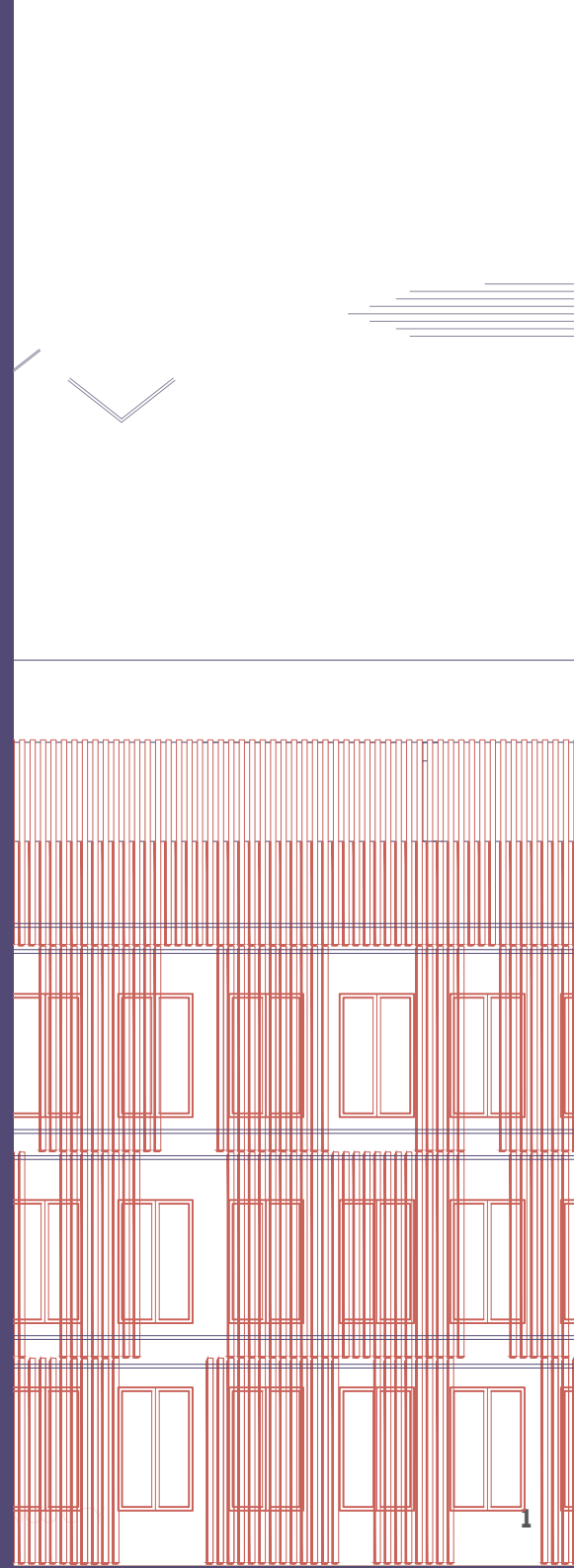


PEDAGOGY, ARCHITECTURE & DISABILITIES: REDESIGNING A SPECIAL NEEDS SCHOOL IN MEXICO CITY



Politecnico di Milano
MSc in Architecture and Urban Design
AA 2021-2022
Author: Tania Andrea Guerra Rodríguez
Supervisor: Prof.ssa Barbara Coppetti
Esame di Laurea - Sessione Dicembre 2022

INDEX

Acknowledgements	5		
Abstract	6		
Introduction	8		
1. Pedagogy, Architecture & Disabilities	9		
1.1 Montessori Pedagogy	10		
1.1.1 Montessori Architecture	11		
1.1.2 Case studies	12		
1.2 Steiner Pedagogy	15		
1.2.1 Steiner Architecture	16		
1.2.2 Case studies	17		
1.3 Reggio Emilia	20		
1.3.1 Reggio Emilia Architecture	21		
1.3.2 Case studies	22		
1.4 Disabilities/Architecture	25		
1.2.1 Disabilities - a definition	25		
1.2.2 Inclusion in architecture	26		
1.5 CTDUCA - A case study	30		
1.5.1 Services	32		
1.5.2 Mobility	34		
2. Context	37		
2.1 Mexico City	38		
2.1.1 Urban history	44		
2.1.3 Hydrography	46		
		2.2 Acacias neighbourhood	48
		2.2.1 History	48
		3. Redesigning a special needs school in Mexico City	53
		3.1 Project	54
		3.1.1 Masterplan	56
		3.1.2 Urban elevation	58
		3.1.3 Ground floor	60
		3.3.4 First floor	62
		3.3.5 Second floor	64
		3.3.6 Third floor	66
		3.3.7 Roof	68
		3.1.8 Sections	70
		3.1.9 Front Elevation	72
		3.1.10 Back Elevation	74
		Conclusion	76
		Bibliography	80
		List of figures	82
		List of drawings	84



This thesis is dedicated to my brother.
Thank you for teaching me about life and tolerance.
Thanks for inspiring us.

I would also like to thank my family, my husband and
Polimi friends for the support while doing this thesis.

Thanks to my supervisor, Prof. Coppetti for the numer-
ous tutoring and guiding.

ABSTRACT

This research aims to understand the influence of pedagogical methods in the design of schools, focusing on inclusive schools. The type of research will be a qualitative one through theoretical analysis. The final result is an architectural design project for a school for Down Syndrome students in Mexico City taking into consideration the design tools identified in the research. This project has a personal meaning for me as the school to be designed is my brother's current school.

To achieve this aim, we are going to deep dive into four pedagogical methods, their characteristics, and their origins. We will then study their influence and reinterpretation in school architecture around the world through case studies. After that, we will look at the identification of key characteristics from these methods that can help create a more inclusive school. Finally, we will apply the findings to the design of a real school.

Despite the advanced knowledge in materials, technology, and architectural theories, the school's design is still developing. At the moment, many schools are being built without real thought of the design and its effects on the users, being this a problem since school design is crucial in an adequate learning experience.

During the first half of the last century, more specifically during the war era, there was an enormous advance in the pedagogical field in European countries such as Austria and Italy mostly influenced by the emergence of educational psychology theories such as "constructivism". In this research, we are going to focus on three pedagogical methods born in that era, the followings: Montessori (Italy), Reggio Emilia (Italy,) and Waldorf (Germany). Although these methods have different approaches, they all rely on students' autonomy, the decentralization of authority, and a balanced and holistic worldview. Pedagogy is also highly influenced by its environment regardless of socioeconomic and sociocultural circumstances therefore a proper setting of spaces is key. This relation is not new and can be seen

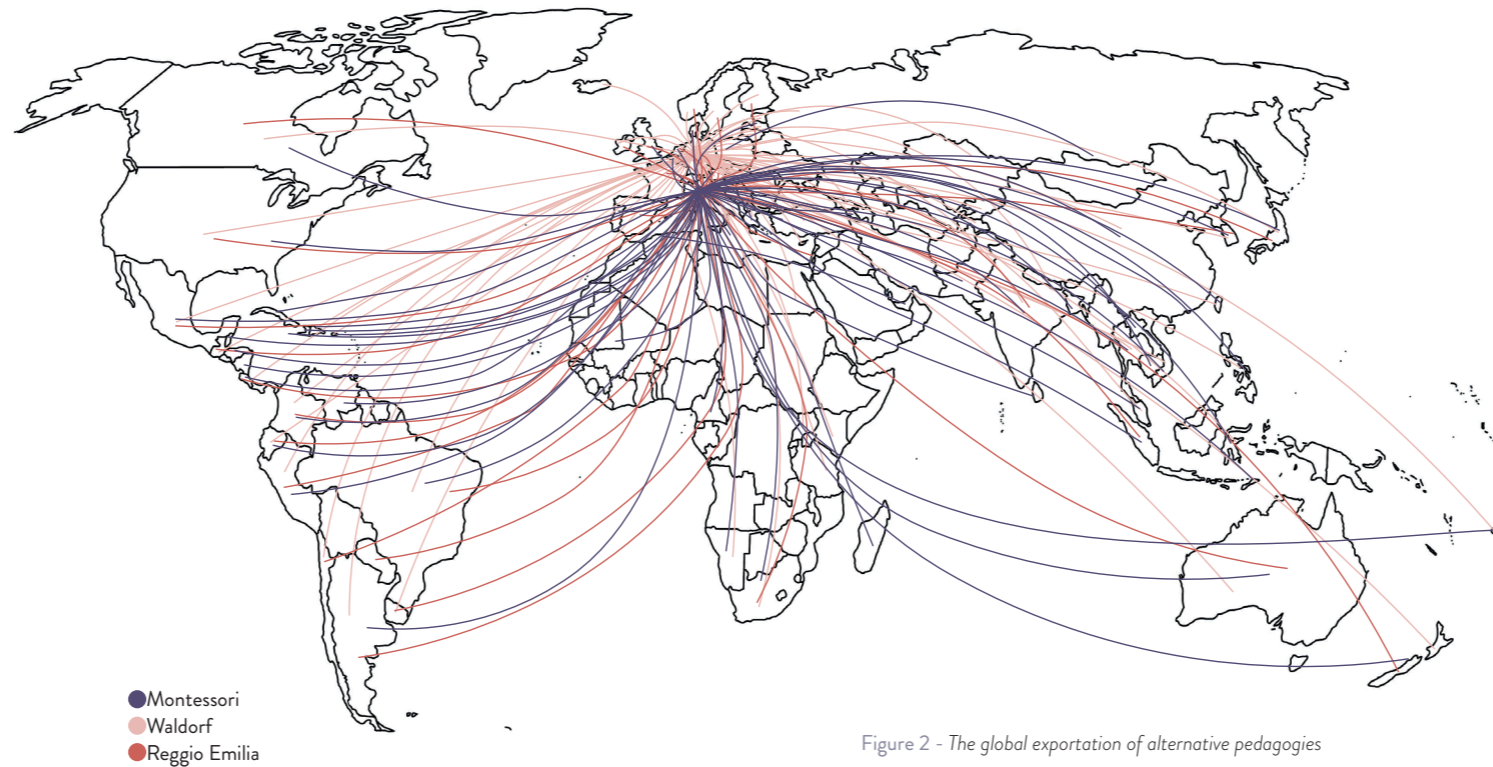


Figure 2 - The global exportation of alternative pedagogies

Keywords: pedagogy, school architecture, Mexico, disabilities, inclusion

with Henry Barnard who in 1849 wrote "School Architecture", one of the first school construction manuals which are taking into account pedagogical methods in the building of learning spaces. Throughout the years, specialized architecture manuals for schools such as the Montessori's one has been created and the design methods have migrated and been applied throughout the globe. Examples of this are Waldorf's "Family School" in Costa Rica by Arkitito Arquiteura, Oficina umauma & Luiza Gottschalk, the Reggio Emilia's "Tellus Nursery School" in Sweden by Tham & Videgård Arkitekter and the Montessori's "Delft Montessori School" by Herman Hertzberger in Holland.

The methods have been proven to work well especially in the developmental stages of kids, proving to be effective not only for the conventional student but also for the intellectually disabled ones. When it comes to inclusive education, is quite a new topic for society. In the past, having a disability meant being put in an asylum, psychiatric hospital, or institution with barely or no education. It is until the middle of the last century and with the emergence of human rights together with the development of the pedagogical methods above mentioned, that disabled people started to have a voice in the education system and therefore a place in the classroom. Inclusive education means integrating disabled students into all the events of a classroom through the exercising of their autonomy and a surrounding with an adequate level of stimuli (such as light or color). This can be achieved by the right application of the pedagogical methods in the design phase of the school. For example, the Montessori's accessible furniture or the Reggio Emilia's natural lighting.

In conclusion, thanks to the evolution of pedagogy and its application to architecture, we are and will witness the development of both, more inclusive schools and highly inclusive spaces in which students (disabled and non-disabled) can better coexist.

The analysis of pedagogy is fundamental to building more inclusive schools and through this research, we aim to better understand its methods to apply them to a real case study.

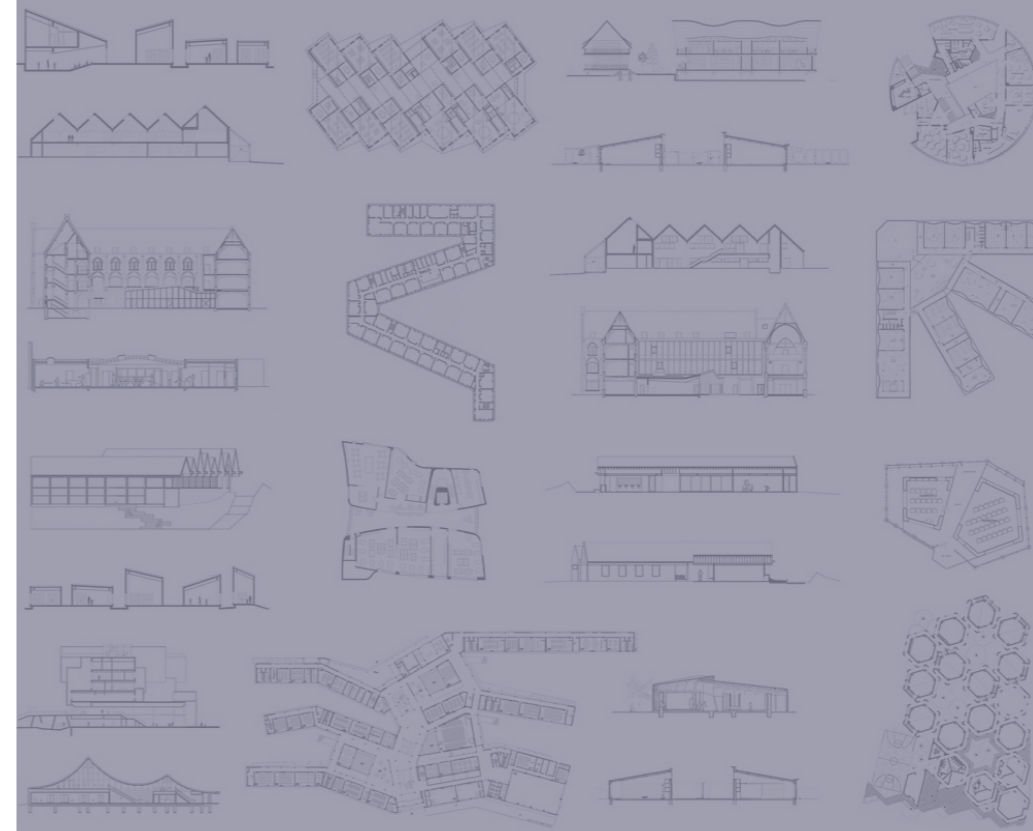


Figure 3 - Architecture of schools
Figure 4 - Inclusion in architecture

CHAPTER 1: PEDAGOGY, ARCHITECTURE & DISABILITY

1.1 MONTESSORI PEDAGOGY

Montessori pedagogy was developed at the beginning of the twentieth century by Maria Montessori, an Italian physician. The first Montessori school opened was the “Casa Dei Bambini” in Rome in 1907. It is estimated that currently, more than 20’000 Montessori schools exist in around 110 countries, making it the more widely spread alternative pedagogical method worldwide.

The Montessori method is children focused and it fosters self-motivated growth that involves all the areas of the kids’ development: cognitive, physical, social, and emotional.

The method is student-led and self-paced, yet guided and assessed by teachers, classmates, and the environment itself, allowing each student to have individualized learning goals and take the time needed to understand the different concepts to be learned. The main purpose of this method is to shape the students to think critically and work collaboratively and with integrity to grow confident and with self-direction. The students learn through the repetition of activities to become better over time (always at their own pace).

Students are divided into work groups of different ages with a maximum of three years of difference to allow socialization with different learning paces. Socialization is key in this method, especially at higher school grades as the focus moves to the understanding of society and of the external world, while during the early years we find a more self-care focus.



Figure 5 - Maria Montessori

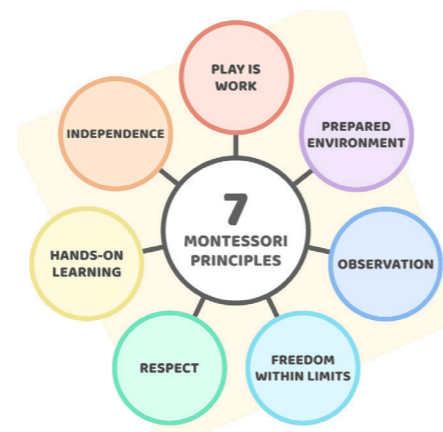


Figure 6 - Montessori principles

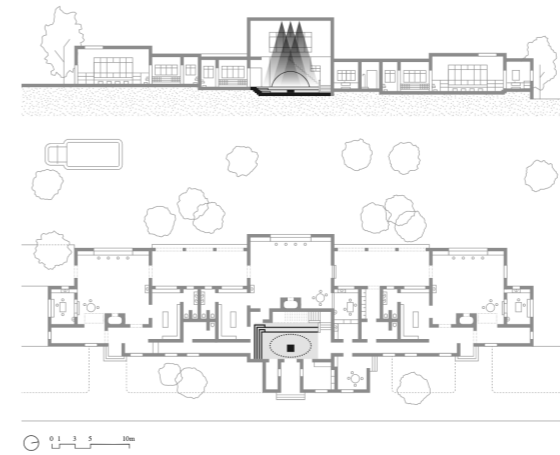


Figure 7 - Montessori guidelines - Everyday gathering spaces inside and outside

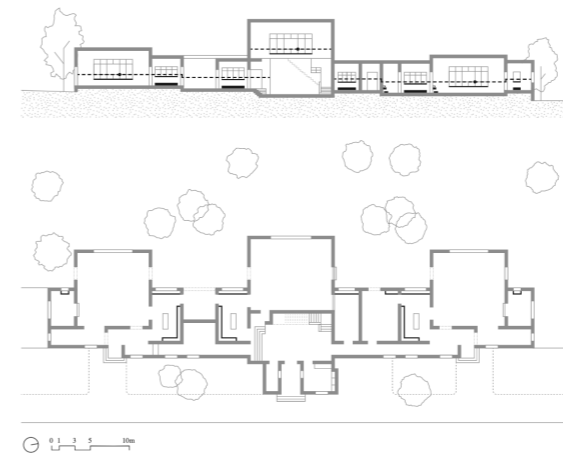


Figure 8 - Montessori guidelines - Accessibility for children of different ages

1.1.1 Montessori Architecture

In a Montessori classroom, children work independently in small groups while respecting each other and their surroundings. Specifically designed learning elements and materials are also essential to the learning methodology. Each classroom is designed to create independence, citizenship and accountability opportunities for all students through multisensory learning.

Since freedom is encouraged, kids are at a higher risk of hurting themselves so attention to safety is very important. At the same time, accessibility and ergonomics should be considered when designing and furnishing the spaces to make them friendly to the multiple needs of diverse students. Accessibility is also a part of making the students independent as it lowers the need for an adult when using furniture such as hangers.

Sensorial experiences are part of this pedagogy, and these should be achieved through the right application and mix of textures, colors, and light.

It is encouraged to use moving walls to have a multiplicity of spatial options and transparent elements such as interior windows to allow communication and hearten curiosity.

1.1.2 Case studies

APOLLO SCHOOL

ARCHITECT(S): Herman Hertzberger

LOCATION: Amsterdam, Netherlands

YEAR: 1980

The school complex was designed by Herman Hertzberger in 1980 in the Apollolaan wooded area of Amsterdam, Netherlands. Hertzberger studied in a Montessori school, influencing his whole career and perspective of spaces. Both schools have an identical spatial organization: a square, in the four corners of which there are classrooms grouped around a central hall. The identity of each school is given by the variation in the detailing and through the positioning of the windows.

The schools do not have a pronounced front or back façade since all of the facades are treated in the same way. One of the rules of the architect is that it's not necessary to specify the functions of everything, inviting children to explore and use the elements as pleased. An example of this is the interior walls which contain niches that can work as sitting elements or study tables.

By placing all the classrooms in the perimeter of the building an atrium is created, illuminated by a skylight placed in the center. This atrium works as a substitute for corridors. Stairs were placed in this central space working as an auditorium but also as a place in which children can work and play individually or together.

The materials were also carefully thought of. The interiors are left in their raw situation to give the students freedom to “personalize” their space according to their needs and likes. The central atrium stairs were originally suggested in marble, but Hertzberger decided that it would have been too cold and not inviting, therefore wood was chosen.

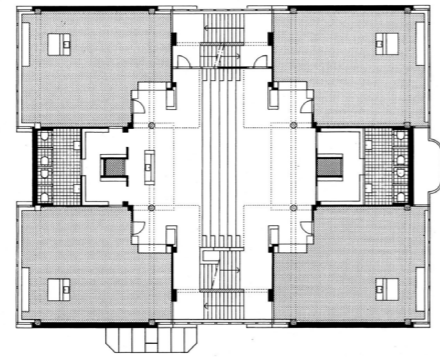


Figure 9 - Apollo Schools - first floor

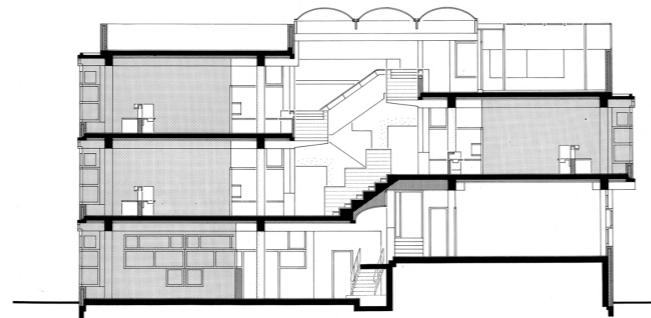


Figure 10 - Apollo Schools - Section

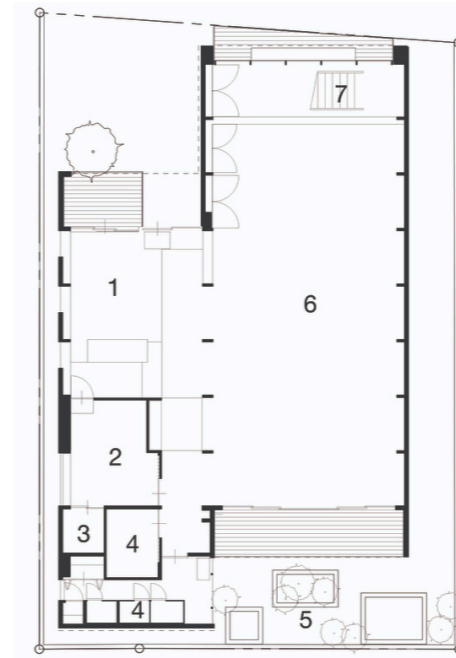


Figure 11 - AKN Nursery - first floor

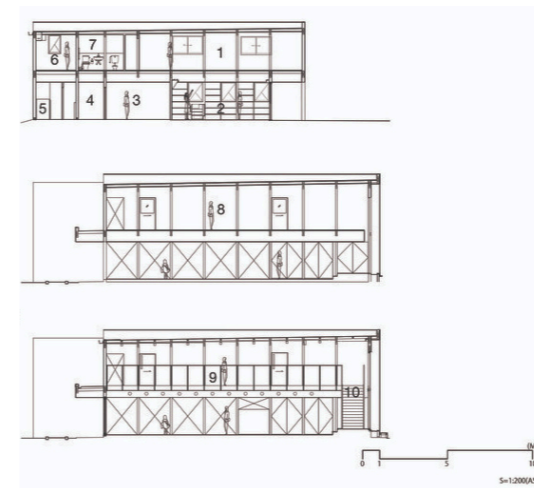


Figure 12 - AKN Nursery - sections

AKN NURSERY

ARCHITECT(S): Eduard Balcells,
Ignasi Riu Architecture,

Tigges Architekt

LOCATION: Akiruno, Japan

YEAR: 2020

Designed in 2020 by Japanese firm Hibinosekkei in collaboration with Youji no Shiro, the complex main concept is the “Forest House”. The name comes from the importance of forests in the area (Akiruno, Japan) and the concept aims to create a better relationship between the child and nature.

The school consists of two squared-shaped buildings and it has two functions: a training center for Montessori education and a playing hall for children of the nursery next to the school. Recalling the forest idea, the interiors consist of local wood elements such as furniture, walls, and floorings, which stimulates both children's and adults' sensitivity. The structure also consists of wooden beams and pillars placed regularly left seen and popping out of the walls, which also work as hiding places or marks to measure length and width. Furniture sizes are made for both adults and children to make them feel comfortable and belong.

Texture plays also an important role in the interiors, hence the treatment of wood varies. For example, in the walls and ceilings, no coating was applied for locals to be able to touch and understand the wood's aging and texture.

1.1.2 Case studies

COMPARISON

In both cases, the functions were not only that of a Montessori school, which makes them more challenging designs, yet they have shown that the design for a Montessori school works for any type of institution despite it belonging to the Montessori philosophy or not. Even though they were built with nearly 40 years of difference and on different continents, the quality of spaces is similar, and the objectives are the same, always taking into consideration the local traditions and cultural needs.

After the comparison, some design features and conclusions for the design of Montessori schools were gathered:

- Articulated spaces are better than regular classrooms to allow students to freely explore and move around
- Spaces between classrooms such as corridors should have a function more than that of connecting spaces. These spaces can become social or study areas
- Materials used should be natural or raw, since it helps connect the student with nature and allows personalization of the spaces, therefore a sense of belonging
- Classrooms should have different types of working materials and elements that can be adapted to the different ages and needs of the students
- Elements such as furniture should adapt to the student and not the other way around. Students should feel comfortable and confident enough in their learning spaces, which would consecutively make easier the exploring, learning, and playing that they are meant to do with the Montessori philosophy.



Figure 13 - Apollo schools - Central atrium



Figure 14 - AKN Nursery - Main hall

1.2 STEINER PEDAGOGY

The Steiner or Waldorf education could be traced back to 1919 when Rudolf Steiner started training teachers for the first Steiner institution. It is estimated that there are currently more than one thousand Steiner schools in 64 countries around the world.

Steiner education is based on the spirituality and individuality of the student, also taking into consideration the cultural and local aspects of the place in which it is taught, making it a universal pedagogy. It is based on Steiner's anthroposophy theories in which he takes the evolutionary theories not as merely biological but also spiritual. The discovery of one's purpose and professional path should come without the influence of parental pressure. Nevertheless, learning through observation is part of this approach, from cooking to manual activities.

The student life is divided into three phases of seven years each: 0-7 (basic needs and self-expression), 7-14 (creativity development), and 14-21 (self-discovery and self-judgment).

The care of one's surroundings is another characteristic of this pedagogy, which focused on nature and the environment.

Creativity is also important in the Steiner pedagogy. For this reason, the method not only focuses on science-based topics but also on a wide variety of artistic and manual subjects and activities.



Figure 15 - Rudolf Steiner



Figure 16 - Students practicing self-expression through performance

1.1.1 Steiner Architecture

In Steiner's education, "freedom" is considered one of the main pillars, hence the importance of flexible spaces. Non-fixed furniture and movable walls are suggested as a way to make a space flexible enough for students to engage in multiple activities.

Color is also considered an important element in Steiner schools, with vivid colors more helpful for younger kids while cold colors are better for the eldest as they can help them focus.

When it comes to shape, it is encouraged the use of organic shapes, such as the trapezoidal form for the floor-plans, as Steiner himself would consider that sharp common shapes would intrinsically work as direction givers for students, taking away the freedom that education should have. Classroom and school shapes should grow and evolve together with the student; organic shapes should be used for younger children and shapes and angles must become sharper as the students become older, which helps them also with their conception of forms and aesthetics.

Lastly, as it happens also in Montessori architecture, natural light is another important element considered for a healthy educative space as it is deeply connected with nature.

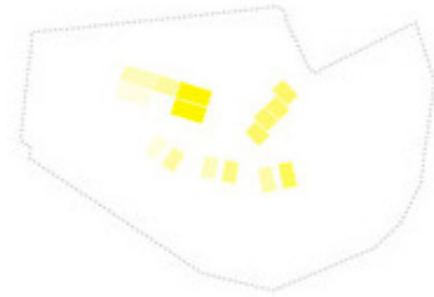


Figure 17 - Apollo Schools - first floor



Figure 18 - Apollo Schools - Section

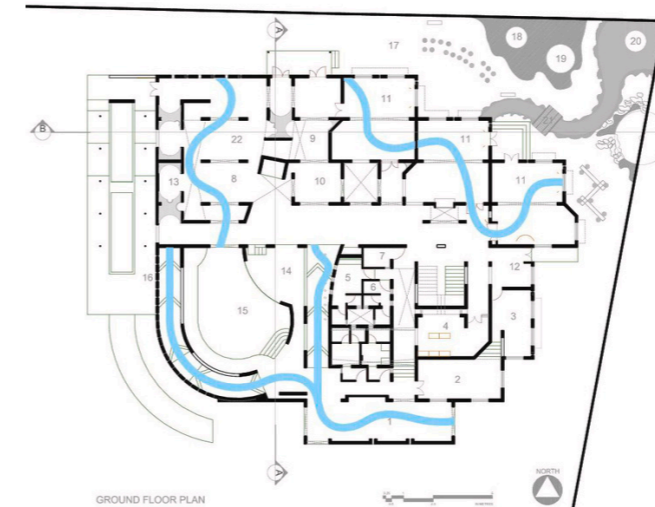


Figure 19 - Yellow Train School - ground floor

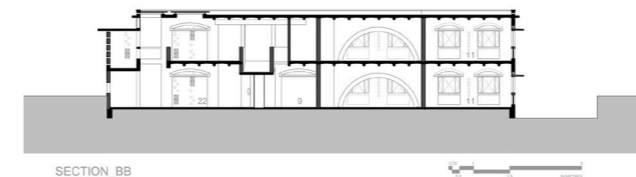
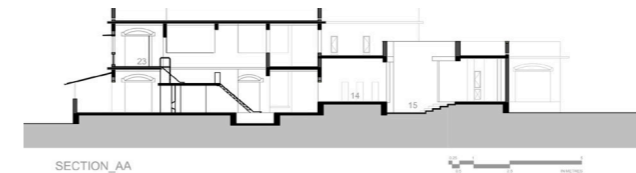


Figure 20 - Yellow Train School - sections + elevation

1.2.2 Case studies

YELLOW TRAIN SCHOOL

ARCHITECT(S): Biome Environmental Solutions

LOCATION: Belaterra, Spain

YEAR: 2018

This school was built in 2013 in the city of Coimbatore, India. The idea behind it was to create a Steiner school while respecting the local educational system, therefore it counts with standard classrooms but elements and areas that recall the Steiner approach.

Play areas and an interior open-air theatre are found inside the building to allow playtime even during the warmest days. A ramp goes throughout the building, making it accessible for everyone.

Sustainability is also a big theme in this school which is seen in the roof water recollection system. The whole school is placed 1.5 meters under the street level for it to avoid heat accumulation and to create a bigger shadow in the surrounding open-air playground. The material excavated for the construction of it was used as construction materials for the buildings.

The complete school is naturally lit and passively ventilated through the windows and openings placed around the building with shading and filtering in some of them for strong light points. The windows also serve as contemplation points for the students and openings such as niches or cave-like spaces are used as creativity zones.

ESCUELA EL TIL-LER

ARCHITECT(S): Eduard Balcells,
Ignasi Riu Architecture,
Tigges Architekt

LOCATION: Belaterra, Spain

YEAR: 2018

This school in Bellaterra, Spain, built-in 2018 consists of six buildings placed into an abandoned garden, from which five are modular buildings transferred from a past location, and one was built and used as a common space and kindergarten.

Spanish architectural concepts are used in the spatial organization, such as the Rambla concept which is used as a welcoming road into the courtyard in front of the building hosting the classrooms creating a more subtle transition between spaces.

The sixth building has a free plan on the ground floor working as a multi-purpose zone, while the classrooms on the first floor are organized and designed according to the different needs and are placed according to different light and external views depending on the life-chapter the students are in.

Both the modular buildings and the new building are placed according to the local topography and characteristics making it more comfortable also for the user in terms such as the natural lighting which is achieved through the multiple windows surrounding the buildings and controlled through blinds, Venetian blinds in the case of the new building. Windows have also a sitting and storage function.

The structure is made of concrete with a thermos wood pre-fabricated panels façade and a ventilated air chamber between the panels and Venetian blinds. Thanks to this mix of materials and ventilation systems, climate comfort is created throughout the year.

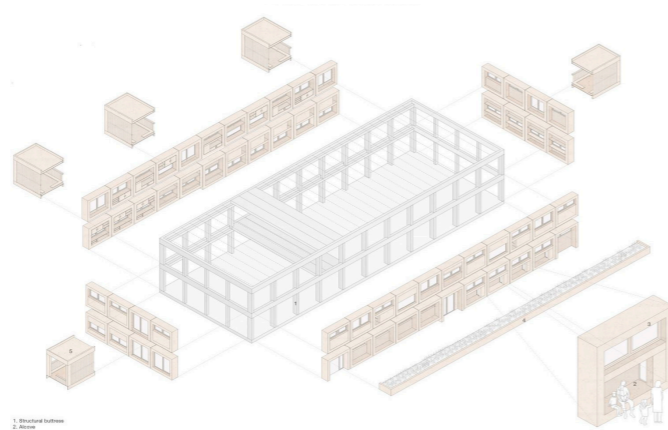


Figure 21 - Escuela El Til-ler - exploded axonometric

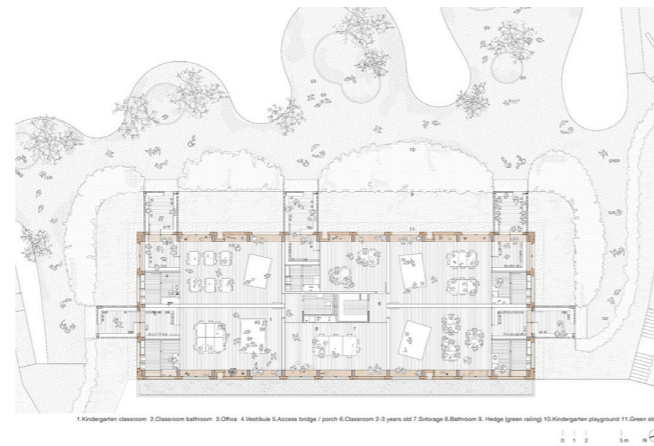


Figure 22 - Escuela El Til-ler - first floor plan



Figure 23 - Yellow Train School - Courtyard view



Figure 24 - Escuela El Til-ler - facade view

1.2.2 Case studies

COMPARISON

The case studies selected are placed on opposite sides of the world, yet the function is almost the same: a multiple grades school. Multiple ages in the same school mean spaces must accompany the student through and help in the transition among the different school grades always taking into consideration the pedagogical principles, making it a challenging design, yet both cases achieve this in their own unique and local way. This can be seen through the following points:

- The use of local elements is seen in both cases: In the Yellow Train School, local materials are used, and local regulations are central guidelines throughout the design, while in the Tiller School the Rambla local concept is used for spatiality
- Freedom of movement: in both cases, open multiple-use spaces can be found where children can freely take advantage of those spaces
- Contemplation as a way of discovery: this is achieved in both cases through the use of windows or openings in the classrooms
- Passive thermal comfort is used: in the Indian case study heating is not required due to the local conditions
- Play as a part of learning: this can be seen in the way of courtyards, playgrounds, and multiple-use spaces in which playtime happens for the kids. Also, the use of openings as sitting areas (niches in the case of Yellow Train and windows in the case of Tiller) is a way of encouraging creativity and a playful sense in kids.

1.3 REGGIO EMILIA PEDAGOGY

Loris Malaguzzi could be considered the founder of this pedagogical approach with the first Reggio Emilia school opened in 1963 (Scuola Robinson). After World War II, there was a need to rebuild the community not only physically but also socially, therefore, together with local families, this approach was developed. In this approach, the child is the main character, and the environment is the third teacher. The environment involves the spatial elements, the teachers, and the parents. Students are meant to learn through the experience of their surroundings and freedom of emotional expression is encouraged to connect with oneself.

It is important for the concept of responsibility and mutual relationships among all the systems to work. Parental involvement is one of the main keys to the success of this education as communication between parent-child and parent-parent is highly encouraged.

Group work is encouraged as a way of including everyone in the classroom and bringing up a sense of community. This also helps in developing a listening and empathetic ability. This collaboration is also a way of highlighting and raising the voice of children's rights in the community.

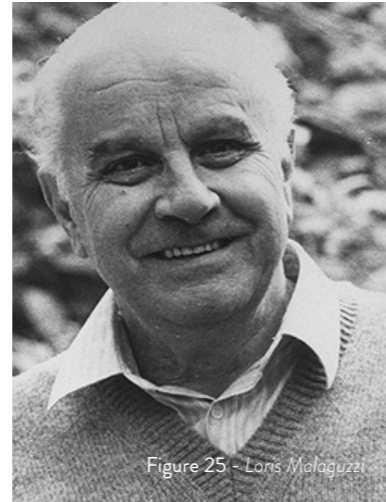


Figure 25 - Loris Malaguzzi



Figure 26 - Kids exploring through natural textures

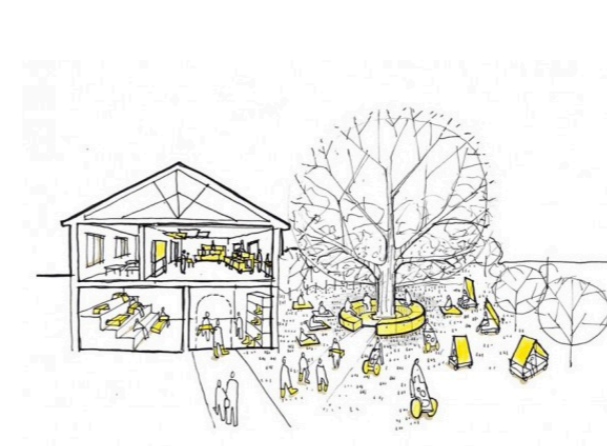


Figure 27 - Scheme of a Reggio School

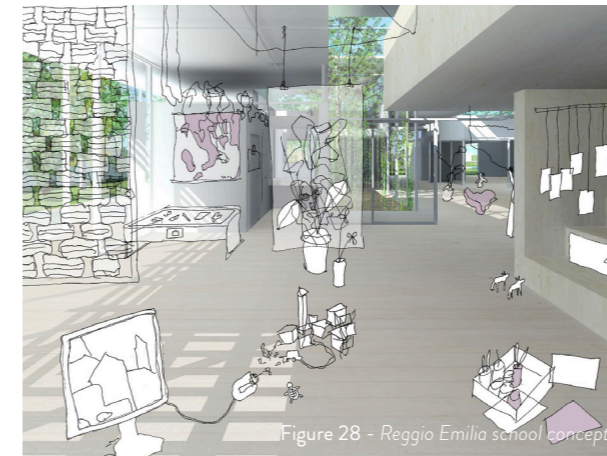


Figure 28 - Reggio Emilia school concept

1.3.1 Reggio Emilia Architecture

As mentioned before, the environment is the teacher of the child in this approach, hence architectural elements are important. Each element is analyzed as an important part of the space.

Space should be flexible enough for different activities to happen according to the needs of the students, therefore the importance of flexibility in the furniture and the composition of spaces. It should also be cozy and familiar for the student so that he feels comfortable and at home.

The emotions of the children are also considered important, therefore private spaces are suggested for students in need of alone time.

As it happens in Montessori and Steiner pedagogies, natural lighting is also a major element in the architecture of Reggio's approach, so elements such as windows, transparent walls, and even mirrors are highly suggested. When it comes to windows, it is considered also a way of connecting the exterior (nature) with the interior. Natural textures in the classroom are also encouraged.

Community sense is also very important, so education requires a lot of group work and areas for gatherings and meetings such as the "piazza" which is a concept that can be seen applied in different situations.

1.3.2 Case studies

TELLUS NURSERY SCHOOL

ARCHITECT(S): Tham & Videgård Arkitekter

LOCATION: Amsterdam, Netherlands

YEAR: 1980

This nursery located in Sweden consists of an organically shaped structure of yellow exterior walls. The entrance is in the central courtyard that is “hugged” by the building as a way of attracting people to come.

The interior is divided into different rooms, and a single central space that follows the “piazza” idea and in which furniture elements are free to be moved according to the kid’s needs, allowing also the creation of different spaces for multiple activities at the same time.

The yellow shell of the building is not only an esthetic element but also works as a light diffuser for the inside of the building as it partly hides some of the windows.

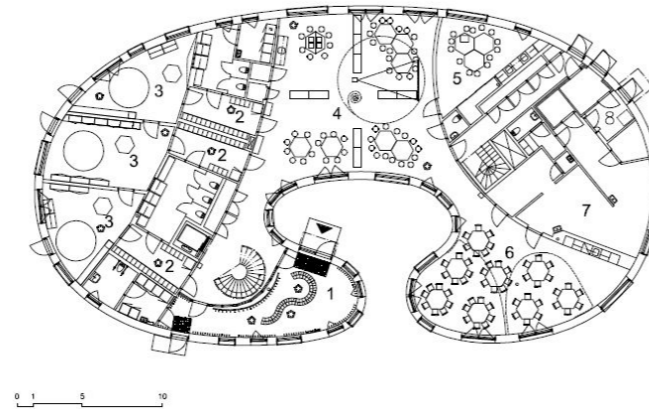


Figure 29 - Tellus Nursery school- ground floor plan

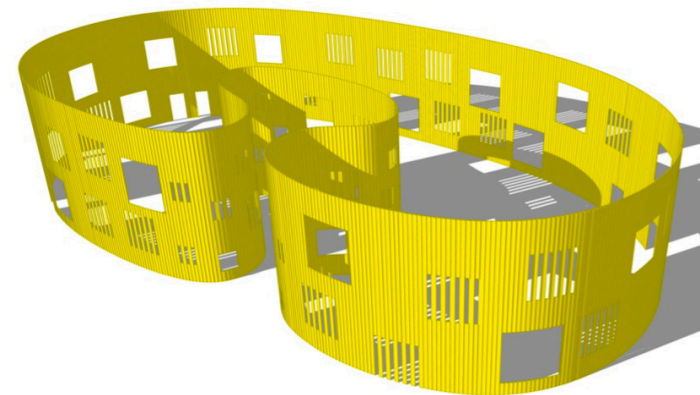


Figure 30 - Tellus Nursery school- shell axonometry

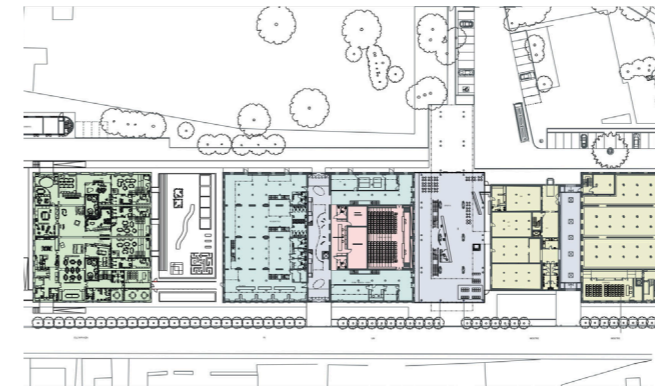


Figure 31 - Centro Internazionale Loris Malaguzzi - floorplan



Figure 32 - Centro Internazionale Loris Malaguzzi -visualization

CENTRO INTERNAZIONALE LORIS MALAGUZZI

ARCHITECT(S): MP Architects + ZPZ + T. Zini

LOCATION: Reggio Emilia, Italy

YEAR: 2002-2009

In 1999 the Comune di Reggio Emilia launched a contest for the restoration and conversion into a Reggio Emilia Pedagogical center of the Locatelli factory buildings which was bought the year before. In 2000 ZPZ Partners and Tullio Zini won the contest. The project was divided into two phases, one that began in 2002 and another one that began in 2007 with a conclusion and inauguration of the center in 2009.

The complex of nearly 12,000 sqm consists of 3 buildings: two in which the auditorium, exhibition center, and multiple-use areas are placed and a third building in which the Reggio Children Foundation is based in which research is done.

The exteriors are keeping part of the original factory structure, while the interiors take a more contemporary organization and floorplans, with colorful rooms and organic shapes throughout the complex. The idea of open spaces can be seen throughout the whole project with areas that are created merely by the mobile furniture placed there.

A mix of textures can also be seen, with a mix of concrete (mainly used for columns) and wood elements (flooring and structural elements).

1.3.2 Case studies

COMPARISON

Both case studies happen in European countries, yet different uses of Reggio's principles are seen in Tellus Nursery in which the approach is applied to a school or educational institution, and in Malaguzzi's Center in which it is applied to multiple uses institutions in which not only educative activities happen, but also research and social events are held. Despite these cases being of a completely different scale and diverse use, the Reggio Emilia approach can be noticed in both cases through the following details:

-The use of open spaces or "piazzas" with mobile furniture and elements is common among them, giving flexible spaces for the children and teachers in the case of the Tellus Nursery and a variety of options of spatial configurations for the different events that happen in the Malaguzzi's Center

-Natural light is also a common topic in both cases, with different applications (lateral/roof) and diffusion of it (façade shade/window filter)

- Vivid and similar colors are used in both interiors and exteriors, being both of a yellow prevalent façade color and green and pink found in both cases

- A connection with nature and a cozy environment is created in either of the cases. In the Nursery, a connection with nature is done through the big windows facing the green surrounding areas, while in the case of the Malaguzzi's Center, the use of windows is mixed with the use of materials such as wood

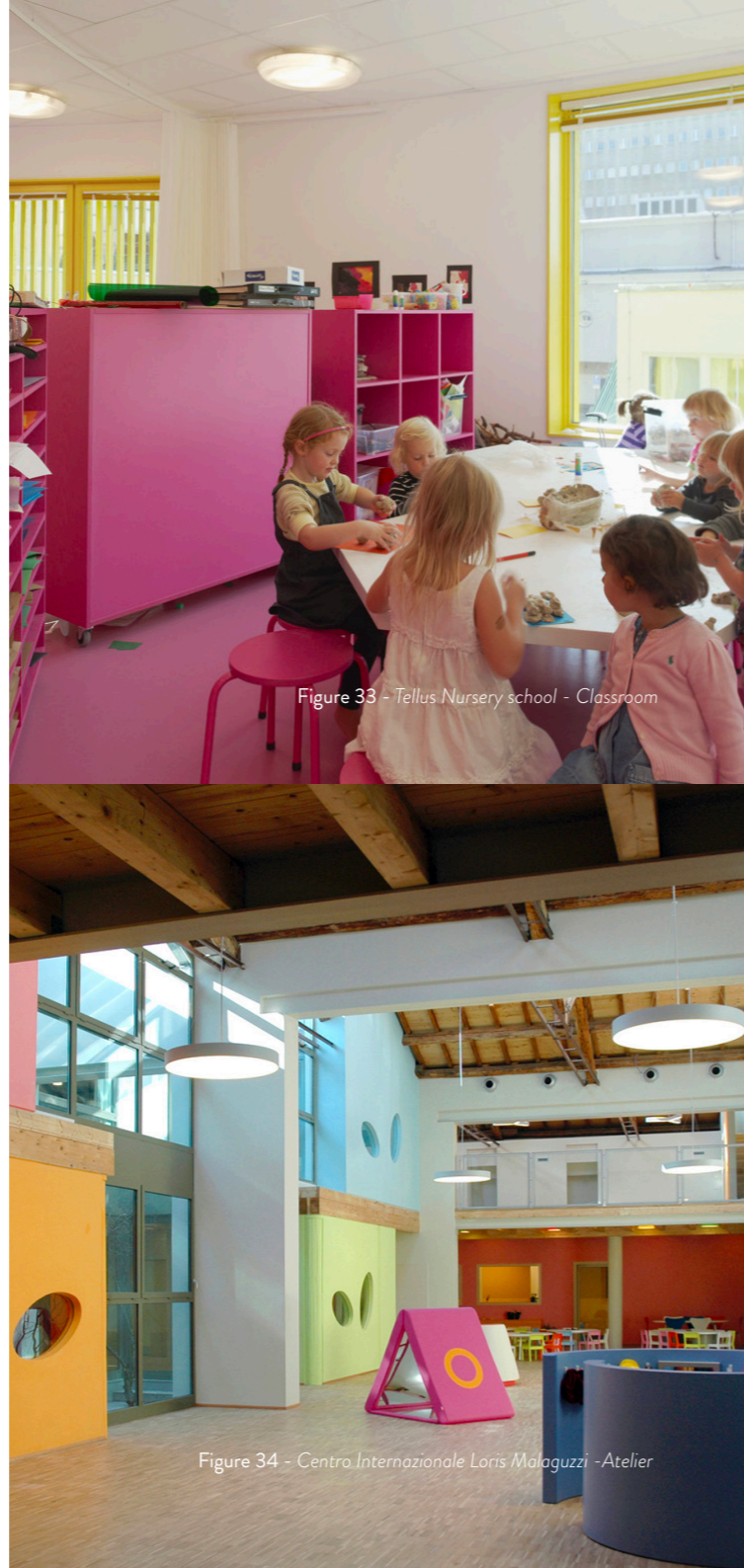


Figure 33 - Tellus Nursery school - Classroom

Figure 34 - Centro Internazionale Loris Malaguzzi - Atelier

1.4 DISABILITIES

1.4.1 Definition & statistics

The World Health Organization defines disability as "the interaction between individuals with a health condition and personal and environmental factors". Many times, the word "disability" is used to define the individual's condition, while it is the condition's interaction with the surroundings that create a disability.

Among the surroundings and environment, architecture is one of the factors with the greatest importance since we are surrounded by it in our daily lives, and unfortunately is also one of the main factors in producing a disability when interaction happens. The more barriers the environment has, the greater the disability created.

According to a census done in 2020, in Mexico, there are currently around 7 million people with a type of disability from a total population of 126 million. Some people have even more than one disability as seen from the percentages: 48% have a disability that makes walking and using stairs difficult, 44% have visual-related difficulties, 22% have hearing-related issues, 19% have a disability that doesn't allow them to take care of themselves, 19% have issues regarding memory or concentration, 15% have communication or speaking related issues and 22% have an intellectual or mental related disability.

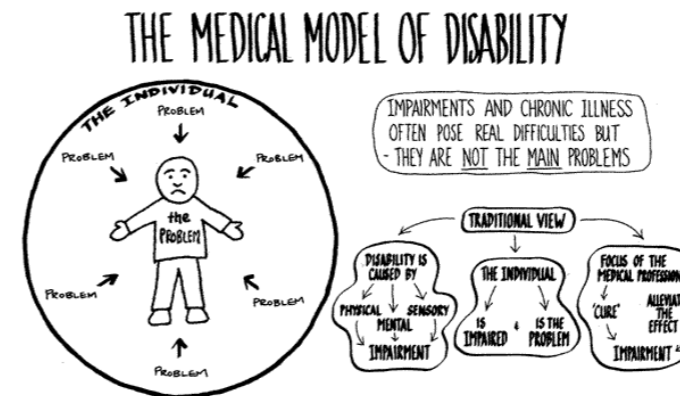


Figure 35 - Medical Model of Disability

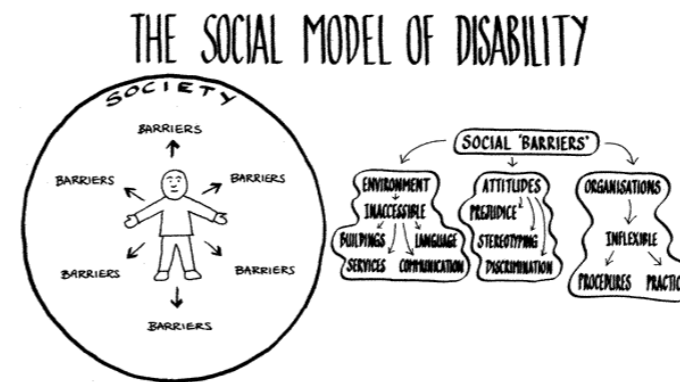


Figure 36 - Social Model of Disability

1.4.2 Disabilities & architecture

Disabilities and inclusion can be controversial topics. While normally a person with hearing impairment might feel a disadvantage in a conversation of fully hearing people, if a fully hearing person joins a conversation between people with the same hearing impairment, the one feeling at disadvantage and “disabled” (or unable to communicate) would be the fully hearing person due to the lack of understanding of sign language. This makes us understand that disabilities are just different ways of experiencing the world, therefore the right to have a comfortable experience should exist.

During the last decades, many improvements have been done when it comes to architectural norms for the inclusion of the disabled. For example, we have seen the establishment of ramp maximum angles for wheelchair use, the rule of a minimum quantity of elevators, and its minimum dimensions. There have been a lot of important improvements, yet most are focused on motor disabilities, which represent only one part of the existing disabilities.

Architecture & inclusion

Unfortunately, minority groups such as disabled people tend to suffer discrimination and/or segregation when incorporated into society, this can happen from their family itself or the government, by denying an adequate education for their condition. Only certain countries such as New Zealand or Sweden consider the intellectually disabled in their construction manuals for schools. As architects, we can help diminish the problem by thinking about these people and their needs at the beginning of a project.

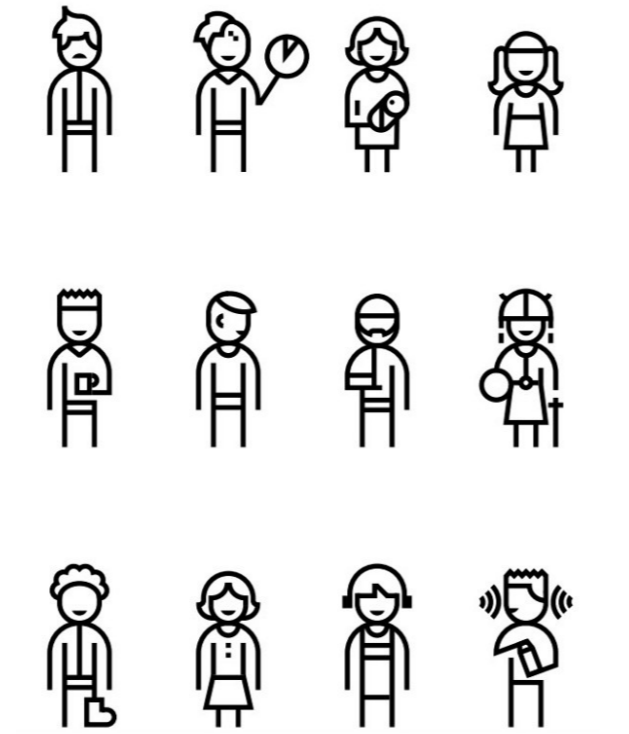


Figure 37 - Microsoft Design Toolkit

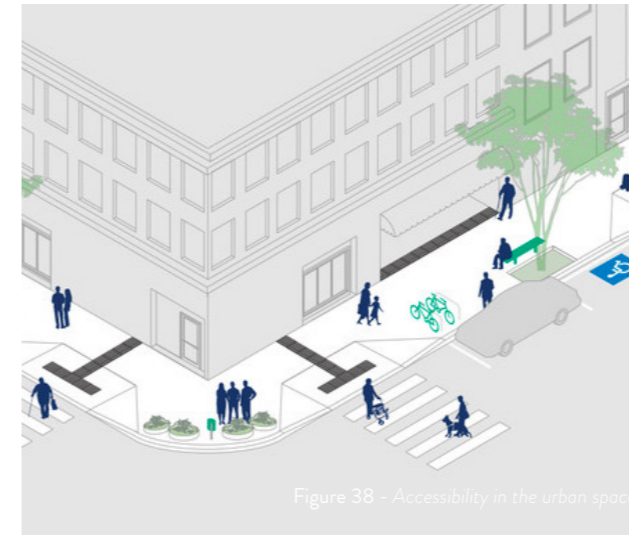


Figure 38 - Accessibility in the urban space



Figure 39 - Sercotel Alfonso XIII Hotel to be one of the first hotels in Spain fully accessible to intellectually disabled people

Disabilities are often seen as a challenge for architectural and urban projects when they should instead should be considered an advantage both architecturally and socially. The first is because it helps define and specify better the project, and the second is because it promotes inclusion in society.

Inclusive architecture means designing and building places that everyone – regardless of disability, age, gender, sexual orientation, race, or faith – can enjoy confidently and independently with choice and dignity. It is about access with dignity, treatment with respect, and relevant services to the different conditions people might have.

Educational spaces for the intellectually disabled

Behavioral, rational, and physical aspects of intellectually disabled students differ from the non-disabled, hence the importance of an adequate education strategy and environment that can integrate them with the rest of the world.

Sensorial perception is the main ability that is affected by the environmental elements and intellectually disabled students experience it in either a hyperresponsive way (too much) or a hyperresponsive way (too less). Therefore, factors such as the layout of the classroom, materials, transition areas, special furniture, insulation, ventilation, lighting, colors, and sunspace should be considered in detail when designing for students with this type of condition.

Among some of the characteristics that a classroom for intellectually disabled students should have we find the following:

- Loose interior furnishings
- Individual work and purpose-suited places
- Insulation to avoid noises and sudden temperature changes
- Absorptive surfaces should be carefully placed. Otherwise, they can increase background noise
- Natural lighting or controlled lighting is important.
- Neutral colors should be applied to the classroom design and the classroom surfaces
- Children's personal color preferences and their use could be beneficial. Even if it could not be applied to architectural settings, it can be applied through study carrels, colored reading lenses, and colored paper
- Materials should be natural and with simple patterns to not overstimulate students' sensorial abilities

An example of a school of this type is the Deyang School for the Deaf and & Intellectually Disabled Children in Deyang, China.

When it comes to Montessori education, elements such as the relation with nature and the holistic view, small group work, and attention to materials match some of the characteristics established for an intellectually disabled student. Additionally, a self-paced working rhythm and independent approach help the disabled student feel comfortable and develop his abilities in the right way. Therefore, it can be considered a positive pedagogical solution.

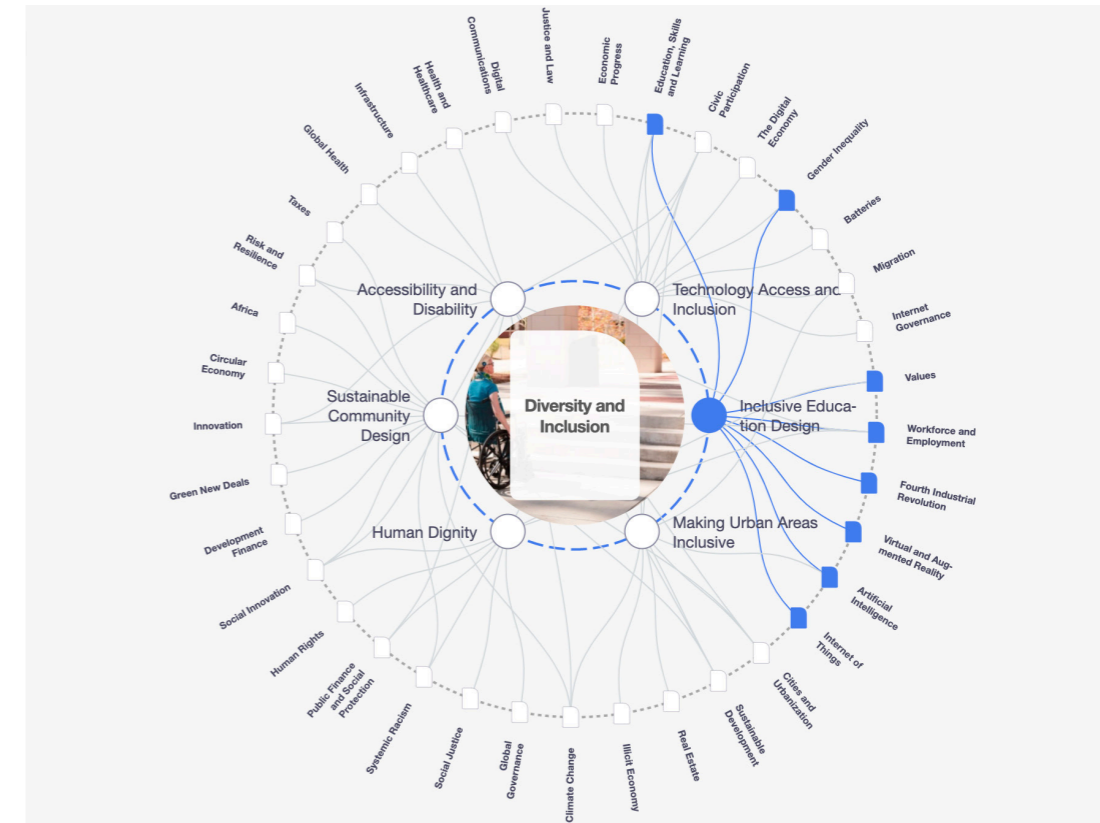


Figure 40 - World Economic Forum - Diversity and Inclusion: Inclusive Education Design

1.5 CTDUCA

CTDUCA (Centro de Terapia Educativa) was founded in 1970 by Dra. Susana Ramírez Robles is the first institution in Mexico to specialize in the treatment of people with Down Syndrome. Their main objective is to enable people with Down Syndrome to become independent through education, experiences, and activities to have better inclusion in society. It is a Private Assistance Institution and foundation financed through sponsors (both public and private) and the monthly tuition fee of students. It is quite small compared to other similar institutions with the number of students varying from 20 to 25 throughout the years. There are currently 18 students, 8 of whom are newborns.

This place has a personal meaning for me as it is the institution my brother has attended for over 10 years.

Current state

The institution consists of a two-level building on a 12x16 meter area. On the ground floor, we find the garage which is their current only open space, the kitchen together with a dining area, the administrative offices, two toilets, a storage room, and two classrooms.

On the first floor, we find a big open space with sinks, locker space, and a laundry area; five classrooms, from which one has been adapted as a bedroom as part of the independent-life program the institution holds. It is a building that was donated by TELMEX (Telefonos de Mexico (a telecommunications company)). It was originally an office building that was later adapted to fit the needs of CTDUCA.



Figure 41 - Students at lunch time



Figure 42 - Teacher tutoring a student

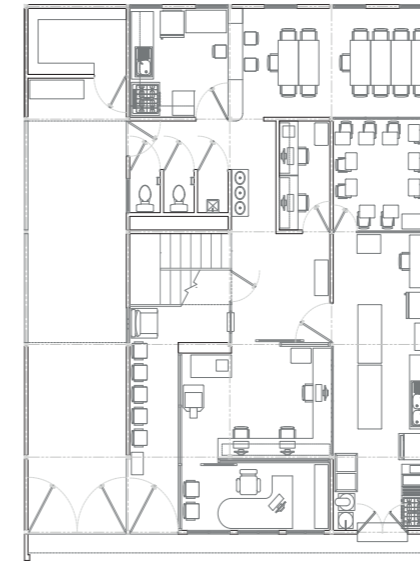


Figure 43 - CTDUCA's ground floor

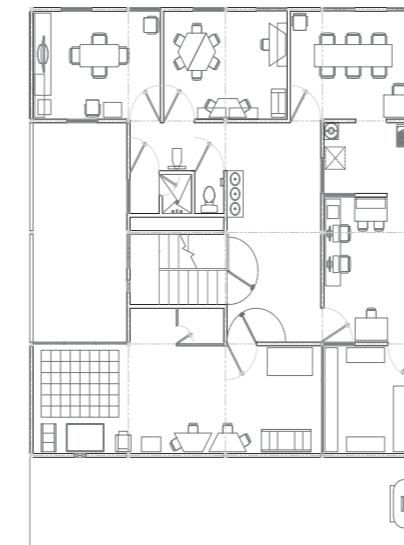


Figure 44 - CTDUCA's first floor

Adjacent to the building, we can find an institution that works as a nursing school and kindergarten for working moms. The back of CTDUCA'S windows face towards a courtyard of this institution which were covered on the past years with a wall that is soon being demolished as it didn't allow light or natural ventilation in the kitchen and dining area.

The current state of the building structurally speaking is well made, yet functionally speaking is not very good, especially due to the lack of space. Despite the different tryouts that CTDUCA has done to fit its needs, the space is not able to fulfill the conditions required to properly provide the services offered.

As part of the research, an interview with the school's principal was done in which the main needs and requests for the project were discussed, these were:

- Natural light and ventilation are lacking throughout the school, especially in the ground floor. With the back side of the school facing another institution, they risk it being covered or taken away as it has already happened, therefore there is a need for independent light and ventilation.

- Spaces are fixed which do not allow for a lot of flexibility and with the number of students varying each year, flexibility would be really helpful.

- There are only two toilets and one shower in the whole school not satisfying the regulations for a school, therefore this should be considered.

- There is a lack of a central gathering space that gives identity to the school. The design should be able to provide this.

2.2.1 Services

The area around CTDUCA is rich in services even in a fifteen minute walk around.

A lot of schools are found even in the same street which make it a potential situation for partnerships among them.

Parks and green areas can also be found around, indeed CTUDCA teacher take the students daily in the morning to the nearest park for a walk and playtime. Most parks in Mexico City consist of greenery, open-air sports courts, playgrounds and pet areas, making them a good environment for kids.

Major shopping malls are also found in the surroundings, such as the Plaza Universidad or the new Manacar Mall. In these malls a variety of stores and services are found, from clothing, restaurants, beauty services, public service offices, tech stores.

Entertainment services are also present in the area. Among them we find theatres, movie theatres and arcade services inside where we can find bowling, billiard and go-kart games. In fact, once a week, CTDUCA students are taken to a near bowling alley as it is a fun activity to do and it also helps them to develop motor skills.

Finally, relating to health services many private medical offices are found in the area, yet only one public hospital is found withing fifteen minutes.



2.2.2 Mobility

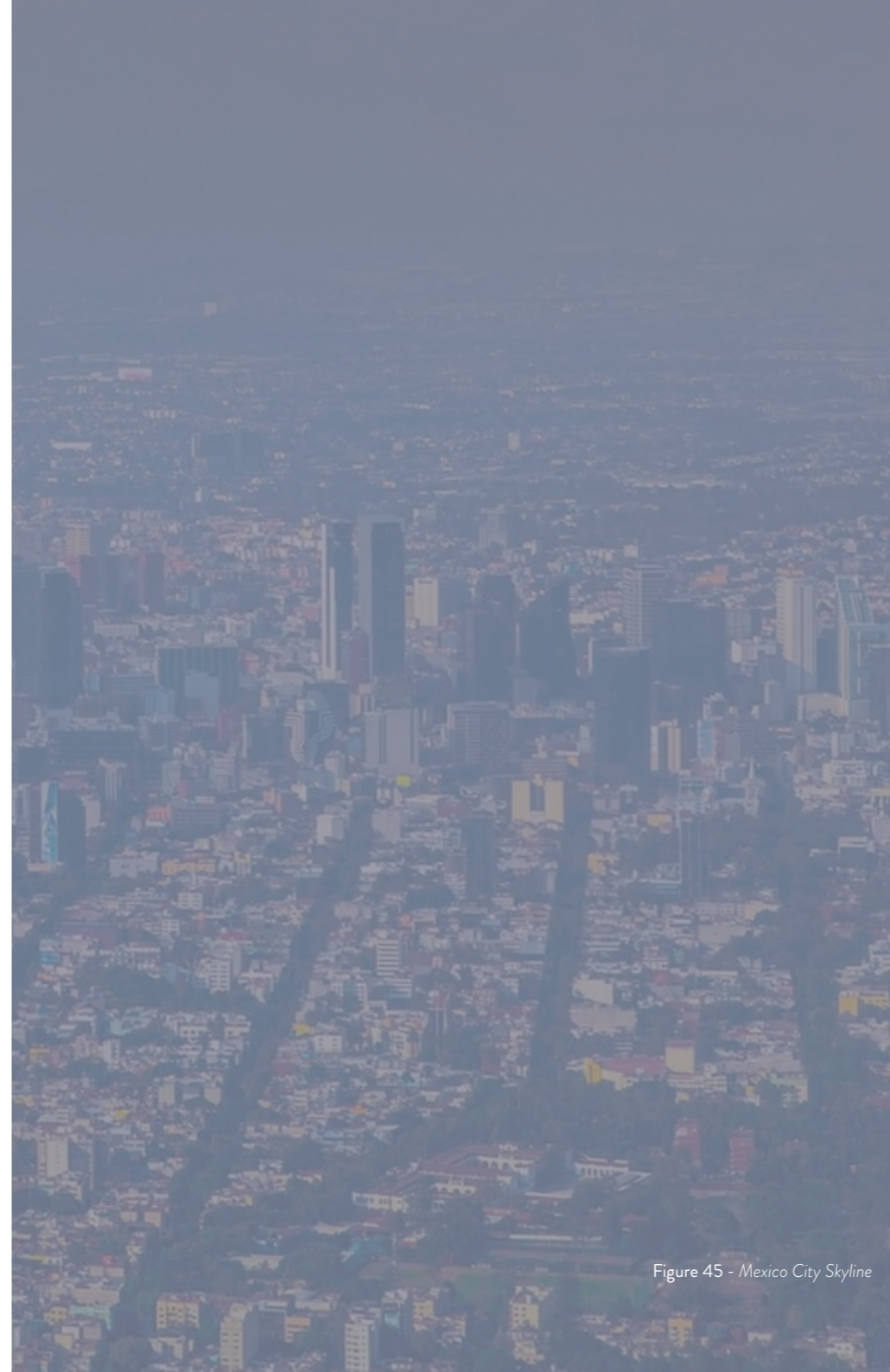
The area is also rich regarding mobility. It is scattered in major roads, such as Insurgentes Avenue or Río Mixcoac pass by, with secondary roads crossing by, such as José María Rico road, and finally smaller streets dividing the areas left in between.

Due to the multiplicity of roads found around, public transport is also found in numerous forms withing 15 minutes of CTDUCA. From the insurgentes Sur metro station to multiple bus stations placed all around the area including a Metrobus station which connects the whole Insurgentes Avenue.

Thanks to this convenient location, some of the elder students of CTDUCA go to school by themselves, helping them develop their independence sense.



Drawing 3 - Mobility



CHAPTER 2:

CONTEXT

Figure 45 - Mexico City Skyline

2.1 MEXICO

Surface: 1,964,375 km²

Population: 130 million

Regions/states: 32

Language: Spanish & 66 indigenous languages

Capital city: Mexico City

Borders: United States of America, Belize, Guatemala



2.1 MEXICO

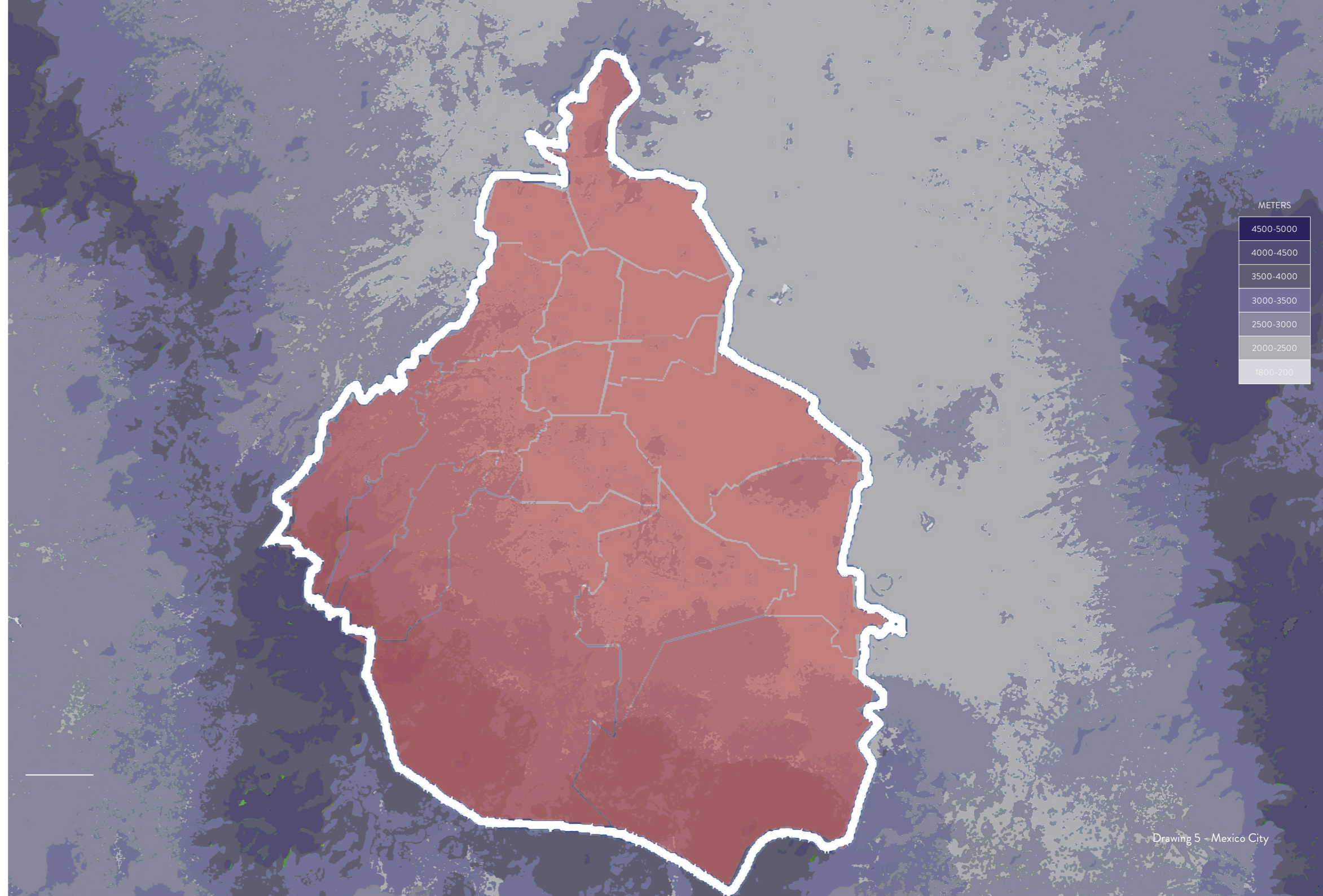
MEXICO CITY

Surface: 1.485 km²

Population: 20 million, from which 9 million in urban areas and 11 million in metropolitan areas.

Internal divisions: 16 delegaciones

Bordering Mexican states: Morelos, Estado de México



2.1 MEXICO CITY

2.1.1 Urban History

A city with more than 20 million inhabitants and with a surface of 1485 km², Mexico City is the capital of Mexico and one of the biggest cities in the world. The current city was founded in 1594 by the Spanish conquerors on what used to be the antique Tenochtitlan Aztec city.

Mexico City's origins trace back to 1325 when it was founded by the Aztecs after a long expedition as they found the sign that the prophecy asked for to find their new city: an eagle eating a snake on top of a cactus. Throughout the years it became one of the greatest empires in the Mesoamerican region with more than fifteen square kilometers.

In 1519 the Spanish conquerors arrived in Mexico City and in 1521 the Aztec Empire fell to the Spanish after a couple of years of battle. From that point on, the city started to change as new constructions were built on the remains or demolished parts of the antique city. Nowadays, many pre-Hispanic ruins can be found under buildings in the City Center, such as the cathedral. Throughout the years the lake started to be filled up with mud and drought for the conquerors to be able to build and extend the city. The only remains of the pre-Hispanic times were the urban layout of the streets, which was traced with colonial-style buildings, and which can be seen in multiple maps sent to Europe during those times.

The expansion and modernization of the city continued until 1810 when the Independence War began and in 1924, three years after the Independence was achieved, the Distrito Federal (another name for Mexico City) was



Figure 46 - Visualization of Mexico city in prehispanic times

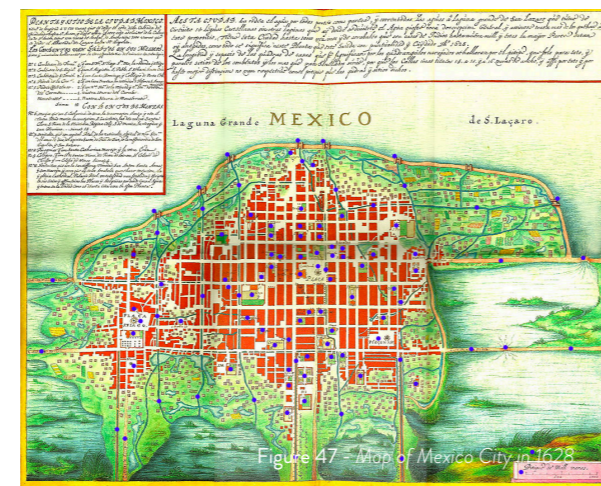


Figure 47 - Map of Mexico City in 1628



Figure 48 - Mexico City aerial view in 1954

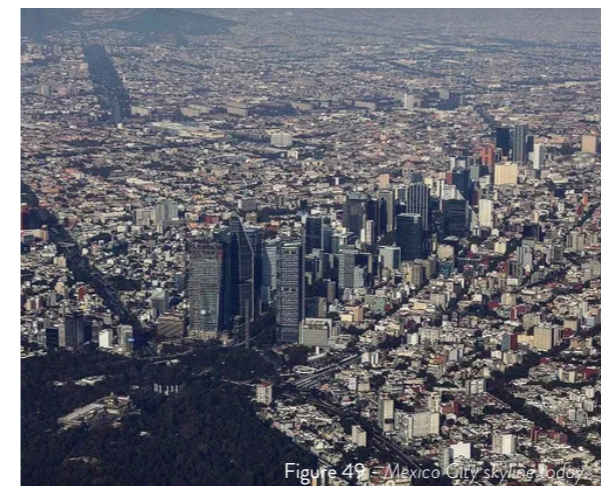


Figure 49 - Mexico City skyline today

created as an independent state in which the country's power would be placed.

The city continued to grow with major expansions happening during the “Porfiriato” (Porfirio Diaz’s presidency) at the end of the 19th century and the beginning of the 20th century. This period is quite controversial as it was a time of big economic and urban evolution, yet this came with many social injustices as most of the beneficiaries of the developments were the bourgeois class, while the poor people remained poorer. An example of this, was the investment in education, which was focused on higher education, while basic education was left behind, with the population being illiterate at the time. Urban developments, inspired in European cities such as Paris, included the construction of new boulevards and big avenues, new buildings with contemporary eclectic and art nouveau styles (Palacio de Bellas Artes is the main example); new neighborhoods were created, such as the Roma and Juarez neighborhoods for the high class and the Obrera and Doctores neighborhoods for the lower classes. Thanks also to foreign investments, other developments of bigger size were done such as the update of the train and port systems. Unluckily the high inequalities in this period, despite the developments above mentioned, led the country into the Mexican Revolution in 1910 which ended in 1917 with the creation of the new constitution: Constitución Política de Los Estados Unidos Mexicanos.

After the revolution, a time of prosperity arrived in the country which was represented in cultural and social growth with education policies and the construction of schools and universities. Ciudad Universitaria can be considered one of the most important of them and is nowadays not only a national symbol but also a World

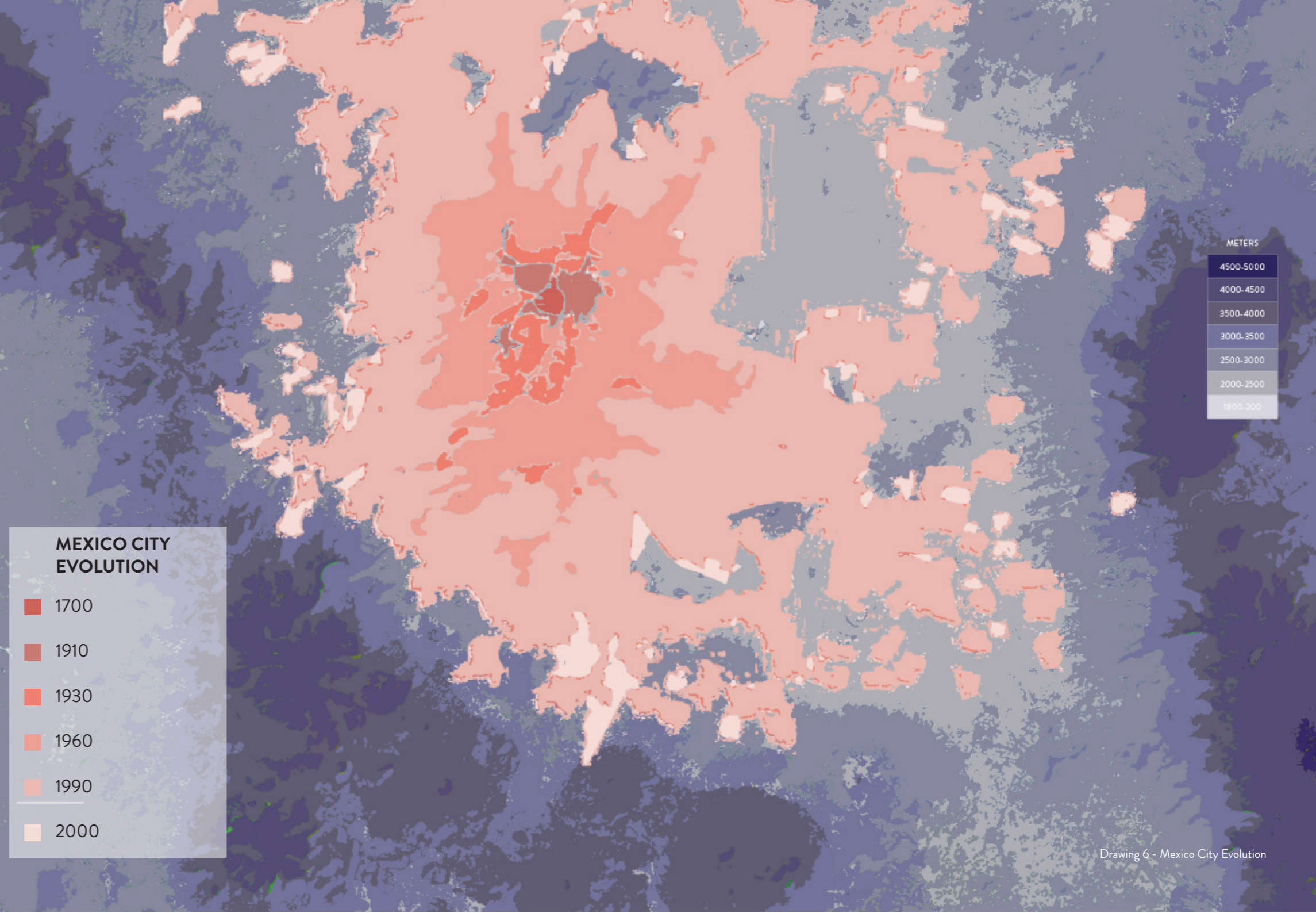
Heritage place. The arts were another sector that had a lot of importance during the first part of the 20th century, with muralism and painting as the most prolific forms of art through the works of renowned figures such as Frida Kahlo, Diego Rivera, David Alfaro Siqueiros, among others. Also, big economic progress was made thanks to the oil privatization and policies that the government made in this period. Mexico City was the center of all of this, with a population arriving at more than three million by 1950, thanks also in part to the industrialization and connections created among states which helped people move from the countryside and adjacent states to Mexico City.

In the second part of the 20th century, the government pursued an economic model: Desarrollo Estabilizador. This phase of history is also called “El Milagro Mexicano” (the Mexican Miracle).

By the end of the 20th century, more than 8 million people lived in Mexico City, eight times the population of 1900.

Nowadays, Mexico City is a contrasting city, marked by its social and cultural history. Prominent medium-class, high-class, and lower-class contrasts can still be seen in many areas of the city. Big urban and architectural developments are happening, making it a hub for architects, urbanists, and developers. From the restoration of colonial buildings and neighborhoods leading to gentrification to the construction of new areas in empty land plots, Mexico City has grown exponentially in the last century.

The current city is divided into 16 “Delegaciones” (delegations) which are subdivided into “Colonias” (neighborhoods).



Drawing 6 - Mexico City Evolution

2.1.2 Hydrography

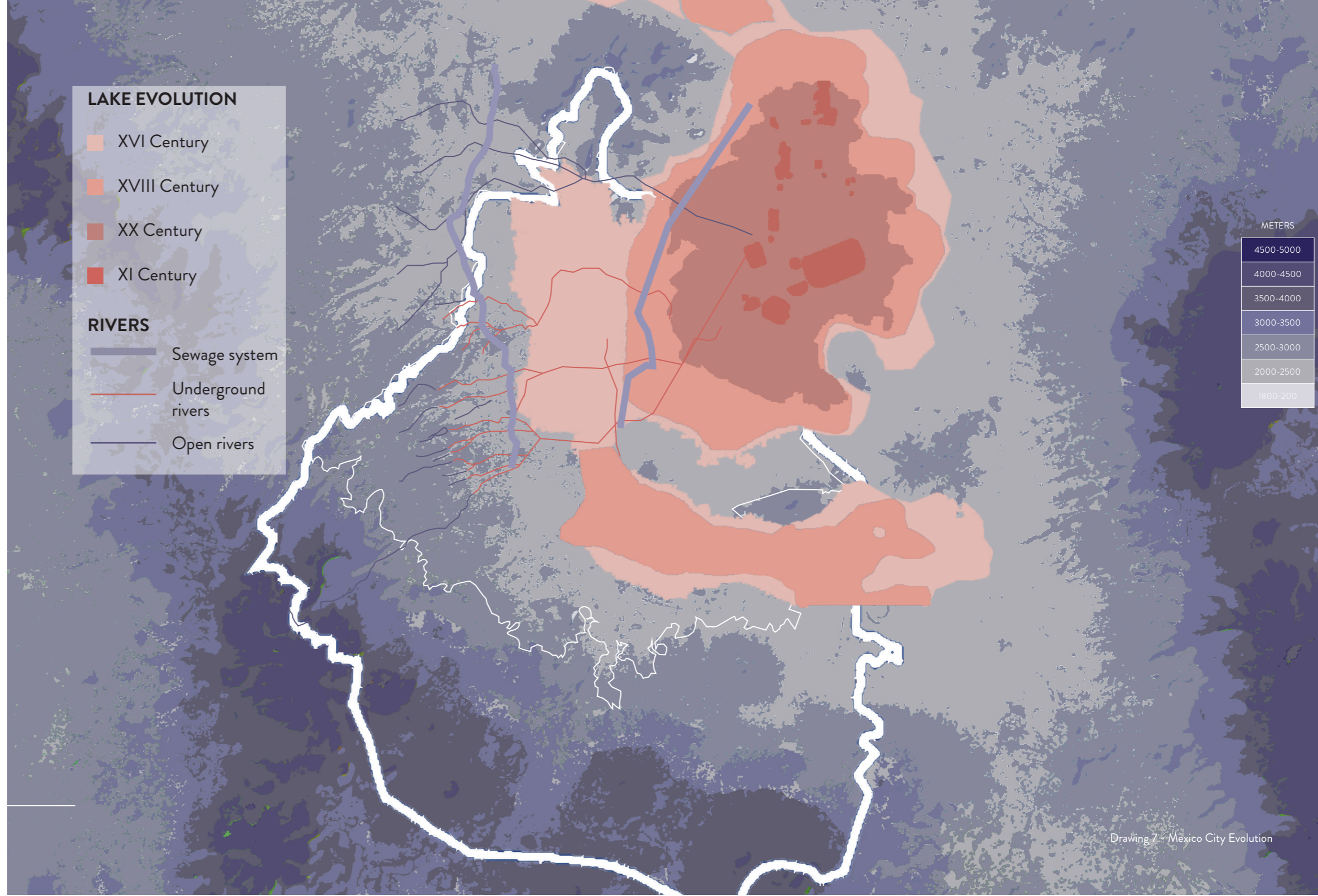
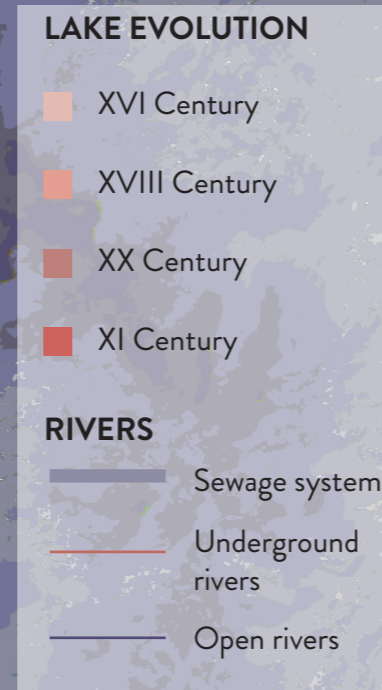
As introduced before, Mexico City has been built on what used to be lakes. In pre-hispanic times, the Aztecs used to live on an island surrounded by four lakes: Lago de Texcoco (where the island was placed), Lago de Xochimilco, Lago de Zumpango, and Lago de Xaltocan which together used to be one single lake in the past covering most of Mexico's City's basin. The Aztecs had adapted to the area and had created a system of islands on the water and canals which allowed them to coexist with the lakes.

Once the Spanish arrived, there was a need for construction and expansion of the city, therefore the drainage of the lakes began together with deforestation. The drainage was done through a connection to the Tula River and continued even after the independence. In 1910 amidst the Mexican Revolution and during the last period of Porfirio Díaz's government, the Grand Drainage Canal was opened up.

Nowadays, there are only remains of the Texcoco and Xochimilco lakes and the natural rivers and artificial canals that once existed are now underground or dry. Most of the canals and rivers that connected the lakes towards the outside of the city are now underground and are covered by major avenues, such as Río Mixcoac or Viaducto.

On the other hand, the drainage of such a big lake (it is estimated that its surface of more than 7,800 square kilometers) provoked a lot of issues, especially flooding which is a problem even nowadays.

Also, another issue of the lake drainage is the lack of solid ground in the historic areas such as the city center which is causing its sinking by 40 cm every year. Important to consider is also the higher effect of seismic events in the mentioned areas due to the lack of solid material to block them.



Drawing 7 - Mexico City Evolution

2.2 ACACIAS NEIGHBOURHOOD

The neighborhood in which my project happens is the Colonia Acacias, a middle-class neighborhood in the south-west of Mexico City. Its origin dates back to the beginning of the past century and was part of the Del Valle neighborhood. This neighborhood started as the idea of local landowners of the Mixcoac adjacent neighborhood to create a comfortable neighborhood with big land plots. In 1908 the construction of Del Valle was announced as an extension to the south of the surrounding neighborhoods, not only Mixcoac but also San Pedro de Los Pinos. At the moment, it is considered one of the major masterplan expansions in Mexico City.

The plan consisted of an orthogonal reticular design that was adapted to the existing surroundings and avenues, yet it has been modified through time. The original plot type was rural with plots of around 2500 square meters and was then approved as urban which provoked the subdivisions of the plots with streets crossing them in some cases.

A major event was the placement of Insurgentes Avenue, a road that crosses most of Mexico City, through the neighborhood, which divided it in two and became a major mobility improvement.

The major growth in population was in 1950s due to the increase of the middle and middle-high class thanks to the economic development of the country in that period (El Milagro Mexicano). Nowadays, we can find multiple minor neighborhoods in what once was the Del Valle neighborhood, such as Acacias, Insurgentes San Borja, Tlacoquemecatl, and Action. It is still a middle-class neighborhood of multiple uses: residential, office-use, and commercial.



Drawing 8 - Acacias collage - before & after



Drawing 9 - Acacias collage - before & after

CHAPTER 3:
THE PROJECT

3.1 PROJECT

Due to the lack of economic resources, the project is divided into 3 phases of construction that can be built at different times allowing monetary recovery. Each phase is independent of the others which means the school can function perfectly with only the first phase until budgets allow them to continue to the next phases. According to the needs defined by the school during the interview, a design was made for the school, always considering the different pedagogies studied before and spatial suggestions applied in all of them such as the use of natural light, natural materials, use of walls as storage space, the flexibility of spaces, among others which can be seen in the next points:

PLAYTIME: A playground was thought to be placed in the next-door school's courtyard which is currently empty, and it was thought of as a shared space among both schools allowing the coexistence of both institution's students teaching both tolerance and sharing values.

NATURAL LIGHT: A central atrium connected to the skylight works as an independent light source for the toilet services and the classrooms, especially the back classrooms which face another school and risk the construction of visual barriers. The central space was thought of as a rectangle square in order to allow more light to enter the spaces.

Toilets are placed on the left side of the building on all floors with ventilation and light coming from the windows placed towards the corridors.

TAKE ADVANTAGE OF SPACES: Most of the wall spaces under the windows or between the columns are used as storage spaces for either student materials, teachers, or student lockers.

ACCESSIBILITY: For connecting the floors there was an initial idea of a ramp but after calculations, was realized that the space was not enough for such an element; later, after consulting with the principal of the school, I was told that the in case of Down Syndrome students, stairs are beneficial for them as it allows them to develop motor skills. The only requested need was for each step to be lower than 15 cm as that height can be challenging for some of them, therefore the height of each step is 12 cm.

To have a more accessible school, an elevator was also thought of as part of the design with the backspace left between the wall and the window being used as storage for each room next to it. This space was also thought of as a possible private space or niche for students in case of an emotional need for private time.

FLEXIBILITY OF SPACES: Moving walls were thought for most of the floors, allowing flexibility of uses and taking into consideration the variable number of students that each group has every year. Another flexible example is the use of open spaces for multiple uses such as the atrium or the therapy open space on the second floor.

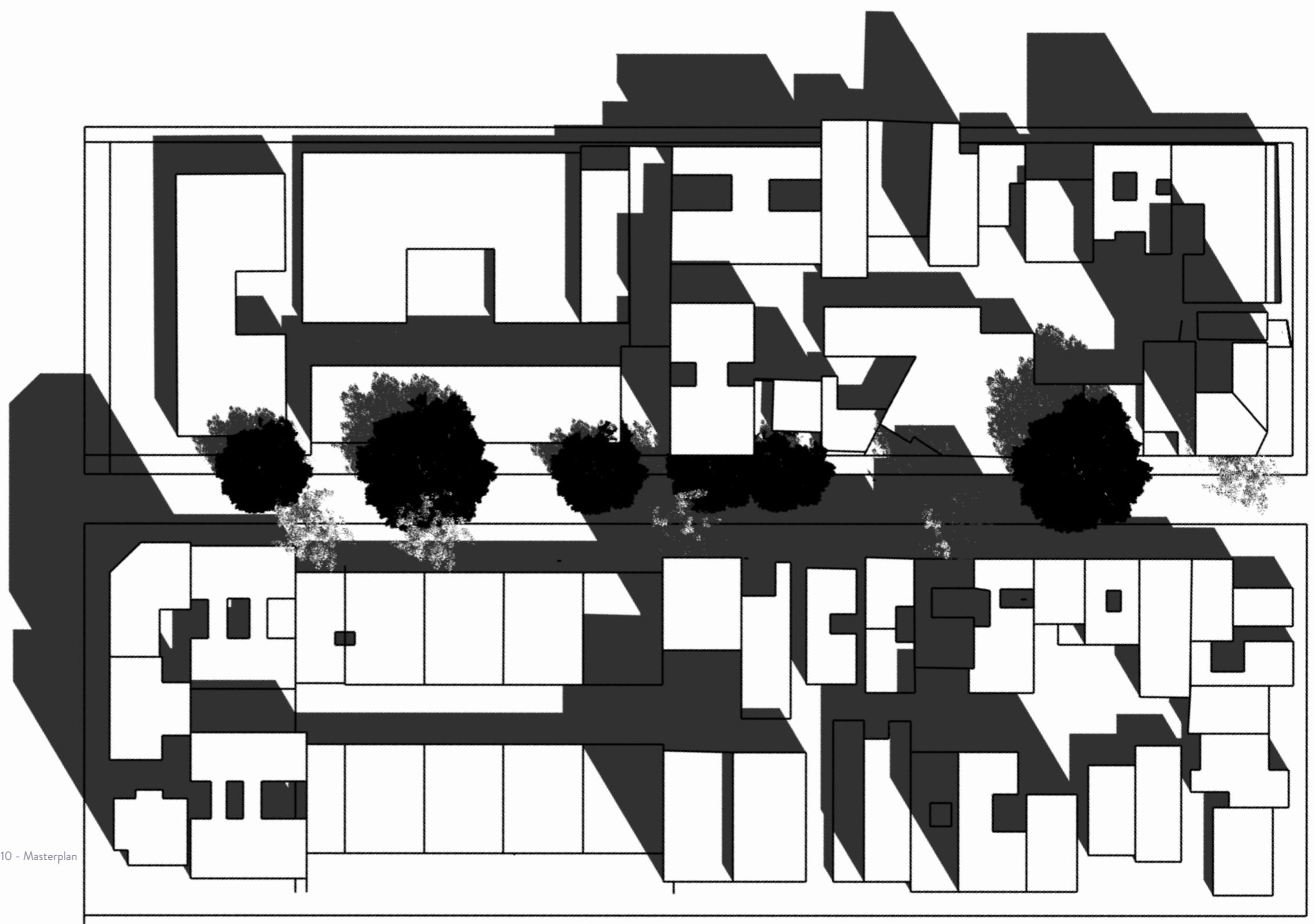
Despite the lack of space, the minimum dimensions were considered throughout the project, from the door openings to the corridor dimensions, to make it as accessible as possible.

3.1.1 Masterplan

The surrounding area of the building is quite dense with a diverse and rich typology of buildings as seen from the elevation.

An interesting characteristic seen on this map is the use of courtyards in most of the buildings, either as a garden or an open-air garage, a common thing in Mexico in residential buildings.

While on the side of the road of the project many educational institutions are found, on the opposite side all the buildings are of residential type, with a mix of townhouses and apartment buildings, being the one in front of the building the newest with the construction made in the past decade.



Drawing 10 - Masterplan

3.1.2 Urban Elevation

The context of the project building is important to be understood therefore a 1:500 elevation was done. The insertion of the building on the Patricio Sanz is interesting as the mix of uses among the surrounding buildings can be seen directly from the façades.

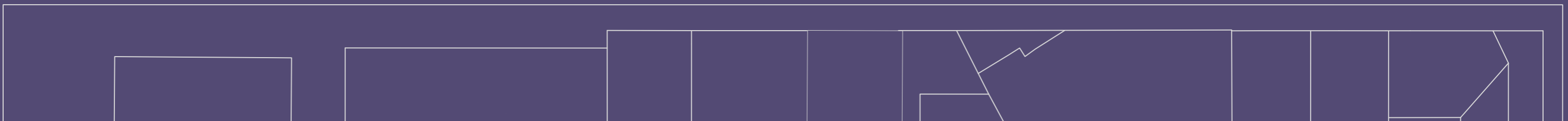
On the left of the project, we have an apartment building and a special education center which appears to be closed at the moment.

On the right of the project, we see a nursery and kindergarten, two residential houses together with another apartment building on the corner of the road. The surroundings are rich both in typology and character. Most of the buildings have been built in the past century, at the origins of the neighborhood.



6 m 18m 30 m

Drawing 11- Urban elevation



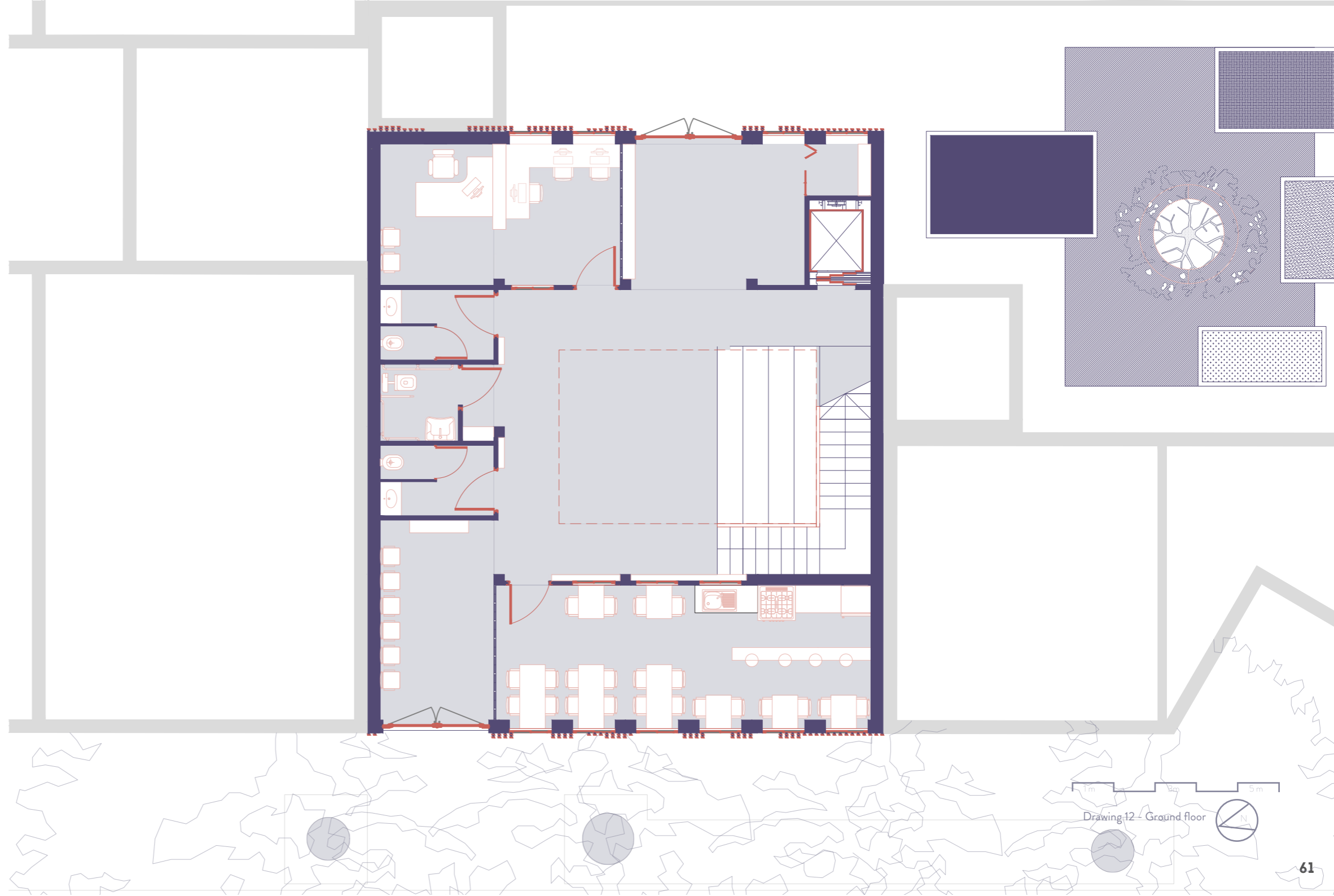
3.1.3 Ground Floor

The first floor represents one of the floors of the first stage of construction. Here we can find the administrative area with the principal's office and staff office. We also find the kitchen is mixed with the dining room following the current spatial organization. Instead of having a cooker in a separate room, the cooker and the children are together which allows them to participate in the cooking process and learn through it.

The central space of this floor contains a multipurpose central atrium that can be seen throughout the rest of the floors which surround this space, allowing light from the skylight to pass through. Among these, uses are a playground, a physical therapy area, and a performance space. This atrium is meant to satisfy multiple current needs of the school: that of a central characteristic space, that of an open space, and that of an auditorium, which due to the lack of space was combined in this area. The atrium is surrounded by stairs that take us to the next floors of the building.

We can also find on this floor the connection with the shared playground with the next-door school: a multi-sensory playground that consists of multiple 30 cm basins of materials and a centralized wood-floor area shaded by a tree placed in the core of the space around which a bench is placed which can be used as a teaching and reflecting area.

Finally, we can find the toilet services placed on the left side of the space satisfying the female, male, and, physically disabled users.



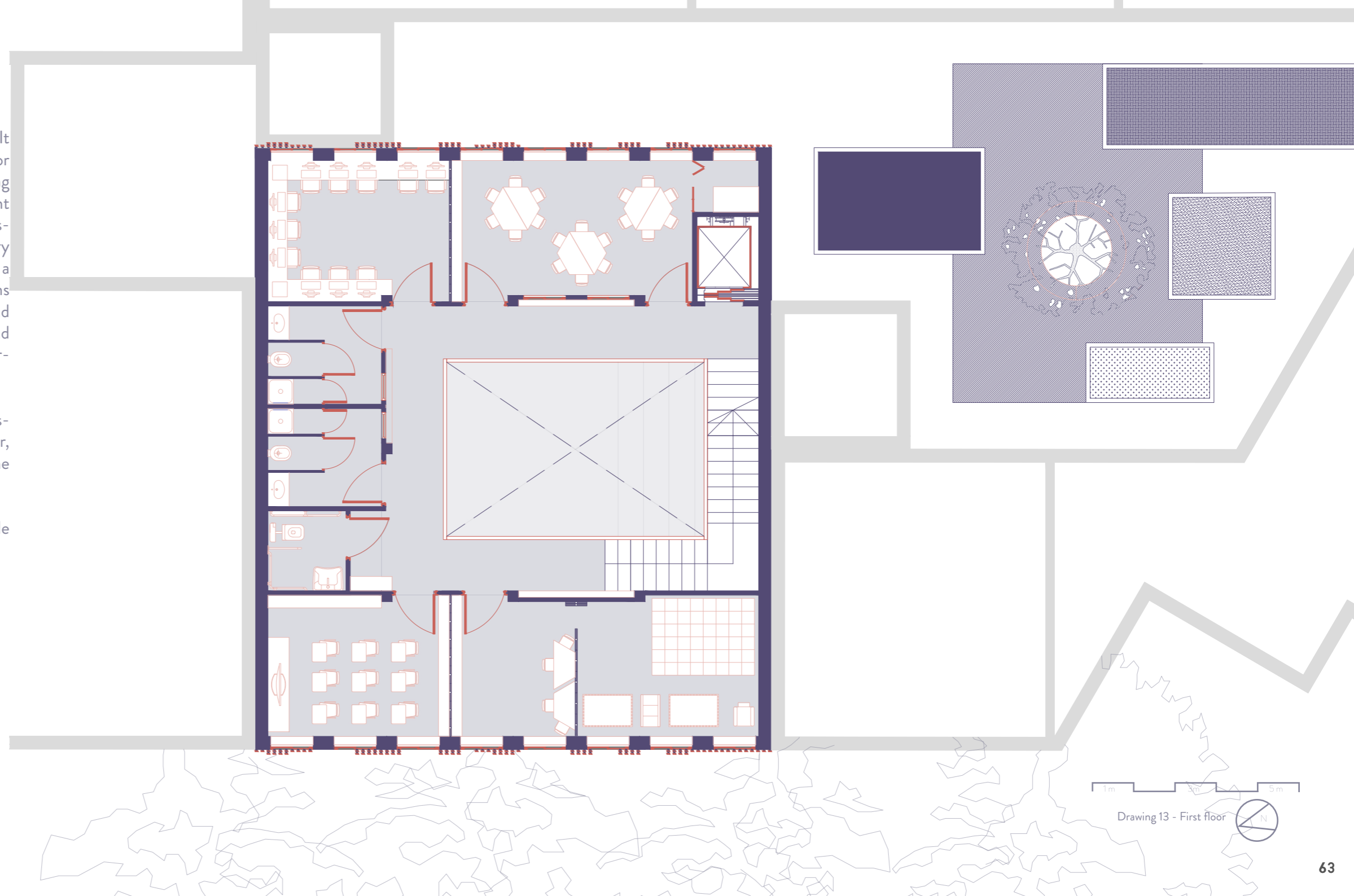
Drawing 12 - Ground floor

3.1.4 First Floor

This floor is part of the first stage of construction. It consists of multiple classrooms that can be adapted or subdivided depending on the needs thanks to the moving wall systems. Here, an alternative classroom placement was designed with a computer classroom, two classrooms for the orange and green classes, and a nursery for the youngest students that is subdivided to allow a small classroom for different activities. All the classrooms have double exposure, both to the street or backyard and to the central space, allowing for better ventilation and lighting together with communication between the corridor and classroom.

Like on the ground floor, toilet services for multiple users are found here with the difference that on this floor, showers, are part of them as a need requested by the school.

The central atrium can be seen in the central light hole protecting the younger users with transparent railings.



Drawing 13 - First floor

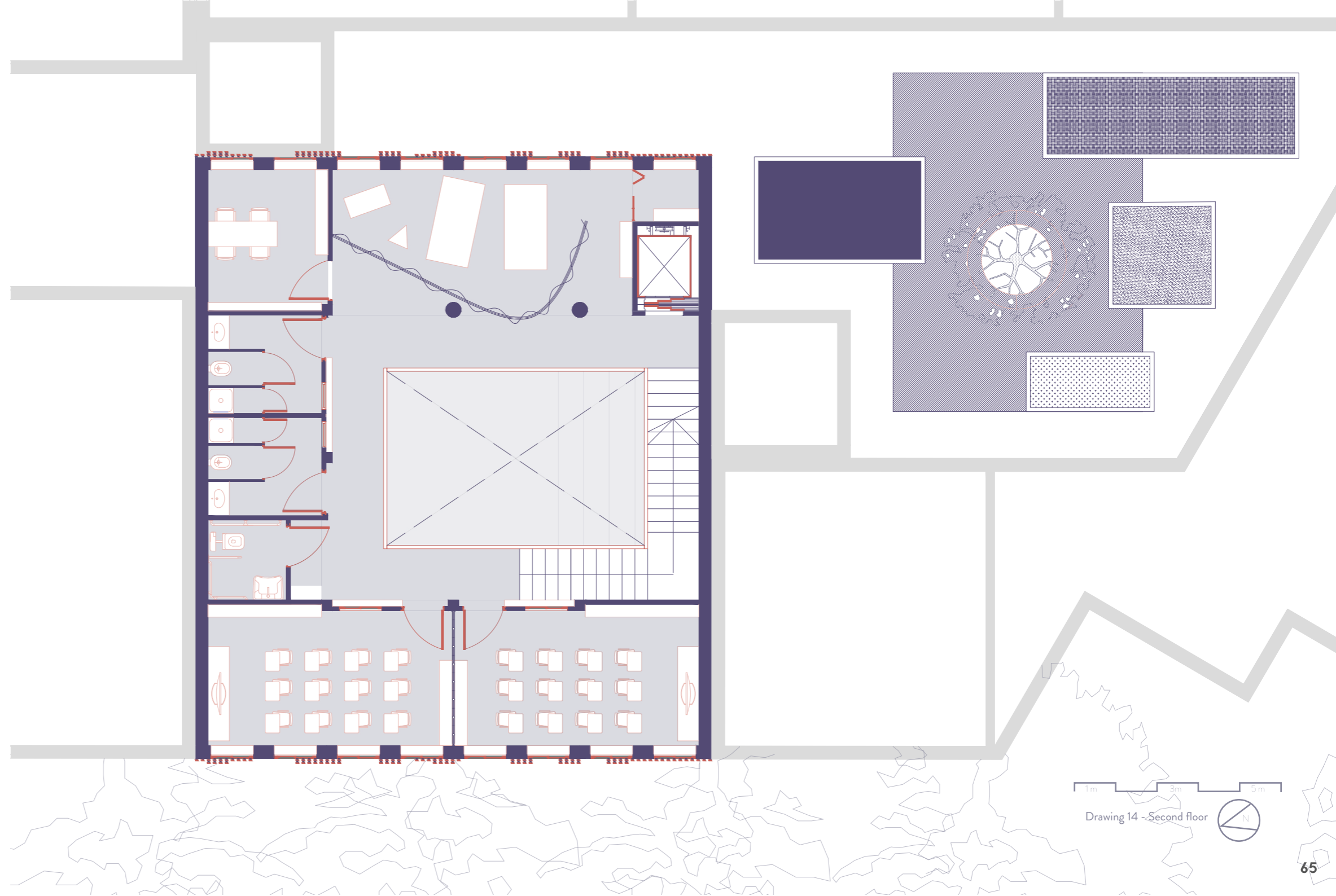


3.1.5 Second Floor

This floor is part of the second stage of construction. It consists of four spaces: two mirrored large classrooms on the west façade for additional didactic activities, a room thought as a library or consultation room, and a physical therapy open space divided from the rest with a curtain, a use which could happen in the atrium zone before this stage of construction.

It also includes the same toilet services found on the first floor with showers and windows to the corridor.

The stairs towards the third floor have an extra step as the distance among these floors is higher due to the thicker layers needed for the third floor.



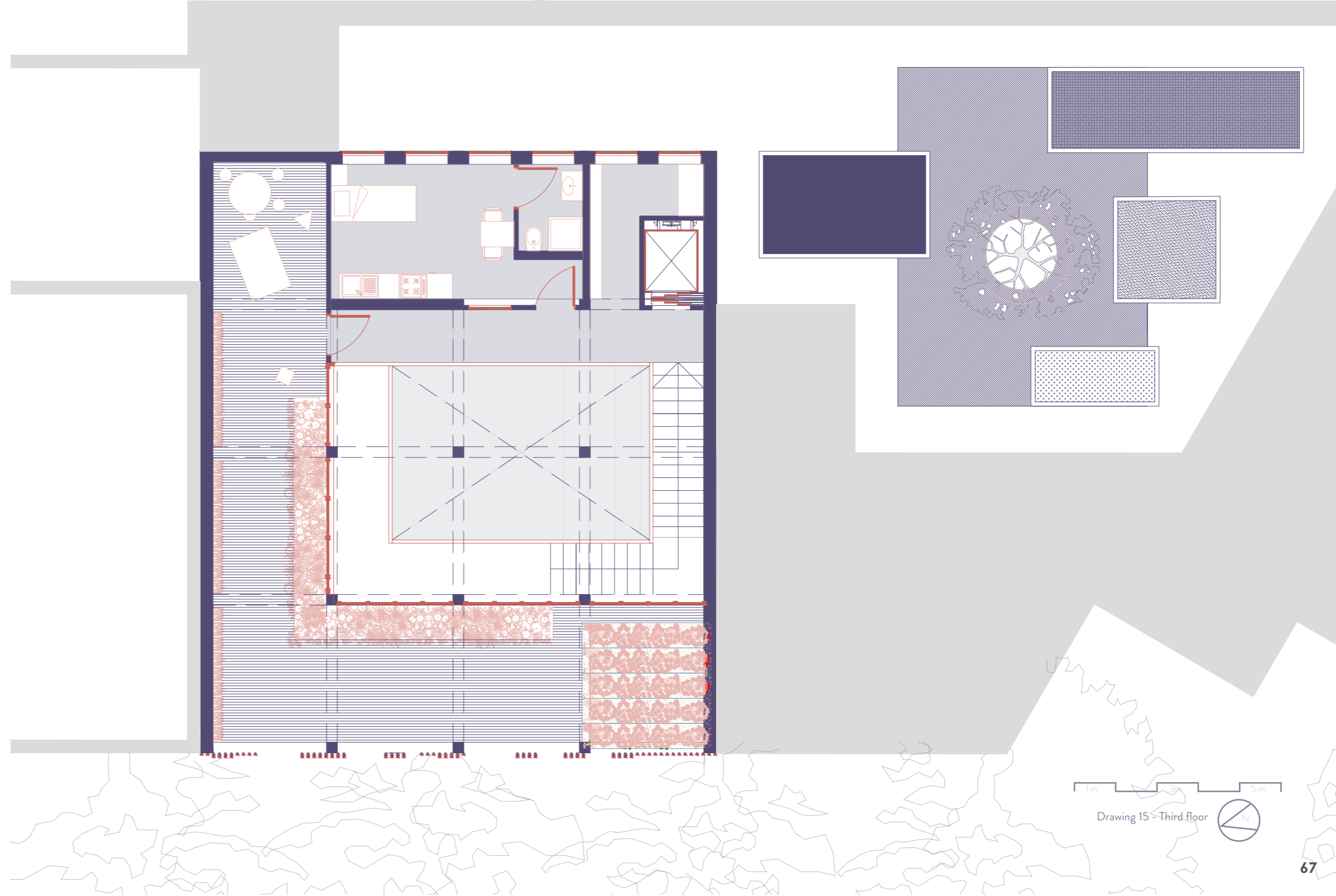
1m 3m 5m
Drawing 14 - Second floor



3.1.6 Third Floor

This floor is the third phase of construction and its main characteristic is a multiple use terrace is seen; among the activities that can be done are open-air physical therapy or a vegetable garden, focusing on the concept of a self-sustainable school. As one of the requests of the school principal was to have the possibility of having an apartment to teach the students independence, an apartment was also designed in this floor.

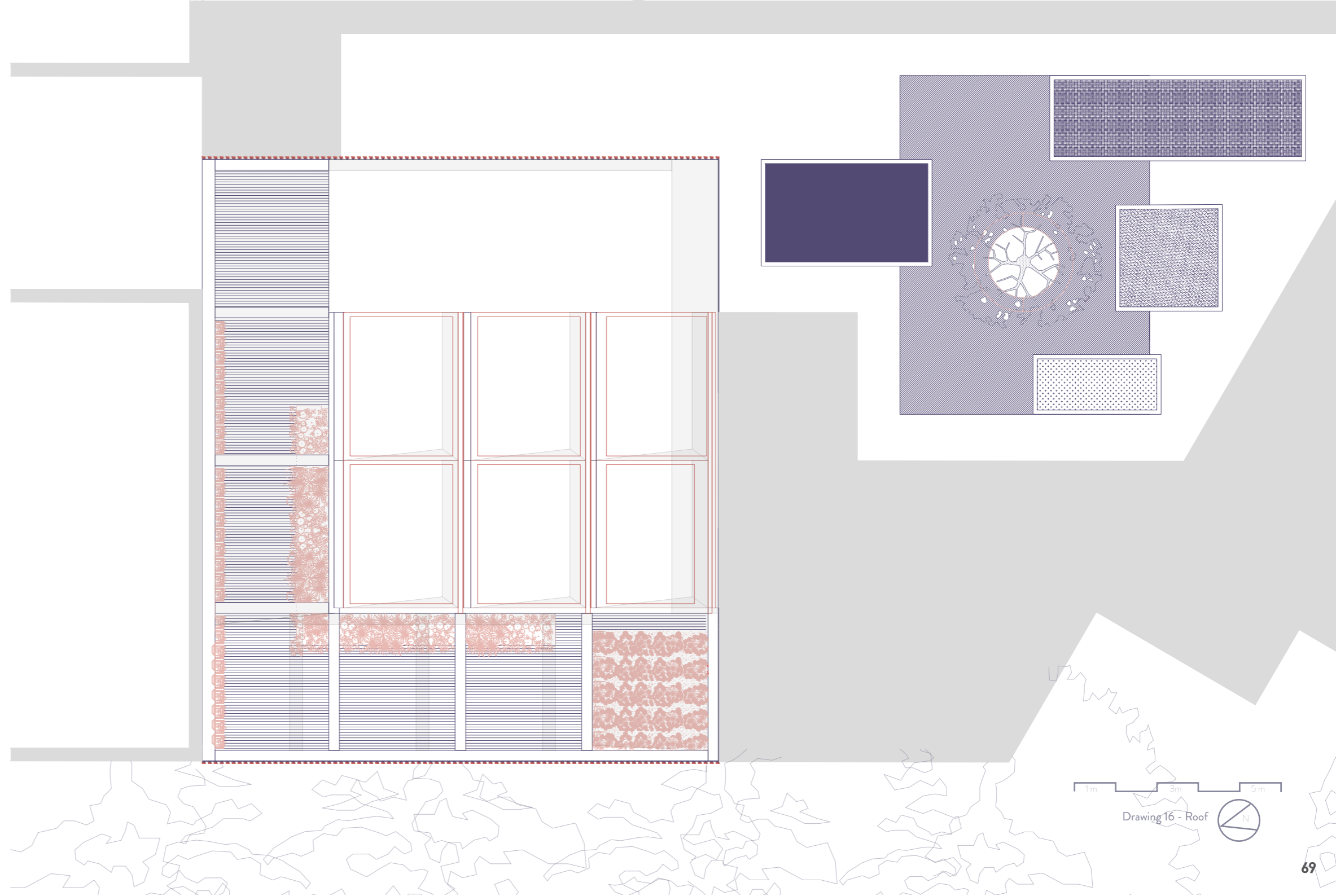
This floor is also connected through the elevator to make it fully accessible and is meant to be a laundry room. In Mexico laundry rooms tend to be on top of buildings together with a roof are for drying clothes, therefore in order to take advantage of the space left between the elevator and the apartment, a laundry room is placed there with the possibility of drying clothes on the open air on the terrace area.



3.1.7 Roof

Here we can see the top view of the building. The highlight of this is the skylight which consists of 6 mechanical windows that can be opened for ventilation and heat control. The windows are inclined and facing the south following the east-west sun movement and allowing the maximum light to enter the building. Between the windows, ceiling drippers are placed to allow water drainage from the common rains in Mexico City to flow and fall into the vegetable planters surrounding the edge of the windows.

To allow the drainage of water also in the case of the apartment alternative, the roof is inclined and connected to a ceiling dripper too.



Drawing 16 - Roof



3.1.8 Sections

SECTION A-A'

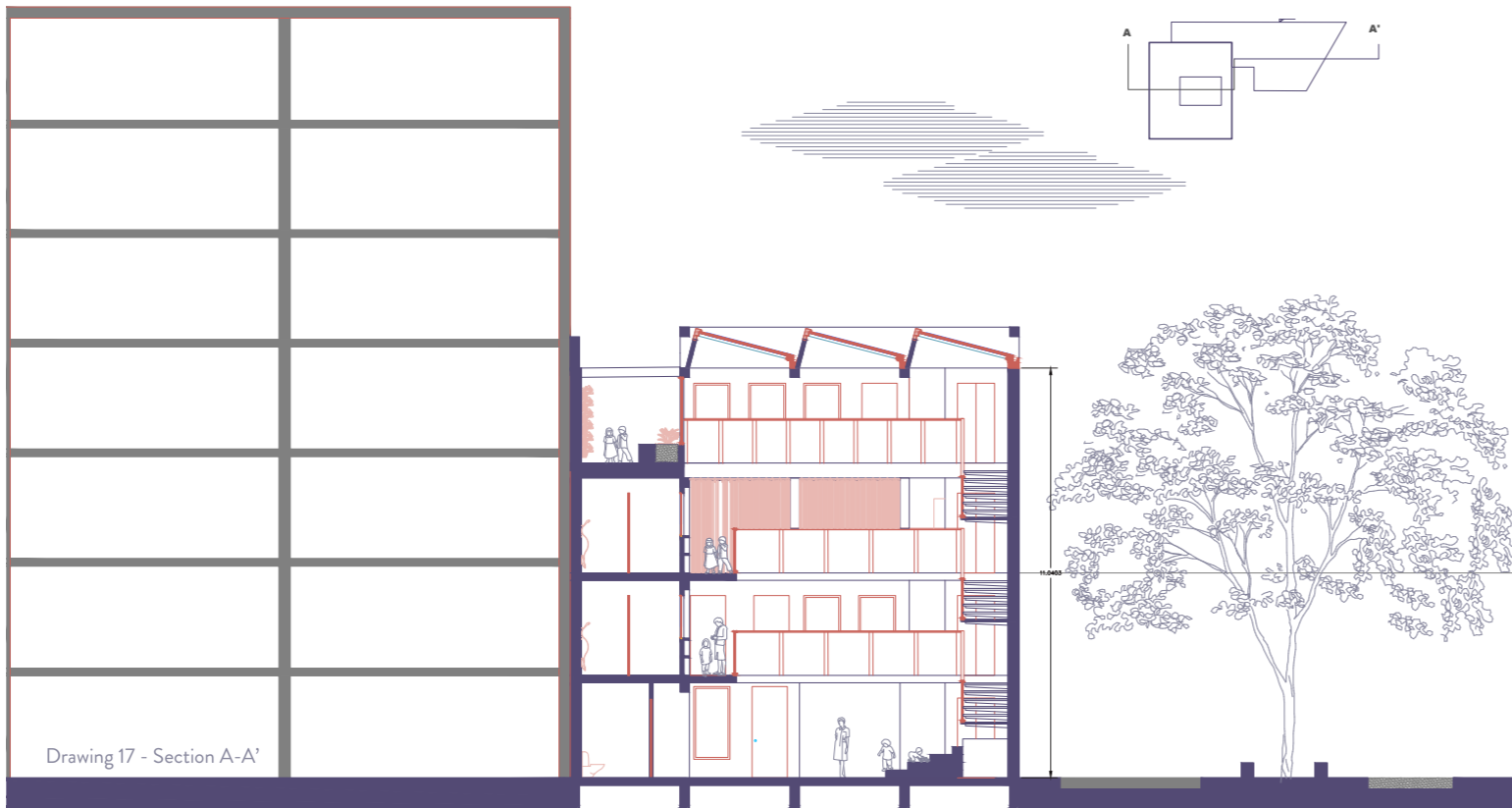
In this section, we can see the floor connection through stairs together with the central atrium's relationship with the rest of the floors.

Apart from the atrium, we can see the kitchen on the right and the storage space next to the elevator on the ground floor.

On the first floor, the rooms are cut. On the left, a flexible classroom and the nursery can be seen on the right.

On the second floor's left side we see the motor therapy open space divided by the curtain and on the right, we see one of the mirrored classrooms cut.

Finally, on the third floor, we see the apartment cut on the left and the vegetable garden and terrace on the right together with the railing that allows a partial view from the street.



Drawing 17 - Section A-A'

SECTION B-B'

In this section, we see the other side of the atrium-skylight connection.

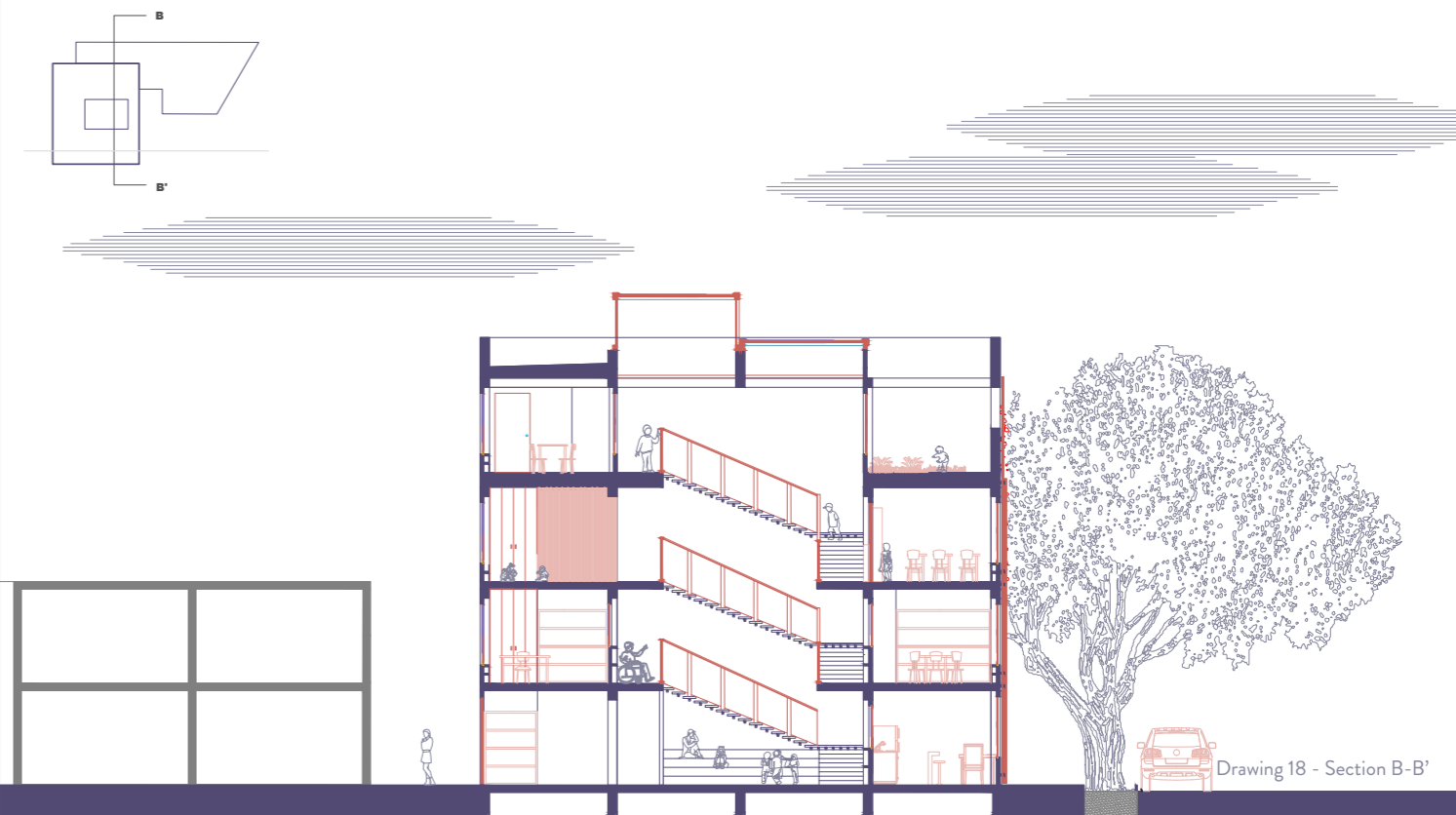
On the ground floor, we can see the atrium stair benches placed next to the stairs.

On all the floors we can see the toilets cut with the interior divisions on the left and the stairs cut to the right. We can also see a view of the classroom's wall towards the corridor and the dividing curtain on the second floor.

On the third floor, we can see the vertical garden and planters placed.

On this view, we can appreciate the way the skylights work, inclined towards the south and with the ceiling drippers between the window fixtures.

Finally, we can see a cut of the shared courtyard, where the basins and central bench are appreciated.



Drawing 18 - Section B-B'

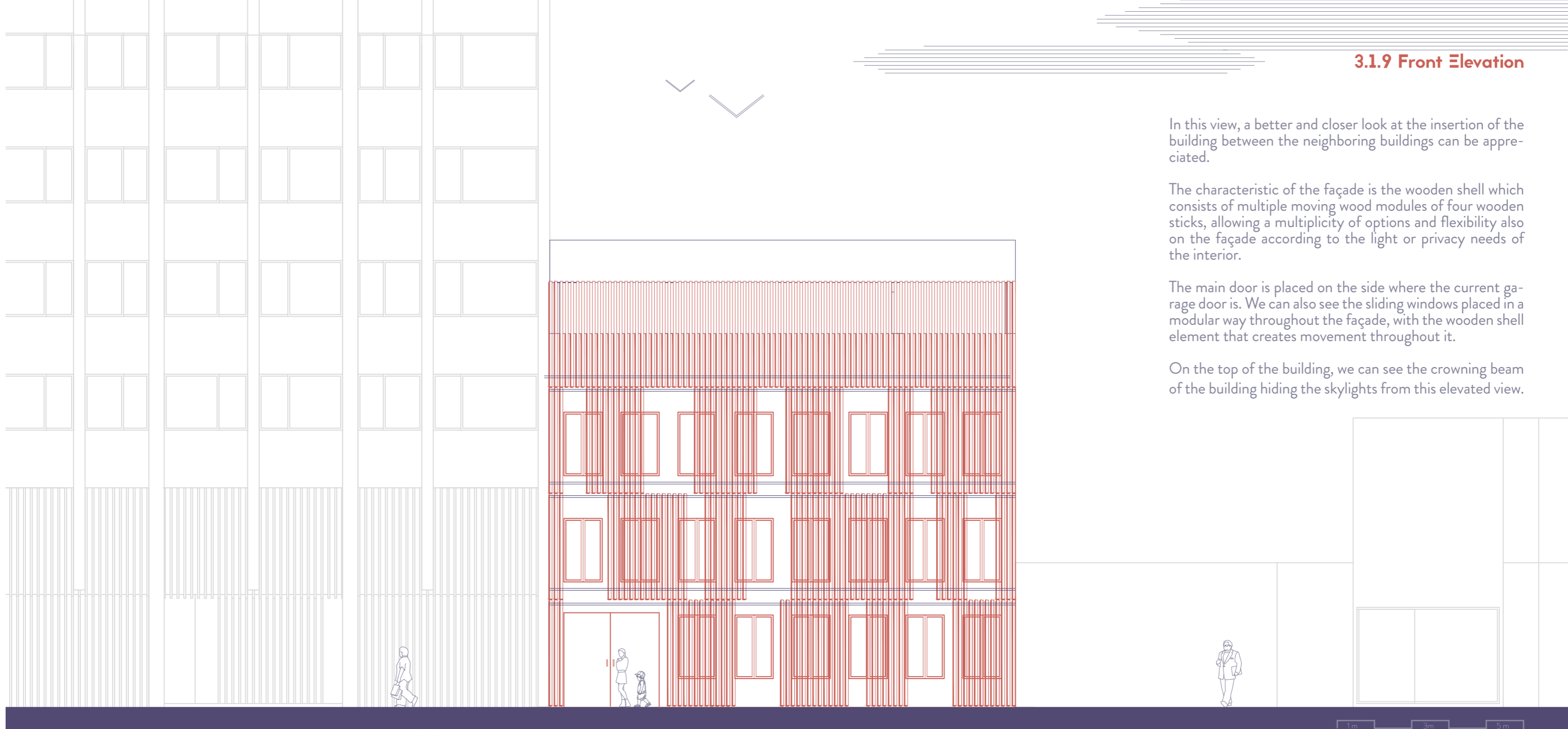
3.1.9 Front Elevation

In this view, a better and closer look at the insertion of the building between the neighboring buildings can be appreciated.

The characteristic of the façade is the wooden shell which consists of multiple moving wood modules of four wooden sticks, allowing a multiplicity of options and flexibility also on the façade according to the light or privacy needs of the interior.

The main door is placed on the side where the current garage door is. We can also see the sliding windows placed in a modular way throughout the façade, with the wooden shell element that creates movement throughout it.

On the top of the building, we can see the crowning beam of the building hiding the skylights from this elevated view.



Drawing 19 - West elevation

3.1.10 Back Elevation

In this view, the view from façade facing the courtyard can be seen. Despite being almost mirrored to the front façade, the entrance is placed in a different position. The sliding wood shell continues here partially on the wall of the apartment.

In this view, we also get different perspective of the courtyard by sectioning a basin and the middle tree.



3.2 CONCLUSION

Alternative pedagogies are strictly correlated to their environment. Studies have been done regarding this relationship and the characteristics of the spatial configurations of these methods have been established in recent years; an example is the Montessori Architecture Patterns. Research such as that of Joachim Dattke, author of “A Montessori Model for Inclusion” has also shown how the Montessori pedagogy can have positive outcomes when working with disabled students as it seems to be in line with their specific needs both in philosophy and in the design of their environment. This analysis aims to further understand the relationships between pedagogies, architecture and inclusion by deep-diving into the Montessori, Steiner and the Reggio Emilia pedagogies and their architecture.

After the analysis of the literature regarding the pedagogies mentioned, a better understanding of children’s needs was achieved, as it made me understand that the configuration of spaces should not only be guided by local regulations but also by students’ perception of space. Especially during the early years of student life, comfortable space is extremely needed as it is a fundamental phase of human development.

When it comes to inclusion, the best way of including disabled people should be the models used in some European countries in which both disabled and non-disabled students are placed to develop tolerance and respect values. Yet, the current situation in Mexico does not allow this to happen as budget cuts in public education are increasing and society is not prepared to treat disabled students as equal to non-disabled. Despite this, I think society can start the change through small steps, such as a common

courtyard (like the one proposed in this thesis) among the disabled and non-disabled.

As mentioned before, this work has a personal meaning to me. My brother has attended this institution for most of his life and I have visited it multiple times and over time tied to conversations with the teachers and principal made me understand that there were many spatial deficiencies. I took this as an opportunity to research and to better understand the relationship between the pedagogy practiced, space and inclusion.

After this research and project, I was able to understand the relationship among the pedagogies and philosophies followed in an environment with the environment itself. Most of the time, design is based on aesthetics, regulations, or structural rules, but as architects, we often leave outside the user’s needs. The way a space is organized or the elements we place as architects or designers can have an impact on the user’s behavior and development, especially in the developing phases and even more when talking about disabled students.

My design aimed to solve the main issues addressed by the principal of the institution taking into consideration the pedagogical design suggestions found during the research which I found to be quite helpful in the process. Down Syndrome’s

Finally, I hope both my research and design serve as a step towards inclusion of intellectually disabled students which are often left behind on design processes and even on regulations as it’s a type of disability that you “cannot see”. I hope this also helps as a basis for the school’s improvement, even if only some pieces of this project are taken.

**BIBLIOGRAPHY
/
SITOGRAPHY**

LIST OF FIGURES

DRAWINGS

BIBLIOGRAPHY/ SITOGRAPHY

Pedagogy & architecture:

Casabella 750-751 “Scuole del secondo Novecento” <https://www.hertzberger.nl/images/media/Casabella750.pdf>

Châtelet, Anne-Marie, and Marta Gutman. “School Buildings and Architecture.” School Buildings and Architecture - Europe, Bibliography, United states, Bibliography - Encyclopedia of Children and Childhood in History and Society. Encyclopedia of Children and Childhood in History and Society. Accessed November 26, 2021. <http://www.faqs.org/childhood/Re-So/School-Buildings-and-Architecture.html>.

Dyer, Emma. “Interview with Herman Hertzberger (2016).” Architecture and Education, August 29, 2017. <https://architectureandeducation.org/2016/02/03/interview-with-herman-hertzberger/>.

Levin, Malcolm. “Alternative Education.” The Canadian Encyclopedia. Historica Canada. Article published February 07, 2006; Last Edited December 16, 2013.

Martin, Robin Ann. “An Introduction to Educational Alternatives.” AERO: Alternative Education Resource Organization, November 2020. <http://www.educationrevolution.org/store/resources/alternatives/introtoalternatives/>.

McClintock, Robert, and Jean McClintock. “Architecture and Pedagogy.” Journal of Aesthetic Education 2, no. 4 (1968): 59–77. <https://doi.org/10.2307/3331645>.

Wood, Adam. “How to Make a Basic School Design Pedagogically Interesting? Learning from a Case in Ecuador.” Architecture and Education, August 19, 2018. <https://architectureandeducation.org/2018/02/28/how-to-make-a-basic-school-design-pedagogically-interesting-learning-from-a-case-in-ecuador/>.

Montessori pedagogy:

Abdel, Hana. “AKN Nursery / Hibinosekkei + Youji No Shiro.” ArchDaily. ArchDaily, March 14, 2021. https://www.archdaily.com/958475/akn-nursery-hibinosekkei-plus-youji-no-shiro?ad_source=search&ad_medium=projects_tab.

AHH Architecture Studio Website <https://www.ahh.nl/index.php/en/projects/education>

“Akn Nursery.” FuturArc, March 23, 2021. <https://www.futurarc.com/project/akn-nursery/>.

“Apollo Schools - Montessori School and Willemspark School, Amsterdam (1980-1983).” AHH. Accessed January 17, 2022. <https://www.ahh.nl/index.php/en/projects/2/9-onderwijs/113-apollo-schools>.

Bourne, Lori. “Montessori and the Child with Special Needs.” Montessori for Everyone Blog, August 15, 2017. <https://www.blog.montessoriforeveryone.com/montessori-and-the-special-needs-child.html>.

“Erfgoed Van De Week: Monumentale Schoolgebouwen – De Apolloscholen Van Hertzberger.” Amsterdam.nl. Gemeente Amsterdam, July 23, 2020. <https://www.amsterdam.nl/kunst-cultuur/monumenten/erfgoed-week/apolloscholen-hertzberger/>.

Migliani, Audrey. “How to Stimulate Children’s Autonomy through Architecture and the Montessori Method.” ArchDaily. ArchDaily, January 18, 2021. <https://www.archdaily.com/930510/how-to-stimulate-childrens-autonomy-through-architecture-and-the-montessori-method>.

“Montessori Architecture.” Montessori Architecture. Accessed November 26, 2021. <https://montessori-architecture.org/>.

“Play and Learn in Feeling the Warmth of Wood.” e-ensha. Accessed January 10, 2022. <https://e-ensha.com/en-akn-nursery/>.

Selda Al, Reyhan Midilli Sari, Nimet Candas Kahya. “A Different Perspective on Education: Montessori and Montessori School Architecture”. Procedia - Social and Behavioral Sciences, Volume 46, 2012, Pages 1866-1871, ISSN 1877-0428

Spikner, Jennifer. “Montessori for Children with Special Needs.” American Montessori Society. Accessed January 17, 2022. <https://amshq.org/About-Montessori/Montessori-for-Children-with-Special-Needs>.

Sutor, Christine. “Schools We like - Apollo Montessori & Willemspark School in Amsterdam > Integrus Architecture.” Integrus Architecture, December 20, 2017. <https://www.integrusarch.com/2015/03/20/schools-like-apollo-montessori-willemspark-school-amsterdam/>.

Steiner Waldorf pedagogy:

Damovska, Lena. (2005). “The Waldorf pedagogy and children with special needs”. Journal of Special Education and Rehabilitation.

Mochner, Matthias. “Human Beings as the Measure of Things: On the Architecture of Waldorf Schools.” Waldorf Today, July 2014. <https://www.waldorftoday.com/2014/09/human-beings-as-the-measure-of-things-on-the-architecture-of-waldorf-schools/>.

Migliani, Audrey. “How to Design Schools and Interiors Based on Waldorf Pedagogy.” ArchDaily. ArchDaily, March 25, 2020. <https://www.archdaily.com/935990/how-to-design-schools-and-interiors-based-on-waldorf-pedagogy>.

Architecture Steiner Website <https://www.architecturesteiner.com/>

Tao Bak. “For creativity, capability and resilience, Steiner schools work”. The Conversation. June 25, 2014. <https://theconversation.com/for-creativity-capability-and-resilience-steiner-schools-work-24763>

Reggio Emilia pedagogy:

Cavallini, Ilaria, Barbara Quinti, Annalisa Rabotti, and Maddalena Tedeschi. 2017. “Las Arquitecturas de La Educación: El Espacio de Lo Posible. La Cultura Del Habitar En La Experiencia de Las Escuelas Municipales de Educación Infantil de Reggio Emilia.” Revista Internacional de Educación Para La Justicia Social (RIEJS) 6.1 (2017). <https://doi.org/10.15366/riejs2017.6.1.010>.

Gilman, Sheryl. “Including the Child with Special Needs: Learning from Reggio Emilia.” Theory Into Practice 46, no. 1 (2007): 23–31. <http://www.jstor.org/stable/40071630>.

“Map of Alternative Education Institutions Worldwide.” REEVO. Accessed November 27, 2021. https://reevo.wiki/Experiencia?l=en_US#en.

Migliani, Audrey. “Improving the Educational Environment with the Reggio Emilia Approach.” ArchDaily. ArchDaily, July 24, 2020. https://www.archdaily.com/944063/improving-the-educational-environment-with-the-reggio-emilia-approach?ad_source=search&ad_medium=search_result_all.

“Reggio Emilia Primary School by 70°N Arkitektur.” Archello. Accessed November 28, 2021. <https://archello.com/project/reggio-emilia-primary-school>.

Silva, Valeria. “Family School / Arkitito Arquitetura + Oficina Umauma + Luiza Gottschalk.” ArchDaily. ArchDaily, July 2, 2020. https://www.archdaily.com/942774/family-school-arkitito-arquitetura-plus-oficina-umauma-plus-luiza-gottschalk?ad_source=search&ad_medium=projects_tab.

Context:

Concepto. “Milagro Mexicano - Concepto, Modelo Económico Y Objetivos,” 2013. <https://concepto.de/milagro-mexicano/>.

Unam.mx. “UNAM En El Tiempo | Portal UNAM,” 2015. <https://www.unam.mx/acerca-de-la-unam/unam-en-el-tiempo>.

MXCity. “La Evolución de La Ciudad de México a Través de Mapas Y Fotografías.” MXCity | Guía de la Ciudad de México. MXCity, September 8, 2022. <https://mxcity.mx/2022/09/la-evolucion-de-la-ciudad-de-mexico-a-traves-de-mapas-y-fotografias/>.

Quintana, Gabriel. “Arquitectura Del Porfiriato En México | Características Y 5 Ejemplos.” Arquitectura | Concepto, Tipos y Características. Arquitectura | Concepto, Tipos y Características, September 7, 2021. <https://www.fenarq.com/2021/09/arquitectura-del-porfiriato.html>.

Romero, Mayo. “La CDMX En El Tiempo: Mixcoac - Másformás.” Másformás, February 24, 2017. <https://www.masformas.com/ciudad/la-cdmx-tiempo-mixcoac/>.

Salinas González, Carlos Rafael. 2011. “De Suburbio a Ciudad. La Evolución de La Colonia Del Valle En La Ciudad de México.” Bitácora Arquitectura, no. 22 (June): 14. <https://doi.org/10.22201/fa.14058901p.2011.22.25550>.

Sarabia Bailón, Anahi. n.d. “Urbanismo Mexicano: Su Desarrollo Durante El Porfiriato.”

Undergraduate dissertation, Escuela Superior de Artes visuales. Accessed October 17, 2022. <https://aaroo.files.wordpress.com/2014/12/urbanismo-durante-el-porfiriato.pdf>.

Xiu. “La Historia de La Ciudad de México.” Matador Español. Matador Network, July 12, 2019. <https://matadornetwork.com/es/historia-de-la-ciudad-de-mexico/>.

Disability:

“Designing for Special Education - NAC Architecture.” NAC Architecture. NAC Architecture. Accessed November 27, 2021. <https://www.nacarchitecture.com/publications/DesignForSpecialEducation.pdf>.

“Inclusion by Design - Design Council.” Design Council. Commission for Architecture and the Built Environment, 2008. <https://www.designcouncil.org.uk/sites/default/files/asset/document/inclusion-by-design.pdf>.

“Inclusive Design Strategy - September 2012.” Queen Elizabeth Olympic Park. London Legacy Development Corporation, December 2, 2021. <https://www.queenelizabetholympicpark.co.uk/>.

Jebri T, Chen Y. The architectural strategies of classrooms for intellectually disabled students in primary schools regarding space and environment. Ain Shams Eng J 2020. doi: <https://doi.org/10.1016/j.asej.2020.09.005>.

Martínez-Salanova Sánchez, Enrique. “María Montessori, La Pedagogía De La Responsabilidad.” EduComunicación. Accessed January 17, 2022. https://educomunicacion.es/figuraspedagogia/O_montessori.htm.

Meng Deng & Janet C. Holdsworth (2007). “From unconscious to conscious inclusion: meeting special education needs in West China”, Disability & Society, 22:5, 507-522, DOI: 10.1080/09687590701427644

Nikita Kamboj. “What Is Architecture for the Intellectually Challenged, and Why It Matters.” RTF | Rethinking The Future, November 22, 2021. <https://www.re-thinkingthe-future.com/rtf-fresh-perspectives/a469-what-is-architecture-for-the-intellectually-challenged-and-why-it-matters/>.

P. John Clarkson, Roger Coleman, “History of Inclusive Design in the UK”, Applied Ergonomics, Volume 46, Part B, 2015, Pages 235-247, ISSN 0003-6870, <https://doi.org/10.1016/j.apergo.2013.03.002>.

Wagner, Lise. “Disabled People in the World in 2021: Facts and Figures.” Inclusive City Maker, November 26, 2021. <https://www.inclusivecitymaker.com/disabled-people-in-the-world-in-2021-facts-and-figures/>.

“What Is Montessori Education?” What Is Montessori Education. Accessed January 17, 2022. <https://amshq.org/About-Montessori/What-Is-Montessori>.

“Why the Relationship between Pedagogy and Design Is Important.” Innova Design Group, December 21, 2017. <https://www.innovadesigngroup.co.uk/news/why-the-relationship-between-pedagogy-and-design-is-important/>.

LIST OF FIGURES

Figure 1

Personal photo

Figure 2 - Map

Done by the author

Figure 3 - Multiple schools architecture

https://images.adsttc.com/media/images/5bc1/0557/f197/cc91/e100/0021/slideshow/___School_Architecture_Fl.jpg?1539376460

Figure 4 - Inclusivity and architecture

https://images.adsttc.com/media/images/5d54/855f/284d/d16c/1200/00db/newsletter/shutterstock_63798268.jpg?1565820236

Figure 5 - Maria Montessori

<https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcSN7tYR025SWiAHzK7f22nHnRWL6avkMKFqvA&usqp=CAU>

Figure 6 - Montessori principles

<https://www.montessoriuip.com/wp-content/uploads/2020/11/montessori-principles.png>

Figure 7 - Montessori guidelines - Everyday gathering spaces inside and outside

<https://montessori-architecture.org/patterns/creation-of-an-everyday-theatre/>

Figure 8 - Montessori guidelines - Montessori guidelines - Accessibility for children of different ages

<https://montessori-architecture.org/patterns/accessibility-for-children-of-different-ages/>

Figure 9 - Apollo School - first floor

<https://www.ahh.nl/index.php/en/projects2/9-onderwijs/113-apollo-schools>

Figure 10 - Apollo Schools - Section

<https://www.ahh.nl/images/projecten/onderwijs/ApA/10.jpg>

Figure 11 - AKN Nursery - first floor

<https://images.adsttc.com/media/images/604b/4697/f91c/815c/4f00/00f6/slideshow/plan.jpg?1615545981>

Figure 12 - AKN Nursery - first floor

<https://images.adsttc.com/media/images/604b/46b8/f91c/810c/b900/0116/newsletter/section1.jpg?1615546013>

Figure 12 - Apollo schools - Central atrium

<https://architecturehoy.files.wordpress.com/2012/05/apollo-schools-montessori-school-and-willemspark-school-amsterdam-the-netherlands.jpg?w=767>

Figure 13 - AKN Nursery - Main hall

https://www.futurarc.com/wp-content/uploads/2021/03/AKN-Nursery-36204-1-min_05.jpg

Figure 15 - Rudolf Steiner

https://upload.wikimedia.org/wikipedia/commons/f/f5/Steiner_um_1905.jpg

Figure 16 - Students practicing self-expression through performance

<https://www.steiner.edu/wp-content/uploads/2017/05/10.50.12-792x1024.jpg>

Figure 17 - Natural lighting

https://images.adsttc.com/media/images/5e6f/c012/b357/653d/d300/034a/newsletter/El_Til%C2%B7ler_School_1.jpg?1584381961

Figure 18 - Natural light - color

https://images.adsttc.com/media/images/5e6f/c012/b357/653d/d300/034a/newsletter/El_Til%C2%B7ler_School_1.jpg?1584381961

Figure 19 - Yellow Train School - ground floor

<https://architecturez.net/data/styles/large/public/media/biome-yellow-train-school-ground.jpg?tok=wBxBA-gx>

Figure 20 - Yellow Train School - sections + elevation

https://divisare-res.cloudinary.com/images/c_limit,f_auto,h_2000,q_auto,w_3000/v1506934534/f8nzl0sfudcvvez0arng/biome-environmental-vivek-muthuramalingam-yellow-train-school.jpg

Figure 21 - Escuela El Til-ler - exploded axonometric

https://arquitecturaviva.com/assets/uploads/obras/50869/balcells_rius_tiggess_escuela_til_ler_barcelona_13.jpg?h=b91a2eeb

Figure 22 - Escuela El Til-ler - first floor plan

<https://detail-cdn.s3.eu-central-1.amazonaws.com/media/catalog/product/1/9/19-El-Tiler-Balcells-Ignasi-Rius-Tiggess-Waldorfschule-Grundriss-OG.jpg?optimize=medium&bg-color=255,255,255&fit=bounds&height=&width=>

Figure 23 - Yellow Train School - Courtyard view

https://divisare-res.cloudinary.com/images/c_limit,f_auto,h_2000,q_auto,w_3000/v1506933929/adequ0uxtwpfqzmcg8a1/biome-environmental-vivek-muthuramalingam-yellow-train-school.jpg

Figure 24 - Escuela El Til-ler - façade view

https://images.adsttc.com/media/images/5cf9/d2f0/284d/d16d/6a00/043e/large.jpg/El_Til%C2%B7ler_School_06.jpg?1559876326

Figure 25 - Loris Malaguzzi

<https://www.reggiocildren.it/assets/Uploads/12-OK-piccola.jpg>

Figure 26 - Kids exploring through natural textures

<https://www.daynurseries.co.uk/images2/advice/Reggio%20Emilia%20activities%20are%20usually%20done%20in%20small%20groups.jpg>

Figure 27 - Scheme of a Reggio School

https://www.frchildren.org/storage/app/uploads/public/5f6/b6d/fcd/thumb_547_schema_progetto_nuovi_paesaggi_di_aprendimento_600_0_0_0_auto.jpg

Figure 28 - Reggio Emilia school concept

<https://archello.s3.eu-central-1.amazonaws.com/images/2013/02/20/70N-classroom1-furnished.1506666949.088.jpg>

Figure 29 - Tellus Nursery school- ground floor plan

https://www.contemporist.com/wp-content/uploads/2011/01/tn_080111_13.jpg

Figure 30 - Tellus Nursery school- shell axonometry

<https://images.adsttc.com/media/images/5013/5a32/28ba/0d0e/f000/0f02/large.jpg/stringio.jpg?1361344101>

Figure 31 - Centro Internazionale Loris Malaguzzi - floorplan

https://www.mparchitects.it/file/2600x0/import/1073_0.jpg

Figure 32 - Centro Internazionale Loris Malaguzzi - visualization

https://www.mparchitects.it/file/2600x0/import/1074_0.jpg

Figure 33 - Tellus Nursery school - Classroom

<https://cdn.archilovers.com/projects/ba2cc86d-4e5f-41bf-8451-9c1b1fedbafd.jpg>

Figure 34 - Centro Internazionale Loris Malaguzzi - Atelier

https://images.squarespace-cdn.com/content/v1/552e25ece4b0b7b50b-f697ea/1430212058108-SFUKF3UJ4SKIW2Z5PZK2/Scuola+Loris+Malaguzzi_01.jpg?format=2500w

Figure 35 - Medical Model of Disability

https://www.neurodivercitysg.com/uploads/2/6/0/7/26078640/835864786_orig.png

Figure 36 - Social Model of Disability

https://www.neurodivercitysg.com/uploads/2/6/0/7/26078640/835864786_orig.png

Figure 37 - Microsoft Design Toolkit

https://miro.medium.com/max/2000/1*H-RYtQcgLb1mLIE4pJj00Q.jpeg

Figure 38 - Accessibility in the urban space

<https://images.adsttc.com/media/images/5ab1/2851/f197/cc98/1b00/00eb/medium.jpg/001.jpg?1521559629>

Figure 39 - Sercotel Alfonso XIII Hotel to be one of the first hotels in Spain fully accessible to intellectually disabled people

https://muriaplaza.com/public/Image/2022/3/REP3220-1030x687_NoticiaAmpliada.jpg

Figure 40 - World Economic Forum -

Diversity and Inclusion: Inclusive Education Design

<https://intelligence.weforum.org/topics/a1G0X0000057IniUAE/key-issues/a1G0X0000057N7FUAU>

Figure 41 - Students at lunch time

Photo taken by the author

Figure 42 - Teacher tutoring a student

Photo taken by the author

Figure 43 - CTDUCA's ground floor

CTDUCA

Figure 44 - CTDUCA's first floor

CTDUCA

Figure 45 - Mexico City Skyline

https://live.staticflickr.com/65535/49430471488_e60cfd49e2_h.jpg

Figure 46 - Visualization of Mexico City in prehispanic times

<https://mxcity.mx/wp-content/uploads/2019/03/mapas-cdmx-min-1536x860.png>

Figure 47 - Map of Mexico City in 1628

<https://mxcity.mx/wp-content/uploads/2019/03/evolucionC3%B3n-m%C3%A9xico-tenocitlan-6.jpg>

Figure 48 - Mexico City aerial view in 1954

<https://mxcity.mx/wp-content/uploads/2019/03/evolucionC3%B3n-m%C3%A9xico-tenocitlan-10.jpg>

Figure 49 - Mexico City skyline today

https://external-preview.redd.it/mZlhui1ZaolhMqgJ85V_stK9nZl8FoFoe-a8EbSnhAU.jpg?width=640&crop=smart&auto=webp&s=fc5574a61554ed0d-25e134f83a8af9fb428bac0e

LIST OF DRAWINGS

Drawing 2 - Services

Drawing 3 - Mobility

Drawing 4 - Mexico

Drawing 5 - Mexico City

Drawing 6 - Mexico City Evolution

Drawing 7 - Mexico City Evolution

Drawing 8 - Acacias collage -before & after

Drawing 9 - Acacias collage -before & after

Drawing 10 - Masterplan

Drawing 11- Urban elevation

Drawing 12 - Ground floor

Drawing 13 - First floor

Drawing 14 - Second floor

Drawing 15 - Third floor

Drawing 16 - Roof

Drawing 17 - Section A-A'

Drawing 18 - Section B-B'

Drawing 19 - West elevation

Drawing 20 - East elevation