CP 10

complex projects

LABORATORY

L I F E

TU Delft

2024

COMPLEX PROJECTS
Bodies and Building Berlin
AR3CP100

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1.1 INTRODUCTION

Medical technology advancements and ethical considerations go hand in hand. Every time science makes progress, more questions arise. Current research and scientific developments are looking into the field of "reproductive engineering," which refers to tampering with the conventional methods of conception, pregnancy, and delivery (R. J. Buuck, 1977). Yet Germany has certain restrictions on access to medically assisted reproduction (MAR), a range of interventions designed to address various forms of infertility and fertility, compared to other countries. This includes all types of assisted reproductive technology (ART), as well as various insemination techniques and surgical procedures (Zegers-Hochschild et al., 2017, as cited by Köppen et al., 2021).

Köppen et al. (2021) explain that the legal framework that governs MAR in Germany is notable for its lack of flexibility as well as being obsolete. Despite that, reproductive medicine specialists continue to use the Embryo Protection Act (ESchG), which was passed in 1991, as the legal foundation for implementing MAR. Several ART-related procedures as well as some alternative diagnostic methods are prohibited by the ESchG. Egg cell donation, surrogate motherhood, and elective single embryo transfer are a few examples of such practices. Revermann and Hüsing (2010, as cited by Köppen et al., 2021), state that the controversial ban on egg cell donation is intended to prevent identity problems in children. Bergmann (2011) argues that this position is based on gender stereotypes, in which it is acceptable to be unsure of one's father's identity but not of one's mother's. Because of restrictive laws, men who are single or in same-sex relationships, as well as women who are unable to conceive using their own egg cells, are unable to access MAR in Germany.

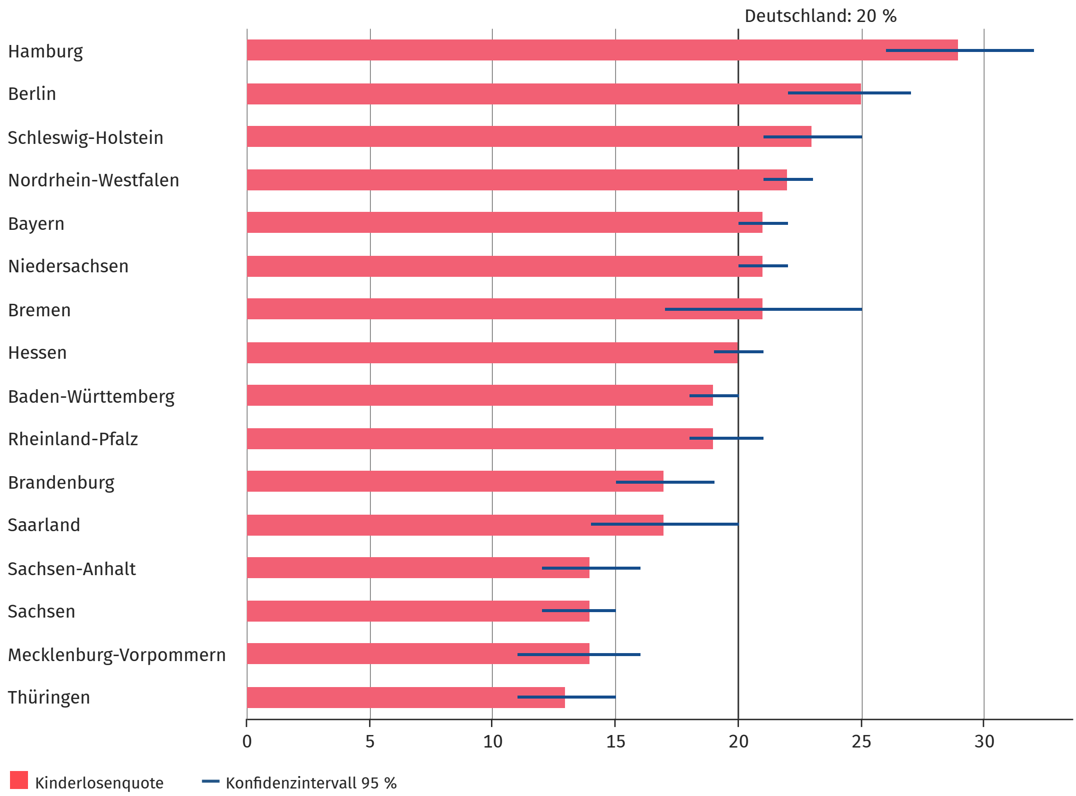


Figure 1: Kinderlosenquote im Jahr 2022 bei Frauen im Alter zwischen 45 und 54 Jahren (Statistische Bundesamt, 2023)

1.2 PROBLEM-STATEMENT

Like several other countries, Germany has a consistent and gradual rise in the average age at which women give birth to their first child. According to Dudel and Klüsner's (2019) research, women's average age at their first childbirth increased from 28.8 years in 2009 to 30.1 years in 2019. Since then, the Statistische Bundesamt (2023) has released data showing an additional increase to 31.7 years in 2022. This is in line with a long-term trend, resulting in a reduction in the reproductive timeframe for women. This trend can also be seen in men, where the average age at first birth for women has risen from 33.1 years in 2019 to 34.7 years in 2022 (Statistisches Bundesamt, 2023; Dudel and Klüsener, 2019).

Results from a study by Datta et al. (2016) showed that people who put off starting a family experience a greater risk of infertility. According to the Bundesärztekammer (2018), as cited by Köppen et al. (2021), the estimated prevalence of infertility in Europe ranges between 7% and 9%. Passet-Wittig et al. (2016) found that 7.5% of women and 6.5% of men had infertility problems in two German birth cohorts in 2012 and 2013.

But what motivates people to postpone having children? According to Mills et al. (2011), important variables include the availability of effective contraception, advancements in women's education and employment, changing gender equality and values, changes in partnerships, housing conditions, unstable economic conditions, and a lack of family-friendly policies. Women's fertility and the likelihood that parents will have additional children are affected if their first births are delayed. The struggle between pursuing additional education and career development and the ideal biological window for women to have children causes significant postponements.

Although Germany fully legalized same-sex marriage in 2017, the acceptance of reproductive freedom is still limited by the standards that define who is eligible for MAR. The different legal treatment of social motherhood and social fatherhood in Germany's MAR framework is a prominent example of reproductive inequality. In particular, it is acceptable for third-party donors to donate sperm, but not egg cells (Barnes and Fledderjohann, 2020, as cited by Köppen et al., 2021).

According to Patel et al. (2018), this causes approximately 20.000 - 25.000 German individuals and couples to seek cross-border ART services each year. Ikemoto (2021) defines the desire to travel for ART and the related activities that make up fertility travel as "reproductive tourism", and states that the concept of reproductive tourism has groewn significantly in the recent years. Deonandan (2015) emphasizes that surrogacy stands out as one of most popular categories within reproductive tourism. This involves clients who are infertile traveling abroad to hire foreign surrogates to carry their children through pregnancy for a compensation fee. González (2020) notes that there are several moral and legal concerns in this industry. Among the many legal concerns is the question: who is the child's legal mother? While legal parenthood is acknowledged with the intended parents in some countries, in others the woman who gives birth is regarded as the child's legal mother. Surrogacy also raises ethical concerns in addition to the legal issues, in particular with international surrogacy. Since the surrogate uses herself as a tool, some regard surrogacy as exploitation. Furthermore, some claim that only vulnerable women would consent to international surrogacy, making it just another way that women are exploited.

1.3 RESEARCH QUESTIONS

This research looks into creating a new architectural typology that provides an alternative for people who are unable to start a family due to medical constraints or due to being part of same-sex couples. This brings us to the central research question:

How does the architectural design of a medical laboratory building contribute to the safety and social acceptance of artificial birth processes?

The goal of this research is to find architectural solutions that respond to the unique needs of those who are having difficulties starting a family by creating a safe and efficient environment for artificial birth procedures.

To help answer the central research question, a devision was made into subquestions. These subquestions go into different parts of the topic, such as:

What ethical considerations are associated with unconventional birth methods and assisted reproductive technology?

Because of ethical and legal problems surrounding artificial birth, research will be required into the concerns surrounding artificial birth. This will help determine the public opinion and lead to important decisions such as: should it be an open or closed building? or should the building be publicly accessible? which will in turn determine the safety of the artificial birth process.

What are the specific spatial requirements for conducting artificial birth procedures within a medical laboratory setting?

Looking into the artificial birth process itself, could help determine what type of spaces will be necessary.

2.1 RELEVANCE

Present theories show, that ART has been seamlessly integrated into modern medicine, where they play a critical role in facilitating family planning. With over five million ART-conceived infants, some countries now have ART-conceived births exceeding 5% of total births (De Geyter, 2017). Despite this global trend, Wilson (2016) points out Germany as one of the European Union's most restrictive countries when it comes to ART. The question arises: could there be an alternative solution?

2.2 THEORETICAL FRAMEWORK

A potential alternative put forth by Nami et al. (2023) calls for the development and use of an artificial womb during the whole prenatal process. With the use of artificial womb technology (AWT), childbirth would take place in a machine that resembles an incubator rather than inside a human. Bulletti et al. (2011) support this idea stating that the ability to implant human embryos in ex vivo uterus models or an artificial uterus, along with the availability of computer-controlled artificial hearts, kidneys, and lungs, present new opportunities for the development of an artificial uterus. These discoveries create opportunities for the development of an artificial womb that can support fetal development and growth outside of the human body.

De Bie et al. (2023), take a more neutral standpoint by examining the ethical considerations regarding ART. They talk about balancing the potential benefits with the potential harms to the fetus, the parents as well as society.

FETUS

AWT is currently aimed primarily at extremely premature infants. Furthermore, AWT may protect fetuses from potentially harmful gestational conditions like chorioamnionitis, oligo- or anhydramnios, and intrauterine growth restriction. It is expected that AWT will help these premature infants by lowering their mortality and morbidity. Additionally, it is believed that AWT technology can enhance fetuses' viability and security at the same time. But there are risks involved with AWT as well, the most significant risk is that AWT or its complications could cause death or severe disability. Unfavourable outcomes from AWT may include both immediate and delayed physiological effects, such as brain bleeding. Furthermore, according to Landau (2007, as cited in De Bie et al., 2023), a thorough investigation of the behavioural and psychological effects of the lack of physical maternal-fetal bonding is necessary. Long-term effects are difficult to investigate and won't be resolved until long after the first human research subjects are old enough to undergo these evaluations. (De Bie et al., 2023)

PARENTS

De Bie et al. (2023) point out that the literature to date has not done a very good job of examining the potential benefits of AWT for mothers. Even though the emphasis is frequently on the fetus's increased survival and decreased morbidity, there may be advantages for the parents in cases where the mother's health is in danger or where corrective measures can be carried out without endangering the mother's health. The Laboratory Life project may fill a gap in potential benefits for AWT mothers as well as same-sex couples. Behavioural, emotional and psychological effects on the mother may also result from the lack of physical maternal-fetal bonding during the AWT treatment of the fetus. This may decrease the feeling of "new baby motherhood," which is usually connected to fulfilment and significance. Consequently, the mothers' experiences should be investigated within the context of AWT.

SOCIETY

De Bie et al. (2023) clarify that while some have proposed that AWT could change parent-child and parent-fetus relationships, they believe these outcomes are unlikely to happen to a notable extent. In addition, de Bie et al. (2023) explain that the presence of AWT can bring attention to or increase gaps in healthcare access. As with other Neonatal Intensive Care Unit interventions, AWT will likely turn out to be highly expensive due to the requirement for constant, intensive bedside monitoring and treatment. Financial status could restrict accessibility, and multiple research studies indicated the potential for this financial barrier to worsen social inequality. Moreover, it is anticipated that AWT will initially be a limited commodity, which raises questions about how it will divided and the standards used to make those decisions.

As explained by Browne et al. (2023), several feminists claim that AWT could make pregnant people feel even more disadvantaged and controlled, regardless of whether it is intended to replace natural gestation entirely or in part. According to this perspective, pregnancy and childbirth are moving away from the generally accepted experience and toward a technologically driven process. Some argue that by giving pregnant women more options for reproduction, AWT could empower them.

As stated by Browne et al. (2023), the impact of AWT is dependent on how it fits into the current range of reproductive technologies as well as the level of inequalities and injustices in the society where the technology is introduced.

3.1 CLIENT

INTERNET RESEARCH

Internet research will be the main method used to find clients for the project. Two separate categories have been established in order to make sure that the clients are in line with the goals of the project. In the end a collaboration between both categories is necessary to make the project possible.

1. The first category is the government. Because of the sensitivity of the project, the state of Berlin and several federal departments are necessary to make this project possible. The government will need to change some laws to allow artificial birth. Internet research will help find the departments that are necessary to make this project possible.
2. The second category is private companies. These private companies are again devided into 2 sub-categories, the first being Laboratory Research. These are clients, dedicated to research in the fields of artificial reproduction, fertility, and reproductive medicine. These clients should bring the laboratory equipment, as well as laboratory staff. The second sub-category is Medical Expertise. These clients are required to have knowledge or experience in obstetrics, reproductive medicine, or a related field of medicine. This guarantees an advanced understanding of the complexities of the project and the capacity to offer insightful opinions. These clients should bring the medical equipment as well as medical personnel. There are over 100 hospitals in Berlin and not all of them will be clients. By doing research on the internet, I hope to find the most suitable medical clients.

3.2 SITE

MAPPING

To determine the best location for the medical laboratory building, maps are made of the following:

1. A research collaboration map, showing the nearby network of hospitals, research facilities and universities.
2. A protected nature areas map, showing the protected nature areas in berlin.
3. A clean zones map, showing the areas with low air (CO_2) and noise pollution as well as a low crime rate %.
4. A retrofit map, showing the pieces of land owned by the government of Berlin that could be used to construct the medical laboratory.
5. A geothermal potential map, showing the sites with no soil restrictions for geothermal energy.
6. A energy efficient mobility map, showing the public transport network or Berlin and places where multiple mobility nodes come together.

These maps lead to 3 potential locations for the medical laboratory building. These locations are then analysed based on how well they fit within the requirements listed above. After finding the most suitable location, an analysis per scale is made in the form of maps to get a better understanding of the location, looking into:

1. Scale XL – In what district the location is.
2. Scale XL – What localities these districts are known for.
3. Scale XL – The main traffic flows surrounding the location.
4. Scale XL – The nearby hospitals, fertility clinics and research institutes.
5. Scale L – The surrounding neighbourhoods.
6. Scale L – The busy and less busy areas nearby.
7. Scale M – The accessibility of the site.
8. Scale M – The heights of the surrounding buildings and trees.
9. Scale S – The current site occupation.
10. Scale S – The proposed site and it's measurements.

3.3 PROGRAM

CASE STUDY

The first research method involves carrying out case studies on both hospitals and laboratories to gain an understanding of the dimensions and ratios.

1. To create a benchmark for the hospital part, 4 models are made. These models of the Vivantes Klinikum, New North Zealand Hospital, Brain Hospital and Organ Factory are analyzed on the context, organization and program.
2. The benchmark of the laboratory part, an case study is conducted of 8 laboratories, 6 medical- and 2 general laboratories, originating from the Laboratory design guide by B. Griffin (2005).

By researching existing hospitals and laboratories, I can gain a better understanding of spatial requirements, size considerations, and the necessity of specific rooms.

EXTERNAL EXPERTISE

To verify the information gathered from the benchmark, architectural firms, such as EGM Architecten & Gortemaker Algra Feenstra, are contacted. These firms have designed hospitals in the past and provided their approach to hospital design and the factors that should be taken into account.

CINEMATIC EXPLORATION

The program's final research method is a cinematic exploration, which includes a film analysis focused on the conceptual theme. An example is "The Pod Generation," a film that illustrates a "not too distant future" in which couples are able to share pregnancies using artificial wombs, in the shape of detachable pods. I want to learn how directors see these kinds of ideas by looking at these films. It also helps to outline the types of rooms they anticipate being used in the future and how they see these spaces serving both the intended parents and the babies. This gives the research an unusual new perspective that could enhances the program's creative elements.

4.1 CLIENT

Two separate categories have been established in order to make sure that the clients are in line with the goals of the project. In the end a collaboration between both categories is necessary to make the project possible.

THE GOVERNMENT

The first category is the government. Because of the sensitivity of the project, the state of Berlin and several federal departments are necessary to make this project possible. The government will need to change some laws to allow artificial birth. In addition the government should provide funding and a piece governmental land to construct the medical laboratory.

PRIVATE COMPANIES

The second category is private companies. These private companies are again devided into 2 sub-categories, the first being Laboratory Research. These are clients, dedicated to research in the fields of artificial reproduction, fertility, and reproductive medicine. These clients should bring the laboratory equipment, as well as laboratory staff. The second sub-category is Medical Expertise. These clients are required to have knowledge or experience in obstetrics, reproductive medicine, or a related field of medicine. This guarantees an advanced understanding of the complexities of the project and the capacity to offer insightful opinions. These clients should bring the medical equipment as well as medical personnel.

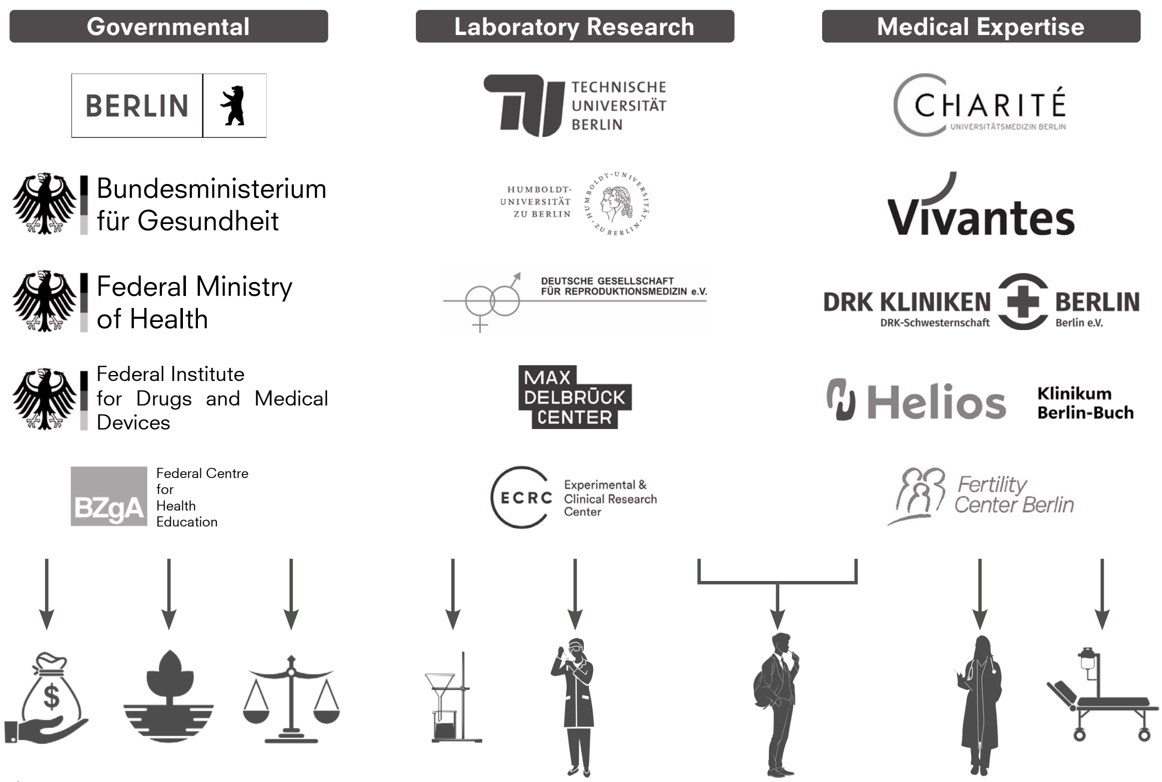


Figure 2: Necessary Clients, illustrated by author

LABORATORY STAFF

Researchers

Ratio 1:15-20 m²

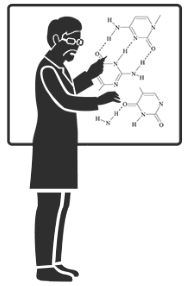
157 - 210 researchers per lab

Lab Workers

Ratio 1-5:100 m²

80 - 400 lab workers per lab

Students



Ratio 10-30:1 lab

10 - 30 students per lab

Figure 3: Laboratory staff, illustrated by author

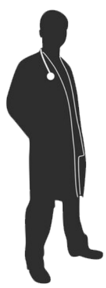
MEDICAL PERSONNEL

Nurses

Ratio 1:1-3

266 - 800 nurses

Doctors



Ratio 1:15-30

14 - 28 doctors per department

Students

Ratio 1:2

400 students

Figure 4: Medical Personnel, illustrated by author

4.2 SITE

4.2.1 SITE REQUIREMENTS

To determine the most suitable location for the medical laboratory building, requirements are made the that the site should abide by. The requirements are as follows:

RESEARCH NETWORK

To promote collaboration between the state of Berlin and private companies, the clients that can offer knowledge in terms of medical sciences, healthcare or experimental/ laboratory research are mapped. Most of these companies are located in the city center and in the South-West of Berlin.

PROTECTED NATURE AREAS

To ensure that no controversial buildings, ex. a pollice station or prison, will be constructed next to the building, the medical laboratory should be built **next to** a protected nature area. The protected nature areas are determined by the Nature Conservation Legislation including Natura 2000. This includes landscape conservation areas, special protected bird conservation areas, flora and faune habitats and protected areas of the landscape.

CLEAN ZONES

To ensure a healthy environment for the babies to grow up, the intended parents to stay and visit, the medical personnel and laboratory staff to work, the medical laboratory should be built in a location with low air (CO_2) and noise pollution as well as a low crime rate %.

RETROFIT

The state of Berlin should offer up a piece of land, that could be used to construct the medical laboratory. Instead of looking at all areas of land available, a combination is made between governmental land and retrofittable land, defined as land with ignored potentials like, bare land, industrial land or parking lots. These areas not only help the state of Berlin solve the problem, it also helps reduce urban sprawl and thus consumption.

GEOTHERMAL POTENTIAL

Because of the energy crisis in Berlin, the building needs to make use of renewable energy. The United Nations have defined 6 types of renewable energy, 4 of which are available in Berlin. Geothermal energy is the most reliable and consistent form of renewable energy, therefore the building needs to be in an area where this goethermal energy can be used. (This does not mean that other renewable energy sources are not used.)

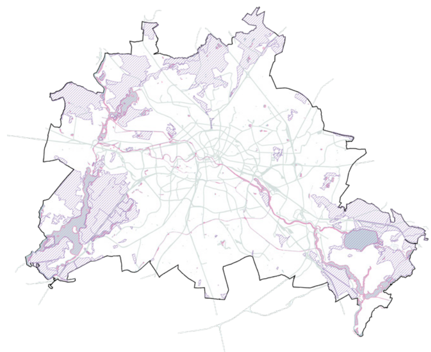
ENERGY-EFFICIENT MOBILITY

For certain typologies, the energy expended to reach a building exceeds the energy usage of the building itself. For an average hospital, 22% of the energy consumption, originates from people travelling to the building. To help reduce this consumption, areas in busy regions are designated for buildings with higher peaks by strategically locating typologies based on their peak hours, reducing the need for extensive travel. The medical laboratory needs to be nearby a location with 2 types of transportation.

Together, these requirements provide a framework for evaluating potential sites.

Research Network

Figure 5: Reserach Network, illustrated by author



Protected Nature Areas

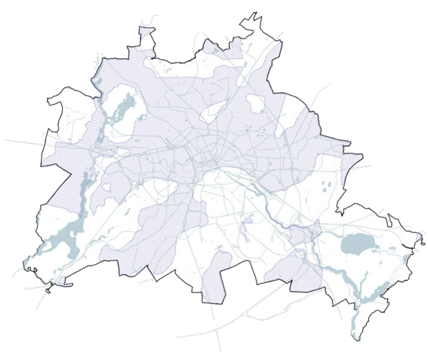
Figure 6: Protected Nature Areas, illustrated by author

Clean Zones

Figure 7: Clean Zones, illustrated by author

Retrofit: Existing potential

Figure 8: Retrofit, illustrated by author



Geothermal Potential

Figure 9: Geothermal Potential, illustrated by author

Energy-efficient mobility

Figure 10: Energy-Efficient mob., illustrated by author

4.2.2 POSSIBLE LOCATIONS

The requirements lead to 3 potential locations for the medical laboratory building. These locations are analysed based on how well they fit within the requirements.

LOCATION A

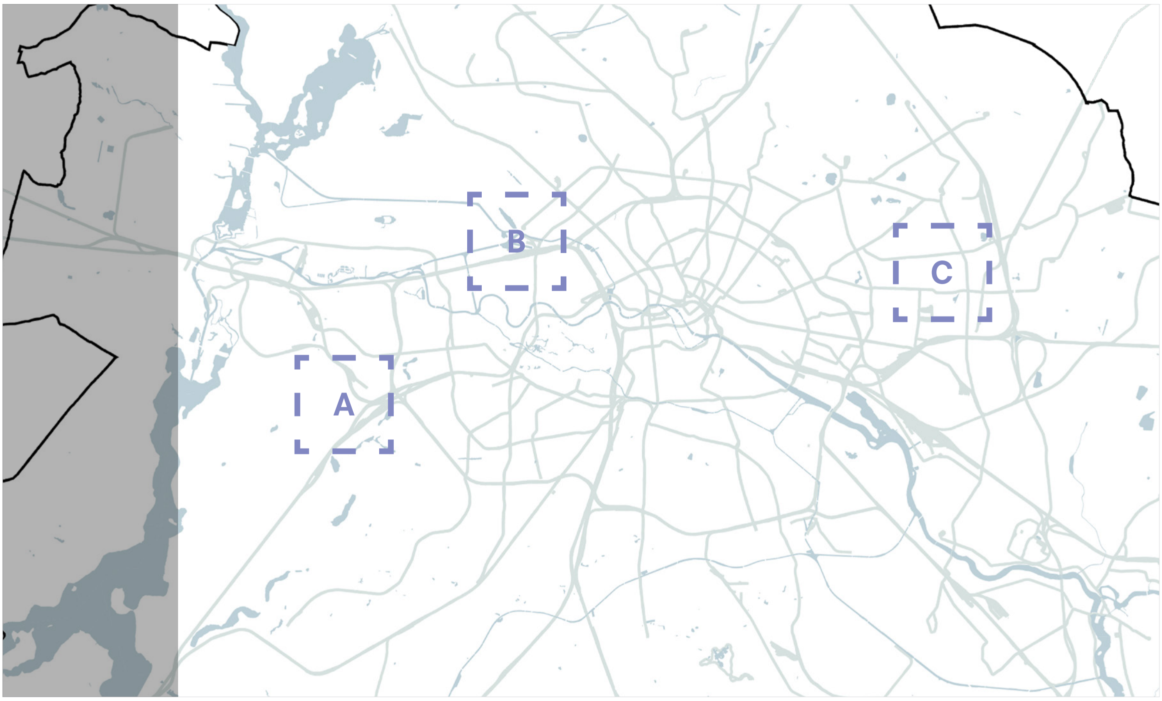
The first location is in Charlottenburg-Wilmersdorf at the border of the Westend and Grunewald district. The site is located next to the Grunewald forest and the site itself is a sports facility owned by the government. The site is near 2 S-bahn stations and borders 2 neighbourhoods and congress center Messe Berlin.

LOCATION B

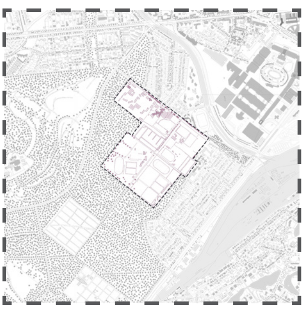
The second location is in the Mitte district just North-west of the city center. The site is a governmentally owned park and is located nearby 2 S-bahn and U-bahn stations. The site borders the Charité campus, however it also looks out at a graveyard. Due to the sensitivity of the project, the location was deemed not suitable.

LOCATION C

The third location is in the Lichtenberg district surrounded by forest. It is nearby the Evangelical Hospital. The site is the least accessible, only by bus, and seems very isolated. After comparison location A was concluded as most suitable.

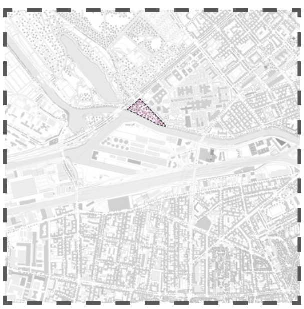


Location **A**



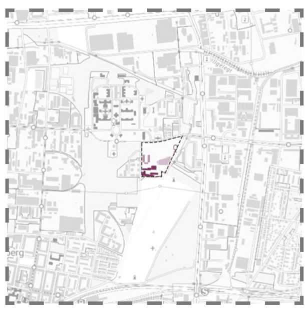
Charlottenburg district

Location **B**



Mitte district

Location **C**



Lichtenberg district

Figure 11: Potential Locations, illustrated by author

Location A

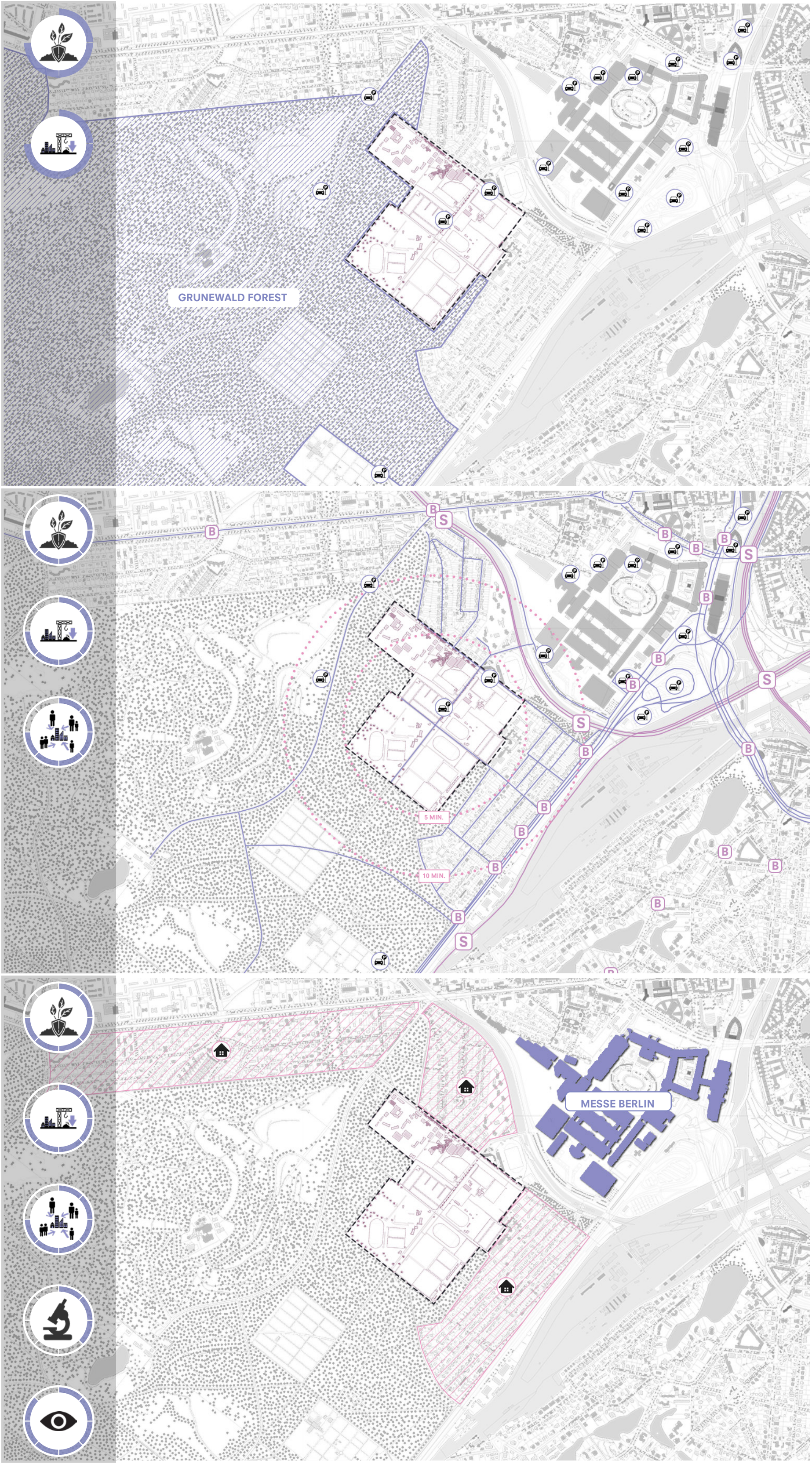


Figure 12: Location A, illustrated by author

Location B

Figure 13: Location B, illustrated by author

Location C

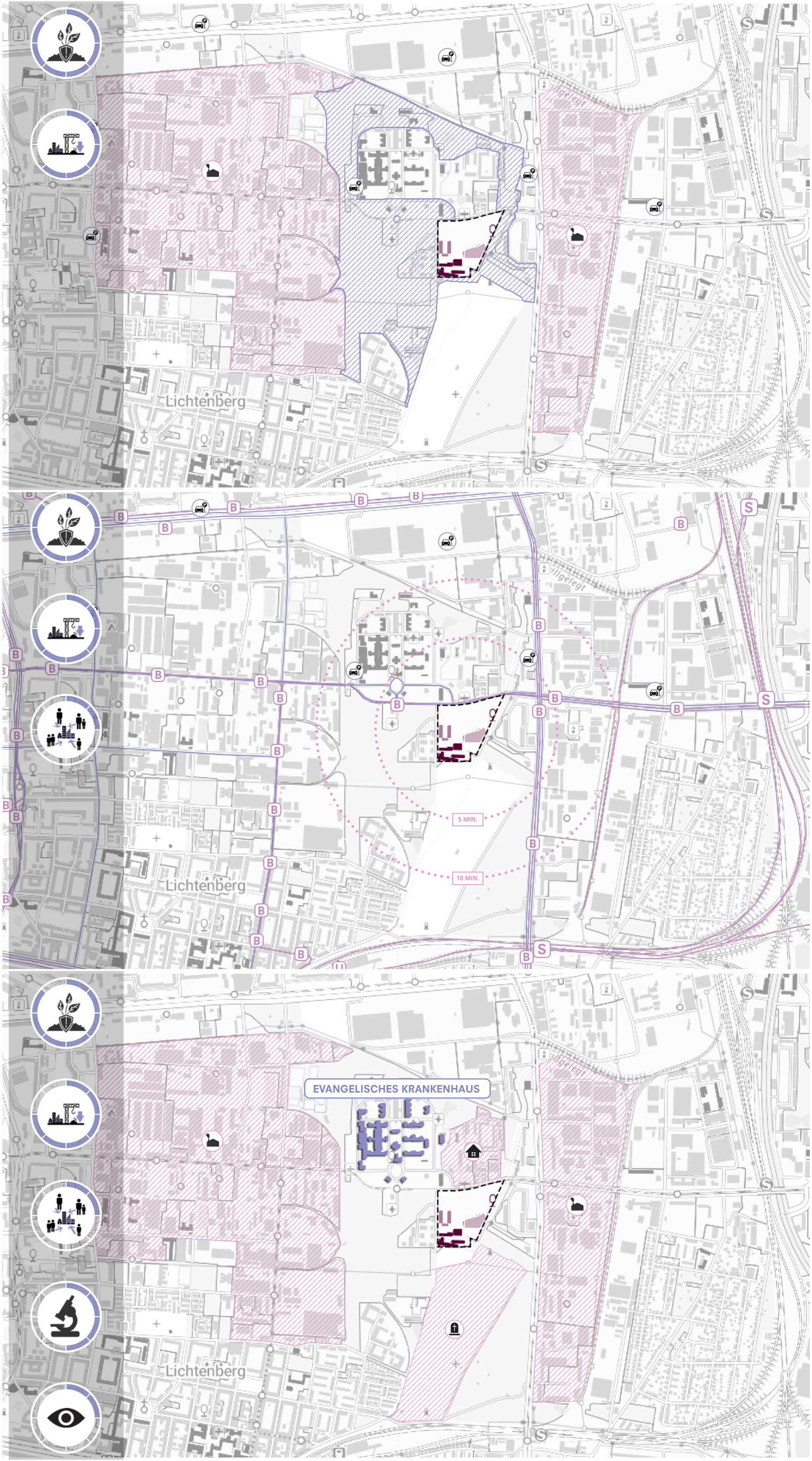


Figure 14: Location C, illustrated by author

4.2.3 ANALYSIS PER SCALE

After finding the most suitable location, an analysis per scale is made in the form of maps to get a better understanding of the location, looking into:

SCALE XL – DISTRICTS

The proposed site is located in between the westend- and grunewald district. The westend district is located to the west of Berlin's city center and is home to Berlin ExpoCenter City, an international exhibition center and Olympiastadion, which was built for the summer olympics in 1936. The grunewald district borders the westend districht and is known for the grunewald forest.

SCALE XL – LOCALITIES

The site is bordered by the Grunewald forest, the largest green area in Berlin. The forest is protected by the Nature Conserva-tion Legislation. Within the forest lie the teufelsberg and nature conservation center.
The olympiastadion, located North-West from the site, is home to German football team Hertha BSC. The international congress center Berlin ExpoCenter City, formerly known as "Messe Berlin", is situated North-East of the site.

SCALE XL – MAIN TRAFFIC FLOWS

The main traffic flows near the site consist of the B2 Bundesstrasse, Bundesautobahn 115 and public transport. The Bundesauto-bahn 115 is a highway that con-nects from outside the city of berlin (Berliner Ring) to the city center (Berliner Stadtring). B2 Bundesstrasse, runs almost 950 km from the Austrian- to the Polish border and is the longest federal highway in Germany. Multiple mobility nodes come to-gether near the site at the Westkreuz and Grunewald station such as the S-bahn and U-bahn.

SCALE XL – NEARBY KNOWLEDGE

Multiple hospitals are within a 10-minute drive from the location. One of the hospitals is DRK Kliniken Berlin, which is an necessary client. Vivantes Klinikum is yet another necessary client. The Vivantes Augeste Viktoria Klinikum is only a short 13-minute drive away. Two of Berlin's 13 reproductive facilities are within a 15-minute drive.

SCALE L – SURR. NEIGHBOURHOODS

The location is situated in the Siedlung Eichkamp neighbourhood, which has roughly 3.500 residents and is a quiet suburb in comparison to its neighbours Halensee approx. 28.550 residents, Pichelsberg approx. 7.650 residents, and the city center, >150.000 residents.

SCALE L – BUSY AREAS

When it comes to areas that people visit frequent, the city center is much busier than the districts outside of the Berliner Stadtring. It is similar to the Bundesautobahn 115 in that it serves as a boundary between highly crowded and quiet places. Some busier clusters appear outside of the city center, such as the Theodor-Heuss-Platz (U-bahn station) and the S-Grunewald station. However, the site itselt doesn't seem to be constantly active.

SCALE M – SITE ACCESSIBILITY

The site is quite close to the Bundesautobahn 115, making it easily accessible by car from both outside of Berlin and within the city center. There are two S-bahn stations nearby, the S-Messe Süd and the S-Grunewald, both of which are within a 10-minute walk. There are also a couple bus stations in the Siedlung-Eichkamp neighborhood that provide access to the site within a 10-minute walk.

SCALE S – CURRENT SITE OCCUPATION

At the site are 3 sports facilities, all of which are owned by the state of Berlin and renamed in 2007. Julius Hirsch, Hans rosenthal, and Wally Witmann sports facilities.

SCALE S – PROPOSED SITE

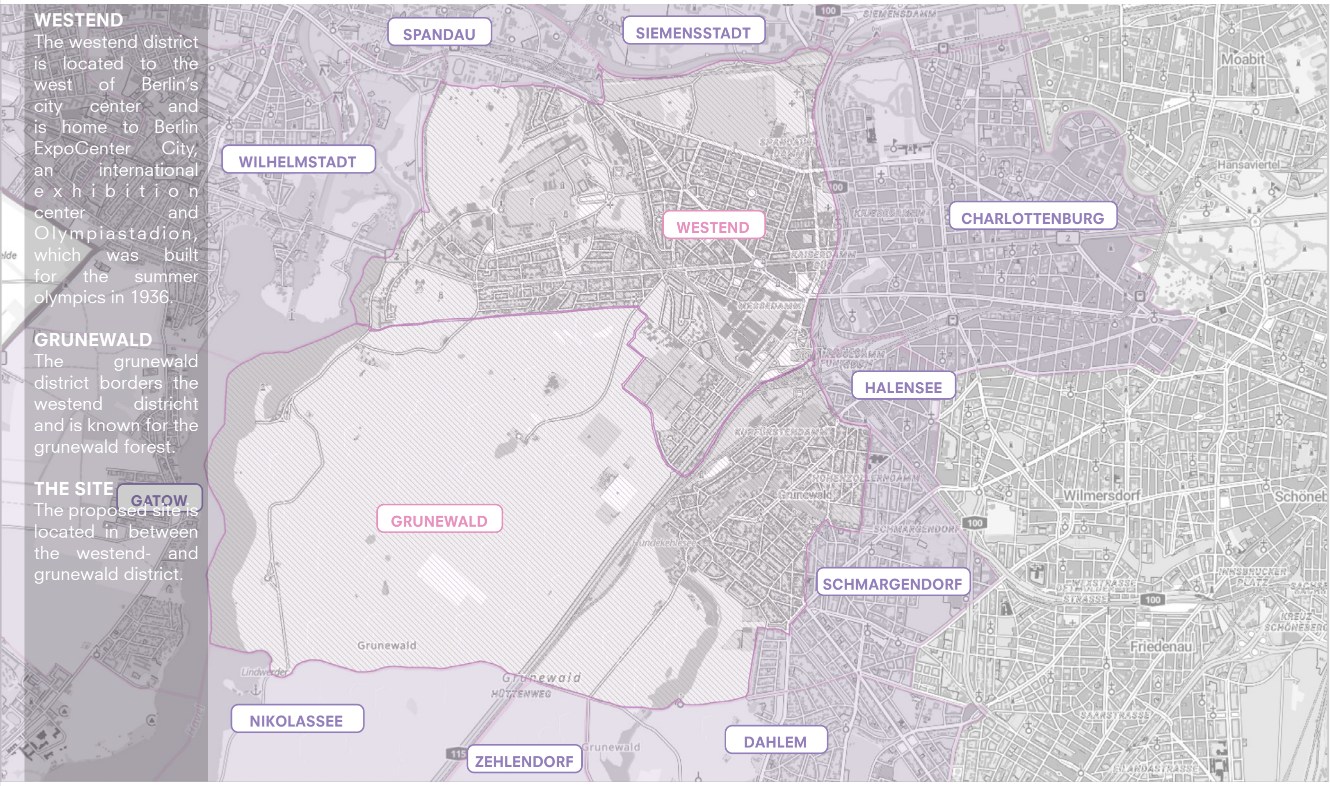
The existing site of the Julius Hirsch Sportanlage is considered as the most suitable location for the medical laboratory building. This site has two sides that border protected nature areas, and it is the farthest away from the neighbourhood. Furthermore, the Julius Hirsch Sportanlage is the least used of the three sportanlagen on the location. In terms of site measures, it provides the largest area for a medical laboratory.

DISTRICTS

WESTEND
The westend district is located to the west of Berlin's city center and is home to Berlin ExpoCenter City, an international exhibition center and Olympiastadion, which was built for the summer olympics in 1936.

GRUNEWALD
The grunewald district borders the westend districht and is known for the grunewald forest.

THE SITE
The proposed site is located in between the westend- and grunewald district.



LOCALITIES

OLYMPIA STADION
The olympiastadion, located North-West from the site, is home to German football team Hertha BSC.

BERLIN EXPO-CENTER CITY
The international congress center Berlin ExpoCenter City, formerly known as "Messe Berlin", is situated North-East of the site.

GRUNEWALD FOREST
The site is bordered by the Grunewald forest, the largest green area in Berlin. The forest is protected by the Nature Conserva-tion Legislation. Within the forest lie the teufelsberg and nature conservation center.

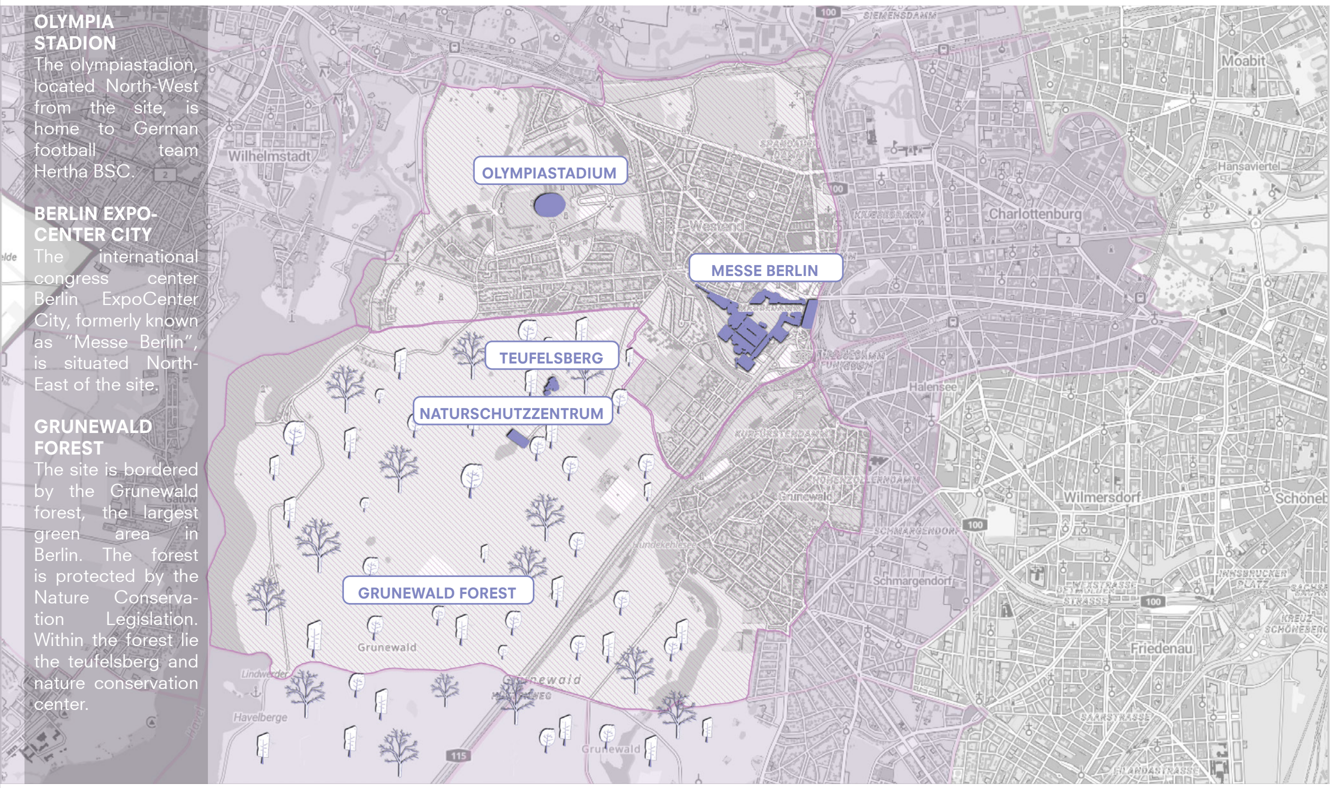


Figure 15 & 16: Districts & Localities, illustrated by author

MAIN TRAFFIC FLOWS

The main traffic flows near the site consist of the B2 Bundesstrasse, Bundesautobahn 115 and public transport.

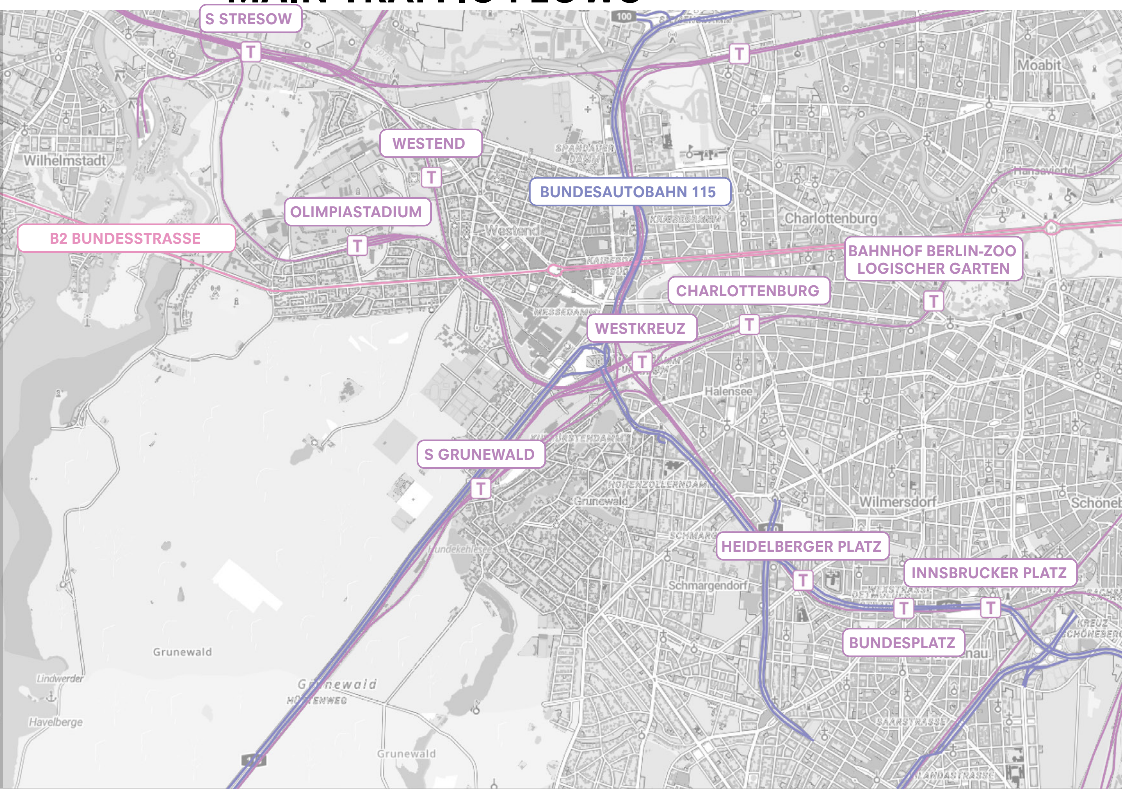
CAR

The Bundesautobahn 115 is a highway that connects from outside the city of berlin (Berliner Ring) to the city center (Berliner Stadtring).

B2 Bundesstrasse, runs almost 950 km from the Austrian- to the Polish border and is the longest federal highway in Germany.

PUBLIC TRANSPORT

Multiple mobility nodes come together near the site at the Westkreuz and Grunewald station such as the S-bahn and U-bahn.



NEARBY KNOWLEDGE

HOSPITALS

Multiple hospitals are within a 10-minute drive from the location. One of the hospitals is DRK Kliniken Berlin, which is an necessary client. Vivantes Klinikum is yet another necessary client. The Vivantes Augeste Viktoria Klinikum is only a short 13-minute drive away.

IVF CLINICS

Two of Berlin's 13 reproductive facilities are within a 15-minute drive.

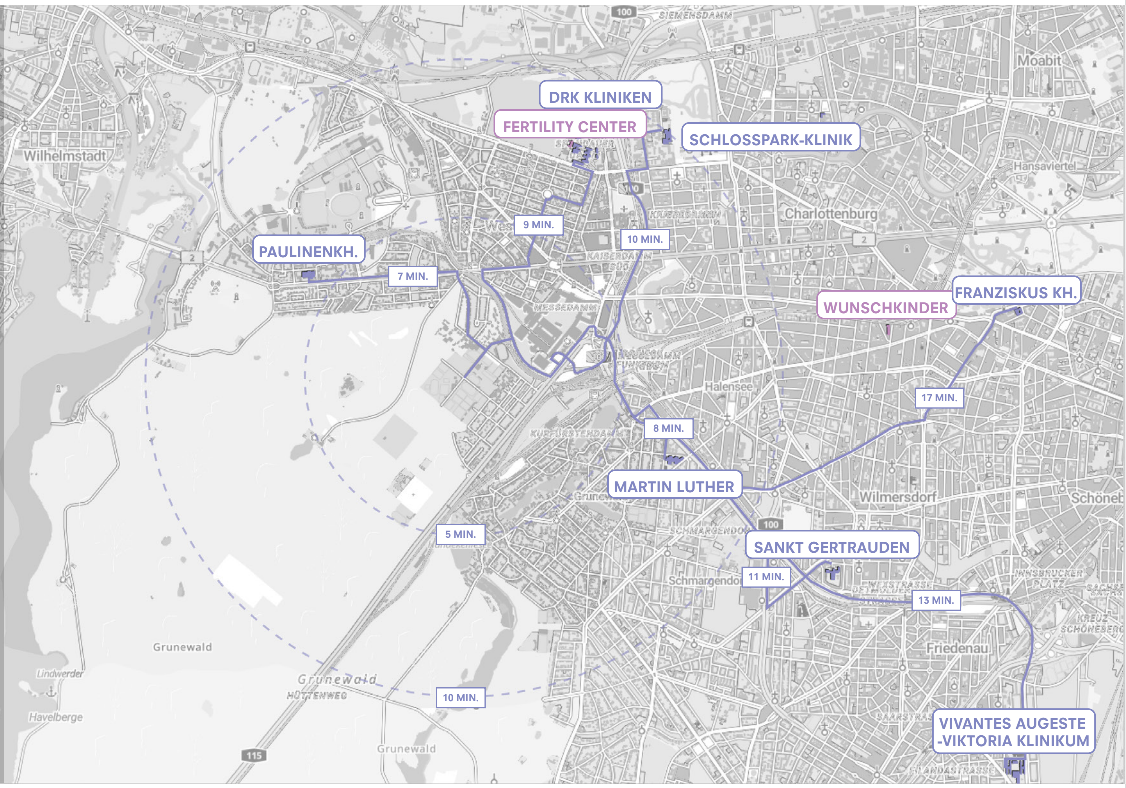
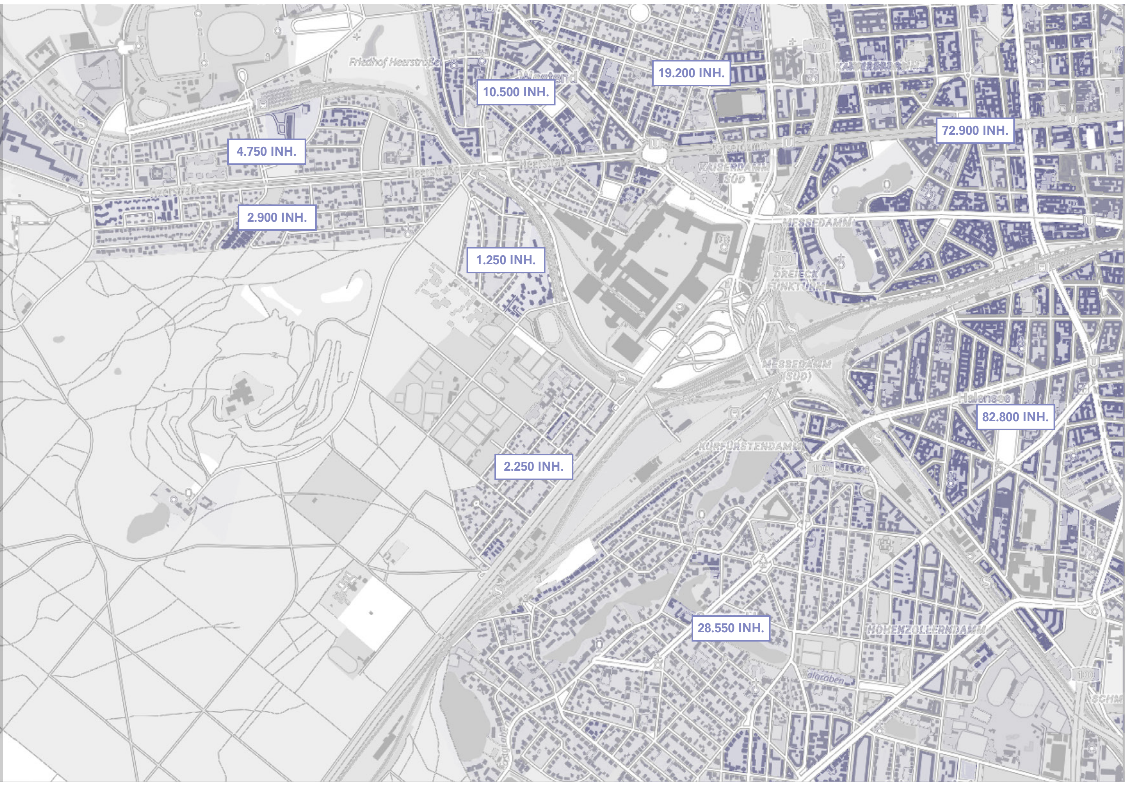


Figure 17 & 18: Main traffic flows & nearby knowledge, illustrated by author

SURROUNDING NEIGHBOURHOODS

THE SITE

The location is situated in the Siedlung Eichkamp neighbourhood which has roughly 3.500 residents and is a quiet suburb in comparison to its neighbours Halensee approx. 28.550 residents, Pichelsberg approx. 7.650 residents, and the city center, >150.000 residents.



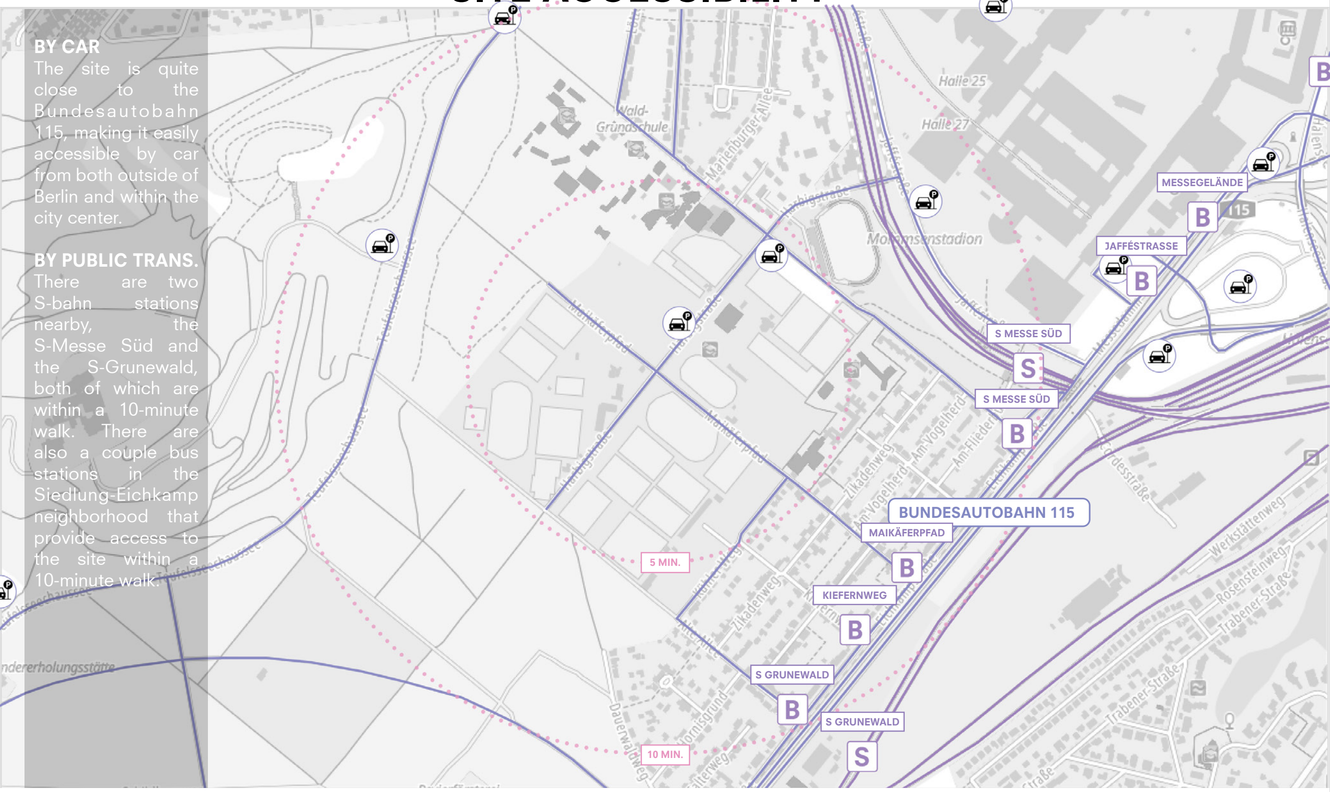
BUSY AREAS

BUYS AREAS

When it comes to areas that people visit frequent, the city center is much busier than the districts outside of the Berliner Stadtring. It is similar to the Bundesautobahn 115 in that it serves as a boundary between highly crowded and quiet places. Some busier clusters appear outside of the city center, such as the Theodor-Heuss-Platz (U-bahn station) and the S-Grunewald station. However, the site itself doesn't seem to be constantly active.

Figure 19 & 20: Surrounding Neighbourhoods & Busy Areas, illustrated by author

SITE ACCESSIBILITY



BUILDING HEIGHTS

Figure 21 & 22: Site Accessibility & Building Heights, illustrated by author

CURRENT SITE OCCUPATION

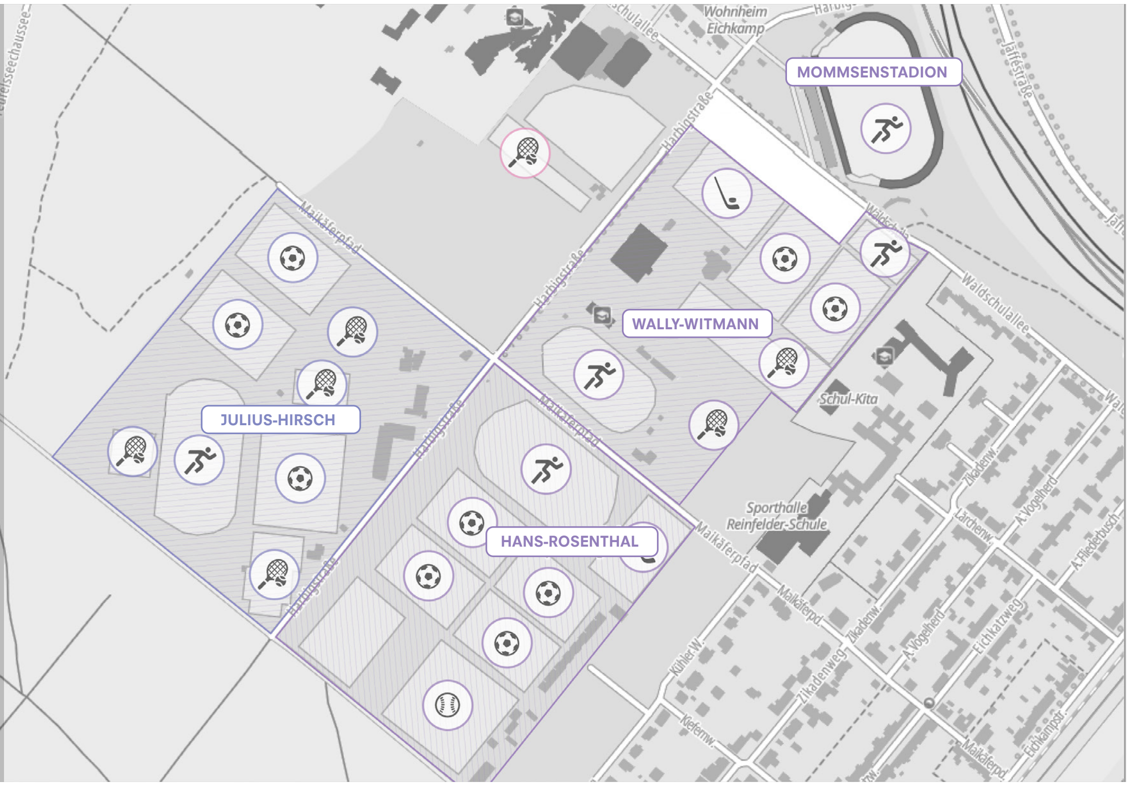
At the site are 3 sports facilities, all of which are owned by the state of Berlin and renamed in 2007.

JULIUS HIRSCH
Built in 1928/'29 as sportshall Eichkamp.
Approx.: 105.000 m²

HANS ROSENTHAL
Built in 1928/'29 as sportanlage kühlerweg by the Charlottenburg Building Authority.
Approx.: 97.000 m²

WALLY WITMANN
Built in 1930, to be renovated between 1950/'56 and expanded & modernized untill 1987. Includes the Mommsenstadion of 35.000 m².

Approx.: 88.000 m²



PROPOSED SITE

PROPOSED SITE
The existing site of the Julius Hirsch Sportanlage is considered as the most suitable location for the medical laboratory building. This site has two sides that border protected nature areas, and it is the farthest away from the neighbourhood. Furthermore, the Julius Hirsch Sportanlage is the least used of the three sportanlagen on the location. In terms of site measures, it provides the largest area for a medical laboratory.

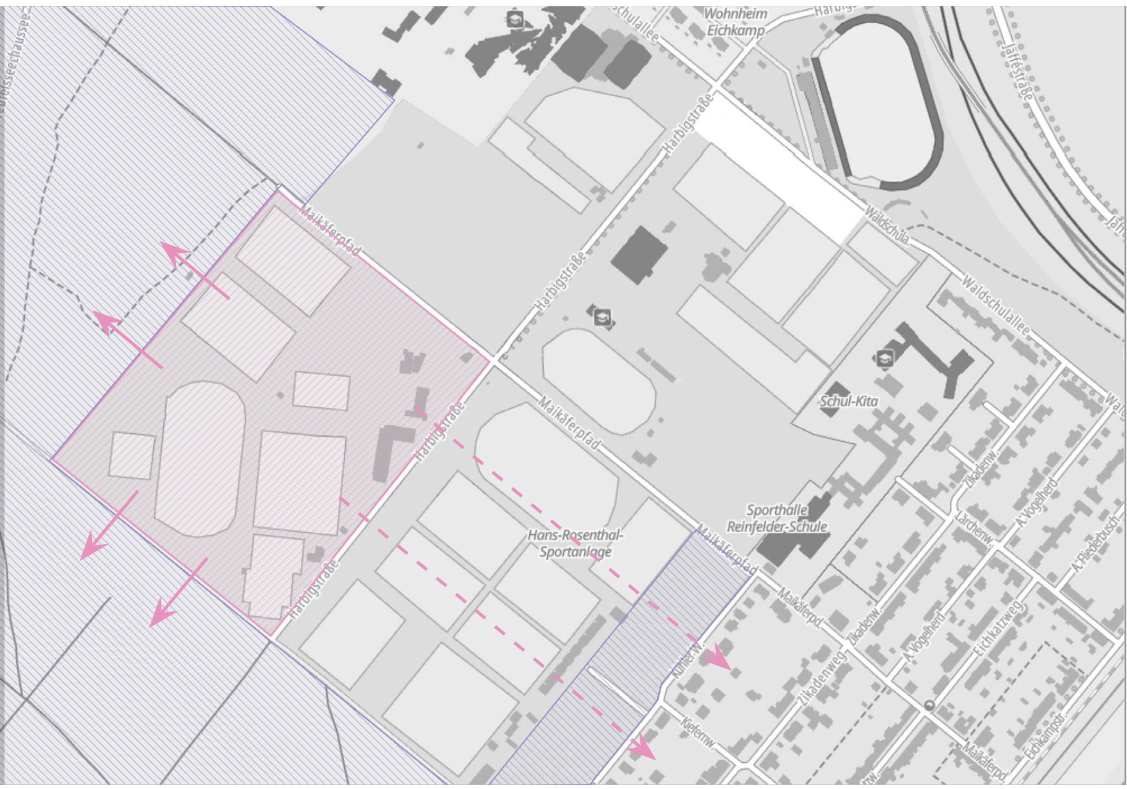


Figure 23 & 24: Current Site Occupation & Proposed Site, illustrated by author

4.3 PROGRAM

4.3.1 BENCHMARKING

HOSPITAL

Four hospital models were developed to serve as a benchmark for the medical laboratory's hospital part. The Vivantes Klinikum, New North Zealand Hospital, Brain Hospital, and Organ Factory were analyzed based on their context, program, and organisation. All hospitals, with site areas ranging from 50.225 m² to 310.500 m², had a similar GFA of 80.000 - 115.000 m². The number of beds ranged from 255 to 1.375, resulting in a wide variety of 64 m² to 314 m² per bed. According to interviews with Gortemaker Algra Feenstra and EGM Architecten, an ordinary hospital has 100 m² per bed, whereas an academic hospital has 135 m². The medical laboratory building should have a GFA of 80.00 - 100.000 m², with 135 m² per bed.

BBB Studio

BRAIN HOSPITAL

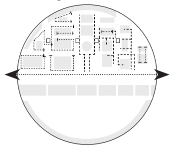
Sander Geluk, Sumeet Joshi, Edward Kooij, Martin Sitorus - Group Flows - Hospital

General information about the project
The Brain hospital, designed by Daria Khramova, is a hospital of 85.000 m² located in spreepark in Berlin. The hospital is based on a site of 164.000 m² which contains a grid, restricted by the roads and river surrounding the site. Inside of this grid is a circle with a diameter of 250 m, which contains the program of the hospital.

Site Area: 164.000 m² | Total GFA: 85.000 m² | Beds: 400

The Program
The program of the hospital is devided into 3 categories: hospital, research and leasure. These 3 categories are placed within the circle and have the following ratios: 42.500 m² hospital, 19.550 m² internal gardens, 13.600 m² psychiatry, 6.800 m² hotel and 2.550 m² research tower.

Organisation of the building
The organisation of the brain hospital is based on a grid with a ratio of 3:4. Different types of flows are organised within this grid. Not only the general circulation, but also the inpatient circulation and circulation of visitors.



BBB Studio

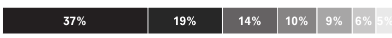
ORGAN FACTORY

Sander Geluk, Sumeet Joshi, Edward Kooij, Martin Sitorus - Group Flows - Hospital

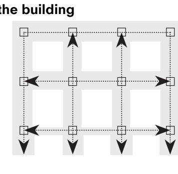
General information about the project
The Organ Factory, designed by Hana Marisa Mohar, is a combination between an airport city and a hospital. The project is 80.000 m² situated in the center of the Schiphol corridor. The hospital is designed to conducts transplant surgery, and distribute biomanufactured organs. The project's main focus is medical tourism.

Site Area: 50.225 m² | Total GFA: 80.000 m² | Beds: 255

The Program
The program is devided into 3 categories: biomanufacturing and distribution of organs, transplantation surgery and research and conference. Within the program this is translated into the following ratios: 29.600 m² hospital, 15.200 m² retail, 11.200 m² circulation, 8.000 m² laboratories, 7.200 m² hospital, 4.800 m² research offices and 4.000 m² administration.



Organisation of the building
The organisation of the Organ Factory is based on overlaying a grid over the plot. Within this grid, cores were made which were in turn connected to each other. The program was built around these connections.



BBB Studio

VIVANTES KLINIKUM NEUKÖLLN

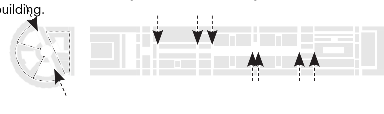
Sander Geluk, Sumeet Joshi, Edward Kooij, Martin Sitorus - Group Flows - Hospital

General information about the project
The Vivantes Klinikum Neukölln, originally designed by Reinhold Kiehl at the start of the 20th century, is one of the biggest municipal hospitals in Berlin. At first, the hospital started out with 450 hospital beds but, over the years, the hospital has significantly expanded to 1.200 hospital beds. The hospital is situated in a the Neukölln district, a vibrant and culturally diverse area of Berlin, which is home to a diverse mix of local and international communities.

Site Area: 55.500 m² | Total GFA: 88.050 m² | Beds: 1.375

The Program
The campus of Vivantes contains multiple hospital buildings. The building that was analyzed accommodated the Mutter-Kind-Zentrum, a children's hospital, which had the following functions: 40.500 m² circulation, 37.250 m² hospital, 7.400 m² retail and housing, 1.700 m² laboratories and 1.200 m² administration.

Organisation of the building
The organisation of the Vivantes Klinikum is based on a linear grid. Within this grid, rooms were made which follow this linear organisation. The later addition of the Mutter-Kind-Zentrum stands out due to it deviating from the linear logic of the rest of the building.



BBB Studio

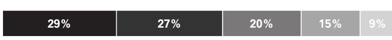
NEW NORTH ZEALAND HOSPITAL

Sander Geluk, Sumeet Joshi, Edward Kooij, Martin Sitorus - Group Flows - Hospital

General information about the project
The New North Zealand Hospital is a nature hospital, originally designed by Herzog & de Meuron architects, for a competition that was held between 2013-2014, and is planned for completion in 2025. The building is located in Hillerød, Denmark, and is designed to respond to the Danish landscape.

Site Area: 310.500 m² | Total GFA: 115.000 m² | Beds: 576

The Program
The hospital is devided into 4 floors and a basement layer. The upper two levels accommodate the bed wards, the first floor houses the outpatient clinics, and the ground floor contains the ICU, emergency, and surgery departments devided as follows: 40.000 m² outpatient clinics, 38.000 m² bed wards, 21.500 m² internal garden and 27.250 m² ICU, emergency & operation dep.



Organisation of the building
The organisation of the hospital is based on integrating the building into the context. The shape results in a large central garden with views of nature and the necessity for short internal connections. The orientation of the building is based on vertical-, horizontal- and diagonal symmetry.

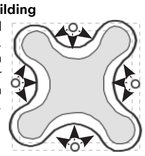


Figure 25: Analysis Hospital Models, illustrated by author

Brain Hospital

New North Zealand Hospital

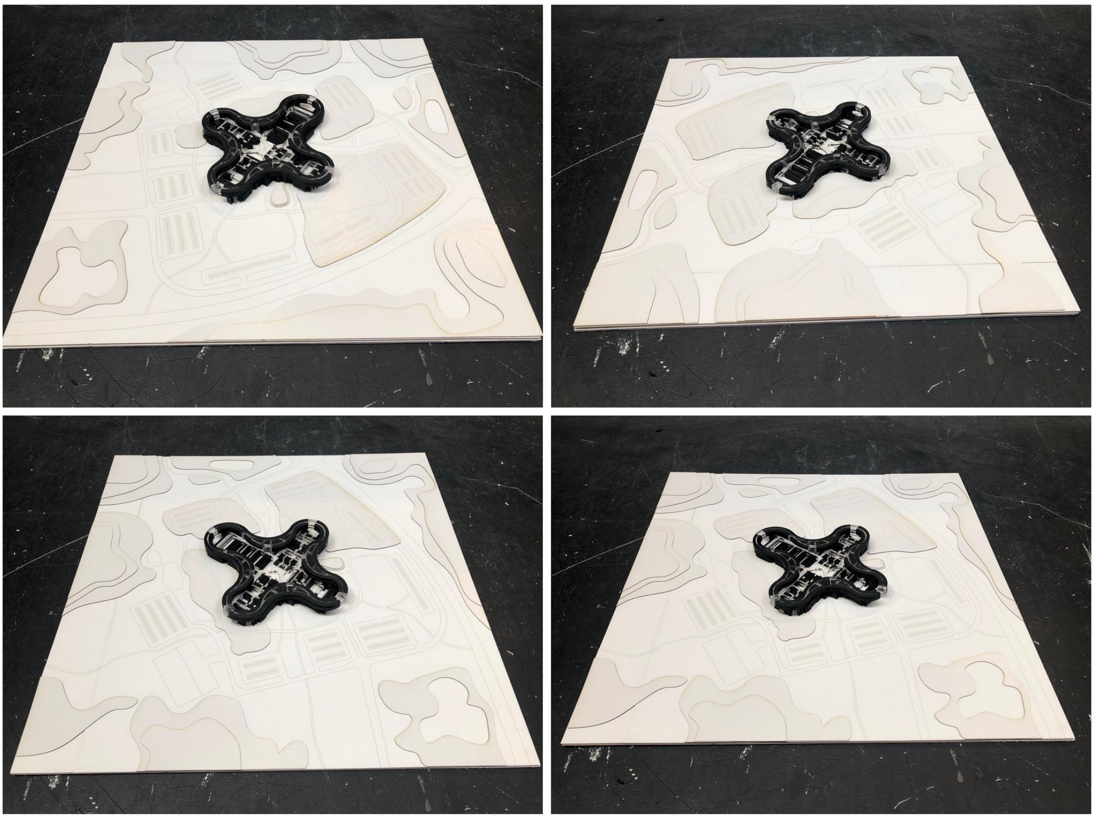
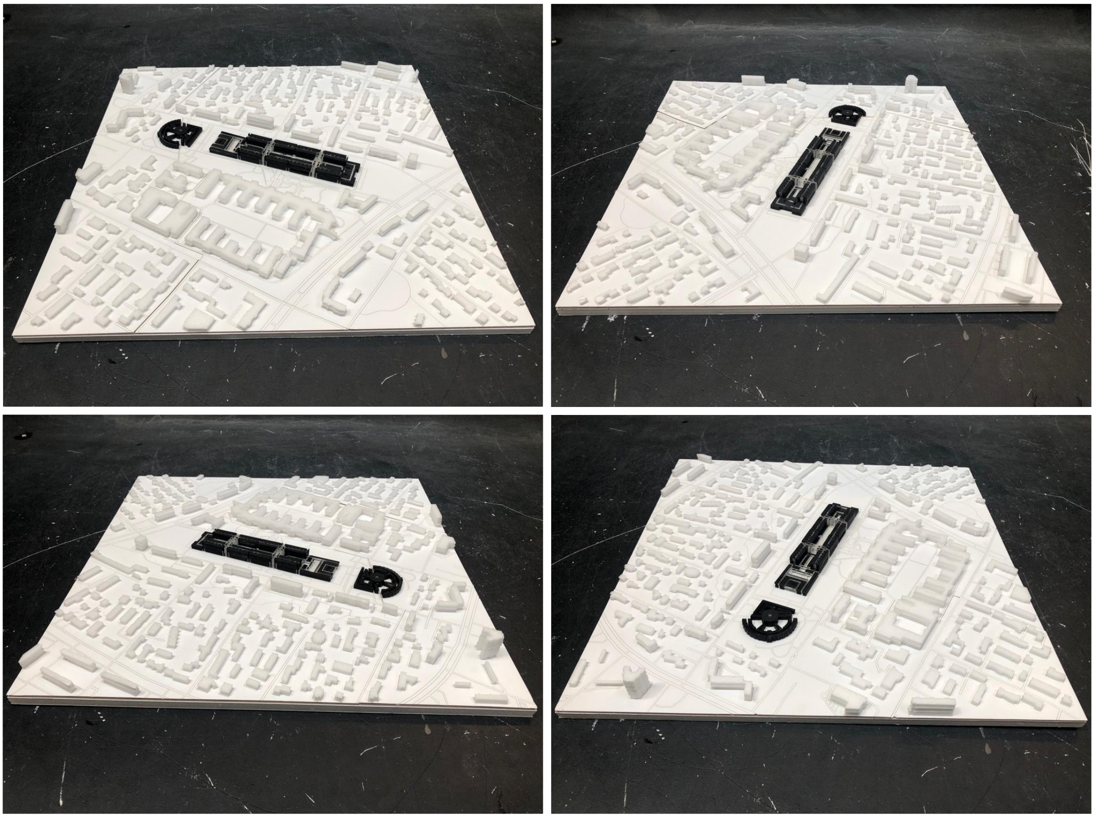


Figure 26 & 27: Brain Hospital & NNZH, illustrated by author

Vivantes Klinikum



Organ Factory

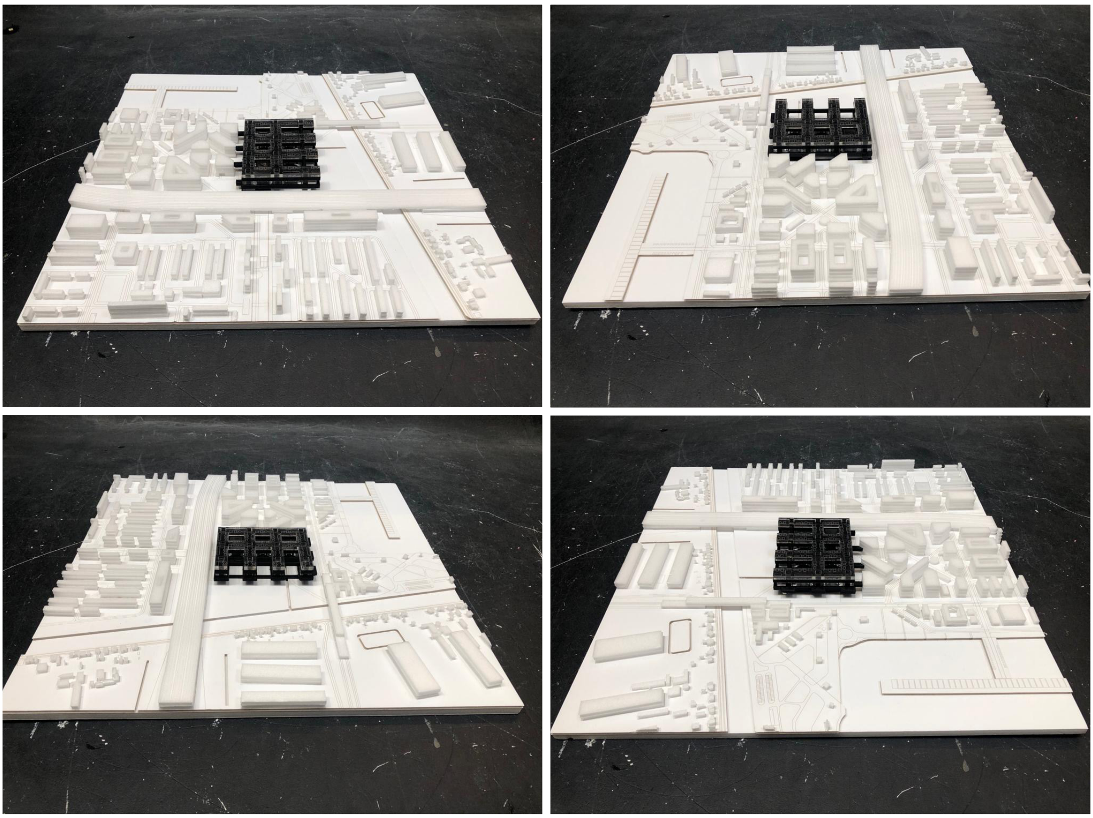


Figure 28 & 29: Vivantes Klinikum & Organ Factory, illustrated by author

LABORATORY

In addition to the models developed for the hospital section, eight laboratories were examined. These were six medical laboratories and two general laboratories. The laboratories were analyzed using a program divided into three sections: laboratory, research office, and rest. Finally, it was determined that the research facility portion of the medical laboratory should account for around half of the total building space. The research facility will include four laboratories of 8.000 m² each, as well as four research offices measuring 3.140 m² each, totaling 11.140 m².

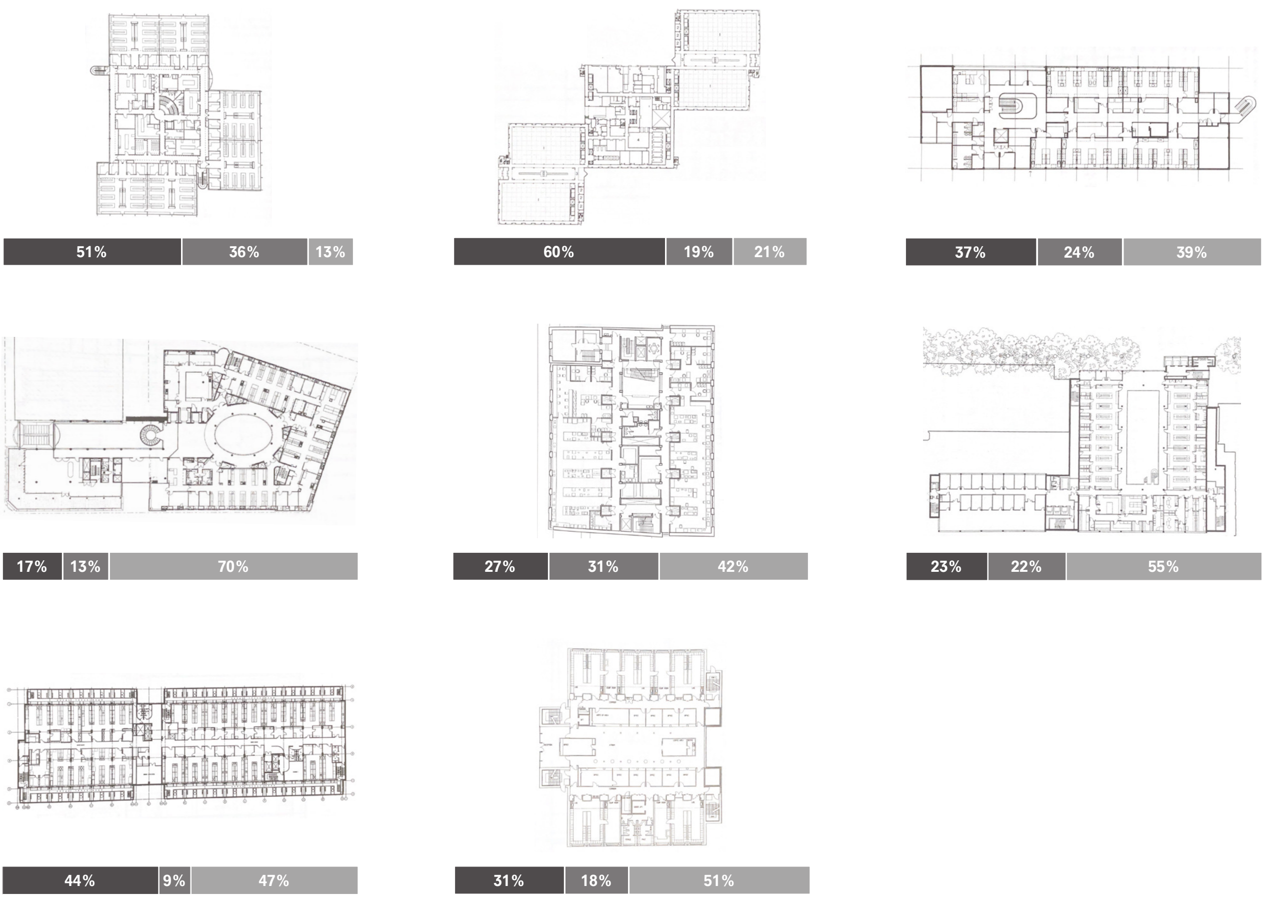


Figure 30: Laboratory Analysis, illustrated by author

KEY SPACES

The analysis of both the hospitals and laboratories not only provided the GFA for borth sections, it also provided some of the key spaces which are essential for the medical laboratory building. Some rooms were added based on the expected processes that will be required.

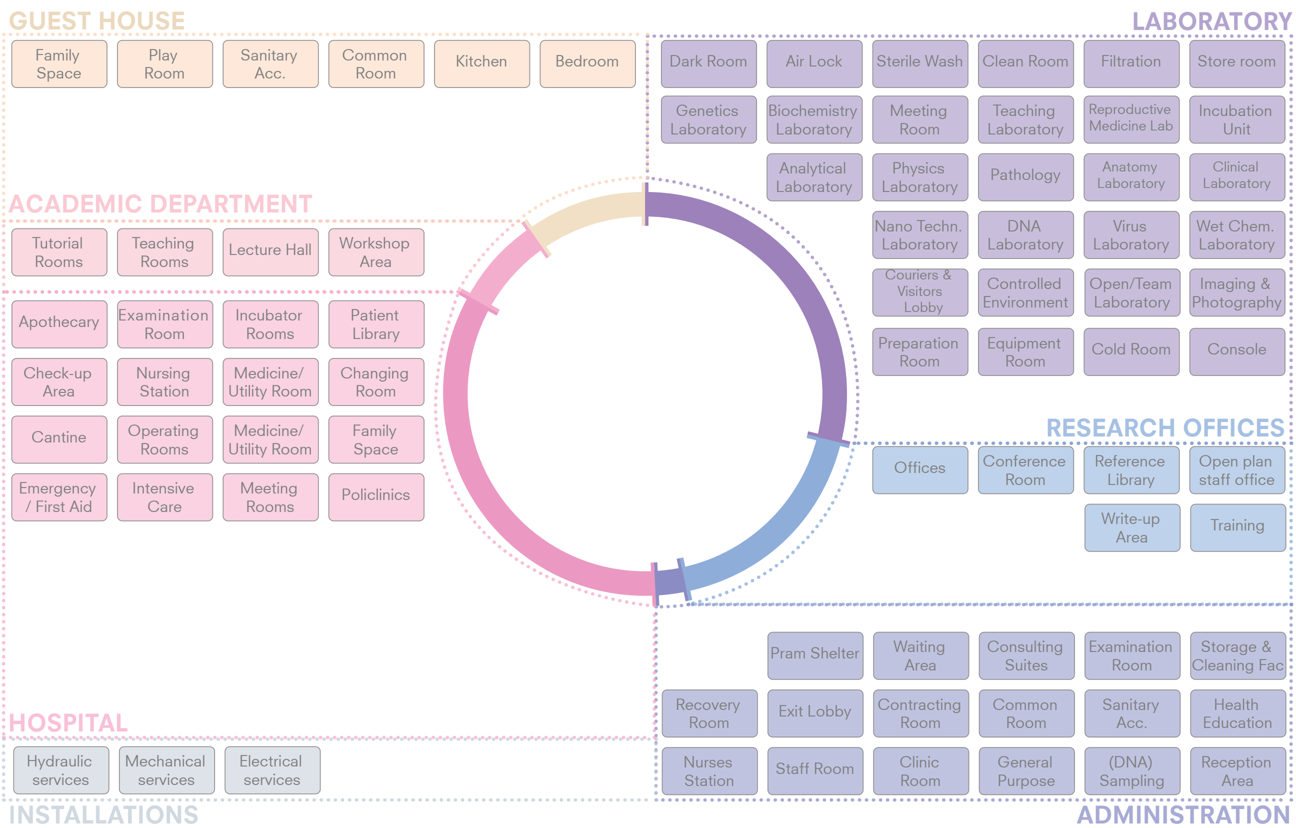


Figure 31: Key Spaces, illustrated by author

Figure 32: The contracting process (Image from the movie "The Pod Creation")

Figure 33: Family space to connect with the baby (Image from the movie "The Pod Creation")

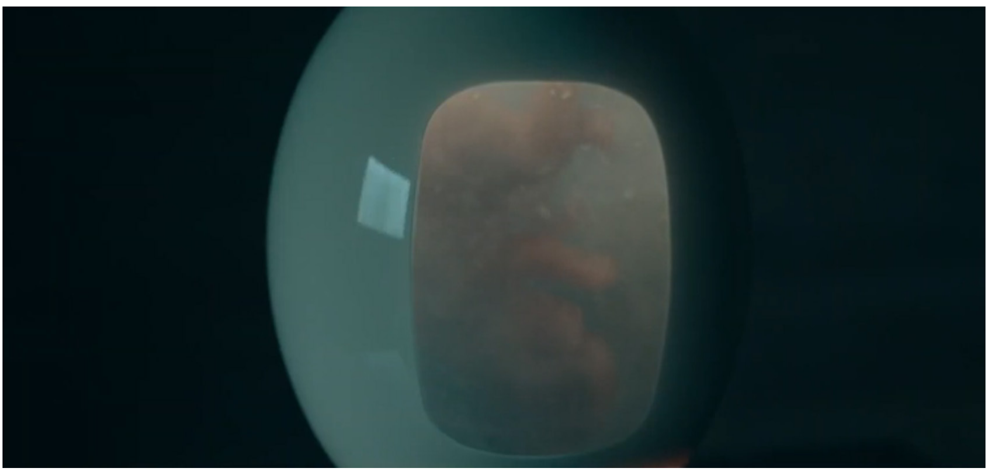


Figure 34: The artificial wombs, or pods, in which the baby grows (Image from the movie "The Pod Creation")

PROGRAM BAR - RESEARCH FACILITY

The information from the analysis of laboratories was put into the following program bar.

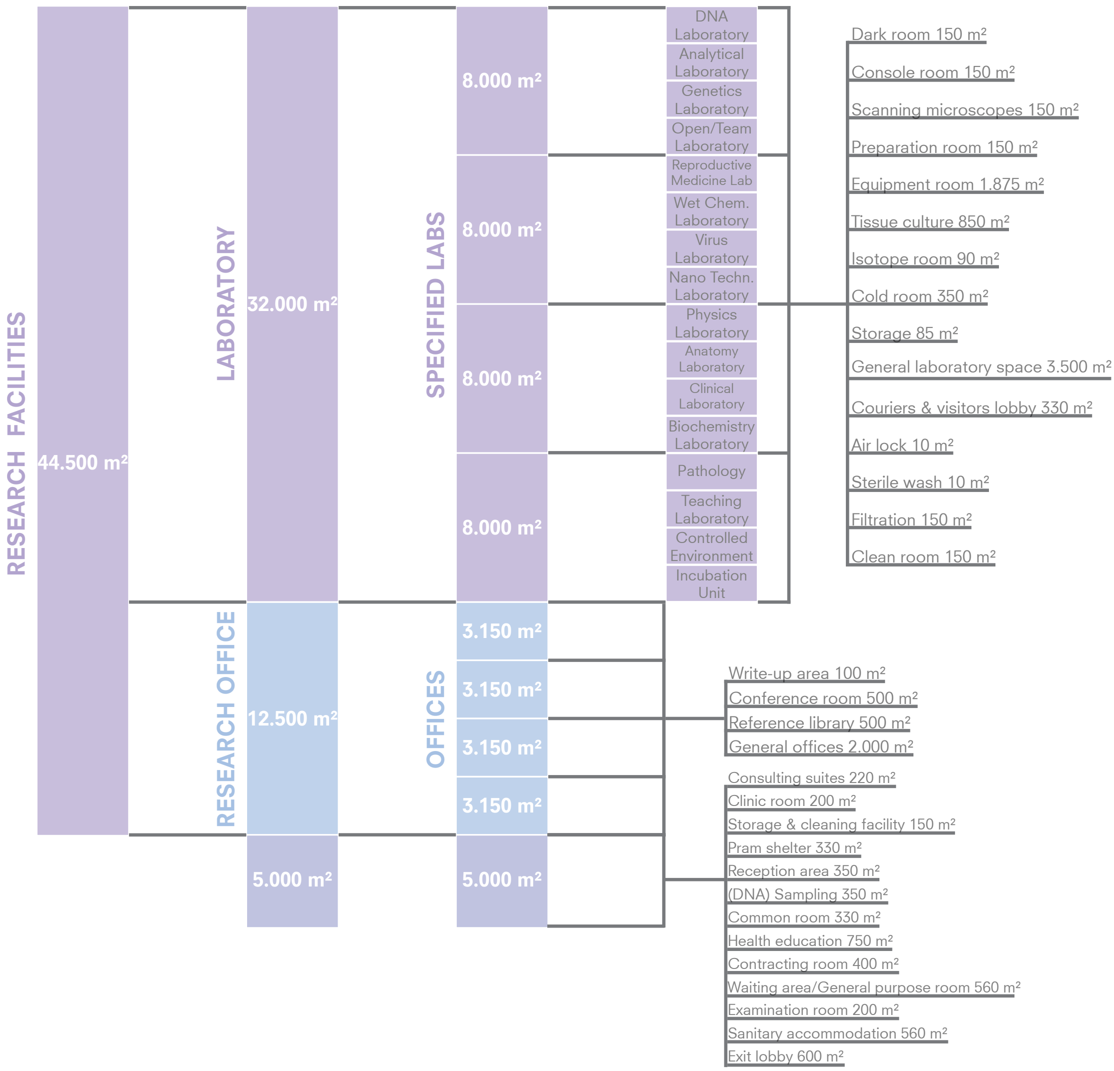


Figure 35: Program Bar - Research Facility, illustrated by author

PROGRAM BAR - MEDICAL FACILITY

The information from the analysis of the hospitals and was put into the following program bar.

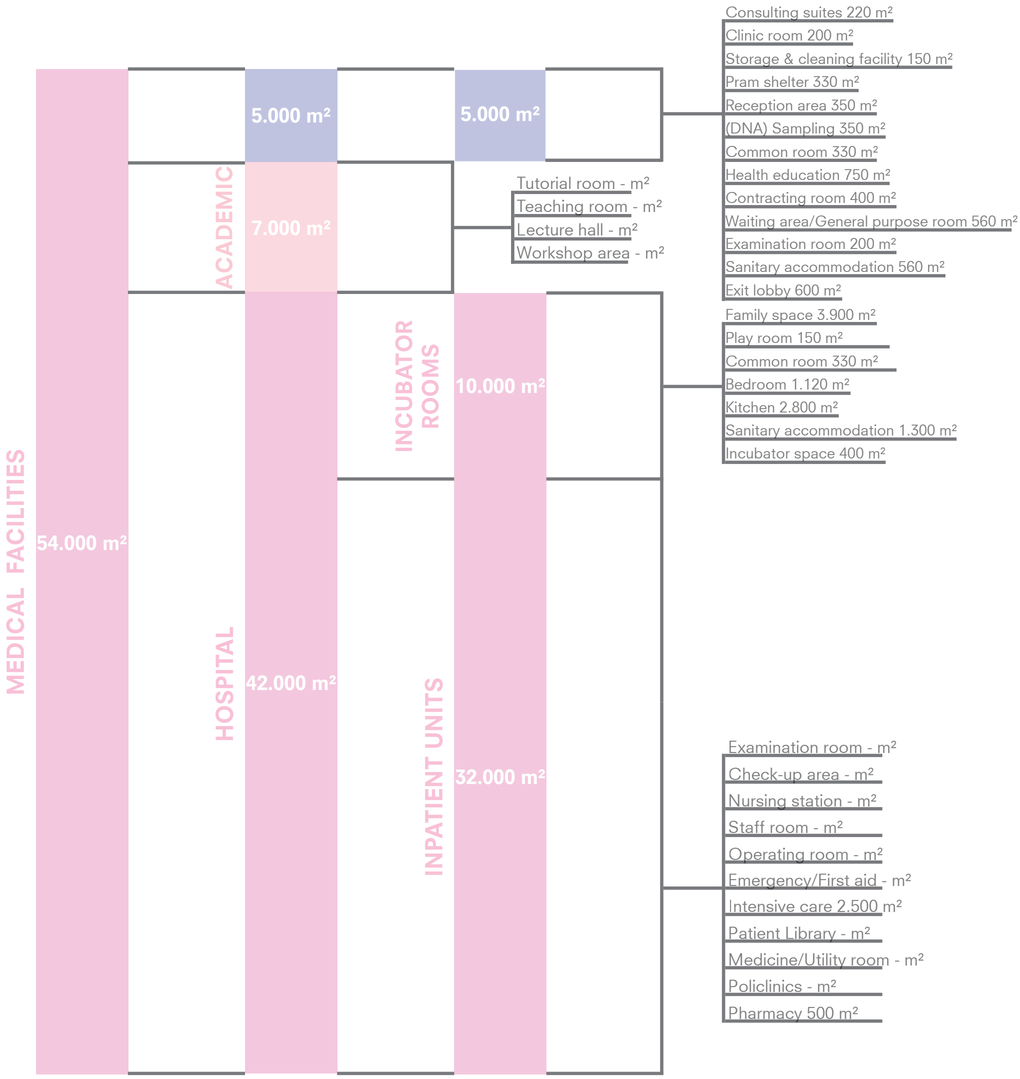
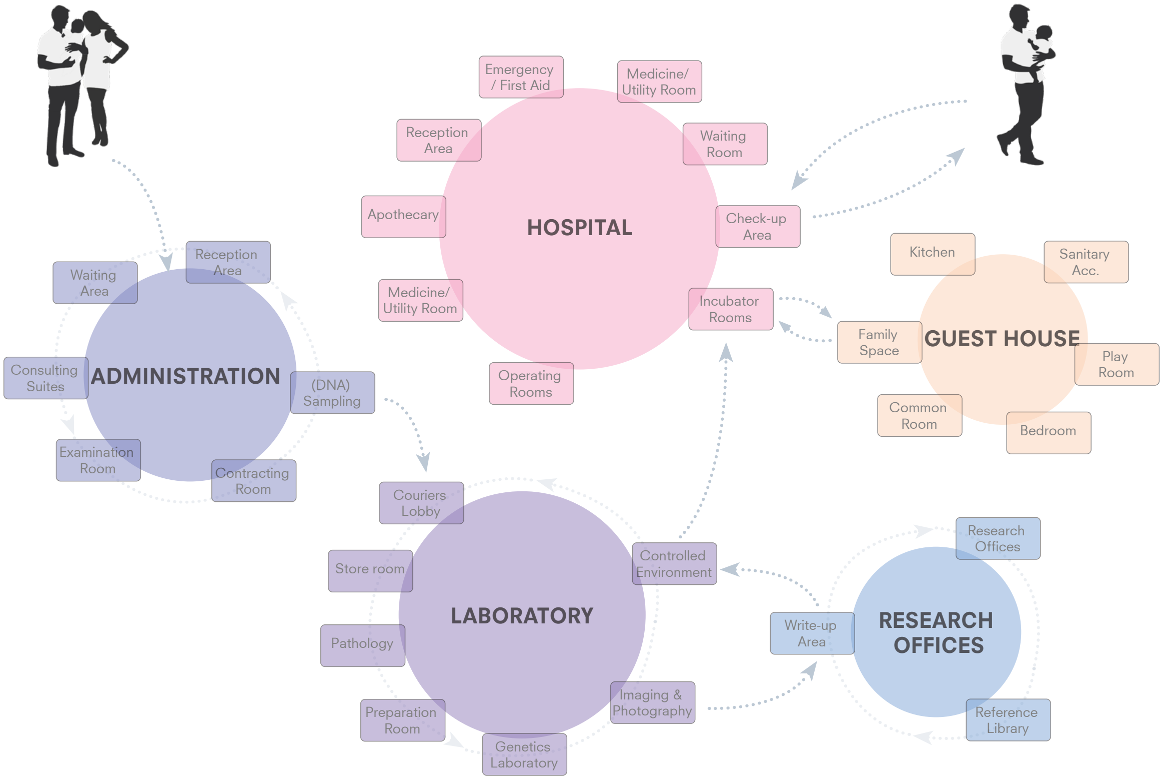


Figure 36: Program Bar - Medical Facility, illustrated by author




KAAN Architecten | Netherlands American Cemetery Visitor Center
Herzog & de Meuron | New North Zealand Hospital
H. van de Velde & W. Quist | Kroöller-Müller Museum
Atelier 5 | Siedlung Halen

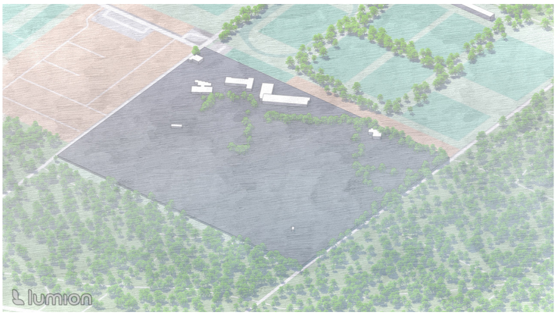
Figure 37 & 38: User Journey & Design Ambitions - Research Facility, illustrated by author

MASSING

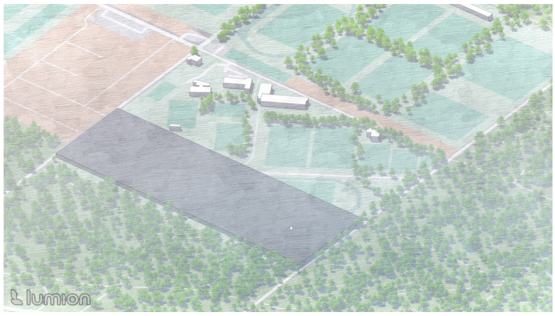
The information from the program bar was put into different masses onto the site. First looking into how much area it would require to build the whole medical laboratory in 1, 2 and 4 stories.

Afterwards different forms of massing were put onto the site trying to play with the concept of organisation. The definitive mass needs to be determined during MSC4.

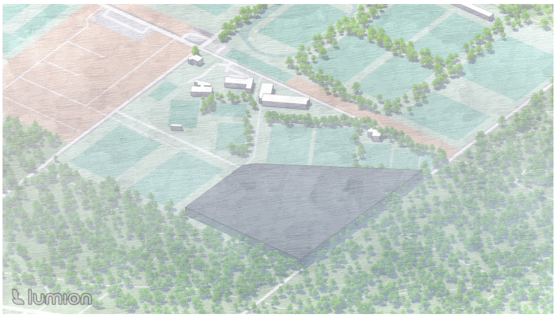
1 Story



2 Stories



4 Stories



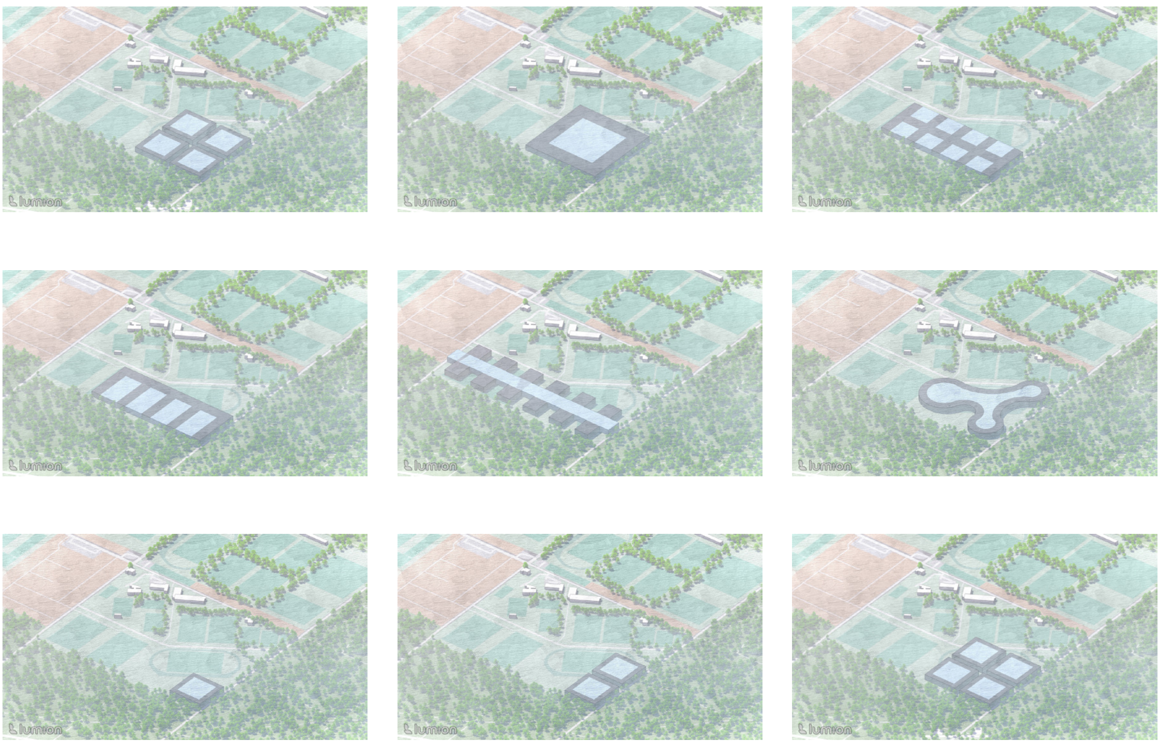


Figure 39 & 40: Fitting Mass & Massing study, illustrated by author

5.0 BIBLIOGRAPHY & FIGURES

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