volume design, implementation of detailed design in technology and sustainability.

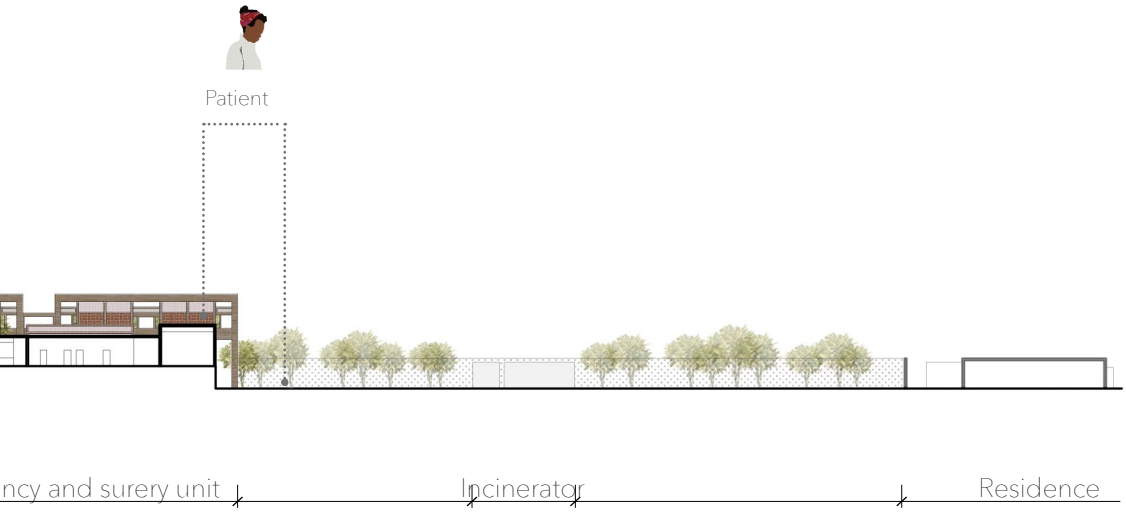

SITE & PLA
Main Entrance
of the hospital
Lal
B


N DESIGN
A
Vehicle Access
boratory
Mother and baby unit
Staff Entrance
Entrance of surgery unit
CT
Entrance of emergency unit
B
Exit to wards
P
A
51
Site plan 1:1000

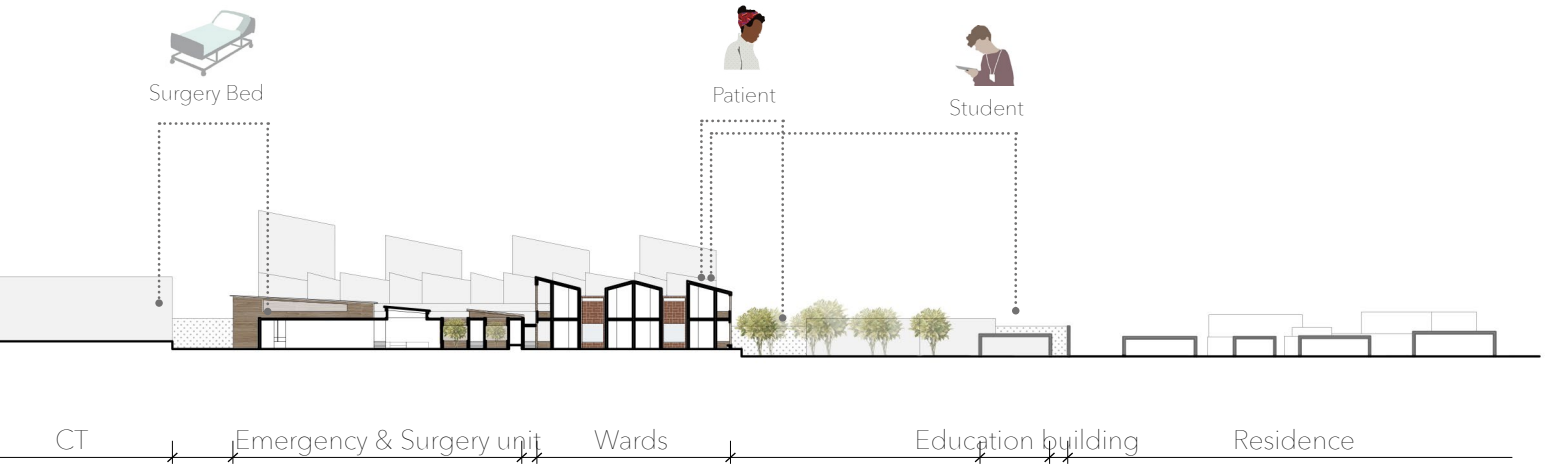




The volume of the emergency and surgery unit equals to the other buildings in the Panzi hospital when the volum
A-A, the flow of doctors is efficent between the neo ward & delivery unit and the emergency & surgery unit. And th
a educaiton building nearby where medical students study. They could help nurses and doctors take care of the pa



Site section A-A 1:1000



Site section B-B 1:1000

es of the inpatient wards keep balanced with the surrounding residential buildings. As it is shown in the site section
e inpatient wards are close to the green area which is beneficial for the recovery of the patients. In addition, there is
tients when they hang around at the green space.

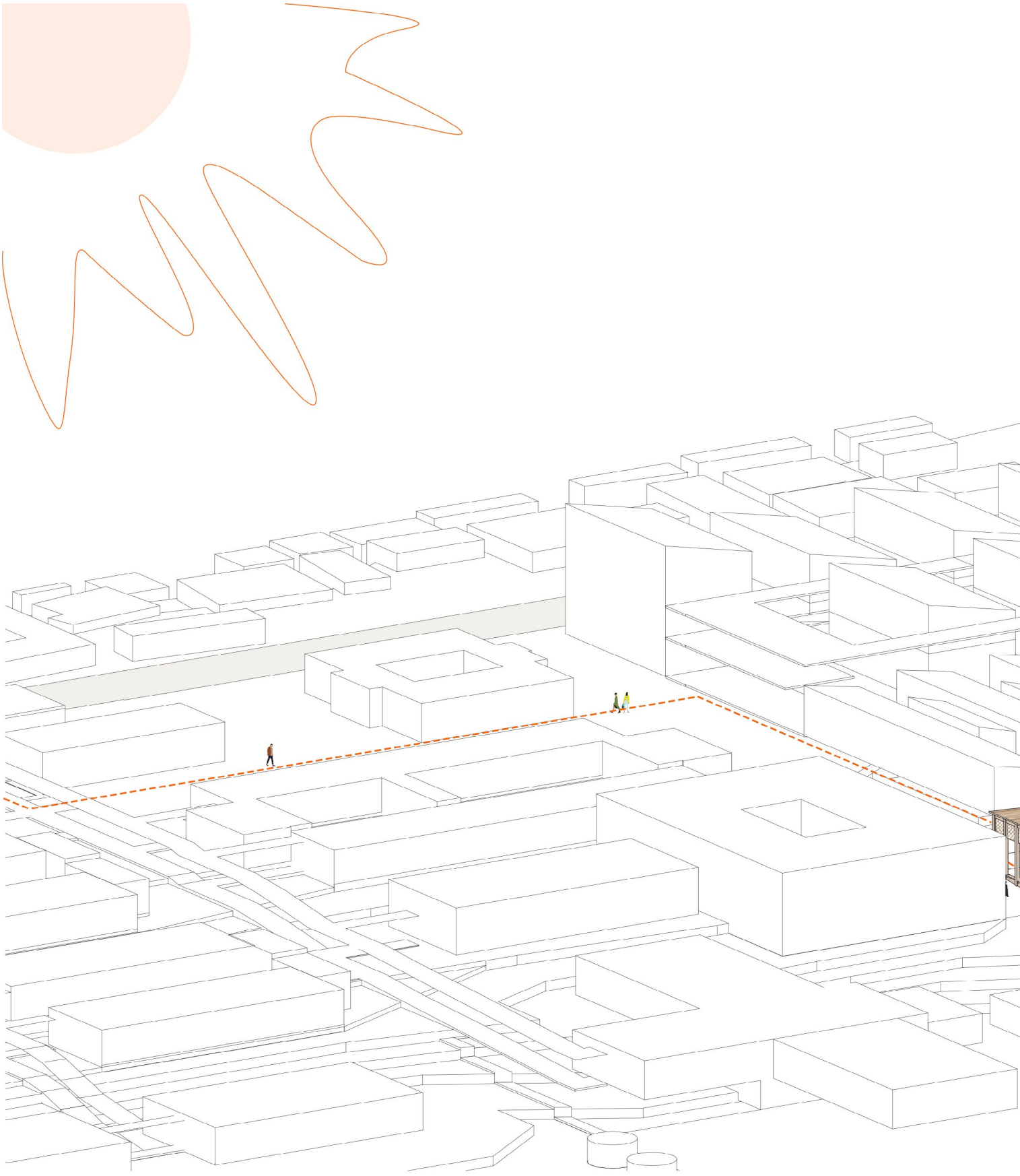
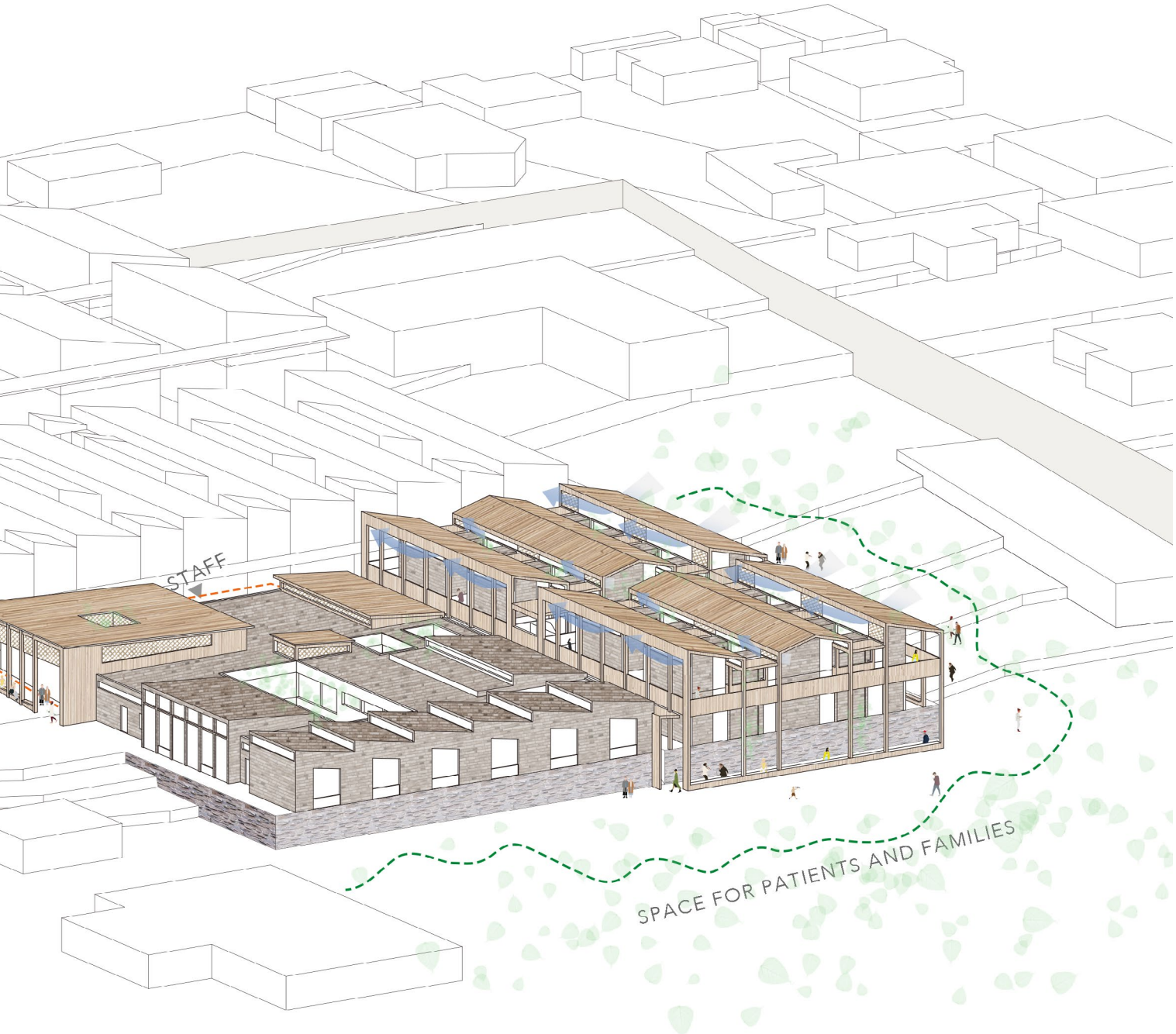
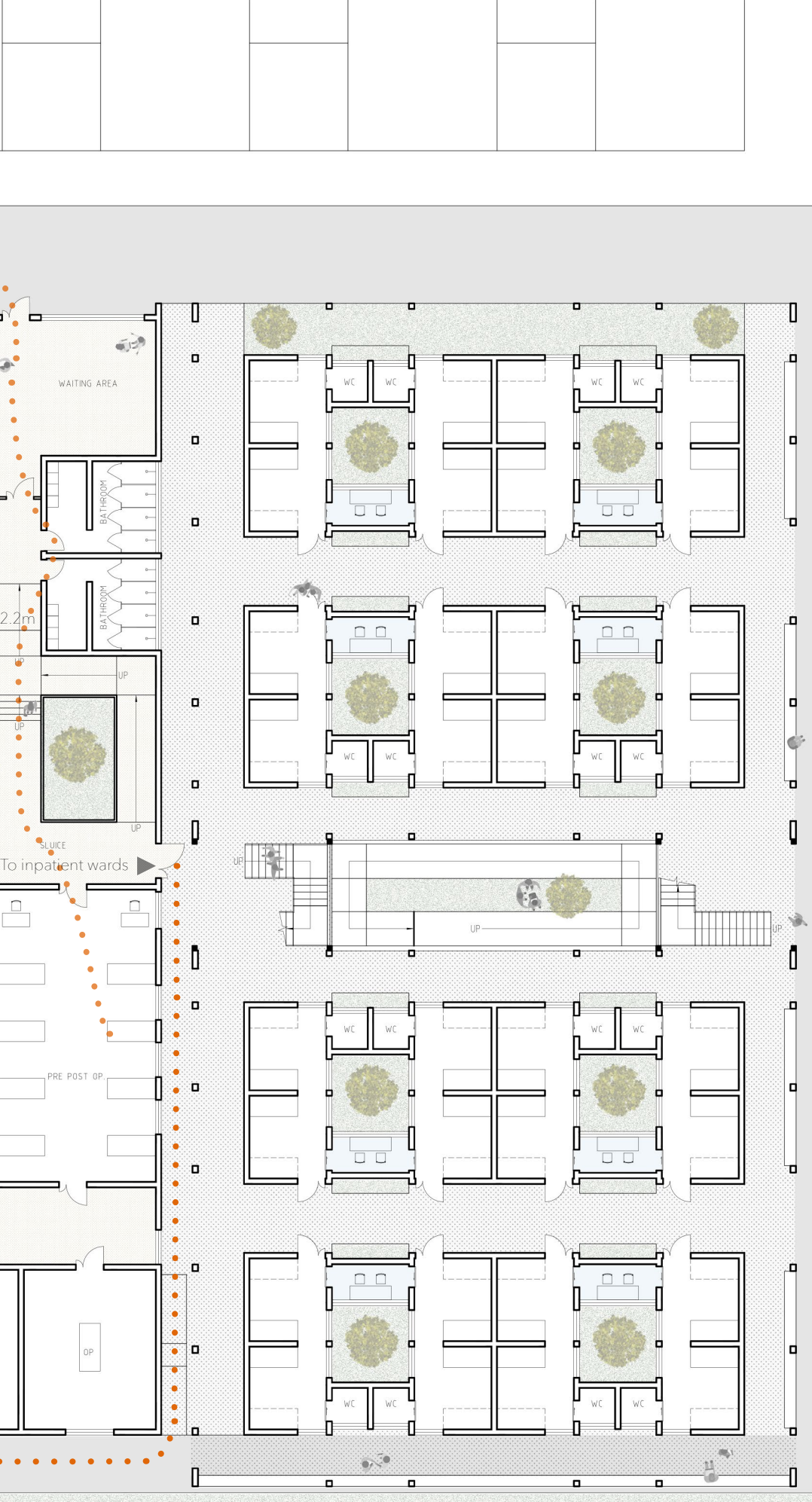


Figure 33. Axonometric of the new emergency and surgery unit on site

Space under roof is designed for patients who prefer to wait outside before treatment, which could also support for the overwhelming needs in the critical situation. And for the health of inpatients, the wards area is surrounded by a large green space of the hospital, where they could take a deep breath as well as talking with others to make themselves more relax.

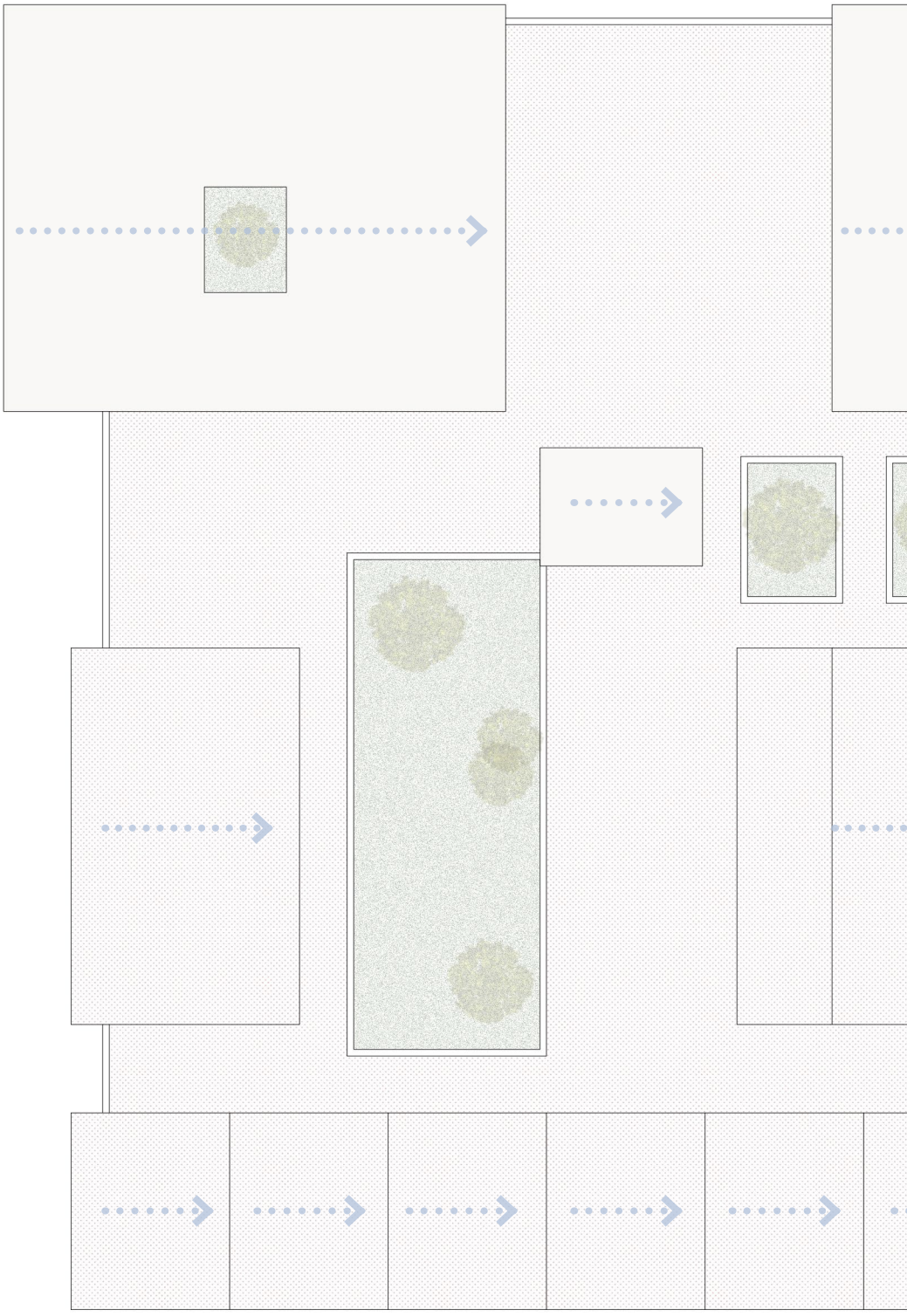


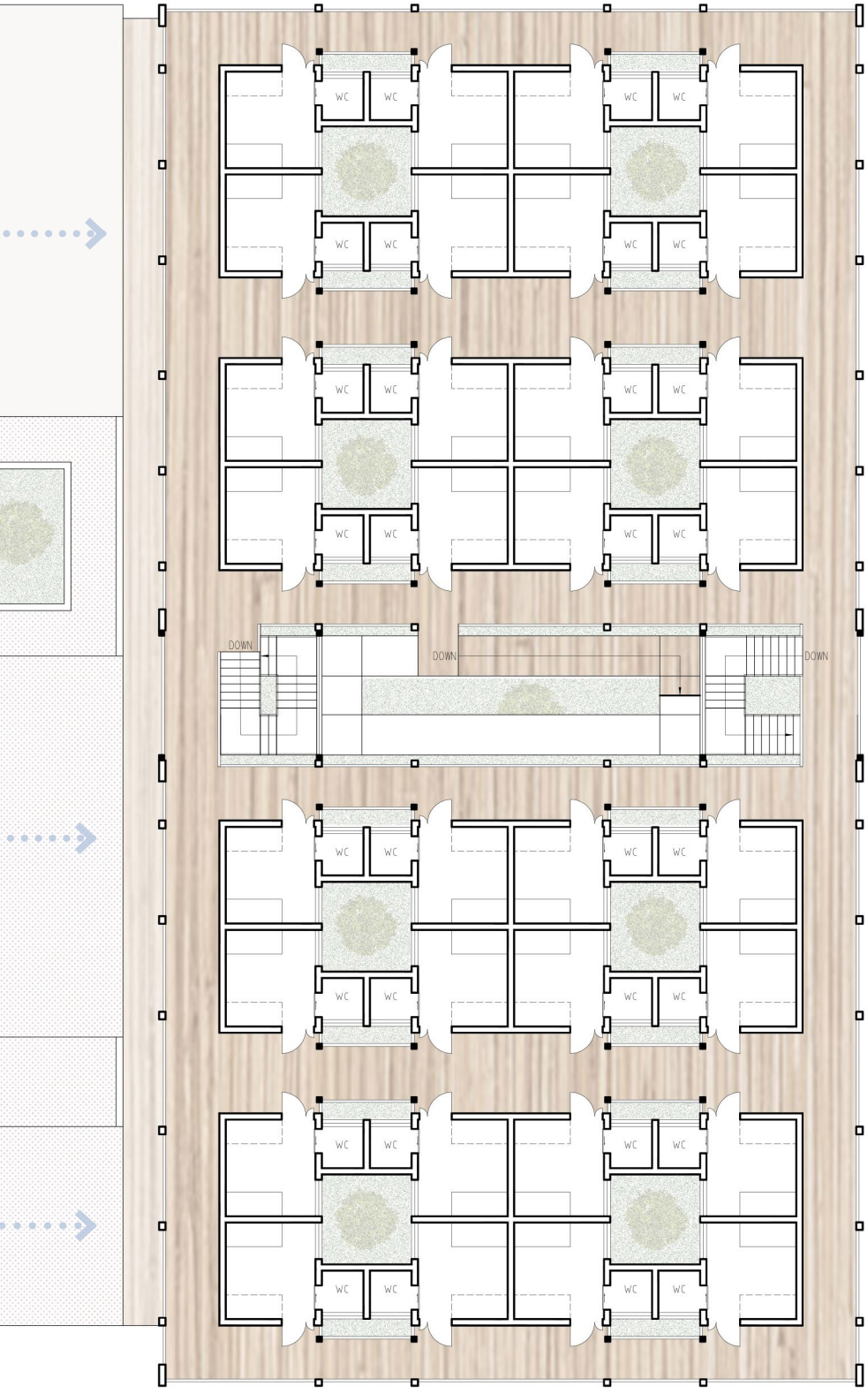
For efficient flows of treatment, the functions are organized in different zones of the emergency and surgery unit, which could be regarded as a combination of several small buildings. In between thess small buildings, different size of green space are inserted for natural view and way-finding.



First floor plan 1:250

N





Second floor plan 1:250

UNITS & FLOWS

The diagram above shows flows in different situation of patients. The patients who get sick mildly could go home after triage or after easy procedure. Some of them need to stay at the observation room for further diagnosis. If, they get more serious, patients would be moved to emergency rooms and maybe operation rooms. Before or after the surgery, patients may be moved to the CT building to have examinations. And if patients come by ambulance, they would enter from the extra door next to the emergency room to short the flow.

Patients of the surgery unit come here with appointment in advance. Generally, they come in time and go to the pre-operation after bath. After the operation, they would be awake in the post-operation and transfer to the ICU wards or odinary wards.

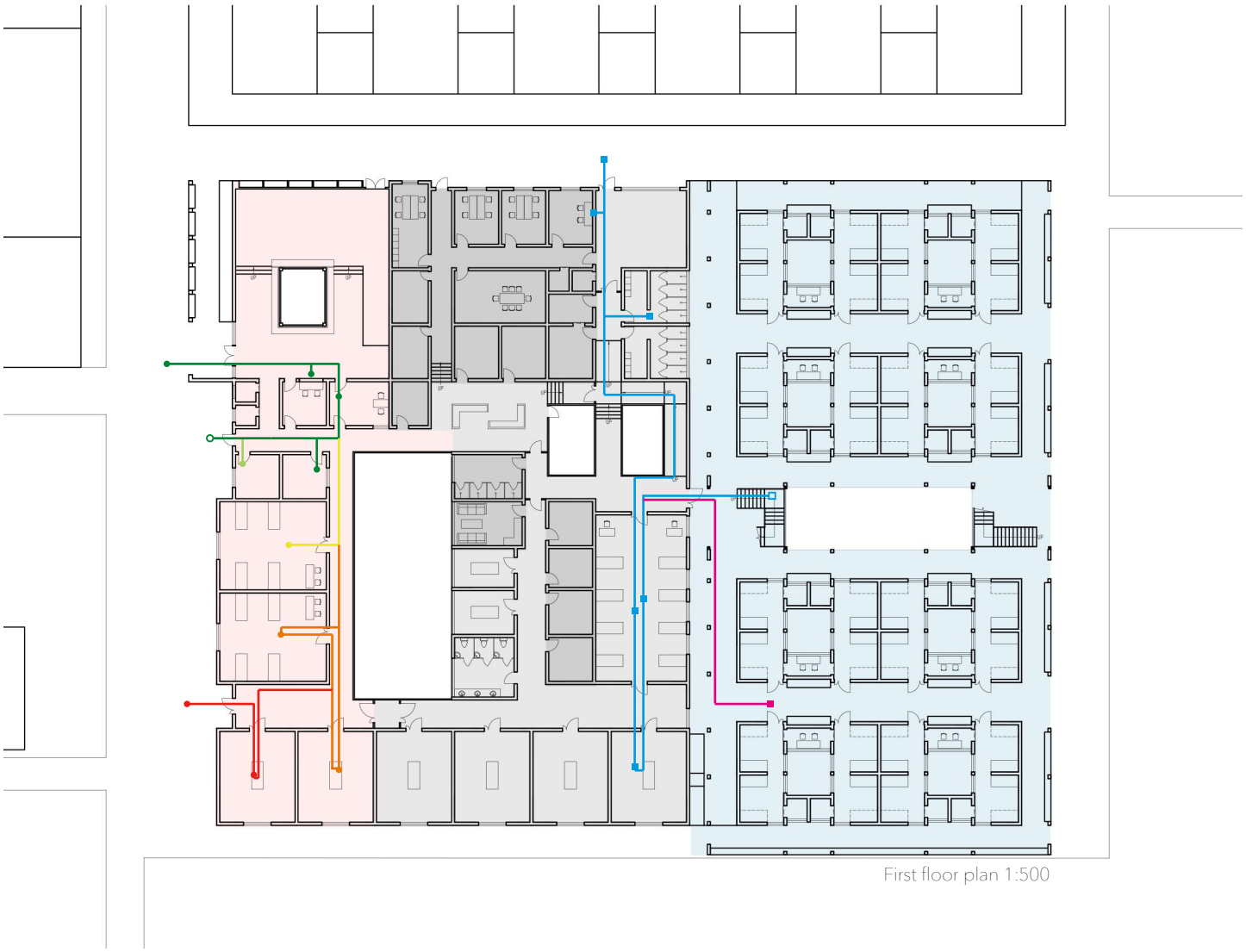


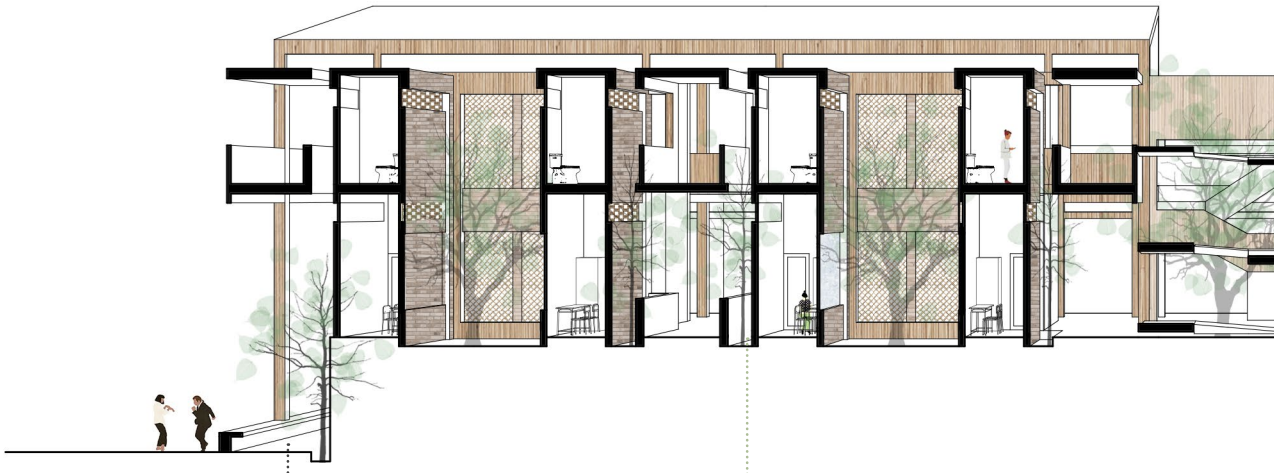
Figure 34. Patient flows in different situation

The clean zone is located at the south of the site, which wind mainly comes from. It maintains good air quality in the clean zone. The entrance for staffs is more narrow than the entrance for patients, and it is hiden behind the big volume of the main entrance hall of the emergency unit.

The doctors and nurses would come to the office area at first. When they have planed operations, they would come to the cloakroom and then enter into the clean zone. On the way to the operation theater, they will pass by the equipment room, medicine room and tool room to pick up what they need for surgery. Sanitary flow would happen between two adjoining rooms in the clean zone or the sluice area.

Figure 34. Doctor flow in surgery unit

SECTIONS & SCENES



At outdoor space of wards area:

There is a large green area for daily activities of inpatients. And it's located 3-meter lower than the wards, which is a way to keep the private and quiet environment of wards. Stones are backfilled in the earthwork, which responds to the stone facade in the Panzi hospital.

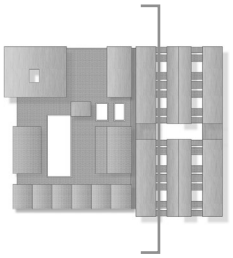
At the door of a ward:

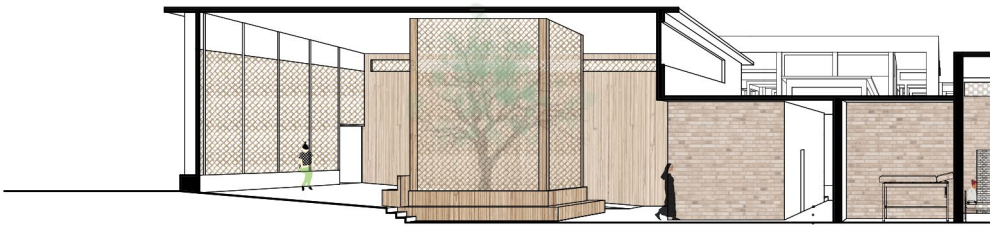
On the way to the ward, patients would pass by these corridor plants. And while they open the door, green outside the viods of the wall would pop up, and the big opening on the side to the courtyard could also minimize the stress of patients.

At the corridor of wards area:

The enviromnet of the corridor is a combination of bricks, bamboo and the green, which creates a comfortable semi-outdoor space and gives a cozy experience.

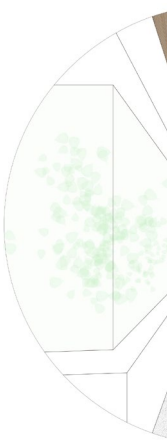
Section C-C 1:250





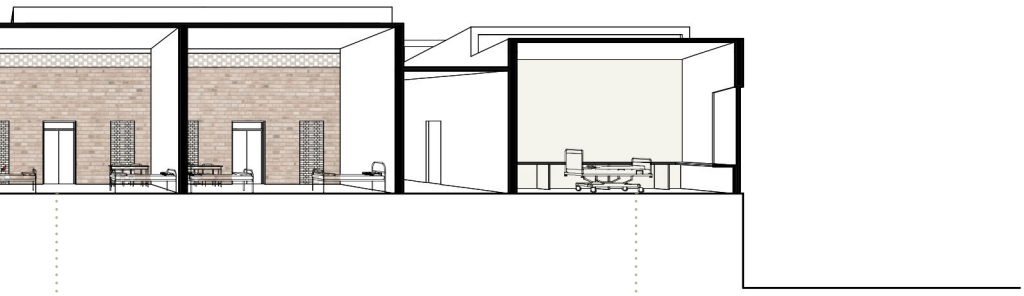
From triage to procedure:

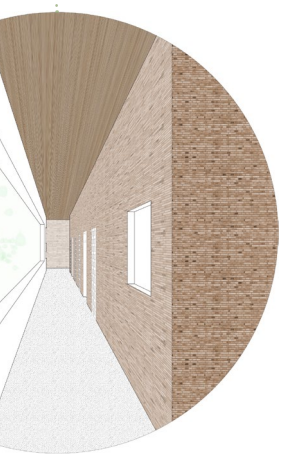
The corridor with a large opening to the courtyard for view of green ends up at a meeting point, where patients could talk more with doctors.

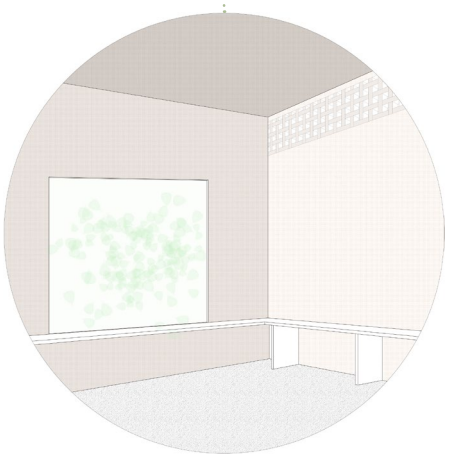


From proce

The way to a green view decrease str the viods or eye contact outside.







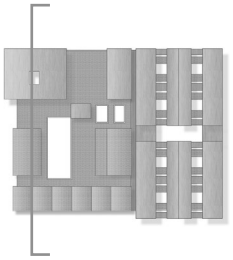
edure to observation:

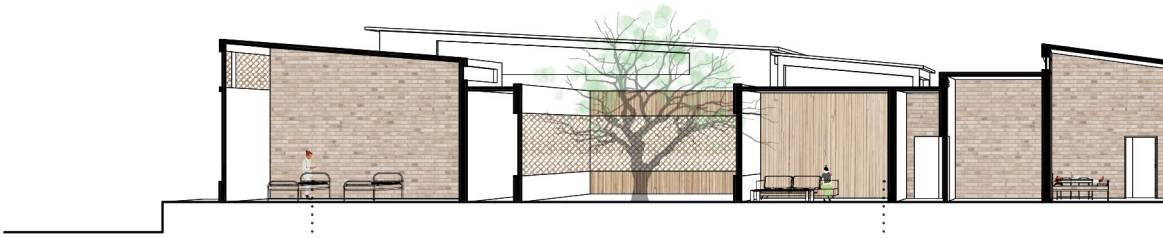
a unknown area with
and flowing air could
ress of patients. And
n the wall could avoid
s between inside and

Emergency room/ Op room:

Large opening to the quiet green area of the hospital is the way to create a relaxed circumstance during treatment. The viods on the wall is a strategy to reach natural ventilation.

Section A-A 1:250



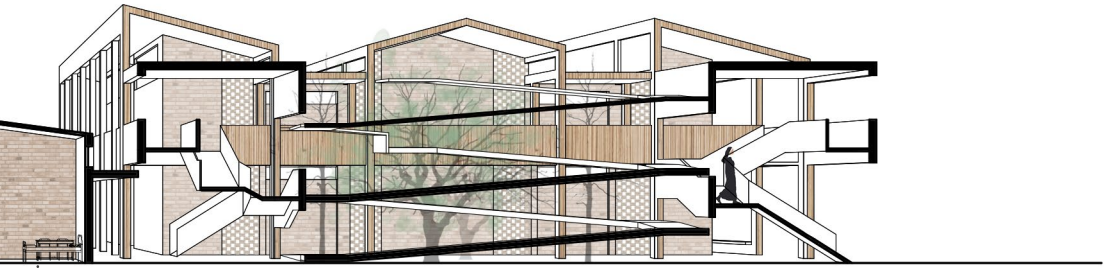


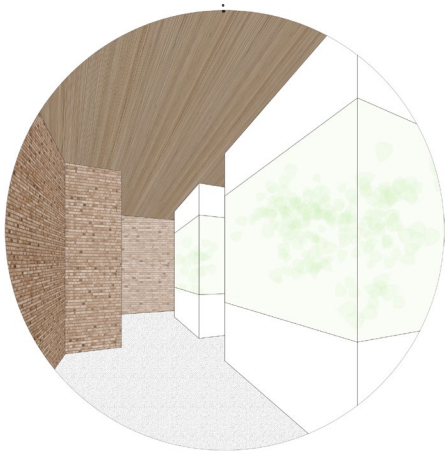
In the observation room:

There are 4 beds in an observation room. Patients can view outside either through the window or through the sky window.

At the meeting point:

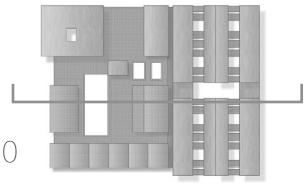
The meeting point with lifted roof is located at the junction of the two gardens, which is the brightest area of the unit.





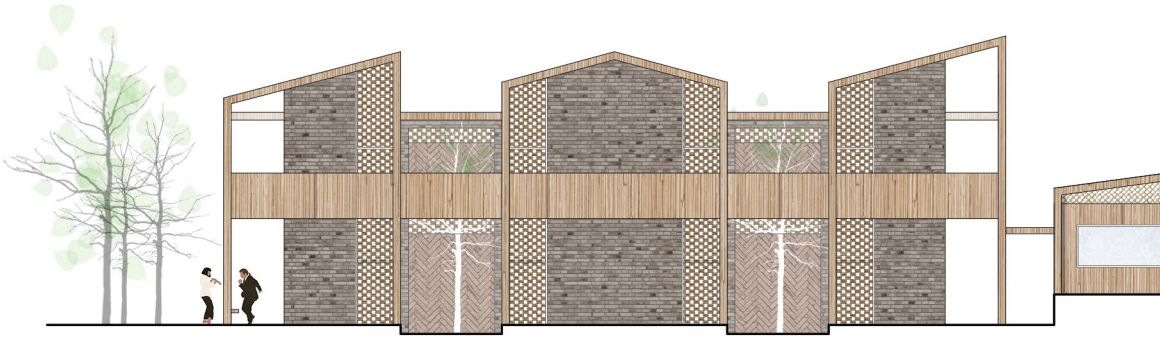
At the entrance from wards:

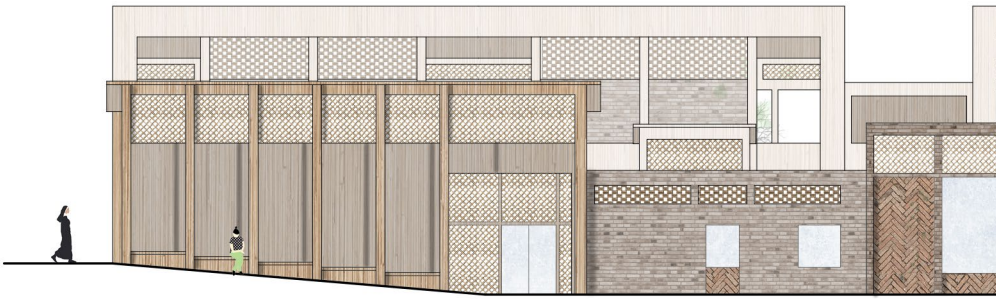
The space of entrance for the patients from the inpatient wards is wider, and the garden could decrease stress of patients.

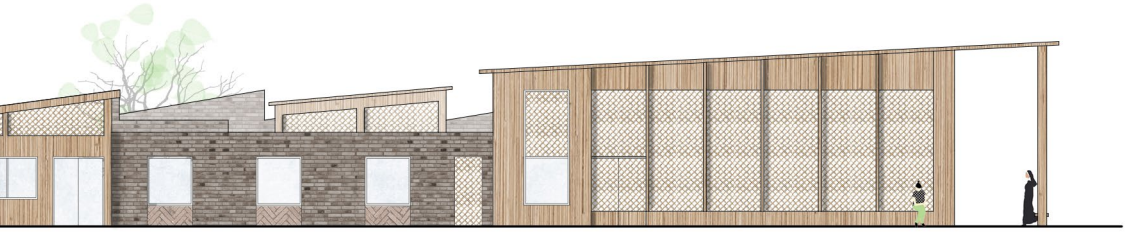


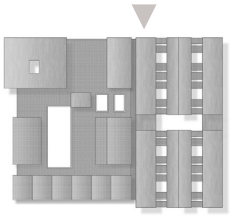
Section B-B 1:250

FACADES & DETAILS

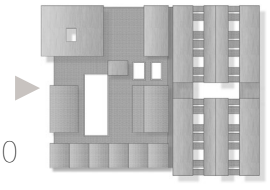




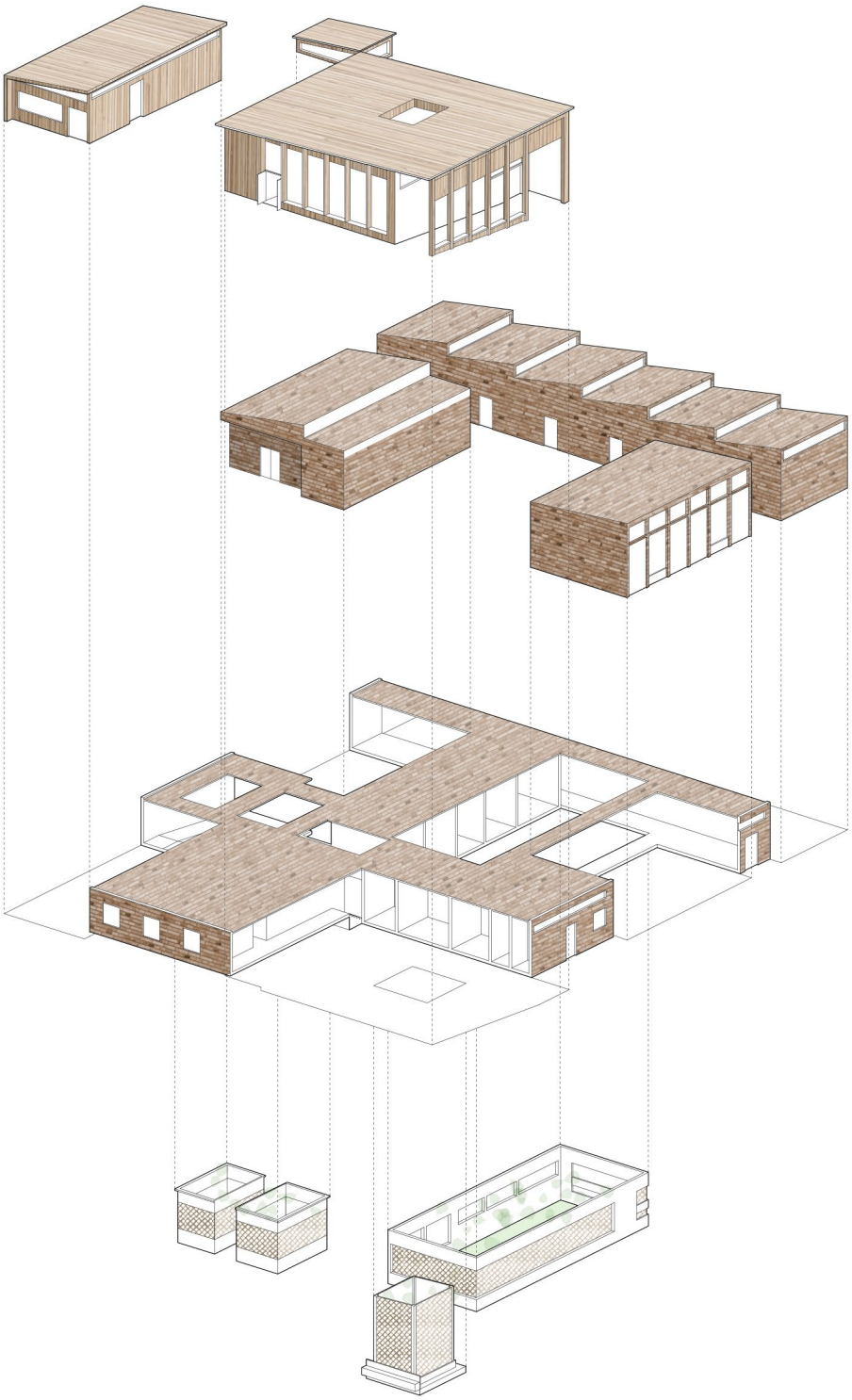




Northeast elevation 1:250



Northwest elevation 1:250



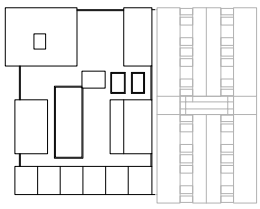
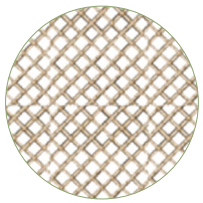


Figure 35. Materials of the Emergency & Surgery unit

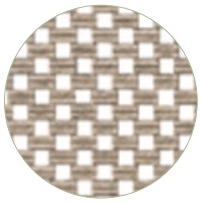
Bamboo



Bamboo is used as the material in the the public area for example the waiting area of the emergency unit, the entrance part of the surgery unit and the meeting point. On the one hand, it does help to decrease stress of patients since it come from the nature. On the other hand, it works as a sign of the area, where patients could meet staff and get help.In addition, because bamboo is a kind of lightweight material with higher bending strength, so it is an idea material for seismic-resistant constructions.

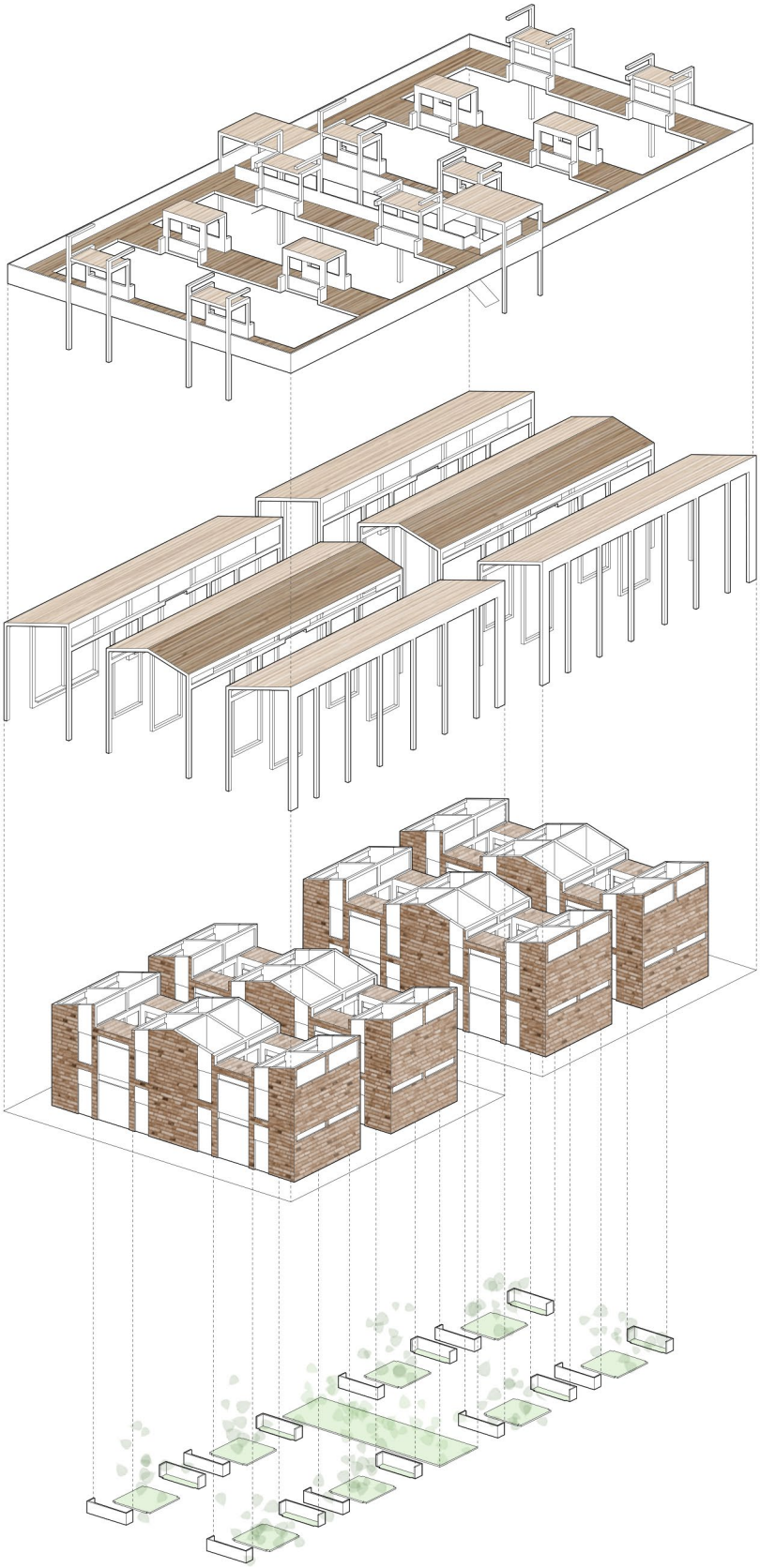
The bamboo woven panel is a semi-open form of the wall to make a connection between inside and outside.

Brick



Bricks is an elements of the building material of the Panzi hospital as well as the city Bukavu. In the emergency and surgery unit, it shows into three different forms. The normal pattern of bricks is used in the majority of the facade, while the second pattern of bricks represent depression of the facade to shrink big volumes.

The brick wall with voids is mainly located at the high area of facades, which is a solution for natural ventilation.



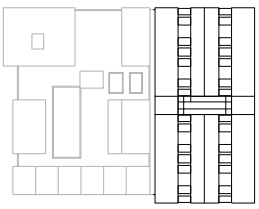


Figure 36. Materials of the Inpatient Wards Area

The principle of combination between bamboo and bricks in the wards area is siminar as the way for the emergency and surgery unit.

There is a hierarchy of privacy in the aspect of green area design in the wards area. As soon as the patients come out from the surgery unit, a big and open green garden right comes into sight. Then, on the way to their rooms, there are small parterres on either side of corridors. And, after patients arriving into rooms and lying on the beds, they will realise there is a quite and private courtyard with a beautiful tree outside the window, which is a utopia for stressful patients.

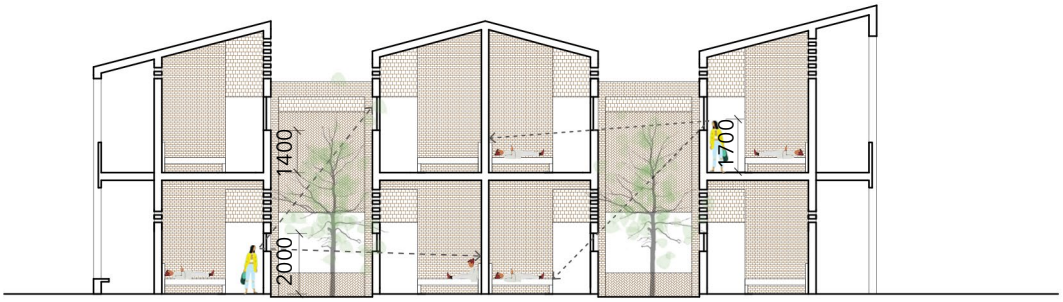


Figure 37.Sight analysis in wards unit, section 1:250

To keep privacy of the inpatients in wards, the size of the windows of wards are designed. The hight of the window is 1.4 meters. If patients stand in front of the window on the second floor, they won't see the patients lying on the bed of the opposite room as well as the patients on the bed of the wards on the first floor. In addition, with trees in the courtyards, views to opposite rooms are more blurry.

When patients lying on the beds, they could view outside by the window and voids in the front wall.

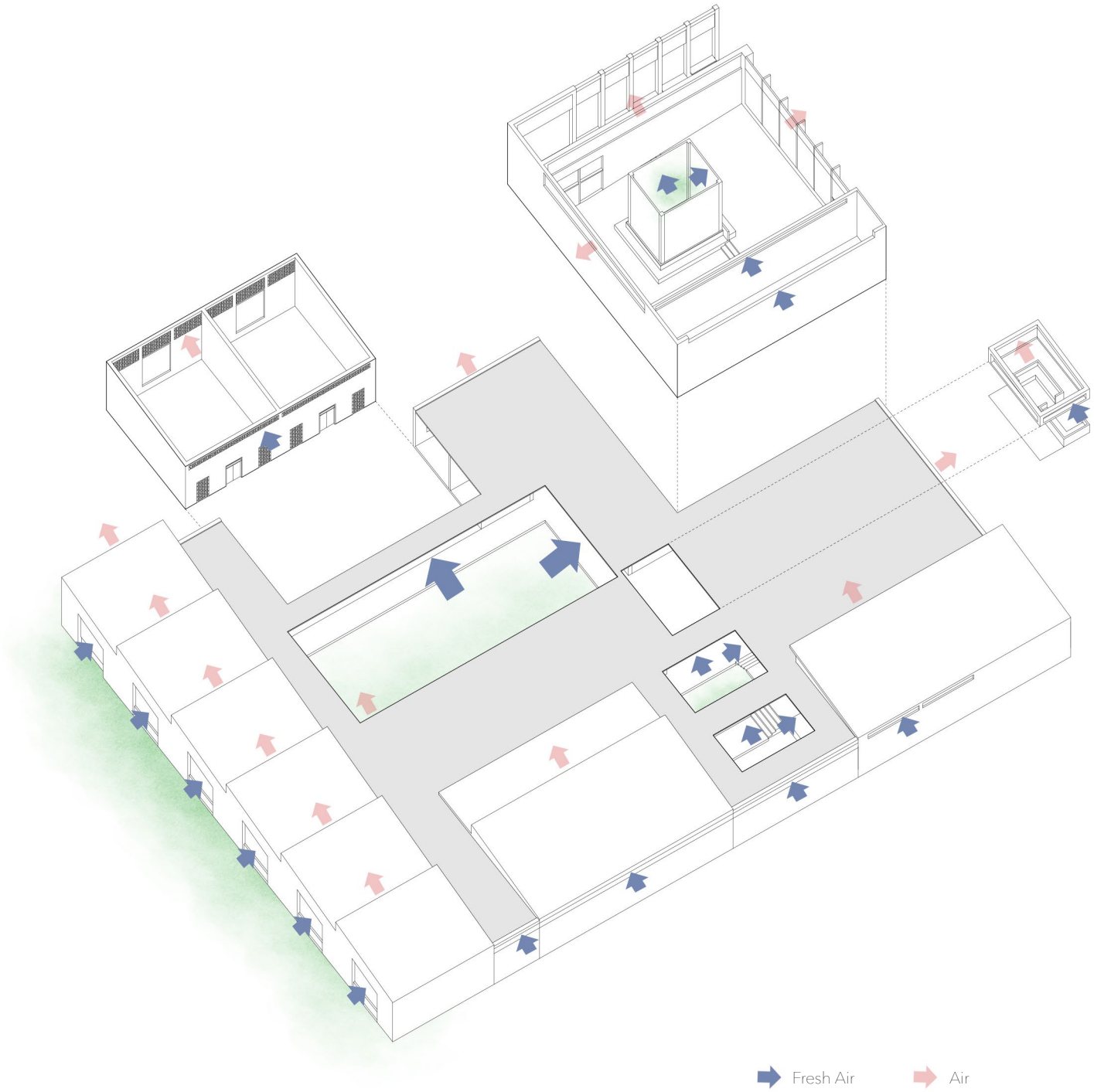


Figure 38. Natural ventilation in the Emergency & Surgery unit

The natural ventilation system is based on the viods on the facade and the opening gardens. Fresh air usually comes from south to north in this region. In the emergency and surgery unit, fresh air come in and out directily in the rooms with lifted roofs. As for the other part of the building, the grey area shown above, fresh air comes mainly from the gardens and leave though the voids on the top of facades.

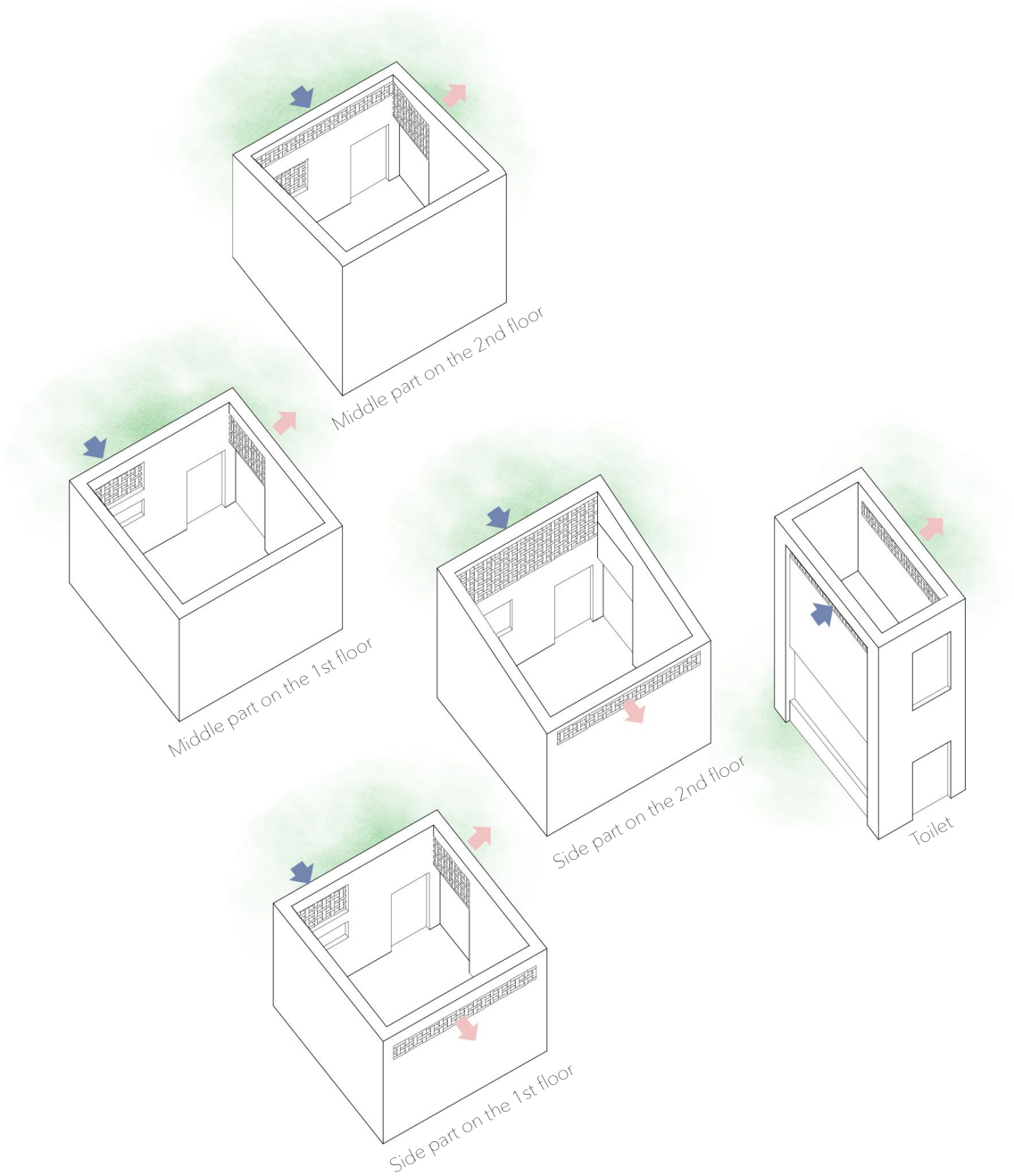


Figure 39. Natural ventilation in the Inpatient Wards Area

The inpatient wards is covered with many green area. Fresh air comes from the green and leave to the green. On the one hand, these plants create a calming environmentair with good air quality. On the other hand, these plants absorb most of noises, which is a low-tech solution for the noise control in this design.

REFLECTION

The main conclusion of this Master Thesis is that an emergency and surgery unit could be designed for decreasing stress by some architecutral variables, like home-like environment, access to view and nature, light, noise control, barrier free environment and room layout.

As an emergency and surgery unit, safety is the basis of stress-reduction. A secure atmosphere in a hospital would base on easy wayfinding, privacy and contact with doctors and nurses. As for the space for stress-decreasing, different green relations, noise reduction, sense of home could create a calming environment for patients. To achieve the home-sense envionment, human-scale volumes, familiar materials and family company would be important architectural variables to examine.

After this Master Thesis, two directions could be explored in a better way. Firstly, site visiting is worthy to be planed. Talking to patients there could be helpful to make a patient-oriented design for the hospital. In addition, modules of stress-decreasing space could be designed, which could be adopted in other condition and situation.

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APPENDIX

INTERVIEW QUESTIONS

1.Perception of health, illness and death and beliefs about what causes disease. Are there spiritual / cultural aspect that we should consider?

2.Do people trust the healthcare system / doctors. When will people go to hospitals when they get sick. What kind of illnesses are common?

3.What kind of help and treatment they prefer (based on their economic situation)? Are there different types of processes depending on their resources?

4.Where are the patients and doctors from? Local or from the other villages? How do they get here?

5.Who are the patients? Approximately percentages of different age groups (in emergency/ surgery unit), male female,

6.What is special about the Panzi hospital? What are challenges at this location? What from the Swedish hospitals is considered positive? And negative? (Compared to Swedish hospitals, what factors are obviously different in Panzi hospital?

(function arrangement, flows of staffs, patients and trash, technical floor/rooms, staff areas…) (The first thing you may think about)

7.Thinking of the future perfect, what would the ideal situation be? What part s of that could be implemented now, and what can be prisoned? Needs and wishes in the future? And future possibilities.

8.Climate conditions. Possibilities to stay outdoor in the night time/ rainy season?

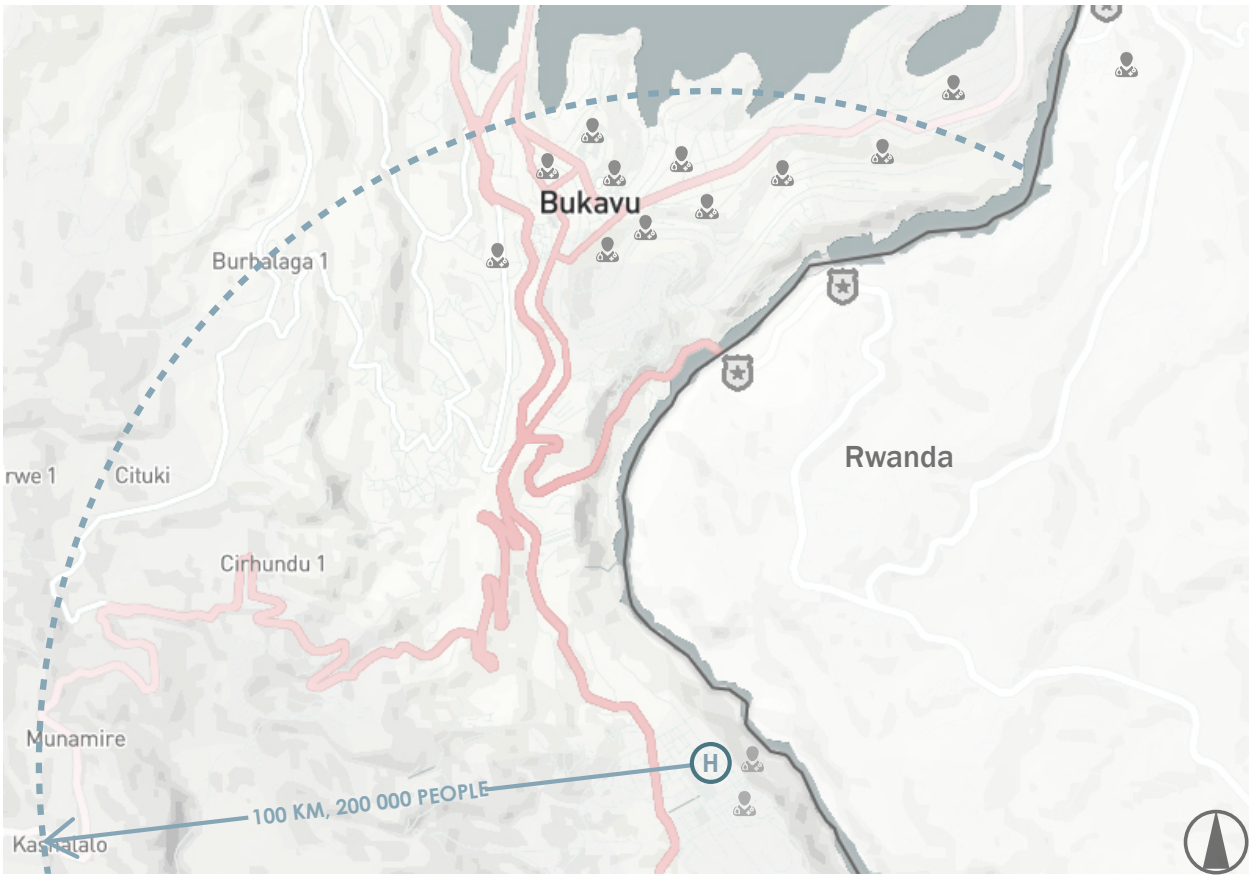

Figure 40. Living area of staffs and the traffic situation

Summary of the interview with Jean- Paul, the doctor of Panzi hospital

Panzi Hospital serves people who live around 100 kilometers away. Taxis and mini buses are their common ways of transportation. However, the difference from the other place is that all of the taxis are unaccessible to pass through the congestion area. So, passengers have to get off and transfer to another taxi. In addition, the mini buses would pick up and drop off passengers as their needs.

Most of doctors and nurses working at Panzi hospital live in the Bukavu City and even Rwanda. And it is convenient for them to commute by staff-buses, while some of them prefer to drive their cars. Certainly, there are some staffs living near by the hospital.

Summary of the interview with Urban Berg, willing doctor from Sweden working at Panzi Hospital

Patient

From: Bukavu or Rwanda

Desease: lung infection, heart disease, abdominal operation, orthopaedics problems

Treatment period: around one week

Needs: cheap in baby delivery, urgent treatment before paying

Doctor in surgery unit

From: Bukavu or Rwanda

Work: microscope operation, projection surgery

Needs: more nurses for patients;
more staff rooms

Panzi hospital

Serve for: 200 000 people surrounding

Management: belongs to Christian church, intergrated on the national level

Problem: crowded due to study visit of students;
20 patients and their families stay in a ward room;
no food supply;
insufficient number of toilets;
undeveloped infrastructure(electricity, water, sanitation)

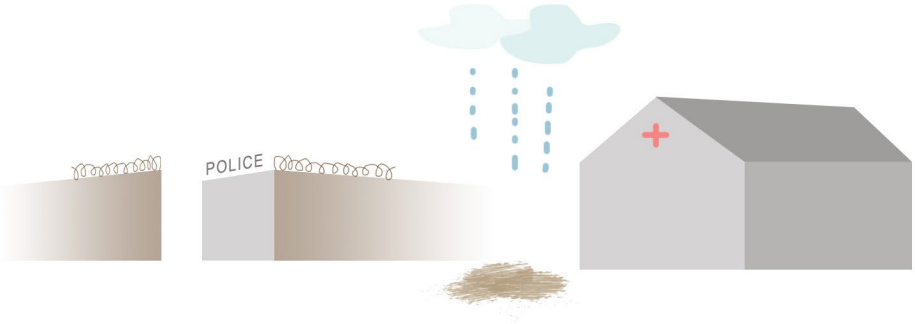

Figure 41. The environment of the Panzi hospital

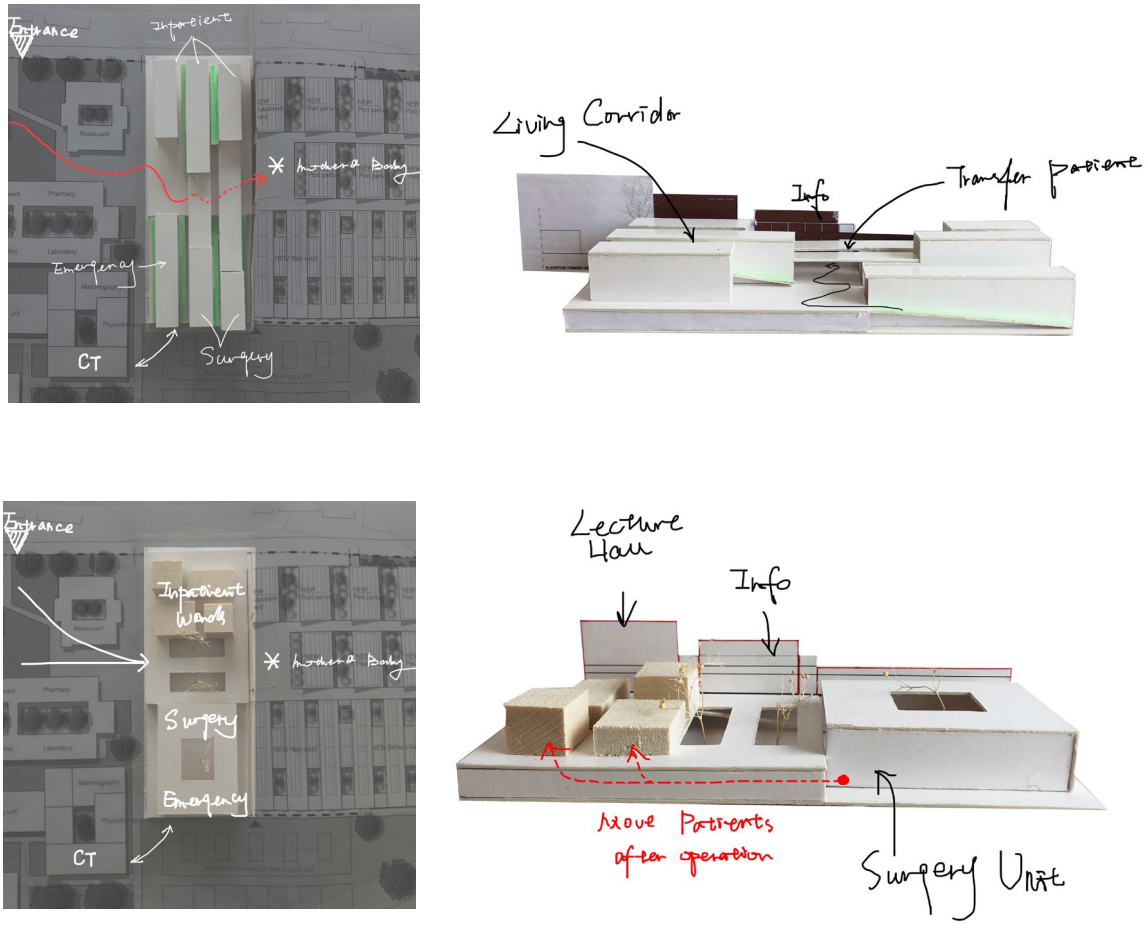

Figure 42. Photos of models on volume study on the location of option A

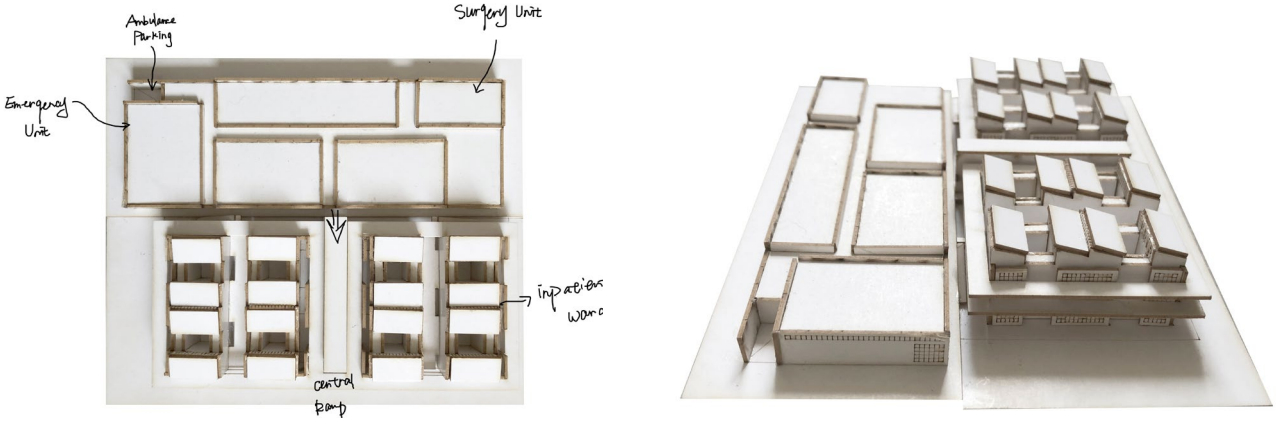

Figure 43. Photos of models on volume study on the location of option F

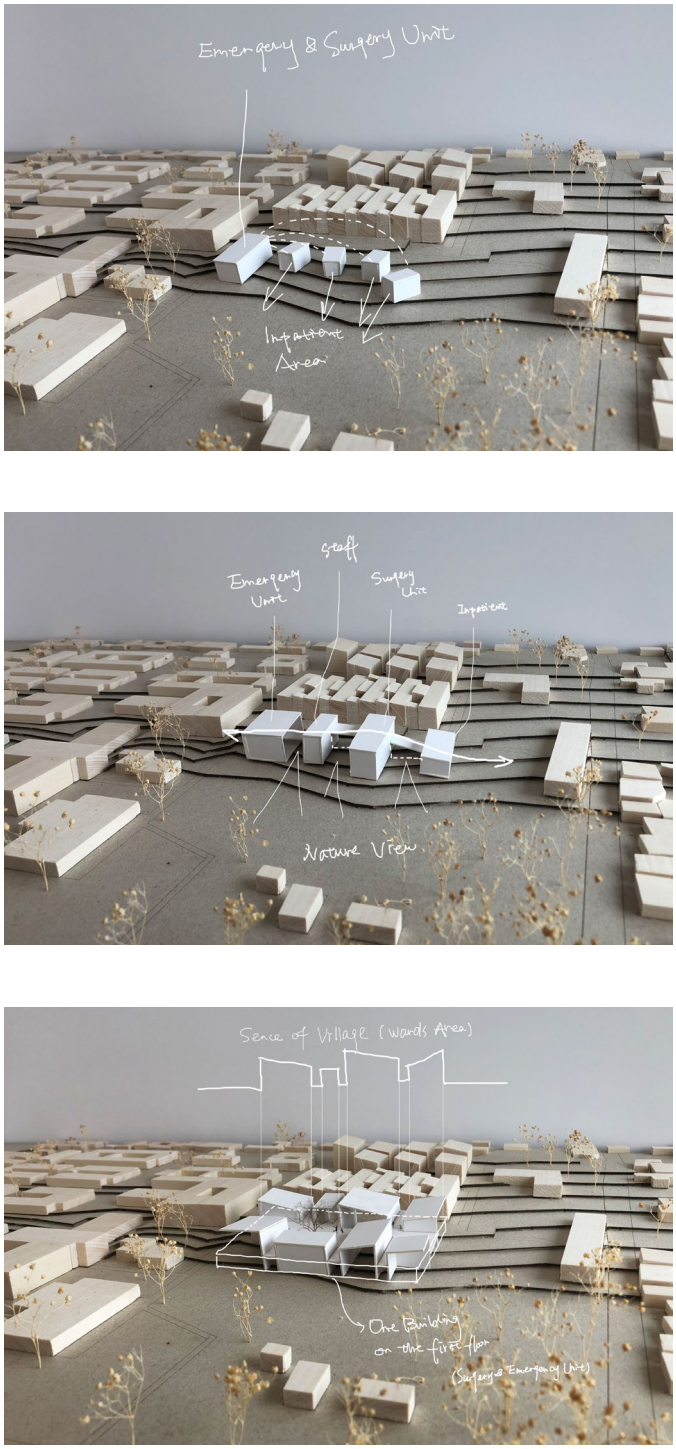

Figure 44. Photos of models on volume study on the location of option F

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