Politecnico di Torino

Design Strategies to Regenerate the Outdoor Spaces in First-cycle School Buildings.

A Transformative Model for the Post-pandemic City, based on the Case Study of Turin.

Andrea Rodriguez Ramirez

CORSO DI LAUREA MAGISTRALE IN
ARCHITETTURA PER IL PROGETTO SOSTENIBILE

Tesi di Laurea Magistrale
Sessione di Laurea 12 / 2021
A.A. 2020/21

"Children learn best through their everyday experiences with the people they love and trust, and when the learning is fun. And the best place for these experiences is outdoors, in the natural world".

- Center for Families, Communities, Schools and Children´s Learning

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Andrea Rodriguez Ramirez

Relatore
Roberto Giordano
Politecnico di Torino
DAD - Dipartimento di Architettura e Design

Co-relatore
Caterina Barioglio
Politecnico di Torino
DAD - Dipartimento di Architettura e Design

Daniele Campobenedetto
Politecnico di Torino
DAD - Dipartimento di Architettura e Design

INDEX

Abstract

This research aims to identify a transformative model to regenerate the first-cycle school buildings in the post-pandemic city. Starting from the school infrastructure in Turin and compared with international cases, the research focuses on outdoor spaces, intended as a resource to face the pandemic's critical situation and facilitate the integration of innovative learning processes. The two-step analysis findings concentrate firstly on the whole stock of first-cycle school buildings in Turin and secondly on a selection of representative cases. Those are the basis to propose a spatial toolkit that identifies design principles and architectural devices that could be generalized to other design contexts.

Based on this theoretical and statistical work, the intervention is conducted in three schools in Turin, an experiment that follows a morphological and typological study as the base for identifying the transformative potential of the outdoor spaces. As a result, it has been possible to create the first spatial toolkit that summarises and conceptualizes design tools that could be put in action on school open spaces. Those strategies must improve the quality of the available space for a possible regeneration and new relations between the city and the school buildings, giving children the opportunity to have innovative outdoor learning activities and practical classes.

Introduction

Two years have passed from learning how to live with the pandemic, with the virus has changed people's lifestyles, making it much more virtual and limiting citizen interaction. Events, concerts, sports, work, and education have taken an unexpected turn. However, the question is, is it positive for everyone? How do the people live from each age range in this situation? How much has living people with their families changed when studying from home?

This research seeks to analyze the educational sector, prioritizing children as the most affected by virtuality about the quality of experimental education they should carry out in their schools. The primary issue is the difficulties guaranteeing children's attendance at online lessons for many reasons, access to the internet connection, lack of technological devices, and adequate spaces and support to attend virtual classes. According to the ISTAT statistics (2020, ISTAT), the estimated in Italy is about three million children between the 6 and 17 years that had difficulties attending school during the lockdown in Italy. The problem transcended to high children desertion when closing the schools have been reopened with an adaptation of spaces returning to their normality only at the beginning of 2021. Nevertheless, how could be this studied from the architectural point of view? How could it be solved from the open spaces relating it to the new outdoor learning concept? It is crucial to promote solutions for Covid 19 that is increasingly affecting the areas and people's interaction by searching how it is possible to transform it to ensure the presence and experimental education by suitable dimensions and measures, changing the children's learning process. Similarly, practical activities have not been possible.

The pandemic has blocked social interaction and contact with nature, a fundamental part of comprehensive training. This situation generates an essential impact in the psychology of the educational space, involving the learning process and the pedagogy to apply it for the children at school. Starting from these considerations, this thesis focuses on outdoor areas of First Cycle school building that host the age ranges of children that have been more affected during the pandemia Covid-19—. In other words, the research intended the outdoor spaces as a resource to face the pandemic's critical situation and facilitate the integration of innovative ways of learning to change the design principles for the Piano Nazionale di Ripresa e resilience (PNRR) to understand how could be managed the investments on the redesign of the school buildings in any context.

In 2020, the pandemic put the spaces of school buildings under stress. The European and Italian experience of the pandemic highlighted the limits of a dated heritage, which requires urgent interventions. The Italian school infrastructure, made by approximately 40.000 buildings, is a layered and widespread heritage, which requires a rethinking based on recent decades' social, demographic and pedagogical changes. After the pandemic, national and European funds and programs - the Italian "Piano Nazionale di Ripresa e Resilienza" is the primary outcome - represent an opportunity to invest and transform this architectural heritage that needs to be explored, analyzed, measured.

The research analyzes and measures the whole stock of outdoor spaces of Turin's first cycle school building stock. Data on a territorial and architectural level are analyzed and compared to understand the transformative potential of outdoor spaces in the whole urban area. It was necessary to make a typology analysis based on the urban responses from the building to the city and follow the urban morphology of the city of Turin. Typological and morphological classifications are made to identify recurring situations, focusing on the school's position on the lot and relationship with different urban fabrics and types of context like Islands, Peninsulas and Fulls. To make this work, several sources were investigated: the main is the "Anagrafe Nazionale Edilizia Scolastica", that a national level offers information on the status and the numbers of square meters for each building school. Municipal and Regional databases were crucial too: Geoportal for the base map of Turin and the activities around the case studies.

After exploring the whole first cycle of school buildings stock in Turin, the second analysis step occurred. The selected three school buildings represented recurring urban and architectural situations. Through the three cases, I could enter a more detailed scale and focus on the architectural level. These cases form the basis for a design experience on the open spaces about the school, studied with the school building and the context. With the study of references of school buildings that have carried out interventions with a view of an experimental education is possible to extract from national cases in Italy and International examples the design strategies to a school regeneration project in the post-pandemic city.

Fueled by the comparative study of other national and international experiences, the design path constitutes the base for a first design toolkit for outdoor spaces of first cycle school buildings. A spatial toolkit is a tool in which design principles and spatial devices are summarized and conceptualized. This tool could be used as inspiration for those who have to face the issue of school buildings regeneration in a similar context, for example, the professionals, architects, professors and municipality authorities, to participate in these changes for education quality. Early classification of spatial strategies is elaborated, putting as the primary point the intervention of a school's open space, which, according to its typological analysis and its relationship with the building, can be used in various ways to generate new forms of experiential learning.

DIAGNOSIS

GENERAL PANORAMA OF THE ACTUAL SITUATION

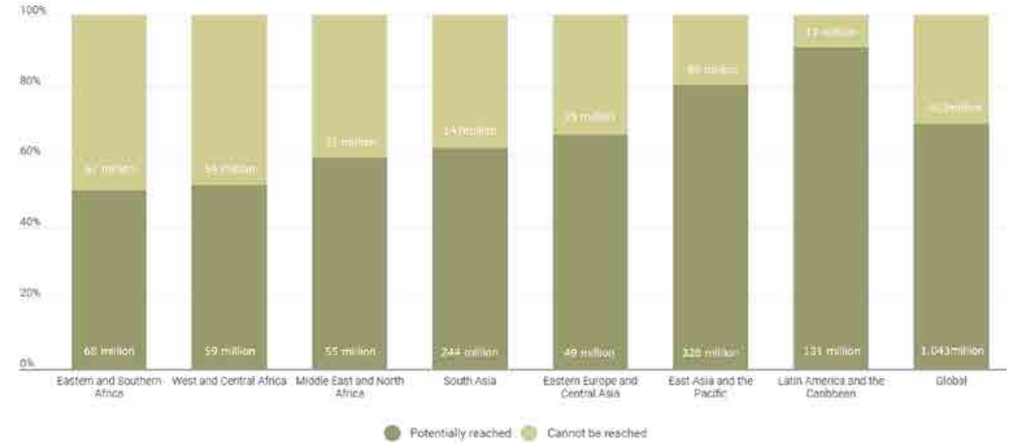
0 - 1

General panorama of the actual situation of the Covid 19 in the first cycle of education sector

Among the new challenges brought by the pandemic are the inequality of internet access, because in many places the signal and the quality of communications is not the best, as is the case in Italy in the southern part of the country, where the internet is very precarious. In addition to this, not all students were prepared to study digitally nor did they have the study conditions at home, so they made use of the internet in schools or even did not have a laptop at home for homework. Also due to the scarcity of resources worldwide, the problem of parents having their children studying at home all day in front of the computer generated both desertion and a drop in educational level, especially for children, who find it difficult to concentrate if they do not have a teacher or tutor to guide them.

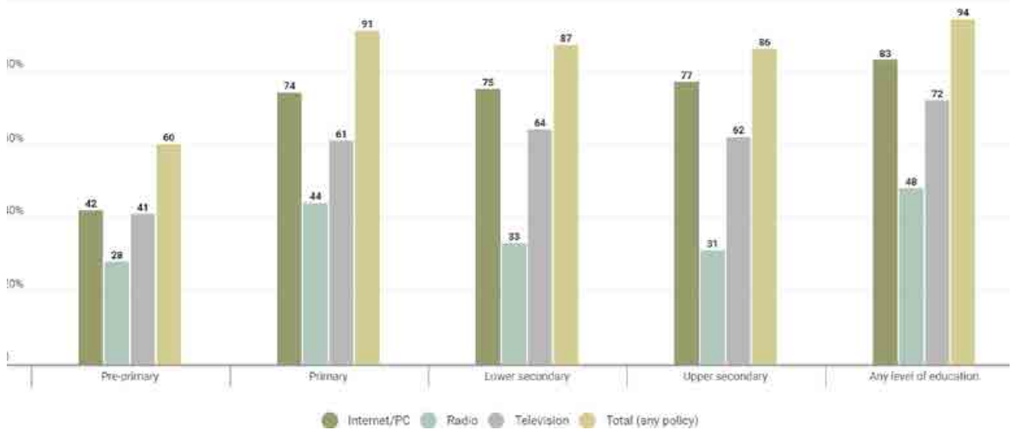
According to UNICEF figures (UNICEF, 2020), schools have been closed to more than 168 million children around the world for almost an entire year due to COVID-19, as of March 2020. In addition, around 214 million children worldwide, or 1 in 7, have lost more than three-quarters of their previously acquired learning 188 countries imposed school closures across the country during the pandemic, affecting more than 1.6 billion children.
On the other hand, when education began to be digitized for children, 1 in 3 children in the world could not access to the virtual classes, which led to desertion and family problems, since some did not have parental support or they just didn't have the skills to watch the classes.
Although, governments implemented distance learning, children have been the most affected and their return to classes has also depended on the economic situation and conditions of educational buildings in which they saw classes.

According to data and statistics from UNICEF, on National Education Responses to COVID-19 School Closures, the current number of students who fail to have a remote education is abysmal since the technological requirements are not met at home, as well as parental support is not always possible. But how have countries acted worldwide to generate education while schools have been closed? Overall, 94% of the ministries of education analyzed develop policies regarding the provision of at least one digital distance learning tool but only 60% provided this for the pre-primary level of education. Thus, as for most countries, the most common approach was digital instruction, which was used by 42% of the countries for pre-primary education, 74% for primary education, and 77% for secondary education. higher. (UNICEF, 2020)



Source: Authors' calculations using MICS, DHS and other national household surveys.

As we can see in the graph, at least 463 million – or 31 per cent – of schoolchildren worldwide cannot be reached by digital and broadcast remote learning programs enacted to counter school closures. *Percentage and number of students potentially reached and not reachedt by digital and broadcast remote learning policies, by region (pre-primary to upper secondary)*



Sources: UNESCO-UNICEF-World Bank Survey on National Education Responses to COVID-19 School Closures (2020) and UNICEF country offices (2020).

Taking into account these figures, and the current situation that is affecting the quality of education especially in children, is it possible to help as architects from the social, urban and architectural point of view?

0 - 2

School´s architecture before and after the pandemic

Before the Pandemic, education was already facing a crisis of inequality of opportunities for children, which according to ONG, it represents more than 250 million children out of school. Moreover, at a universal level, in most countries and approximately 387 million primary school children (56 %) in the world did not have basic reading skills. Therefore, before Covid 19, the educational situation worldwide already had its deficiencies, adding to it the financing deficit to achieve the sustainable development objective 4, related to the quality of education, calculating that the debt will increase with the Pandemic. According to experts as Cooper Robertson (ONG,2020), who says that outdoor relations are essential for post-pandemic classrooms, the priority starts to be experimental learning to improve aspects like environmental comfort, accessibility, urban design connections, social impact, etc.

Thinking of Pandemic as an opportunity for school regeneration has brought new spaces and architecture. New measures guarantee a quality education, especially for children who are currently having problems viewing virtual classes. Will it be possible to resize the spaces for the comfort of students when they return to class? What measures should be taken into account to adapt classrooms and return to lived classes? How to organize the entrance and exit of the school in a safe way and avoid riots? Where is the best space to see a course that is not large enough for its development? How can educational activities such as canteens, gyms, auditoriums or cultural activities, lobbies and corridors be adapted?

According to the Re-School text (BARIOGLIO, 2021), one factor determining the presence of spatial resources in Italian school buildings is the demographic decrease following the reduction in the demand for space. With this, analyzing the physical and morphological characteristics allows us to identify transformable areas with new city activities. Therefore, it is proposed to design schools and make interventions following two-time criteria; the first is short-term, possibly temporarily and adapt to post-pandemic needs. The second is long-term, where a starting point is constituted to rethink School buildings from scratch and adjust them to new requirements. Furthermore, it promotes diverse experiences in open spaces and new ways of learning, putting children in contact with nature, improving their cognitive capacity. But, how to make better use of outdoor spaces? How to change the ways of teaching according to the outdoor areas? How could nature be involved in the children´s learning processes? Following the research of "Fare Spazio"(FONDAZIONE AGNELLI, 2020) from the Fondazione Agnelli in Turin, the new projection of the outdoor spaces contributes to identifying and expanding the educational reach in school buildings for the development of activities in different ways according to the area, complying with the distance and health measures. This situation should consider the time so that it could be temporary but with projection and looking to a better future, creating flexible spaces with temporary devices that can be removed if needed. The new ways of quick and flexible construction should change the view of more practical ways of teaching using natural outdoor spaces and the strong relation with nature.

According to this, there are three principles proposed by the Torino Urban Lab (FONDAZIONE AGNELLI, 2020). First, we can highlight the timely proposals that allow flexible spaces to be made in record time. Second, project interventions must be feasible with the locally available resources at an economic level, thinking in the future to improve the educational quality of school buildings. As a third and last point, the interventions must be reversible, for which they must be flexible and temporary, considering that the space can be worked, lived and experienced in many ways. This constructive way efficiently, quickly and economically, make the buildings prepared for when the Pandemic ends or even to support an emergency similar to the Covid 19 pandemic. On the other hand, and continuing with Cooper´s thinking (HARROUK, 2020), there is a possible guideline to create the indoor and outdoor spaces for learning that should consider some of the following points. As a first point, the mental health of the students by the correct way of managing the air, light and social distancing considerations after the Pandemic. Finally, the Pandemic represents a time to restructure ideas for the design of schools according to their typology, analyzing spaces that can be transformed from external natural areas and considering their relationship with the interior of the building, promoting new ways of learning with more space and quality.

0 - 3

School outdoor between architecture and pedagogy

The potential of outdoor spaces from the pandemic to the post-pandemic school

During the peak of the health emergency in 2020, there were several cases in which the open spaces of schools have shown their potential, supporting the extension of educational activities, facilitating entry and exit flows, organizing waiting moments etc. These experiences contribute to observe to open spaces with a renovate perspective, to reconsider them as a integral part of the school infrastructure, a precious resource in the process to regenerate the school buildings, also to face the latent pandemic condition. Studies on the potential of outdoor school activities are obviously not new. Analyzing it thoroughly from the field of children's pedagogy takes a significant role from its connection with children to the planned practical way of learning. This field worked from the architecture of the space and the environment, becomes a fundamental element for the development of children, studying the sensations and emotions caused by inhabiting a space and developing educational activities on it.

Analyzing some educational theories such as: "The Gardens" thought by Froebel (1840 - Blankenburg, Germany), Dewey with his philosophy of learning by doing (1894 - Chicago, America), Maria Montessori and her Montessori method (1907 - Rome, Italy), In the World of pedagogy created by Steiner (1919 - Stoccarda, Germany), it is possible to understand the close relationship between the benefits of freedom for children when they are studying in open spaces and the introduction of play to teach as a primary learning methodology. These great thinkers coincide in the environment's capacity in the cognitive development of the child or student, emphasizing the creation of a free, natural, open environment that complies with adequate conditions of climate and comfort.

Thanks to the integral development model, all those points help improve the teaching process, which aspires to the student's physical, intellectual and spiritual growth through cooperation with the teacher and the outdoor space. From these theories, the learning environments have been the subject of more structured research, according to the establishment of CELE (2015). International studies on this issue have found how the environment has influences on human development, improving the common conception of the learning idea that can be traced to the physical aspect but also including dimensions as the cultural, institutional, social and psychological dimension (Kolb, 2015). But how does this relate to architecture?

This research has one crucial approach to improving learning environments through the different spaces that can be re-designed. Following this line, from the sensory point of view, it is sought that the student's senses are educated through these spaces. The assimilation of the concepts is more efficient through the experience of living in the garden and nature as an essential element that accompanies and enriches training outside the classroom. Contact with nature becomes that tool to experience the relationship between the individual and the surrounding world and see and understand the growth of a plant that can be related to their own life. Similarly, custom architecture or furniture and games suitable for children complement this self-learning process, understanding play as a means to stimulate curiosity and motivate inquiry activities. An example of these spatial devices is laboratories, which constitute places of experience par excellence and sites where culture and art are promoted, with excellent educational and learning value, such as coliseums or open-air amphitheatres. Talking about the health measures of the Pandemic, the courtyard is the potential to manage all these experiences and create different ways of teaching with the relation of nature and the vast space where it is possible to organize the children experiences. In addition to this, the management of light and colour are essential parts of creating these spaces, which can also depend on the seasons, regulating the climatic conditions for children's experiences. On the other hand, it is sought that the use of materials for the development of this architecture is ecological and with a low environmental impact, also seeking to create awareness from an early age in caring for the environment and the environmental footprint that will improve living conditions in the future.

Finally is important to mention the relationship with the city and the importance of building an inclusive school environment. Cristina Renzoni (Mattioli, Renzoni, Savoldi, 2020) explain in detail how the situation of the Pandemic was experienced in 2020 in Italy, specifically in the Piedmont region. She mentioned three critical points to rethink about the relationship between the school and the city that represent future decisions and the interventions of the space adjacent to the school. In the first place, carefully observing the frontal area that becomes an extension of the entrance to the school is the point where citizens converge, thinking about improving accessibility to schools. The second dimension that is urgent to review is the facilities close to educational institutions. If the school space is not enough, is it possible to identify other areas that lend themselves to hosting educational activities? It is necessary to map the context and identify those points that favour the location or improve. Third, to create an academic community, it must develop or consolidate territorial alliances between schools to respond to the post-pandemic situation by building an inclusive and quality school.

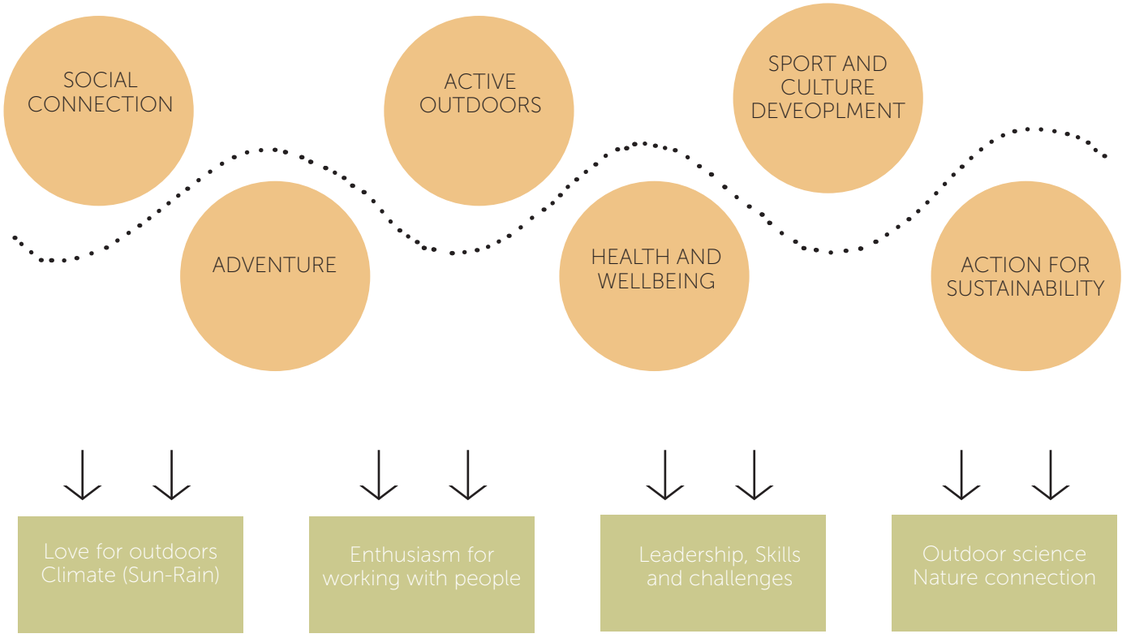
0 - 4

The potential of outodoor spaces to integrate innovative educational process

The outdoor spaces that integrate the innovative educational process could host an extended variation of activities such as social experiences at open air for sportive or cultural activities, study in contact with nature, perceptual and sensorial experiences. the spatial extension of the classrooms and how it is possible to connect all this study of the school and relate it with the school building.

According to the article, 'Nature experience reduces rumination and subgenual prefrontal cortex activation by Bratman (Becky Brady, 2016) he states, "More than 50% of people now live in urban areas, and by 2050, this proportion will be 70%." High urbanization is creating a deficit disorder of nature because of the lack of interaction with nature regularly regarding the diagnoses of cognitive problems. The educational environment has a critical role in the children´s capacity for learning practically, interacting with other students and professors having a complete learning experience. In this way, talking about the benefits of outdoor learning is possible to relate the teaching and the behaviour with the efficiency and productivity, being also happier and enjoying much more the time in the schools. Also, having an outdoor experience helps children be less stressed and control their emotions, working on the interpersonal communications between the students and the community.

For an innovative learning process or a new school design, it´s essential to consider all those studies about pedagogy and cognitive health to provide more architectural solutions as the landscape design and the relation with the interior of the building. Following the green paths that cover all the open areas that introduce children to the building is also supposed to follow the same criteria of the big spaces to promote cultural and group activities, always thinking on the post pandemia era. On the other hand, experimental and sensorial development is another criteria that children must improve by outdoor activities such as the orto or planting games, scientific labs in and classrooms. According to the research "What is Outdoor Learning?" by Dr Roger Greenaway (Greenaway, 2005), one of the best trainers of facilitators and educators through all the world worked to bring out the full benefits of active and experiential learning. He defined the term "Outdoor Learning "as involving outdoor play in the early years, school grounds projects, environmental and sustainable education, recreational activities, personal and social development, team building, leadership training, management development, adventure therapy ... and more. That is how this big concept does not have a clearly defined boundary. (1)



Following the concepts of the DfES & QCA (Roger Greenaway, 2005) The National Curriculum, 'Aims for the School Curriculum' 1999; Outdoor Learning is real learning, but why?

Outdoor learning doesn´t happen only in the natural environments where students can see, hear, touch and smell the real thing. It also occurs where actions have accurate results and consequences. Outdoor learning can help to bring many school subjects alive while also providing experiential opportunities for fulfilling the National Curriculum aim "to enable pupils to respond positively to opportunities, challenges and responsibilities, to manage risk and to cope with change and adversity."

Outdoor learning as an educational method has strengths such as:

- Low costs through the use of materials and nature
- Multidisciplinarity, since many concepts are learned in different ways
- Inclusion, since nature and culture are combined as part of a whole.
- Sensory development and stimulation through the freedom to explore through the senses.
- Reduction of illnesses and stress in students thanks to contact with nature and the outside.

As it has been possible to analyze in the previous cases, learning in the open air allows the creation of transversal, diverse, more practical competencies in students. In the same way, it stimulates cognitive skills and concentration. It generates health and well-being, considering the bioclimatic and comfort points that must be designed to conceive a good space. This new methodology has been further strengthened after the Covid-19 pandemic. It is expected to continue growing because it is momentary, but we must be prepared for any unforeseen event that puts both education and health of the students at risk.

1.- https://www.outdoor-learning-research.org/Research/What-is-Outdoor-Learning

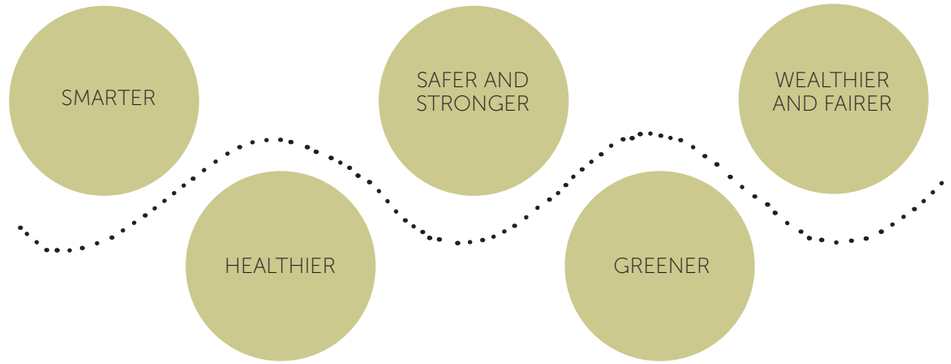
Continuing with the theory based on researchers who have dedicated valuable time to analyze and study outdoor learning, it is worth highlighting some characters such as Margaret McMillan, who worked in Bradford for several years and campaigned to improve conditions for children by becoming a member of the school board. Therefore, she was very influential in improving the city's educational system. Thanks to her study, she analyzed the potential that outdoor learning had for the health and wellbeing of children. Margaret McMillan based her work on the pedagogue Froebel, who built studies on the value of external learning due to his childhood experiences. She was always in a constant relationship with nature, considering that outdoor play was intrinsic to learning and development for children.

In addition to McMillan and Froebel, Pestalozzi (1746-1827) and Isaacs (1885-1948) have also significantly influenced approaches to outdoor education in the early years. Joyce (2012) suggests that identifying a historical context in outdoor learning is critical to understanding modern practices. The recognized importance of outdoor education was by introducing the Early Years Foundation Stage (EYFS) guide in September 2000. It is possible to explain that play is the factor underlying the early years' education that provides opportunities to play indoors and outdoors should be provided, emphasizing that outdoor activities are great learning but also challenging. solving problems presented to the children for their intellectual and personal growth. Following this line, the outdoor learning environment offers opportunities to learn and develop knowledge and understanding of the world since it is a much richer context than the indoor one.

According the Scottish Government's speech that mentioned the principal outdoor learning objectives, we can say that; outdoor education should improve children's smartness and critical skills. This type of learning should improve the children's health by having lifelong recreation, as walking and cycling activities ideal for physical and emotional wellbeing contribute to a healthier city. Outdoor activities also make children safer and stronger because of the social divisions that make them strong and confident by creating groups and interacting with more people. Another point is the greener, as frequent and regular outdoor learning encourages children and young people to engage with the natural and built heritage. Wealthier and fairer as the outdoors provides excellent opportunities to use a wide range of skills and abilities not always visible in the classrooms. Becoming aware of such skills can fundamentally change personal, peer and staff perceptions and lead to profound life expectations success. (2)

From the previous theories, it is possible to understand nature's great value and significance in outdoor experimental learning in children. But, how much does it influence, and which factors? Nature promotes sensory-motor development, movement, spontaneous and creative play and sociability. It also favours the development and coordination between the nervous, immune and endocrine systems, thus improving resistance against diseases. In addition, it enhances learning processes: attention is an essential mechanism for learning, and children have an innate curiosity to explore the world.

2.- https://www.swdevonacademy.com/learning/learning-outside-classroom/



Nature offers a wide variety of sensory experiences, and the more movement and senses are exercised in the early ages, the better cognitive skills they develop later. Wells (2000) also found that the elements of nature had an essential effect on children's cognitive development to the extent that they improve attention span.

Although in a study carried out at the University of Heidelberg (Germany), some competencies of children in Primary Education were analyzed by comparing the results of those who had attended an ordinary nursery school with those who had participated in an outdoor school type forest school. The latter was found to follow the class better, pay more attention, be more autonomous, resolve conflicts more peacefully, be more creative and argue their opinions better.

Finally, one of the most recognized theories to remember is the Montessori Model, which for me, has been one of the best educational methods. This theory emphasizes the need to encourage the natural development of students' abilities through self-direction, exploration, discovery, practice, collaboration, play, deep concentration, imagination, and communication. In addition, this method includes eight educational principles that contain keys for a correct approach to objectives when designing and promoting a spatial intervention in the open spaces of a school.

1. Learning by discovery
2. Preparation of the educational environment
3. Use of specific materials
4. Student's free personal choice to what to do
5. Classrooms for different age groups
6. Learning and collaborative games
7. Classes without interruptions
8. Teacher as guide and supervisor

PART 1

PRIMARY SCHOOL: A CASE STUDY ANALYSIS

1 - 0

Criteria and reflection of the case of studies

In the next chapter, a series of references are studied from the open space point of view, analyzing in detail which activities are proposed to solve problems such as the post-pandemic situation and to face the city or, in other words, build a town through educational equipment. Initially, 4 Italian references are presented, followed by four international references that in various ways manage to meet the objectives of improving urban space and innovating in terms of children's ways of learning.

Each case study is presented with images and a brief description that expand argumentation, analyzing at an architectural level the relationships established between the interior in terms of classrooms and the exterior. In the same way, when separating them by locality, Italian projects present a diversity of forms. However, it is seen that the design of a patio in the school prevails, either internal or external, that seeks to connect with nature to enhance the spaces of learning and create new open-air classrooms. For their part, international schools base their designs on the formal design from a module that generates flexible spaces where children's learning occurs. Both the school and the open spaces follow a logic that respects the pattern or module designed to create spatial diversity indoors and outdoors.

After reading these references, what is used as a method to extract the design strategies? First, think about what relationships or connections you want to generate at the urban level, that is, at the city level, taking into account a typological study to know and identify how open space is classified in schools in Turin. In addition, diagrams are made with the possible interventions, seeing which are some of the most innovative activities or functions that can be introduced in an intervention of a first cycle school building. Finally, these activities are connected with the city, where they are carried out after analyzing how are developed in the internal and external courtyards and their relationship with the main context.

1 - 1

Definition of "First-cycle School" around the world

Considering Primary, Elementary and Middle School

To begin with, is important to understand the term of First cycle School or middle education, how this concep or term change around the world and what it is about in some different countries. First of all, let´s start to know what is the primary school.

A primary school is a term to classify the children who are four to eleven years old and sometimes up to thirteen years of age, used in United Kigndom, Ireland, Australia, New Zealand and South Africa. It also can be known as elementary school in North America and the Philippines and normally is a school cycle that comes after preschool and before secondary school.

"*The International Standard Classification of Education (ISCED Level 1) considers primary education as a single phase where programmes are typically designed to provide fundamental skills in reading, writing, and mathematics and to establish a solid foundation for learning*". (1) This classification is a statistical framework for organizing information on education maintained by the UNESCO as a member of the international of economic and social classifications of the United Nations. That´s how the UNESCO defines the middle education as the the priority field of the cultural educational development in the XXI century.

According to the Online Etymology dictionary, the words "primary school" derived from the French école primaire, which was first used in an English text in 1802 (2). In the United Kingdom, "elementary education" was taught in "elementary schools" until 1944, when free elementary education was proposed for students over 11: there were to be primary elementary schools and secondary elementary schools; that is a term already used by London County Council from 1921 to describe some 11–14 schools, still in use in Florida, Ohio and Brazil.

Passing through the term Elementary Schools we could say that it has different meanings according the locations of use. It could be known as "Board Schools", this term were first established in England and Wales in 1870 by the Forster Act (Elementary Education Act 1870)(3). Nowadays, there are currently 92,858 elementary schools (68,173 public, 24,685 private) following the numbers of the National center for education statistics for United States(4).

1.- http://uis.unesco.org/en/topic/international-standard-classification-education-isced
2.- https://www.etymonline.com/word/primary

Usually, the elementary schools have six grades with students between 6 and 13 years old, but the upper age limit can also be 10 or 14 years. In the United Kingdom, Ireland and other Commonwealth nations, and in the most publications if the United Nation Educational, Scientific, and Cultural Organization Primary School is the preferred term to use, otherwise, the Elementary School term is still preferred in some countries as United States but in some cases it takes also the kindergarten through to second or third grade and in the elementary school it covers the grade three through five or grades four to six. In Canada is also prederred the term Elementary School but it reders to grades 1 through 6, with kindergarten being referred as pre-school.

In Italy, the first cycle education (Eurydice Network , 2021) is made up of primary with students from 6 years of age and lasts 5 years and lower secondary education with a range of age between 11 years of age and lasts 3 years. In this school cycle, students pass from the first to the next one without exams, but at the end of the first cycle education, students who pass the final state examination progress directly to the second cycle of education, the first two years of which are compulsory. To understand this division a little bit more general, (Eurydice Network , 2021) the Italian education and training system includes ECEC (0-3 and 3-6), primary, secondary, post-secondary and higher education.

Now that we have a general panorama of what is consider the first cycle around the world, it is possible to start looking to some examples that hosts this kind of students and cycle of education, to understand which can be the relation between the architectural design of this buildings that of course are very different and the spaces for children to study, to do the recreation and also interact with more students and the citizen interaction, depending if the open spaces are with the street face or is inside the construction.
Just as terminology is studied worldwide, it is also important to review architectural references from different parts of the world, at an international level, exemplifying the various design typologies that have new learning techniques in open spaces for children but also in Italy, how current buildings are being developed and improved to turn them into greener, comfortable and pleasant spaces for the enjoyment of study and thus achieve good results at the cognitive level of the students.

3.- Book: A History of the Western Educational Experience: Second Edition_Gerlad L. Gutek.
4.- U.S. Department of Education, National Center for Education Statistics. Digest of Education Statistics, 2001

1 - 2

Italian studies and experiences for outdoor learning

Enrico Fermi´s school
Architects: BDR BUREAU

Location: Italy - Torino
Status: Constructed.
Project Year: 2017
Plot Surface: 6.125,90 m^2
Open Spaces: 3.927,17 m^2

The school was delivered to the city community completely renovated in just over a year of construction. A new school model is born from Turin to improve the quality of education by building the right environment for educational innovation.
The project completely rethought the existing school, working in an integrated way on an architectural and didactic level. The design themes addressed at all levels were: internal / external relationship, furniture as a transformative element, constant presence of the green element with pedagogical value. The entire school system has been designed, also in the management aspects, to become a real community school. At the compositional level, the project proposed an intervention that innovates dialogically comparing itself with the existing structure, rethining the building's accessibility system and redesigning its envelope by adding volumes that constitute new fronts and devices for outdoor activities.

Outdoor spaces are caracterized by the strong relation between the interior and exterior and its relation with the city, redesigning the interior of the courtyard as an articulated learning landscape, through the furnishings, in different types of environments. With the new design, the building searchs to transforms the back of the building into a new facade that creates a new main entrance, protecting also the green space.
That´s how the space starts to be articulated between the interior and exterior, controlling the semi-public and public spaces and also making a good use of the couryards for the new ways of learning. Regarding the program of the intervention it was design according to the new system of accesses promoting controlled and continuous building use, following the concept of community schools to integrate a large number of activities and services that could be opened to the community and the neighbourhood, making a good use of the external lanscape.

References

1.- Paula Pintos, 2019. (https://www.archdaily.com/925586/enrico-fermi-school-bdr-bureau).

Image Source: Archdaily

On the other hand, with the interventions of the facades, the new design aims to create a formal independence to each volume, establishing specific physical and visual relations from the outside spaces of the school with the context.

Inside the building, the classrooms were rethinked to achieve the relation between interior and exterior learning landscape where there is the possibility to study and make group lessons.

That´s now the intervention provide clusters with micro outdoor spaces or gardens for an experimental lessons and recreation next to the close space of the classroom.

Image Sources: Archdaily

Nuovo Polo Scolastico di San Lazzaro di Savena - CAMPUS KID

Architects: Mario Cucinella Architects

Location: Italy - San Lazzaro di Savena
Year: 2018 - in course.
Plot Surface: 97.031,89 m^2
Open spaces: 80.735,35 m^2

Urban, cultural, social, anthropological regeneration project, designed in the long term to improve the territory of San Lazzaro di Savena in Bologna. The idea is to create a multi-functional urban campus that houses school functions (expansion of the Jussi middle school and the construction of a new Donini elementary school), sports and cultural functions, promoting the development of skills and the training of talents.

According to Mario Cucinella, (Ingenio, 2020), they are precisely those flexible spaces that integrate different environments for different learning as well as common spaces for community service such as the auditorium. The open spaces are characterized by having a game of lights, colors, dynimc and flexible spaces, courtyards and gardens that has contact with nature to create comfort to the children. Also he mentioned that is important to integrate the interior with the exterior by the connective spaces with the correct activities and functions and the green areas. The shape of the design of this internal courtyard that is the outdoor space of the school generates a constrast with the city and a fluid circulation inside the school. Through the open and closed space with a large plaza, a transition is generated between hybrid spaces that generate dynamism in experimental learning and citizen interaction that are functionally conceived as the two school buildings and the auditorium.Analyzing these Italian projects of Italian, it is possible to wonder, when seeing the high density that characterizes Italy, will there be a criteria or common points that have been used in the cases mentioned above for the requalification of school buildings and their direct relationship with the environment urban? That´s what we are going to understand later...

References

1.- https://www.mcarchitects.it/project/nuovo-polo-scolastico-di-san-lazzaro
2.- https://www.ingenio-web.it/27325-nuovo-polo-scolastico-campus-kid-il-modello-di-spazio-educativo-firma-to-mario-cucinella-architects

Image Source: Mario Cucinella Architects

Organic shapes that let us think how is the open spaces lived in relation with some ortogonal spaces..

Internal courtyard that provides relation with the exteior, because it is not only the building, is also the city.

Image Source: Mario Cucinella Architects

Scuola innovativa primaria e secondaria di primo grado a Lonate Ceppino

Architects: Bertolini e Galli Architetti

Location: Italy - Lonate Ceppino
Status: Competition works
Year: 2016
Plot Surface: 8.839,73 m^2
Open Surface: 3.794,72 m^2

Architectural Project of two rectangular-based naves that generate an open patio typology that allows a connection with the green and the immediate context through a path that crosses it, generating visual relationships as well as pavement. In these patios the idea is to develop another type of more experimental learning, in contact with nature and with the new natural materials that are proposed in construction. The wooden panels accompany the route and make the construction a sustainable building, made with local materials. In all the facades, the pavements and also the roofs, the raster designs that refer to the rural natural fields of agriculture are printed, feeling that they are in a farm, since the building is in a country environment, which is what that you want to transmit to all students by always keeping them related to nature. Althoudh, the conceptual and main idea of the architects was to develop a fixed scene always open to students, capable of representing a story immersed in nature and the green of the countryside.

Image Source: Archilovers - Ground floor with the urban intervention

Ground floor plan that shows the internal courtyard and the relation between the building and the city.

References

1.- https://www.archilovers.com/projects/222721/scuola-primaria-e-secondaria-di-primo-grado.html

Image Source: Archilovers

The outdoor spaces is characterized by having gardens and sustainable learning spaces that teach children to take care of the environment. In formal terms, the scholastic complex is developed in the shape of an "H" going back a bit to rural architecture and making reference to the old mills of the Olona River Valley, taking into account its context. On the other hand, the two wings, one of them longer than the other, are joined in the center by means of a large greenhouse and space to cultivate, which is where the main entrance is located. The first of the two wings of the complex has a function of plaza and the second internal one that is more protected is destined to the activities in the open space generating a theater for the spectacles developing cultural activities. Finally, the project has a community hall, an auditorium and a media library, forming a new civic center that, as mentioned above, is recognizable from the outside thanks to the green facades and its large fountain with the symbol of the mill that characterizes the area in which the school is located.

Image Source: Archilovers

Direct contact with the nature, outdoor and experimental learning.

Relation interior - exterior by the sun light and the nature of the materials used in the facade.

Innovative school buildings: Renzo Piano designs a school also open to citizens

Architects: Renzo Piano

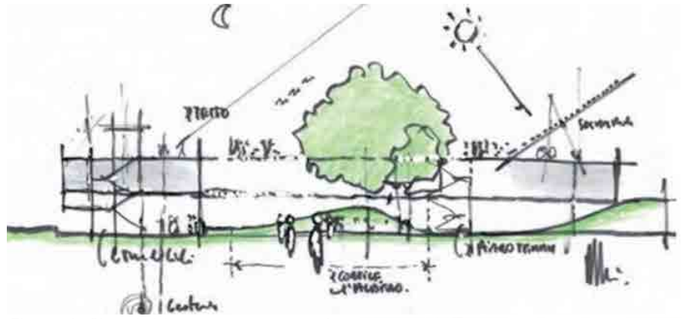
Location: Italy - Sora
Status: Constructive model to the different Italian Cities.
Year: Idea from 2016 to start the constructions in 2021.
Plot Surface: 2.765, 44 m^2
Open Spaces: 1.125 m^2

A 100% sustainable school, efficient from an energetic and anti-seismic point of view but above all innovative. They are the main design criteria of the Architect Renzo Piano, who seeks to create a replicable educational complex that is also open at night and on weekends to host cultural initiatives for the neighboring community creating citizen interaction.
Since 2013, Renzo Piano has decided to dedicate himself to urban regeneration projects based on the "rammendo" concept, which means using the urban layout from the degraded periphery in order to give life to the city. This initiative is coordinated by the G124 group, made up of 6 young architects with whom Renzo has been working for approximately 6 years in the development of these requalification interventions that the various Italian peripheries and cities urgently need.

What are the strategies that Renzo proposes about open spaces?
The Casa Italia Maxi-piano Pilot project, which begins in 2016, has the main objective of maintaining the Italian building heritage but modifying and restructuring it to make it much more innovative, sustainable and safe, changing the concept of learning to open space. One of the main theories and ideas is to start from a large tree inside the building and an observation terrace that enhances visuals and generates internal comfort, as can be seen in figure 1.
In this scheme, it is intended to develop the school starting from the central tree developing in 3 levels. The ground floor faces the garden that will be open to everyone in the city and represents a space for interaction with the city, with sports, the auditorium, so part of the complex is defined as a tower library, accessible to the entire citizen community.

References

1.- https://www.green.it/edifici-scolastici-innovativi-renzo-piano-progetta-scuola-aperta-anche-ai-cittadini/
2.- https://www.renzopianog124.com/progetti/sora/



Sketch clear relation between the central tree-nature and the building.

Figure 1: Sketch idea_source: green.it

3D model to understand what is happening to this typology of closecourtyard that has green external areas for the citizen interaction.

On the other hand, Renzo proposes that schools will follow sustainable principles and energy efficiency that will be developed through the implementation of photovoltaic panels and for the heating and freshness of the internal environments it is intended to use a geothermal system. What is the purpose of this criterion beyond the care of natural resources ?, Raise awareness among students, teachers and all who visit the construction to teach them the issues of energy efficiency, environmental impact, climate change that we can begin to solve and mitigate from architecture, nature and from open spaces that can be shared to generate social responses and urban connections.

Another important criteria mentioned by the prominent architect are materials. The use of natural materials that have an adequate use cycle (LCA) taking into account the raw material process. For this construction, a large glass facade is proposed that allows a wide entry of natural light, generating a sensation of lightness to the structure for which wood is used due to its sustainable and anti-seismic property, due to the fact that the area where it was built The school was characterized by having a high hydrogeological risk, since it suffered an earthquake in 1915. But the architect Renzo thought of everything, what is done to recover the wood used for this project idea? Plant and rebuild the territory with approximately 1500 new trees on a 5 hectare site that surrounds the entire building.

1 - 3

Best scientific international practices for the outdoor learning

Les Cours Oasis – Paris
Method by the Paris Council since 2017

Location: Paris - France
Year: 2017

The Oasis project is an example of the transformation of an open space to improve quality and comfort in terms of living the space. The initiative arises in September 2017 at the Paris Council, with the aim of creating renovated, more pleasant spaces that solve the climatic and social challenges of the 21st century. The courtyards or playgrounds in educational buildings participate in the effect of the urban heat island, in which natural spaces, vegetation, management of rainwater and water points are offered with games facilities for children distributed in a way thought in the existing space. In other words, the internal courtyard becomes the heart of the neighborhoods, which is the starting point for the renovation of schools, thinking of developing a more experimental and nature-related learning.

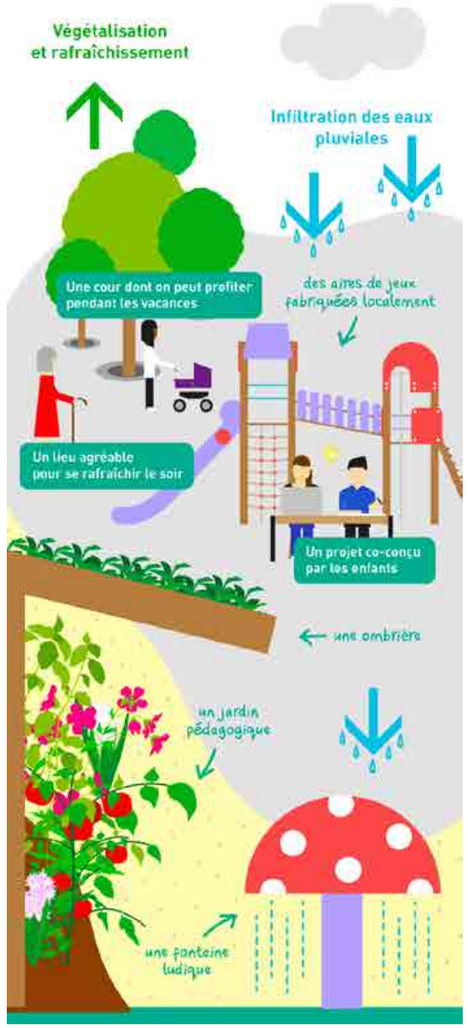
To design and build these spaces, several strategies are established, among which are:
Sustainable strategies, where the use of the soil is planned for its participation in a better management of rainwater and avoid storing heat if there is no shade through the materials and a balance between permeable zones with a preference for open and natural soil, being Nature is a very important point to achieve greater comfort, improving the microclimate of the place, by increasing vegetation, green walls, orchards, educational gardens, also seeking to generate a different playful experience in children.

On the other hand, the furniture is not left behind, which must allow a spatial flexibility between the free space and the space in which the open field is played and enjoyed, generating sensations for users through the use of materials and their contrast with the nature.
Social and educational strategies propose to improve the experience of children in their learning stage, promoting exploration and contact with nature. In addition, its development transmits citizen values such as respect for the environment and coexistence with others, strengthening social ties through spaces to share and exchange ideas.

References

1.- https://inchieste.ilgiornaledellarchitettura.com/scuole-facciamo-il-punto/
2.- https://www.paris.fr/pages/les-cours-oasis-7389

Urban and development strategies propose teamwork with the people who inhabit the place, strengthening psychosocial skills that improve coexistence in the courtyard.
Likewise, once these spaces have been transformed, the idea is to accommodate a wider public, through shared use of the space and opening classes outside of educational hours, where local actors, parents of students and residents of the sector can participate.



Ville de Paris

Image: Cour Oasis du collège Budè 19 arr. / Ville de Paris

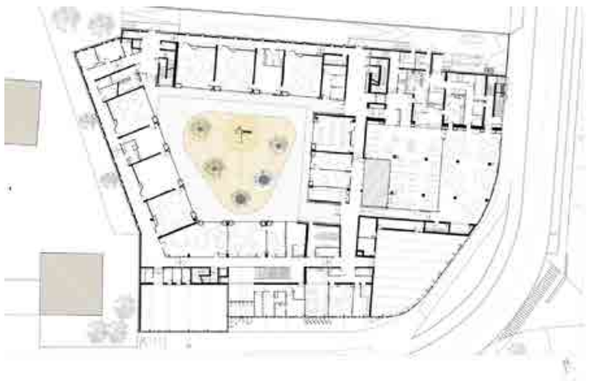
Image: Cour Oasis a l´école Emeriau 15arr. / Ville de Paris

The use of natural elements plays a fundamental role in the design of this Oasis, light, water, the shadow reflected by nature generates a logic of urban cooling.
Through the evaluations and measures of microclimatic and thermal impact, noise level, potential for biodiversity, well-being, social impact, etc., it is reviewed if this idea meets its objective of reducing the high temperatures that are projected with an annual average of 1 ° C to 4 ° C for a reference value of 12.4 ° C today, and 10 to 25 days of heat wave.
The amount of territory used for this project represents more than 70 hectares of surface distributed uniformly throughout the Parisian territory.
Currently these asphalted and waterproofed areas participate in the urban heat island effect, in turn offering natural spaces for the community.

School Center and Leisure Activity Center in Antony
Architect: DFA | Dietmar Feichtinger Architectes

Location: Rue Pierre-Gilles de Gennes, 92161 Antony, France
Status: Constructed
Plot Surface: 3.449,45 m^2
Open Surface: 1.717,17 m^2

Located in the Métropole du Grand Paris, near a station on a curve in Rue Pierre Gilles de Gennes, the building has as much space as possible for the patios, seeking to attract sunlight. To do this, at a morphological level it continues within the limits of the lot, generating large lungs within it. As essential planning criteria, they had natural light, open and bright rooms, great freedom of movement and direct access to the outside. But what would the solar incidence be like throughout the year? When performing a simulation, it was estimated that the formal distribution would be staggered in height, three floors in the northeast, two in the northwest and one on the road from southwest to southeast, generating sufficient lighting both in the schoolyard and inside the building. classrooms, benefiting from energy consumption.
Talking about the open space it is surrounded by four wings of the building forming a large trapezoidal patio that houses nature and a large terrace for the development of experimental and sports learning. Through these outdoor spaces, the aim is to improve air quality, an important factor in the well-being and concentration capacity of children.



Ground floor plan that shows the internal courtyard and the relation between the classrooms with this open space.

References

1.- read://https_arqa.com/?url=https%3A%2F%2Farqa.com%2Farquitectura%2Fescuela-anthony.html

Image: ARQA - School Anthony / Photos: © David Boureau

Image: ARQA - School Anthony / Photos: © David Boureau

On the other hand, at the façade level, wood helps to control the entry of natural light in summer and in winter comfort is optimized by means of a heater that preheats the air and blows it through the fins on the side of the classroom, increasing the CO2 content hence fresh air.
Thus, this wooden element gives rhythm to the glass façade and contributes to the warm atmosphere of the patio.

Images: ARQA - School Anthony / Photos: © David Boureau

Primary School of Giancarlo Mazzanti as a summed theory of 6 points

Architect: Giancarlo Mazzanti

Location: Santa Martha - Colombia
Status: Constructed
Year: 2010
Plot Surface: 4.879,70 m^2
Open Surface: 2.500,88 m^2

The Architect's team raises a series of principles to put together a method to define architecture and the importance of group work for the development of the idea of this elementary school in the city of Santa Marta Colombia. As a first point, the team mentions that architecture goes beyond style, that is, architecture is not only a matter of style or construction of a language that identifies a firm or an architect, but that style arises from understanding the variables to which that construction must respond both at a social, sustainable or natural, economic, urban level, and above all how each work that is built reaches each of the people present in the place, generating interaction between those who share those spaces. This is how categories of work are organized, such as:

- The category of the passage that includes all that are topographies and geographies
- Contexts and theming, that is, the urban relationship with the built.
- Elements with indeterminate growth
- Flexible modules and systems as a design tool
- Connectivity and networks between modules
- Atmospheres and environments, understanding the climate and the comfort factors

Image: Mazzanti´s Group of Architects

Axonometry design that shows the relation between the internal courtyard and the different ways of learning for the children.

References

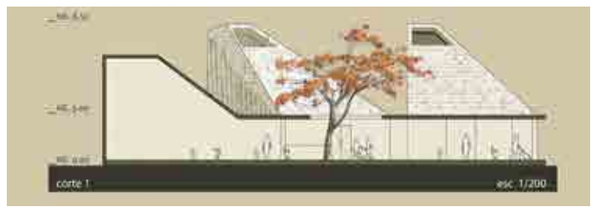
1.- https://www.abitare.it/it/architettura/2011/05/30/progetto-aperto/

Another very important point is the context, but what does it include to analyze and understand a context correctly? Analyze climates, habits of the neighboring communities within which the project will be developed, the specific relationships with the place, with the materials, with the local construction systems and also take into account the construction style of the place. This allows creating a conscious architecture that responds to the environment for which it was requested and that is capable of generating an impact within the area in which it is intended to develop.

EDUCATIONAL MODULE AS PERCEPTION MACHINE

Photos: Iwan Baan

Talking about the open spaces it had been designed starting with the module, used as a tool to house 3 classrooms arranged around a hexagonal patio creating strong relationships between internal and external spaces.
Understanding the module as a design tool, it is possible to build by fragments with the desire to have an open and flexible architecture, capable of adapting and modifying itself over time, which works at the precise moment of the it was post pandemic.



The concentration of flexible modules that adapt to the circumstances of the context depend on the specific topographic situation of the place, with the possibility of exponential growth over time.

Hedge School, Carlow, Ireland - Primary School

Architect: AP+E

Location: Carlow Ireland
Status: Constructed
Year: 2015
Plot Surface: 628,12 m^2
Open Surface: 462,94 m^2

A project different from the rest, a bit out of the ordinary but that I think is worth highlighting as a flexible and temporary element very applicable to the post-pandemic era consists of a circular wooden frame built for a primary school in Carlow, Ireland that seeks organize greenery, natural materials such as wood, and various levels to produce a stimulating and experiential learning environment. The Hedge School is an outdoor educational pavilion that develops the concept and design based on a circular structure with wooden columns that support a space that refers to a classic amphitheater, promoting at the same time informal play and interactive activities according to the different age groups at school

This outdoor space for the children´s learning has a potential of vegetation that is planted within these structural pillars shelter an area that combines nature and learning, generating various sensations and allowing children to begin to understand the principles of ecosystems, the climate, the seasons and the natural wealth that surrounds us as what it is the fauna and flora. Similarly, plantations represent the sustainability that children should be taught to project into the future, always seeking to care for the environment.
As part of learning, students learn to grow their own food, following the development of plants as they follow their educational teacher at school, this also provides sustainable and conscious learning about the proper use of resources and the food we consume. This garden space also has the meaning of the evolution of a student's cognitive process, since as it grows over time, the school of hedges will change its appearance, becoming much larger, savage and protected with the minimalist contrast of soft wood. with minimalist steel wires that makes a framework for growing plants.The success of the project was achieved by involving the students in the process of creating this structure so that it becomes an integral part of the daily life of the school community.

References

1.- https://www.domusweb.it/en/news/2015/09/18/architecture_practice_experimentation_hedge_school.html

This outdoor educational structure allows the Hedge School to expand with activities in open spaces such as theater, games, lessons and meetings. This type of architecture is considered to be changeable, that is, it changes depending on the people who occupy it.

Through the levels, it is sought to create learning spaces by simulating an open classroom where it is proposed to follow a more experimental learning and in contact with the environment.

Outdoor space to enrich the learning process of the students

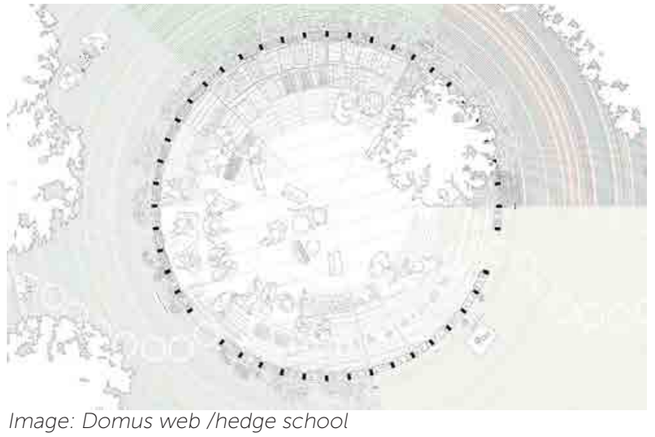


Image: Domus web /hedge school

Circular shape to contrast with the school and create different levels to perform an external classroom.

Ground floor plan

Potentiality of outdoor spaces: Lesson learned from the case study analysis

After making a detailed study of the previous projects at the international and national level, in Italy, there are several points to highlight to take them into account at the project level when we have to start thinking about the restoration of a school or planning a new school design. As common factors, the previous ones use the principle of sustainability as a premise to generate comfortable and pleasant spaces for both students and people, creating a citizen interaction if we talk about a space connected to the city.

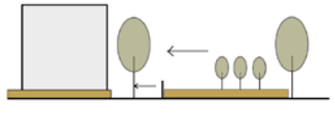
Starting with the open spaces that directly relate the school with the city, it is thought of creating flexible spaces that through geometries inviting people to enter the buildings or stay in common areas, demarcating the routes and zoning of areas through specific interventions. To achieve this, spatial tools are used to seek through nature and interventions such as vegetation, educational and experimental gardens, among others, to generate a microclimate and comfort to promote an adequate cognitive process by part of the students inside the building while enjoying the experimental use of these spaces to promote culture, music and natural consciousness.

To highlight some of the most important points of the previous cases, we can start with Enrico Fermi's school, in which the use of the terraces added to the façade become the primary design tool that generates that interior-exterior relationship and breaks the pre-existing linearity of that façade. Second, the Campus Kid uses the central patio as a flexible element that allows permeability within the building, preserving the natural essence and increasing the C02 content, which helps for adequate ventilation and temperature management within the building. Following this same criterion, the case analyzed, located in Paris, better known as Les Coeurs Oasis, has several sustainable points, highlighting the furniture and its contrast with nature, how these educational gardens are designed, promoting a natural sustainable cycle that includes water and vegetation, teaching students through games in these open spaces about the importance of nature and its care for the future.

Among the references mentioned, we also find the models proposed by Renzo Piano and Bertolini and Galli Architetti these two case studies located in Italy explain the importance of the open courtyard with vegetation as a learning instrument and put as a premise the principles of sustainability like use of materials and their reuse, energy efficiency and the climate impact that design has on the comfort of students.

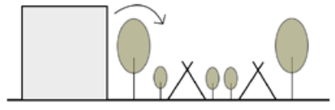
Similarly, in Bertolini's project, they take into account the importance of teaching students in the planting of consumer products and provide adequate spaces for the development of these activities, always relating the project to its context both in a transversal way. urban level as well as design and aesthetic level. The School Center and Leisure Activity Center in Antony project uses the playground as the main tool and the use of wood with natural materials that promote adequate temperature management to achieve better performance in students and use of spaces and educational facilities both internally and externally.

On the other hand, international modular projects such as the Primary School of Giancarlo Mazzanti and Hedge School highlight how a defined modular structure can provide incredible spatiality and flexibility, generating a space for multiple uses that is versatile to change and temporality. In the same way, these spaces put the use of vegetation as the main factor in the conception of the space and seek to create student interaction in spaces created from these internal spaces at the school level but external, in the green area.
The following diagram summarizes the design objectives of those references that are clues for defining the experiment in the next chapters of this research.



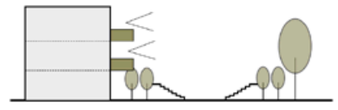
DEFINE PATHWAYS

Define pathways by strategies like colors of the paviment, vegetation and circulation that relates the interior with the exterior of the school building.



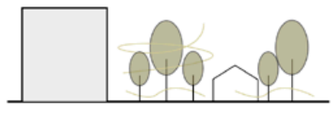
CREATE OUTDOOR CLASSROOMS

Change the spaces for children to learn, having structures for that could be covered and heated or just at the outdoor space.



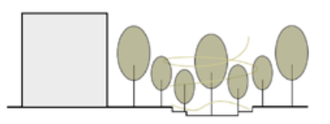
IMPROVE THE BUILDING AT THE ARCHITECTURAL LEVEL

Change the spaces for children to learn, having structures for that could be covered and heated or just at the outdoor space.



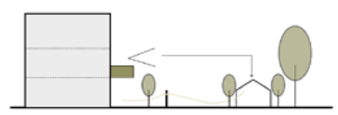
OPPORTUNITY FOR CHILDREN TO WORK ON THE SENSORIAL PERCEPTION

Give children the opportunity to work on their sensorial perception with experimental activities and green gardens.



INVOLVE THE NATURE

Take the nature and the vegetation as a premise for the children´s learning and the design of the spatial devices.



INVOLVE THE CITY

Take into account how is the near context anwering to the building and how it can be improved by the urban connections with the spatial intervencions of the school

PART 2

AN ITALIAN LABORATORY IN TURIN

Taking into account the previous preamble that illustrates the panorama of what the problem is and some architectural examples that seek to solve in some way the method that is called open-air learning, a mapping or laboratory begins in which the case study that is Turin, always focused on this first cycle of education such as primary, elementary and lower secondary education to understand how the application of this new theory or concept is carried out or could be carried out in current constructions or, how points could be generated from the research carried out to replicate in new educational complexes.

Starting from the data of the ARES (Anagrafe Regionale Edilizia Scolastica), with the information available in the regional data and the AES (Anagrafe Edilizia Scolastica Nazionale), it was possible to construct a base to know about the school infrastructure and create a vision about what already exists in Turin. From this informations the research way was based on the morphological and typological characteristics of the building and how are the buildings constructed on the plot surface and their relation with the territory. The mix of these measures helps to create a comparative analysis between the typological buildings and how the outdoor spaces are responding to the city.

At the national level, the main data collections about the school come from two main sources: ISTAT data (ISTAT, 2019), and the collections of the website of the Ministry of Education which includes the single portal of school data, a freely available section relating to data and statistics on school construction. ISTAT data present the numbers relating to the total population of students, teachers, total classes for each academic year. The most recent data date back to the 2019 academic year, with a growth trend that in the last three years has seen the student population grow: 633.006 in 2017, 637.518 in 2018, 640.096 in 2019. Following the work line, the selection of the projects has been made according to the potential of transformation and create an intervention that answers the near context and the social aspects of each part of the city. Talking about statistics is possible to know from the ISTAT (2019) the number of students of the first cycle education sector in Piemonte classifies as; Primary with 185.943 students enrolled, 9.961 classes, and 1.341 schools. and in the Lower secondary school data, we have 117.185 students enrolled, 5.607 classes, and 575 schools. This information gives us the idea of how many children we can help re-thinking the spaces of the school and also near it, giving them the chance to have other experiences in the outdoor spaces. Finally, in Turin, it is possible to have a total of 101.081 children enrolled in the pre-primary education infrastructures.

Scale: 1.2000

2 - 1

The distribution of school buildings on the urban scale:
"a wide spread public infrastructure"

Kowing from the previous information from the ISTAT the total of schools and numbers of students enrolled in Piemonte it´s possible to extract the data from the Ministerial excel list and compare it with the Anagraph list, where we have the sum of 153 schools that host the First school cycle and the sum of 753.591 sqm of open spaces in the first cycle schools in the city.

It is possible to analyze from the map in the right how is the open spaces in the plot surface organized in the city, to know which portion can be used for building development and for a post-covid solution. Particularly, in the downtown area, the open space is smaller than in the periphery, it should be noted that being a dense city in terms of construction is sought that with the interventions lungs are achieved that allow citizen interaction, as well as continuing with the urban morphology, taking into account its entire context. Evidencing on the map of the first-grade school buildings we can see that the biggest open spaces are in the external part of the city and the blocks of the center have to deal with the presence of massive buildings very close to each other and with a very consolidated urban grill of intertwined streets and facades on the roadside.

Turin is characterized by its high morphological density, which leads us to think about the various ways to optimize and improve the current construction, rethinking architecture school buildings from a more social, sustainable, feasible, and urban point of view. Talking about the schools and education sector in the building construction, Turin has an approximate total of 350 schools that are characterized by being architectural heritage made in the seventies that constitutes an infrastructure that makes up the urban morphology but responds in a different way to the city. Currently, changes at the urban level have become an important factor in rethinking those school buildings and their relationship with the built space, the city, and teaching. Of this total, half represent buildings of the first cycle of education, roughly 153 schools house primary and low secondary schools.

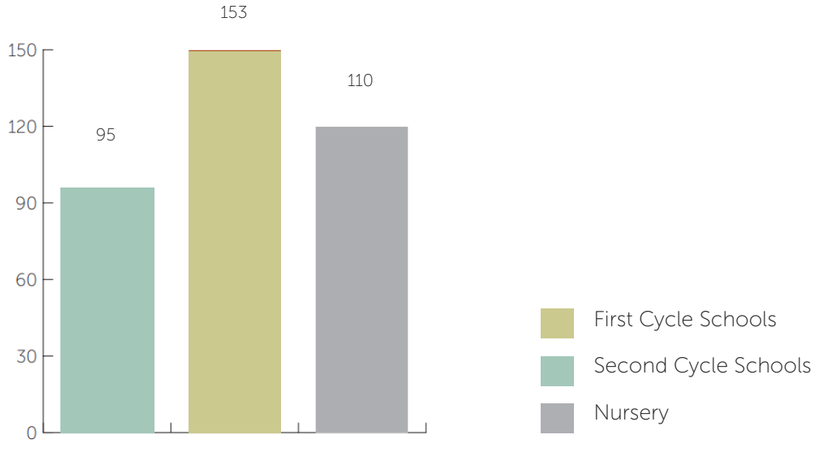
Scale: 1.2000

2 - 2

Measurements and statistics about the First school cycle in Turin

At an educational level, the city of Turin is one of the best to develop both the initial and secondary cycle. However, initial preparation has become a critical part of a successful college journey. For this reason, the number of buildings for children in Italy who are approximately up to 11 years of age in elementary and primary schools is much higher than the other facilities or education cycles. The graph below highlights the number of school buildings, divided by the cycle of studies, in the City of Turin making emphasis on the First cycle that is the one which we are going to take care of.

How did I get those numbers? With the resulting tables called "List and location of active school buildings" and "Surfaces and volumes of buildings" (sqm/mc) from the Single School Data Portal, it is possible to identify each school with the building code, the Municipality, or location, address and the current state of the building. These tables also showed the total free space of the lot on which the school is located, the free area, and the volume. With these tables, it was possible to create a new table to calculate also the open and ratio. Having the list of the school it was necessary to distinguish the school cycles and cancel the ones that didn´t appear on the Website of the Municipality of Turin and by filtering the list of the Database Registry of school buildings was possible to have the first cycle school information.



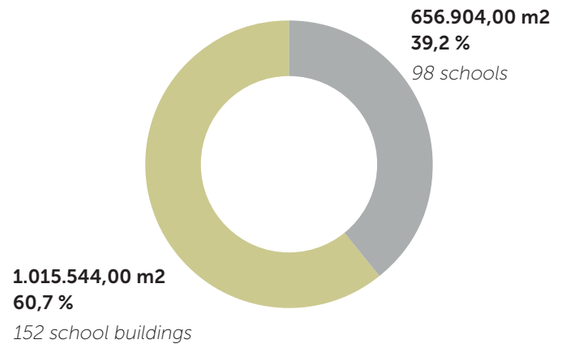
Graph 1: Made with the datas from the ISTAT and the list of the Anagraph and the Ministery.

Total First Cycle Surfaces

1.015.544,00 m2

First Cycle Schools

Other schools Cycles



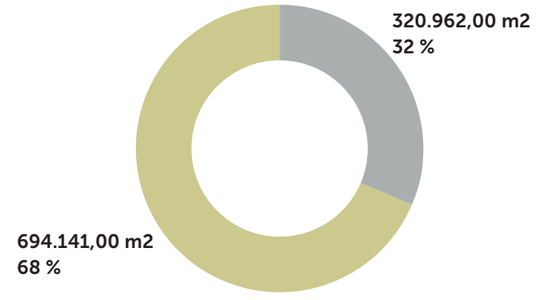
According to the measures obtained at the number and percentage level, the number of first cycle schools in the city of Turin is higher than the other second cycle grades, Infants and high schools. With a total number of schools of 60.7%, which represents the 152 schools that host the first cycle predominate in the construction field in the city of Turin, leaving only 39.2%, with which the other buildings of the second educational cycle are built approximately 98 schools. Taking into account these figures, it is possible to ask, why are there more buildings of the first cycle? Is the relationship between population and built space adjusted appropriately? Is there enough space to house each educational cycle? This could be a question that we can solve in the next part of this research.

Total First Cycle Open Spaces

694.141,00 m2

First Cycle Schools

Other schools Cycles



According to the statistics in which there are many first cycle schools open surfaces, reaching approximately 694.141,00 m2 and with a total of 3.027.847,00 m2 of the other school's cycles open spaces like second cycle and nursery, is possible to analyze in terms of pedagogy and architecture, the relation between ages and outdoor learning. ¿how necessary is it to have it for the children and the teenagers? Probably, the children need more open spaces for having different types of learning that help to increase their concentration and cognitive processes. But, maybe we can think also if talking about the city of Turin it is possible to rethink how to properly use those open spaces and check if this is working effectively talking about urban and landscape design.

How bigger are those quantities?

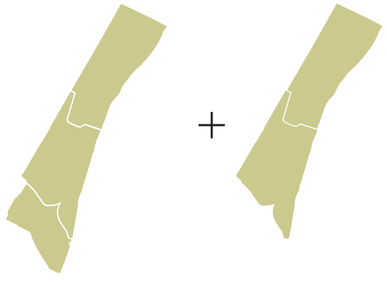
To understand how large is the area occupied by the first cycle schools, a comparison can be made with the parco del Valentino, located in the city of Turin which is characterized by its large expanse of green with an area of 421.000 m2.

With this study is possible to understand how many times the Valentino Park represents the amount of area of the Open Spaces of the First Cycle schools in Turin that as we can graphically see is aproximately one park and more than a half of a repetition of the park.

Total First Cycle Open Spaces

694.141,00 m2
68 %

In relation to the proportion of the park with the total surface found, it is equivalent to **1.65** times the Valentino park.



421.000 m2 228.141m2

Scale: 1.2000

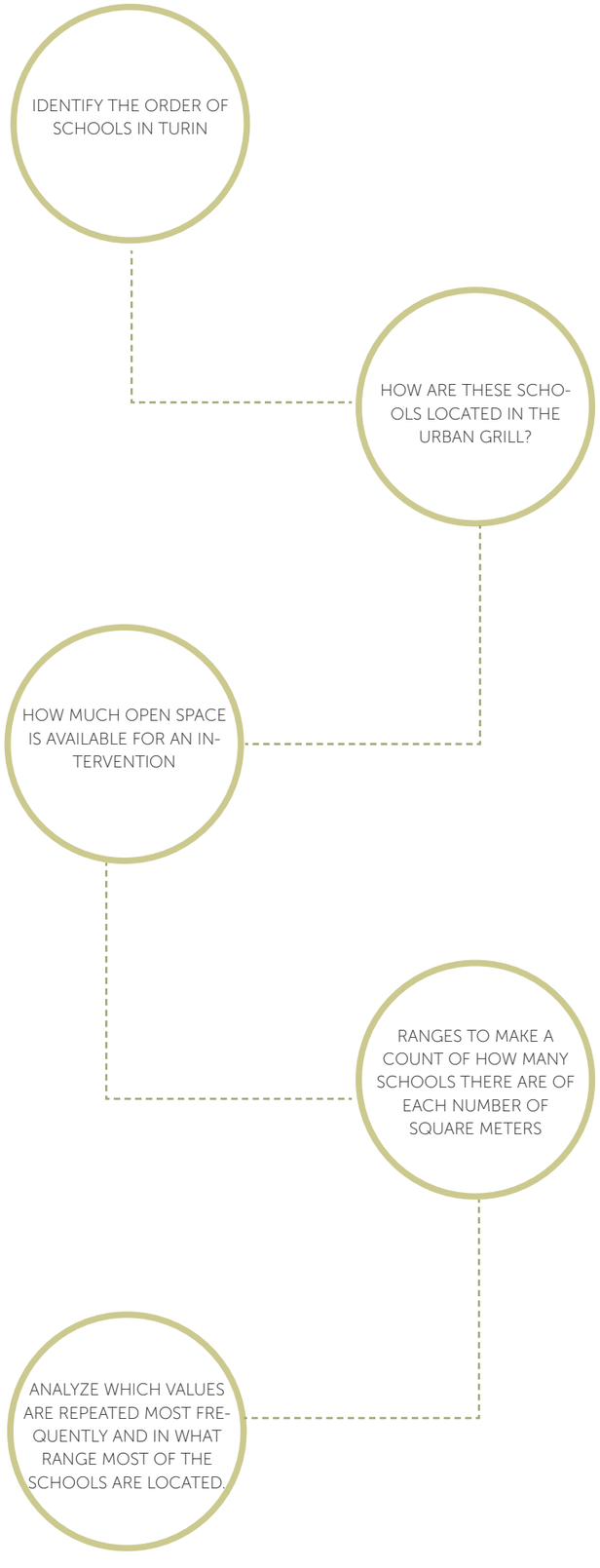
Abacus of all the First-cycle Schools in Turin

According to the exponential growth of the open space, it is possible to organize the first cycle of schools in Turin. Then, know which are the most common values in building typologies and how many spaces we have to intervene. Going into detail and breaking down each school in Turin, an abacus is built on the following pages to organize these figures in specific areas of buildings and their corresponding surfaces. The graphic construction phase of the abacus was made with the base of cadastral parcels digital archive of the city with the shapes of the buildings, available by Geoportal of the City of Turin. In this way, measurements were verified on the Autocad and replaced with the corrected ones.

The main objective of this Abaco work is to organize the entire school building stock to realize with statistics how much space we have free to rethink outdoor learning. Not only in school terms but also in building a city for what a scheme is made to understand how the schools of this abacus are located in Turin and what design potentials can be extracted from this location.

How can this information help know the Italian school resources? Is it possible to individuate the potential of transformation of school buildings? First, it is helpful to understand the ranges of open spaces and also the quantity of openness. Such an acknowledgement can provide one description of the school building stock through a limited number of typical buildings and is therefore preparatory to reasoned planning of interventions on every building.

The school buildings are organized in an ascending manner with the criterion of how ample is the open space that each lot or work area has. In this way, it is possible to see how much space there is for possible intervention and analyze what to do if the space is too small. In the same way, the abacus is developed horizontally in two joined sheets and is read by following the arrows, which will indicate which building follows after the other. Some indicative areas recall an approximation of where the order is located to understand how ample the open space is concerning the work area.



196m2

Antonio Meucci's School

Plot surface: 873

Open Surface: 196

Primary School Balbis Garrone

Plot surface: 830

Open Surface: 350

Public School Rignon

Plot surface: 1.792

Open Surface: 440

Elementary school Don Bosco

Plot surface: 901

Open Surface: 536

Middle School Antonio Meucci Centrale

Plot surface: 2.119

Open Surface: 560

1.244m2

Gozzi-Olivetti School

Plot surface: 1.244

Open Surface: 959

Elementary School Fioccardo

Plot surface: 1.246

Open Surface: 1020

Elementary School Marthin Luther King

Plot surface: 2.636

Open Surface: 1074

Elementary School Parato

Plot surface: 1.864

Open Surface: 1.089

Elementary School Silvio Pellico

Plot surface: 2.452

Open Surface: 1113

Elementary School Coppino

Plot surface: 3.385

Open Surface:1315

Carducci's School

Plot surface: 2.605

Open Surface: 1362

Primary School Falletti di Barolo

Plot surface: 2.394

Open Surface: 1447

Primary School A. Rayneri

Plot surface: 4,745

Open Surface: 1449

Primary school Altiero Spinelli

Plot surface: 2.354

Open Surface: 1449

Elementary school E. De Filippo

Plot surface: 2.286

Open Surface: 1766

1st Cycle School Institute Plana

Plot surface: 3.905

Open Surface: 1780

Elementary School Giuseppe Cesare Abba

Plot surface: 3.111

Open Surface: 1800

GIOVANNI CENA School

Plot surface: 3.227

Open Surface: 1801

Middle school Italo Calvino

Plot surface: 4.400

Open Surface: 1864

Elementary School "Costantino Nigra" De Sanctis

Plot surface: 4.123

Open Surface: 2183

Primary School Rita Levi . Montalcini

Plot surface: 3.997

Open Surface: 2211

Primary School Gabriella Poli

Plot surface: 3.439

Open Surface: 2220

E. Salgari School

Plot surface: 3.821

Open Surface: 2237

Elementary School Antonio Pacinotti

Plot surface: 4.332

Open Surface: 2261

Duccio Galimberti School

Plot surface: 3.693

Open Surface: 2.522

Primary School "ERNESTO CHIOVINI"

Plot surface: 3.742

Open Surface: 2.567

Elementary School Duca D'Aosta

Plot surface: 5.124

Open Surface: 2.575

Pubblic School Vallete A

Plot surface: 4.477

Open Surface: 2.741

Primary school Sibilla Aleramo

Plot surface: 4.447

Open Surface: 2.817

1st Cycle School Camerana

Plot surface: 5.405

Open Surface: 3.024

Elementary School "Guido Gozzano"

Plot surface: 4.970

Open Surface: 3.037

Elsa Morante School

Plot surface: 4.721

Open Surface:3.039

Elementary School Angiolo Gambaro

Plot surface: 4.803

Open Surface: 3.043

Elementary School "Vittorio Amadeo II"

Plot surface: 3.873

Open Surface: 3.054

1st cycle School Regio Parco

Plot surface: 1.867

Open Surface: 618

Elementary School Denis

Plot surface:1.514

Open Surface: 741

Primary School Federico Sclopis

Plot surface: 2.245

Open Surface: 860

Niccolò Tommaseo 1st cycle School

Plot surface: 2.153

Open Surface: 911

927m2

Elementary School Beata Vergine di Campagna

Plot surface: 2.088

Open Surface: 927

Middle School Leone Fontana

Plot surface: 2.607

Open Surface: 1119

Primary School San Francesco D'Assisi

Plot surface: 2.616

Open Surface: 1198

CONVITTO NAZIONALE UMBERTO I

Plot surface: 5.936

Open Surface: 1242

San Giuseppe Cafasso School

Plot surface: 2.589

Open Surface: 1297

Michele Coppino Elementary School

Plot surface: 3.385

Open Surface: 1300

Elementary School Schweitzer "Dante Aligheri"

Plot surface: 3.225

Open Surface: 1502

Pestalozzi School

Plot surface: 3.272

Open Surface: 1593

Medium School Croce

Plot surface:

Open Surface: 1623

Primary School Cesare Battisti

Plot surface: 3.470

Open Surface: 1670

Elementary School Francesco Faà di Bruno

Plot surface: 2.732

Open Surface: 1744

Elementary School Giuseppe Mazzini

Plot surface:3.445

Open Surface: 1884

Elementary school Roberto d'Azeglio

Plot surface: 3.800

Open Surface: 1902

Primary School Edmondo De Amicis

Plot surface: 3.315

Open Surface: 1995

2.094m2

Elementary School "Enrico Fermi"

Plot surface: 4.077

Open Surface: 2094

Sant'Anna School

Plot surface: 5.543

Open Surface:2180

GASPARE GOZZI School

Plot surface: 3.576

Open Surface: 2316

Bilingual European School Of Turin

Plot surface: 3.819

Open Surface: 2317

Medium School King 1

Plot surface: 3.470

Open Surface: 2393

Elementary School Gabrio Casati

Plot surface:4.553

Open Surface: 2426

Medium School King Massimo Mila

Plot surface: 4.205

Open Surface: 2.514

Elementary School Santorre di Santarosa

Plot surface: 5.924

Open Surface: 2.825

Elementary School Roselli

Plot surface: 4.451

Open Surface: 2.843

Elementary School Pietro Baricco

Plot surface: 4.384

Open Surface: 2.846

Elementary School "Pietro Micca"

Plot surface: 4.255

Open Surface:2.924

3.023m2

Primary Public School

Plot surface: 3.812

Open Surface: 3.023

First cycle School Bernardo Chiara

Plot surface: 5.064

Open Surface: 3.110

Comprehensive School "Peyron"

Plot surface: 4.871

Open Surface: 3.122

Elementary School Giuseppe Allievo

Plot surface: 5.615

Open Surface: 3.189

School Padre Agostino Gemelli

Plot surface: 5.393

Open Surface: 3.224

3.238m2

Primary school di Via Fea - Lomardo Radice

Plot surface: 6.032

Open Surface: 3.238

Elementary School Gianni Rodari

3.258

Plot surface: 5.282

Open Surface: 3.258

First cycle School Ignazio Vian

Plot surface: 5.132

Open Surface: 3.316

Primary School Rosa Agazzi

Plot surface: 5.069

Open Surface: 3.444

Primary School
Via Giovanni Flecchia

Plot surface: 4.645

Open Surface: 3.613

First cycle School Ugo Foscolo

Plot surface: 6.670

Open Surface: 3.620

Elementary School
Erich Giachino

Plot surface: 5.116

Open Surface: 3.819

Primary School
"Grazia Deledda"
I. C. "Ilaria Alpi"

Plot surface: 7.832

Open Surface: 3.873

Primary School Di
Via Sidoli - Perotti

Plot surface: 5.755

Open Surface: 3.899

1st cycle School G.B.Vico

Plot surface: 6.850

Open Surface. 3.940

Umberto Saba School

Plot surface: 5.821

Open Surface: 3.948

Elementary School
Leopoldo Ottino

Plot surface: 6.092

Open Surface: 4.468

Primary School dal Piaz

Plot surface: 6.014

Open Surface: 4.484

Middle School Renato Cottini

Plot surface: 7.242

Open Surface: 4.696

Alessandro Manzoni School

Plot surface:7.576

Open Surface. 4.700

Leonardo Da Vinci's
Institute

Plot surface: 7.516

Open Surface: 4.736

5.046m2

Elementary School succursale
Piergiorgio Frassati - Di Via Gubbio

Plot surface: 6.832

Open Surface: 5.046

Middle School Antonelli

Plot surface: 6.960

Open Surface: 5.159

Elementary school
Arturo Toscanini

Plot surface: 7.244

Open Surface: 5.477

Leone Sinigaglia School

Plot surface: 9.891

Open Surface: 5.546

Antonelli School

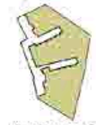
Plot surface: 7.208

Open Surface: 5.604

Primary School G.Fattori

Plot surface: 7.952

Open Surface: 6.215



Ambrosini School

Plot surface: 8.798

Open Surface: 6.249

Secondary School "Martiri
del Martinetto"

Plot surface: 7.573

Open Surface: 6.284

Middle School P.G. Frassati

Plot surface: 8.485

Open Surface: 6.387

Primary School Vittorino
Da Feltre

Plot surface: 8.627

Open Surface: 6.434

John Kennedy Elementary School

Plot surface: 9.551

Open Surface: 6.856

1st cycle school Pola

7.197m2

Plot surface: 9.312

Open Surface: 7.197

Middle School Alberti

Plot surface: 9.519

Open Surface: 7.252

Middle School Sandro Pertini

Plot surface: 10.685

Open Surface: 7.360

Elementary School
Carlo Collodi

Plot surface: 8.517

Open Surface: 7.371

School Piero Calamadrei

Plot surface: 10.154

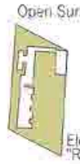
Open Surface: 8.958

9.109m2

Pubblic School
Via Giovanni Servais, 62

Plot surface: 11.162

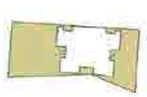
Open Surface: 9.109



Elementary School
"Renato Solarandi"

Plot surface:12.199

Open Surface: 9.170



Middle School Dante Alighieri

Plot surface: 14.606

Open Surface: 9.331

Primary School
Riccardo dal Piaz

Plot surface:12.397

Open Surface: 9.403

Primary School
Franca Mazzarello

Plot surface: 22.307
Covered surface: 9.337
School surface:4.642
Open Surface: 12.970

Middle School Modigliani

Plot surface: 22.307
Covered surface: 9.337
School surface:2.676
Open Surface: 12.970

Elementary School
Antonio Vivaldi

13.969m2

Plot surface: 15.768

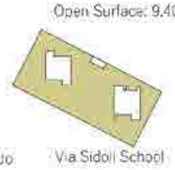
Open Surface: 13.969

Primary School Don Murialdo

14.090m2

Plot surface. 15.768

Open Surface: 14.090



Via Sidoli School

Plot surface: 18.157

Open Surface: 14.819

Primary School Umberto I

Plot surface: 5.344

Open Surface: 3.639

Primary School
Margherita di Savoia

Plot surface: 5.354

Open Surface: 3.661

Elementary school
Aristide Gabelli

Plot surface: 7.099

Open Surface: 3.723

Elementary school
Giuseppe Perotti

Plot surface: 7.722

Open Surface 3.755

Turoldo Davide Maria School

Plot surface: 5.928

Open Surface: 3.778

Elementary school Nino Costa

Plot surface: 5.828

Open Surface: 3.979

Comprehensive School
King Umberto I

Plot surface: 5.658

Open Surface: 3.988

4.041m2

Primary School Augusto Berta

Plot surface: 5.557

Open Surface: 4.041

Elementary School
Neil Armstrong

Plot surface:5.720

Open Surface: 4.056

Elementary School
Giacomo Leopardi

Plot surface: 6.373

Open Surface: 4.084

Elementary School
Felice Maritano

Plot surface: 7.811

Open Surface: 4.802

Elementary School "Sabin"

Plot surface: 6.722

Open Surface: 4.809

1st cycle School Ada Negri
- IC Leone Sinigaglia

Plot surface: 7.033

Open Surface: 4.853

State primary school
Carlo Casalegno

Plot surface: 6.501

Open Surface 4.855

Primary School Keller

Plot surface: 6.602

Open Surface: 4.860

Primary School Italo Calvino

Plot surface: 8.632

Open Surface: 5.756

Middle School Aldo
Palazzeschi

Plot surface: 7.652

Open Surface: 5.887

Elementary School
Giuseppe Perotti

Plot surface: 5.203

Open Surface: 6.894

6.040m2

Middle School Frank

Plot surface: 7.144

Open Surface: 6.040

Elementary School
Ludovico Antonio Muratori

Plot surface: 8.708

Open Surface: 6.106

First cycle School
Edi Franchetti

Plot surface: 8.061

Open Surface: 6.447

Middle School Carlo Levi

Plot surface: 8.455

Open Surface: 6.541

Don Milani school

Plot surface: 7.981

Open Surface: 6.604

Elementary school
Norberto Bobbio

Plot surface: 8.046

Open Surface: 6.643

State School "Dante Alighieri"

Plot surface: 8.875

Open Surface: 6.777

Elementary School
"C. COLOMBO"

Plot surface: 10.210

Open Surface: 7.441

Elementary school
Adelaide Cairoli

Plot surface: 9.237

Open Surface: 7.463

Elementary School
Nievo Matteotti

Plot surface: 9.474

Open Surface: 7.519

Middle School Adelaide Cairoli

Plot surface: 13.221

Open Surface: 7.609

XXV Aprile School

8.477m2

Plot surface: 13.448

Open Surface: 8.477

Matteotti School

11.191m2

Plot surface:13.328

Open Surface: 11.191

Elementary school
Salvo d'Acquisto

Plot surface: 16.865

Open Surface: 11.558

NORBERTO BOBBIO School

12.624m2

Plot surface: 14.309

Open Surface: 12.624

School ANGIOLO SILVIO NOVARO

Plot surface: 14.309

Open Surface: 12.638

Bernardino Dovretti School

Plot surface 15.839

Open Surface: 12.878

Corso Vercelli School

15.116m2

Plot surface: 25.241

Open Surface: 15.116

Primary School Aurora

17.080m2

Plot surface: 21.774

Open Surface: 17.080

Medium School
Ettore Morelli

Plot surface: 21.774

Open Surface: 17.080

Medium School
Vian Ignazio

Plot surface: 29.778

Open Surface: 26.827

Primary School
"Castello di Mirafiori"

31.338m2

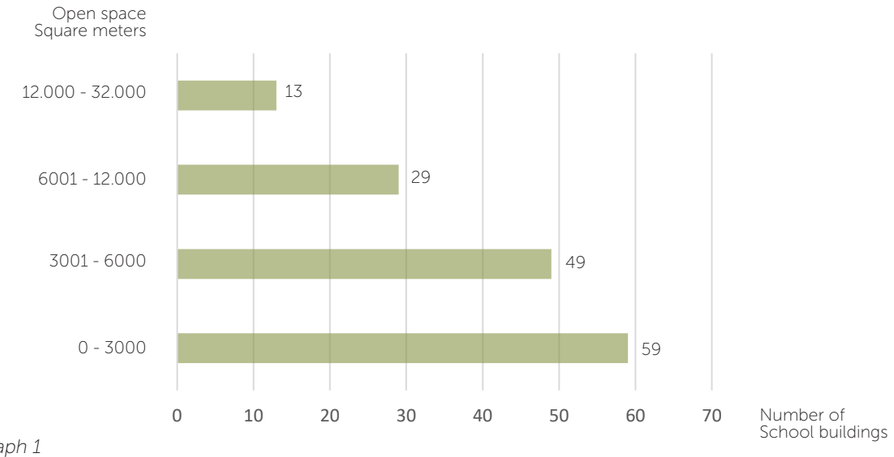
Plot surface. 39.910

Open Surface: 31.338

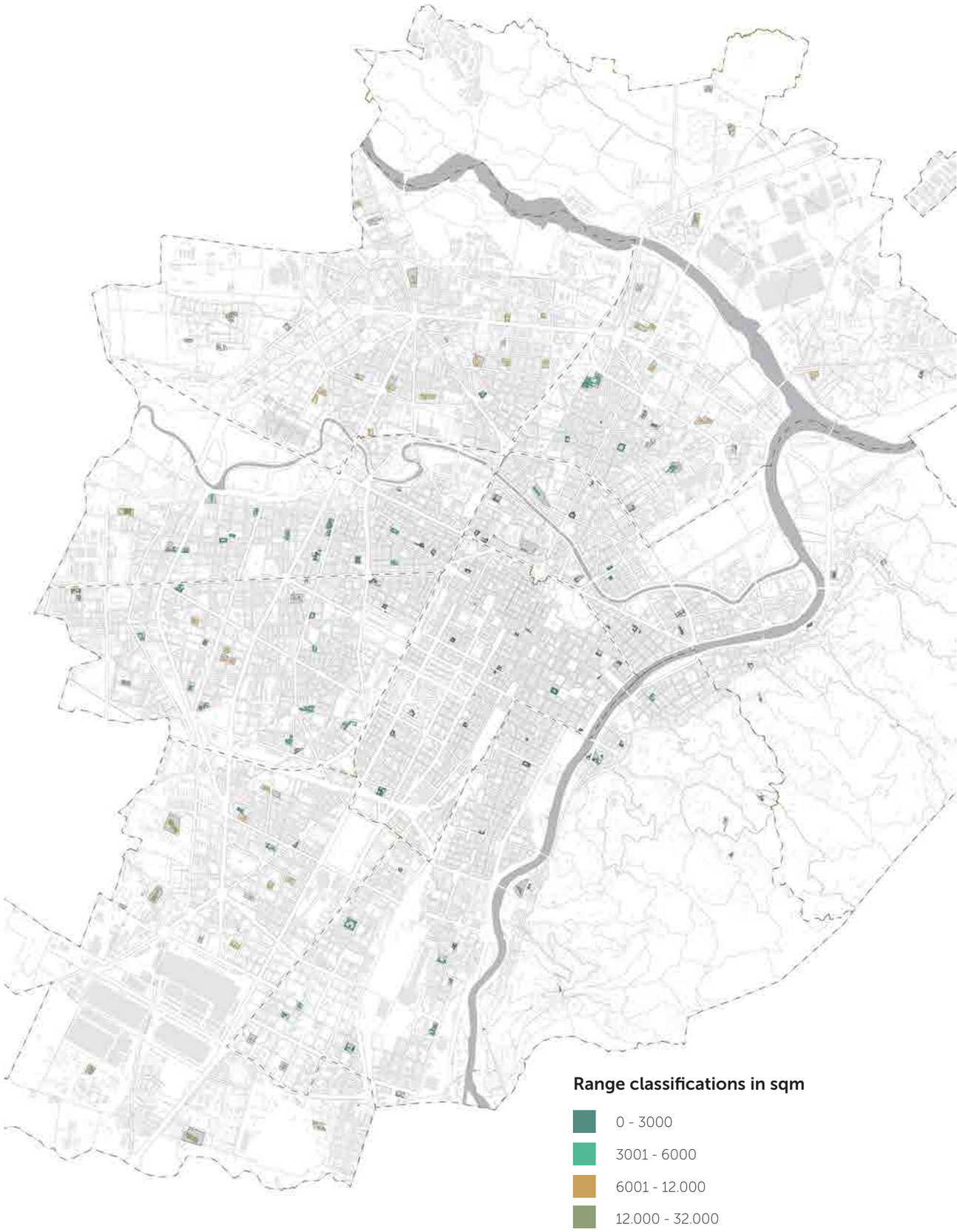
The open space of school building in Turin: A widespread green infrastructure

Making the previous table in ascending order according to the square meters of open or free space, the ranges of areas that predominate in the city of Turin are analyzed.
The previous groupings allow us to identify which are those schools or buildings that predominate in the city of Turin, the majority being found with the least amount of open space, this being consistent with the urban morphology map of the city where we can see that the compact blocks with an internal patio are the most abundant.

From 196m2 to 6,865m2 rounded to the range (0 - 3000) it could be considered the widest range that contains more buildings with little open space. Now, locating each school and seeing them on the map as can be analyzed in the previous maps where there is the surface of the lot and the built-up area, we have that those buildings that have a greater amount of open space are more towards the periphery of the city, being the center and its surroundings the areas with the highest density, therefore the free areas will decrease.
The neighborhoods in which these buildings with less free space predominate could be said to be Crocetta, Cit Turin, Vanchiglia and the center (San Salvario). This leaves other areas such as San Paolo, Mirafiori, Lingotto, Aurora, and even in the periphery where the amount of green area is much greater both in its closest context and in the lot itself.
Finally, with the graph is possible to see an exponential growth of the open space in the abacus, thinking of it as a potential for transformation at an urban level. Concluding that there are many schools that oscillate with an area of open space between 0m2 and 5000m2 taking the sum of 108 schools.



Graph 1

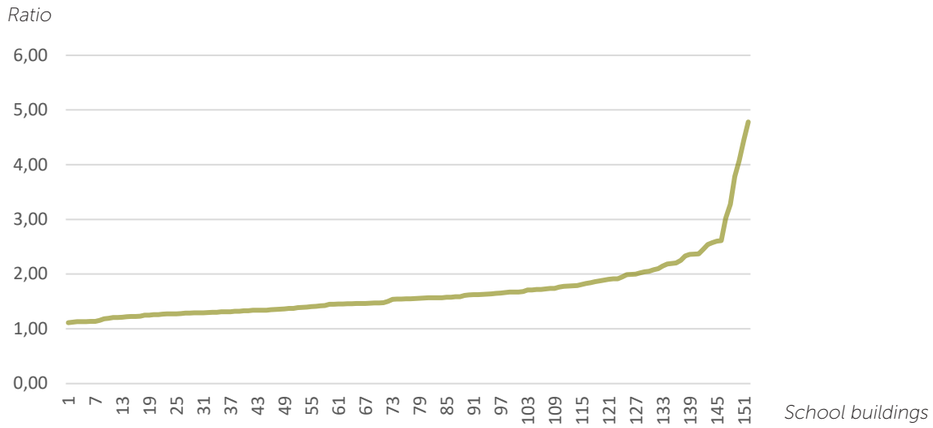


On the map it is possible to see schematically that the green area comprises those ranges of schools that have the least amount of free area, while in the periphery there are those ranges with the greatest amount of free area but despite the fact that the amount of city is greater , the number of schools decreases.

The 'openness' in the Turinese school infrastructure

When making the excel tables, organizing the data from the sources found and the resources used, we have two columns that correspond to the Plot Surface and the Constructed Surface, reviewed from the Ministry and Anagrafe list but reviewing each data with its corresponding measurements in AutoCAD. Thanks to these two numbers given in square meters, it is possible to extract the open space that would be the difference between the complete area and the built space and at the end make a division that would be the Ratio, relating open spaces with plot surfaces, which gives us a figure that does not have a unit but allows us to understand the proportion of related space. These results did not exceed the maximum number of 4.78 starting with a minimum of 1.11, where the numbers from 1.50 to 2.50 were more.

With this information, it is also possible to have graph three that explains this relationship between the total plot surface and the constructed surfaces, such as the one observed below, with which an average of which is the predominant value in the middle of this range.



Graph 3

3 values where we can fine the one that is repeated the most, that is, which is the most common radius in all the first cycle schools of the city, in the same way, to know what is the mean value or the average that each of the data in the distribution would have if its total sum were distributed equally and finally obtain a value that would occupy the central position if we ordered the data from highest to lowest.

MODE	1,13222029
MEAN	1,68
MEDIAN	1,55

With these 3 values, it is possible to understand that the average figure of the radius of the first cycle schools in Turin is 1.68, a number that divides all the schools in two that is the number in the middle would be 1.55, being 1.13 is the number that is repeated the most, that is, one of the most frequent radios.

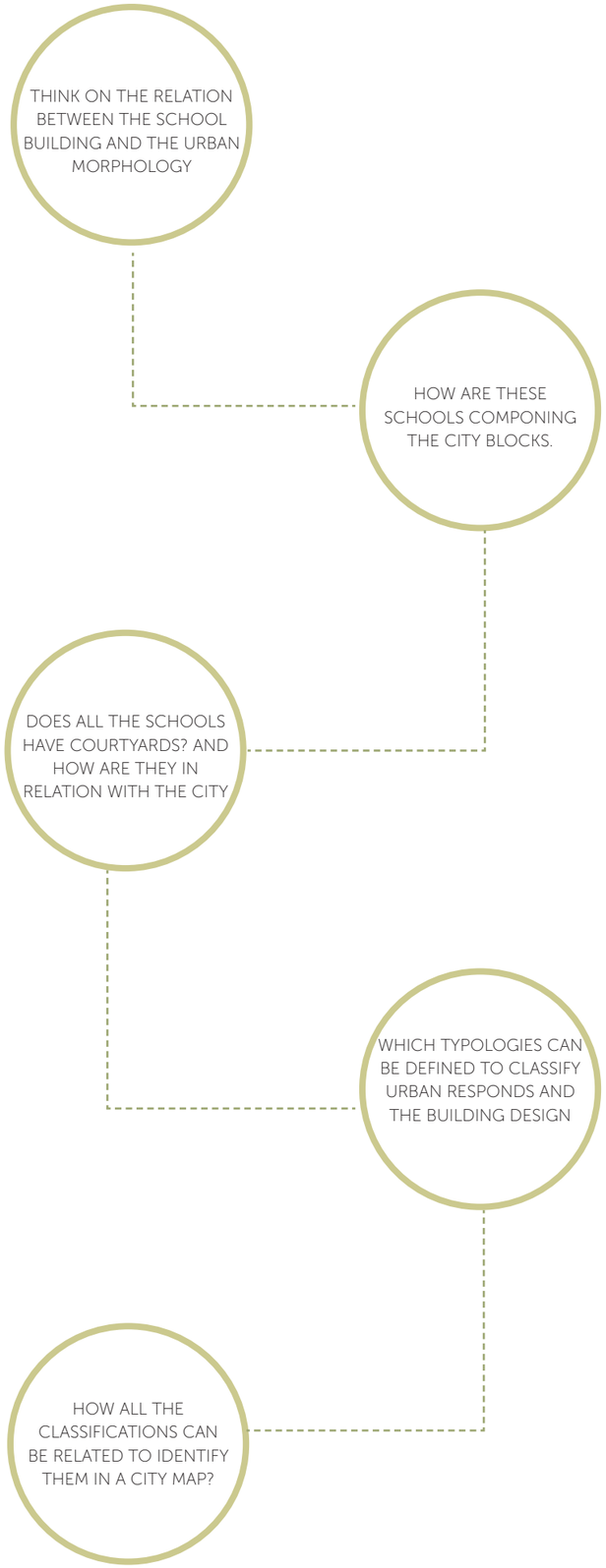
2 - 4

Urban typologies: a way to recocgnize the transformative potential of schools

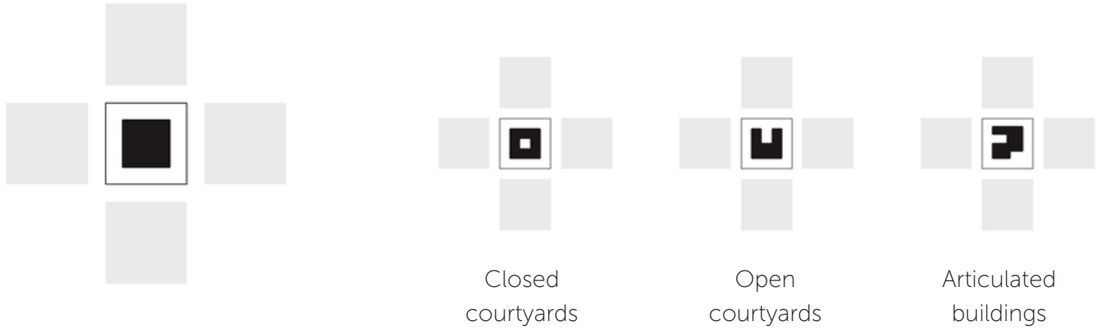
Once we have analyzed each school of the first cycle uniquely, both on the abacus and from the ministerial lists, it is possible to start creating a classification that defines each type of building and its relationship with urban morphology. From the urban point of view and analyzing maps of Turin, they have been identified three macro typologies according to the lot building position, considering the relation between constructed and open space and understanding how it responds to its context.

Firstly, the Islands are more well known as "Isolated buildings", the Peninsulas as "Perimeter buildings", and Fulls as "completed". Following these three first types, they have been identified other subcategories in which the building takes more importance on the open space and the morphology of the block so that it can be designed with open courtyards, close courtyards or just an articulated building. It has been defined following the relation between the close and open space of the building, generating different scenarios and spatiality within the same lot. With this division, we made a matrix table to understand how the building can mix typologies according to the lot and construction, related with the open spaces and answers from schools to the surrounding areas.

On the other hand, and in terms of quantities, we measure the amount of area that corresponds to each typology in the city of Turin, making in the matrix an analysis that give us relevant data that can be useful at the moment of intervention and think on the regeneration of this typologies and how is the best way to do it. The carried-on investigation principal aim is to generate a discussion on how this typology can be rethought as the regeneration of the buildings in terms of open spaces, creating social, natural, architectural and urban strategies to improve learning to a more experimental one.



ISLANDS

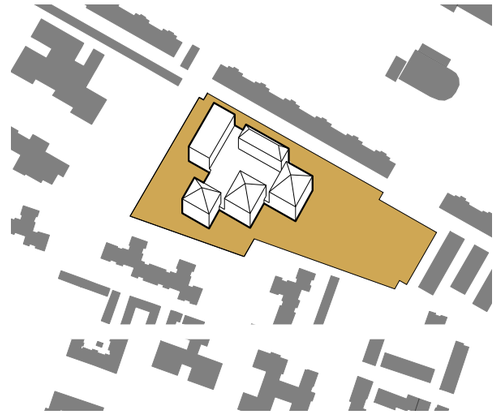


Closed courtyards | Open courtyards | Articulated buildings

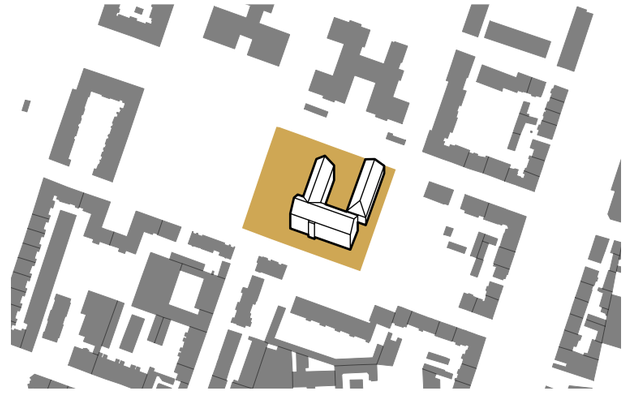
The Island classification is based on the position of the building in the lot, which is characterized for being isolated without touching the perimeter of the lot, leaving open spaces around the building that are considered a potential for transformation that maintains a relationship with the building its context. This Macro-typology has sub-typologies, well known as micro-typologies in where the building takes more importance, having the open courtyards as the first one, the close courtyards and the articulated buildings that are a type of mix of the previous two already mentioned.

The transformative potential of this typology is based on that open space that surrounds the building in the four sides of the built area. As can be seen in the models, depending on courtyard types, it is possible to know if this surrounding space is connected or not with the internal patio of the building. In the same way, if it does not, it is necessary to think about how to generate that connection to promote a permeability that breaks the schemes and generates fluidity in the external space. On the other hand, buildings with an open courtyard are directly related to this surrounding space, and articulated buildings have one or more permeable and flexible spaces that are a potential for an exciting distribution of external space.

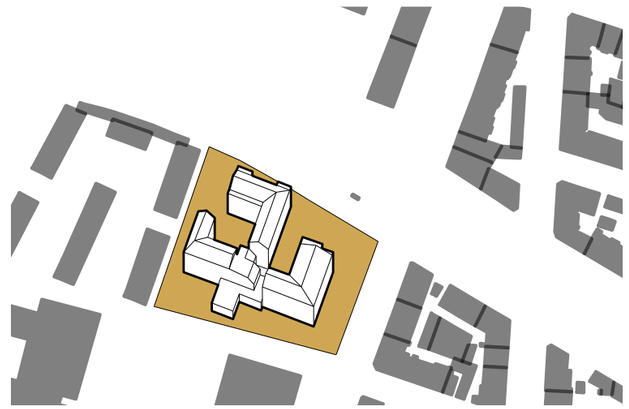
CLOSE COURTYARDS



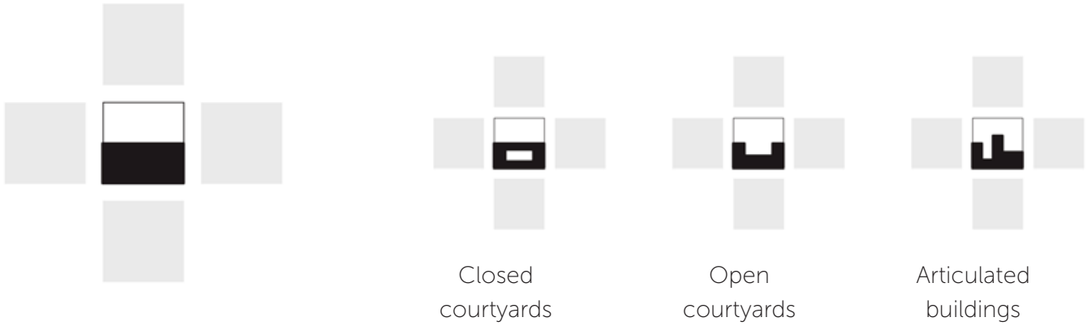
OPEN COURTYARDS



ARTICULATED BUILDING



PENINSULAS



The Peninsulas classification is based on the position of the lot that is caracterized for having large external spaces from minimun 3 sides of the building, having it near to the perimeter of the lot, in any position. In that way, the rest of the free area maintains the strong relation between the constructed and the open space, giving a good response to the context. Otherwise, the building is facing the context in one side of the lot, it´s really important to know how is the design of the facade to follow the urban criterias of a good architectural design.

The transformative potential of this typology is based on that open space that faces the building that fills the lot from the perimeter of one of its sides, leaving a large part of its front free. Depending on the type of patio, it is the relationship with this free space adjacent to the building so that the open patio is directly related, unlike the closed patio that closes to this external space, creating two different environments. On the other hand, the articulated buildings generate greater flexibility of connection of the building with this open space because it is not only one space but several that of different dimensions allow a permeability and relationship with the open space.

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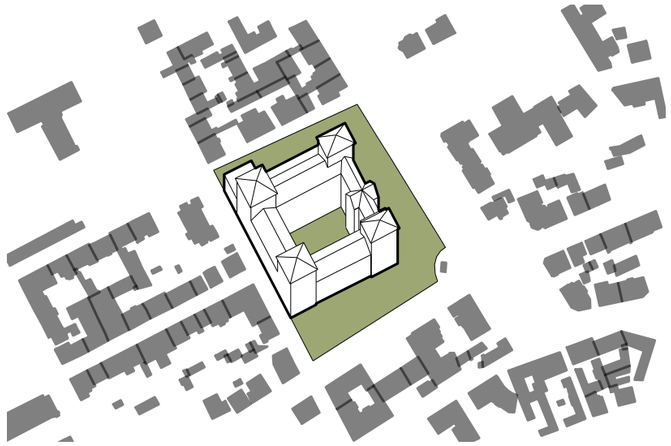
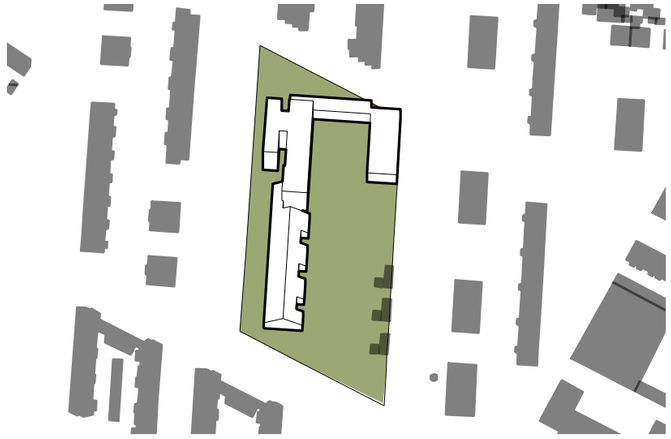
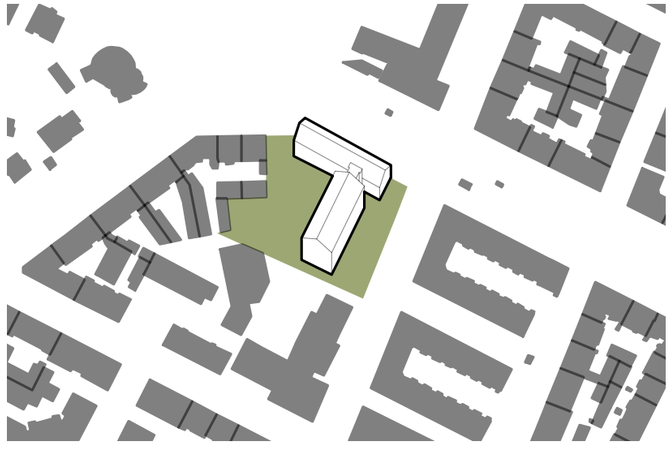


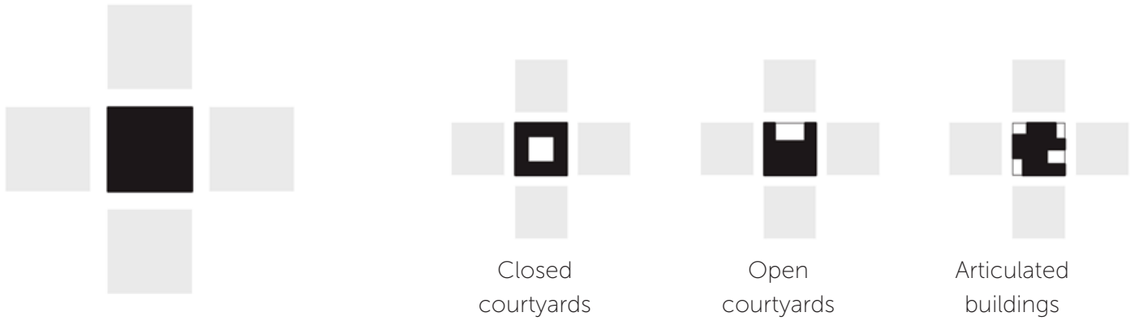
OPEN COURTYARDS



ARTICULATED BUILDING



FULLS



Closed courtyards

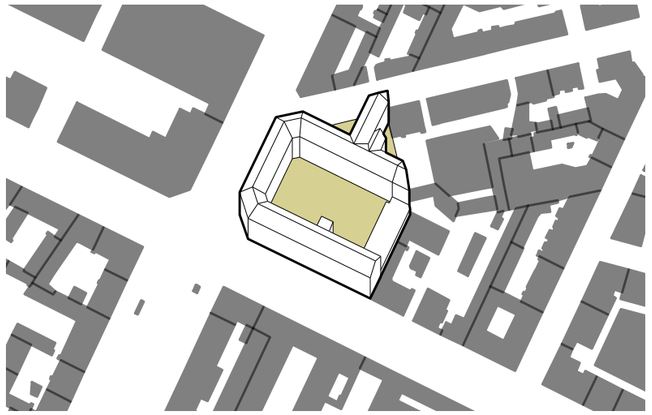
Open courtyards

Articulated buildings

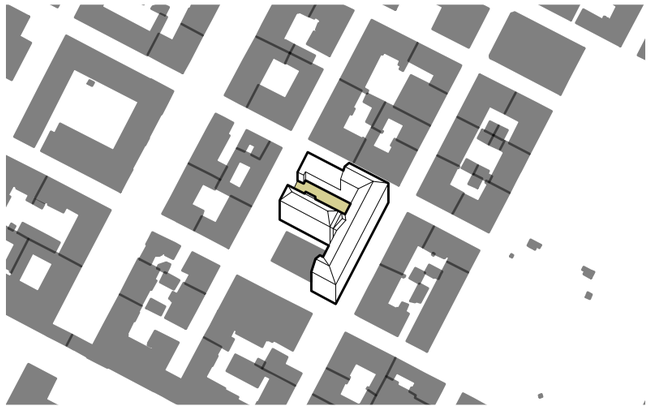
The last macro typology that has named as “Full” makes reference to the constructed area into the lot that in this case is full, without leaving to much space in the surruondings of the buildings since the entire lot covers all the perimeter. In other words, the construction capacity reach the maximum permited to fill the entire work area without outdoor spaces apart from the building. With this typology is necessary to think more about the near context of the cases, in which exists the possibility to expand the urban face to the school building and try to make an intervention in the city to connect the building with the interest places near from the school.

As we can see in the models, the tree subtypes have different advantages or transformation potentials that must be treated differently. In the first place, the closed courtyard covers the perimeter but has an open-air space within the building, so the urban intervention must be thought from the inside, generating a type of urban acupuncture that connects the educational and natural facilities. On the other hand, the open courtyards open a small door so as not to lose the relationship with the city, making it a little easier to determine accesses and even design decisions and finally, the articulated buildings, in the same way, surround the perimeter of the lot. However, they enter and leave at a formal level, generating flexible spaces that can be communicated with the city in detail.

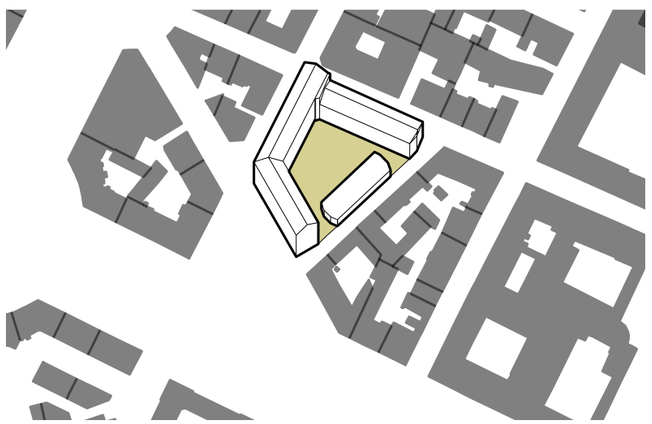
CLOSE COURTYARDS



OPEN COURTYARDS



ARTICULATED BUILDING



The identification of most recurring types

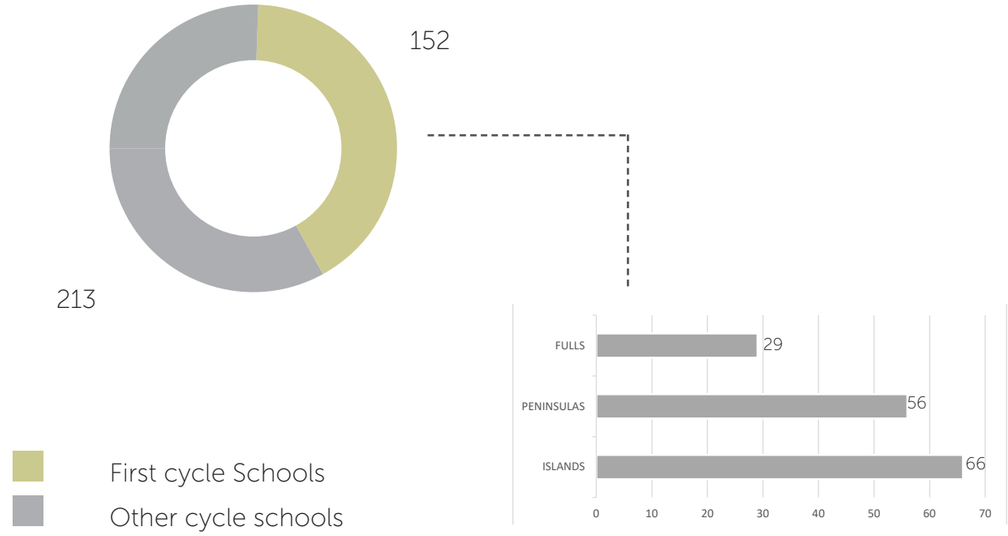
Now that we know what each type and its three subtypes are, with the list made and the data obtained, some graphs are made that explain how many schools there are in Turin of each one. According to the matrix table made, the articulated buildings in the "Islands" and "Peninsulas" typologies prevail, while the "Full" typologies have the lowest number of articulated buildings. Furthermore, the buildings with open courtyards are less in each macro-typologies, and those with closed courtyards are almost double the previous ones.

In addition, the quantity of "Peninsulas" is much lower at a general level than the "Islands", which, viewed from the positive side, leave one side open to the city for its intervention. The typology of the "Fulls" is not the most common, mentioning only some cases that can be seen on the map and that analyzing in detail the urban fabric can be an essential factor to think not only about a specific intervention at the local level but also how to open the school to the city and intervene in its surroundings by building the city.

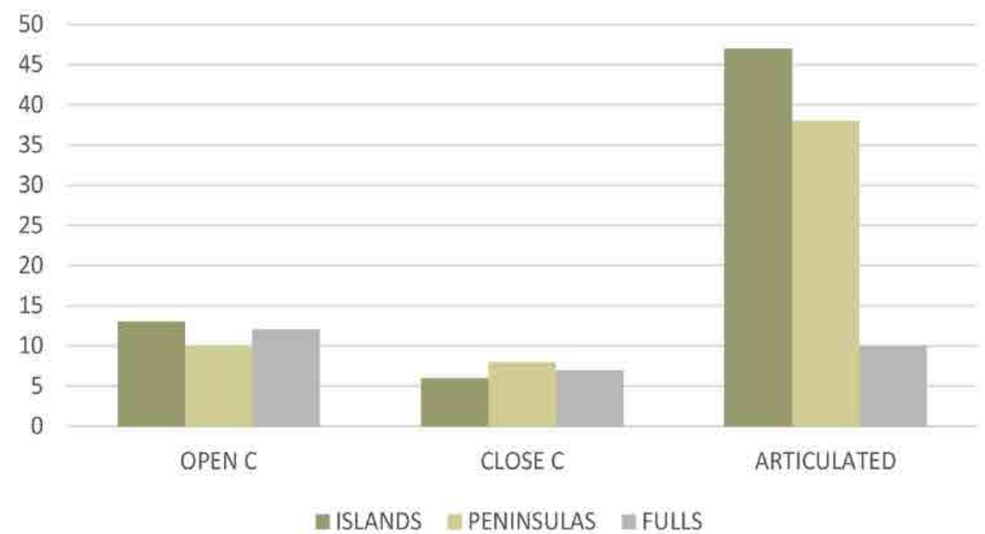
On the other hand, when counting the first cycle schools represented by 152 schools and 213 facilities or infrastructures that house other educational cycles, it is analyzed that it is one of the educational stages with the most outstanding infrastructure in Turin. This conclusion derives in numbers a general graph by macro typologies that has the total numbers for each one, where the "Islands" prevail with 66 school buildings, followed by the "Peninsulas" with 56 and finally the "Full House" with a number of 29 being the smallest.

	Open courts	Closed courts	Articulated Buildings
ISLANDS	13	6	47
PENINSULAS	10	8	38
FULLS	12	7	10

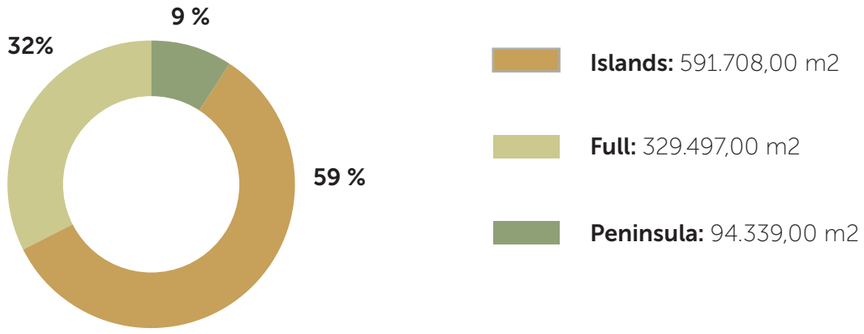
How many schools represents first school cycle education and each typology according to the excel list of all the schools and the urban classification on the different typologies?



The following graph shows how the micro-typology that predominates is the articulated one, which is a positive point for the moment of transforming or modifying a building, counting on a formal permeability from the formal conception of the building to the development of open spaces.



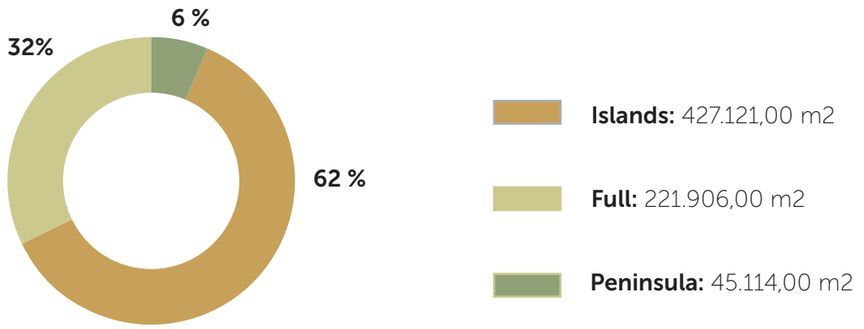
Total lot surface for each typology



According to the measures obtained at number and percentage level, the number of Island classification schools in Turin is the most recurring type with an amount of 591.708,00 m2, which represents 59%, leaving 32%, for the Full classification and just the 9% for the Peninsula.

Considering these numbers, it is possible to ask if there is a lot of Island classification on the construction field, is there enough open spaces and are they well used? How can it be rethought? Looking at the portion of Full schools concerning the Peninsulas, how is the density of Turin, and what can we conclude?

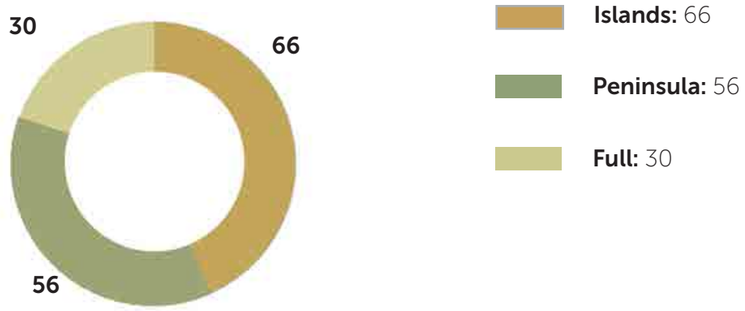
Total open space for each typology



According to the statistics in which there are enough open spaces for the Islands and Full classifications, reaching 427.121,00 m2 for the Islands and 221.906,00 m2 for Full classification, is possible to analyze in terms of landscape intervention at the urban and architectural level, the relation between activities and the use of the open space ¿how it could be intervented and which activities could it promote for the children´s learning in the first cycle?

The quantities for the classification of the Peninsulas are not enough, so the space should be designed carefully to be well-used. Although, attending that the percentage of the "fulls" is almost half of the "Islands", it is possible also to understand that the open spaces and design of outdoor learning should respond to the city and the school that occupies the entire lot space.

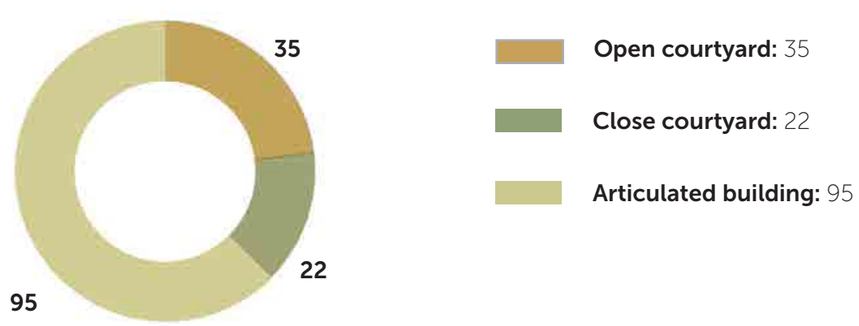
How are those percentages represented in number if schools?



Counting the number of schools for each urban typology on the map, we have that the most recurring type is the "Islands", with a total of 66 schools. This number agrees with the information about the square meters of the lot surface for each typology, confirming that this type predominates in Turin.

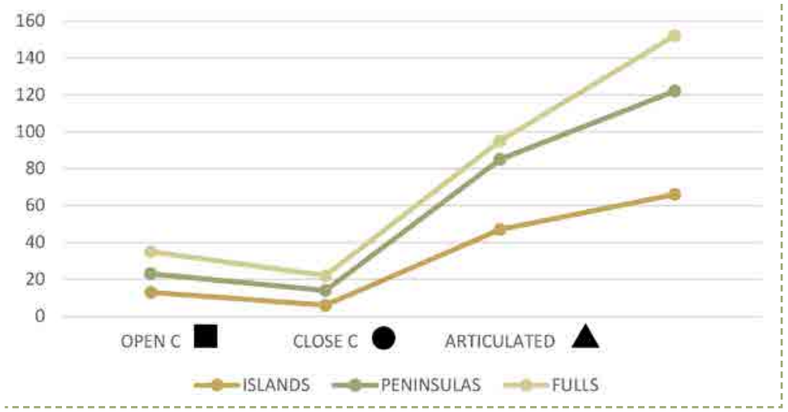
Nevertheless, why would there be more amounts of Peninsulas than the number of square meters shown in the statistics of the areas of the schools? The interpretation could refer to the fact that there are more surfaces or lots that have typologies such as "Fulls" instead of Peninsulas, but there are more "Peninsulas" schools than "Fulls" that may not have such large lot dimensions for getting to coordinate the same order concerning m2 and number of schools.

And the number of schools in the sub-categories of each typology?



With the count of these schools, it is possible to deduce that there are more schools of articulated typology, promoting various forms of free spaces abroad, which is a positive point for the flexibility and projection of these spaces. In the same way, we see that the lowest figure is the closed patio typology, which has only 22 schools, most of which are located very in the centre of the city due to urban density and leaving an intermediate figure of 35 schools that have a courtyard that opens to the city.

How these values and statistics are represented by relating both categorization



The three typologies conserve a similar exponential growth corresponding to whether they have an open courtyard, a close courtyard, or an articulated typology, which increases drastically. From the graph, it is possible to understand that the close courtyards are the least predominant in the city, following the open and articulated ones, being a favourable consideration, since there are buildings with more common free spaces for interventions and restructuring such as those proposed in this research.

Urban Typologies

- Articulated buildings
- closed courts
- open courts
- Fulls
- Islands
- Peninsulas

2 - 5

Measuring the context: school building in the urban fabric

Once the work of classifying the buildings and the area of relevance had been carried out, the research has moved to identify a relationship between these areas and the city's urban fabric. If before the classification was limited to the boundaries of the school's relevant areas, this second classification helps us to give a broader idea of how these schools fit into the city's urban fabric. The school realities that exist are different, and Turin, over time, has seen the urban mesh expand with different solutions, very heterogeneous among them.

The classification of the schools that we will propose has started from an in-depth analysis of the city's urban fabric, defining different "types" of cities that have been overwritten, expanded and added over time. In this classification of the urban fabric, we propose a first distinction of the historical areas of the city, characterized by a compact urban mesh in different directions, with streets perpendicular to each other and closed courtyard buildings that speak a heterogeneous language design of the facades. It follows in the near context realities of residential neighbourhoods built during the first industrial development of the city, with long and narrow blocks in which the buildings tend to thicken on the boundaries of the block, leaving in the centre the space for the courtyards and garages. In addition, this typology is characterized by having a recognizable urban form, where is possible to create a clear grill of urban mesh. In the city's outer areas, however, the most recent development of residential construction appears, with the neighbourhoods organized in blocks and slats, with its internal organization of routes and services.

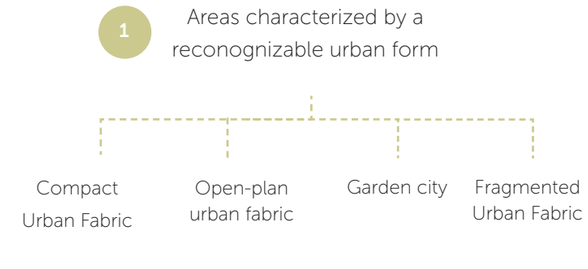
In the classification of the urban fabric, parks, industrial areas and rural areas that remain within the municipal boundaries have been included and considered dependent on the urban grill but in white. The hill of Turin, east of the River Po, is a reality like the others described above, which contains its logic of development at low and medium density, constituting the last border of the city on the eastern side. In this varied urban fabric, schools are placed, dialoguing with the built volume and the urban mesh in different ways, which constitute the basis of the classification that we propose in the following pages.

According to the urban fabric, the classification wanted to separate two important aspects that differentiate how schools are grafted onto the urban fabric: the areas of relevance and the method of construction of buildings. It is easy to imagine how, in the various eras until the second half of the last century, the city was planned and designed to develop in a certain way. We, therefore, find ourselves with buildings well inserted in the urban mesh, appropriately provided for entrances from the streets and accessible areas that fill the space. In the historic centre more than in the suburbs, these buildings enjoy less open space, relegating it more quickly towards the interior of the lot, as they are often leaning against other buildings whose priority is the continuation of the facade wire, uniforming the language of the facades in the heights of the interplane and decorations.

As anticipated, the realities in the recently defined suburban schools are much more detached from following a common language with the neighbouring buildings. Instead, they exist in the space dedicated to them with a more significant amount of open space, capable of accommodating playgrounds, gyms and gardens. The difference lies in how the designers of the past and the more recent ones have understood the way to design schools. However, it is not true that "historical centre" means "little space, much volume": in cases, we find ourselves in the hands of school realities housed in buildings well grafted into the urban mesh, but designed to accommodate other functions that in the past have fallen into disuse such as barracks, convents and market spaces.

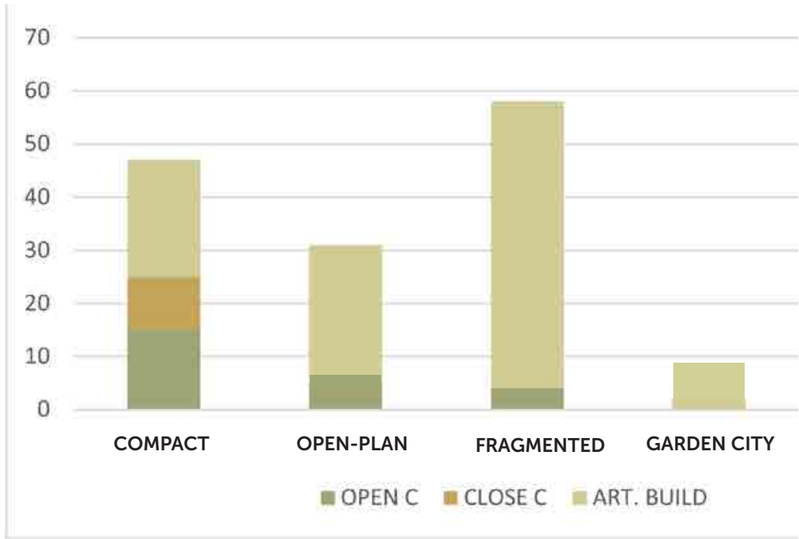
Following this line and starting from an urban map that explains the morphological uses of the city of Turin, five types of urban fabrics are defined, such as Compact urban fabric, Open-plan urban fabric, Garden cities and the Fragmented Urban Fabric. The idea with which the map is developed; observing and analyzing how it affects the urban fabric of each first cycle school, giving us guidelines to know how to develop open spaces and the type of intervention that could be carried out. Nevertheless, why is this classification done? Considering it essential to understand what type of soil we move on, in this case, it is Turin, but if the case study changes, an analysis of the type of soil must be made, defining it and thus analyzing how through these classifications it is possible to intervene and project an improvement both at an architectural and urban level. This Italian city has an important feature to consider. Although the centre has an orderly urban layout that we have classified in the order of "Compact" as the city radius increases, this layout becomes a little more informal and therefore, the classification changes to be "Open-plan" or "Fragmented". What does Fragmented Urban Fabric"mean? Those are the areas characterized by not having a recognizable urban form, it means that is an area that in the future can be re-thinked to be renovated and at the moment there are discountinous. So, what is the final objective of this classification? The idea is to understand and know how the urban morphology affects the school buildings, understand the urban fabric to know which line follows each building and take it into account for possible intervention, and to improve the building and the city.

Matrix with the data of the first cycle schools in Turin

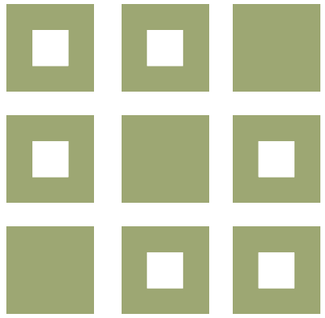


	Open courts	Closed courts	Articulated Buildings
Compact Urban Fabric	15	10	22
Open-plan Urban Fabric	7	0	31
Fragmented Urban Fabric	4	0	54
Garden city	0	0	9

According to the previous classification, a matrix table is generated in which it is sought to identify building typologies where the building responds to the city. How does the morphological tissue follow? How orderly is the urban fabric, and how dense is it? Following these questions, it is proposed to identify each educational building by manual counting on maps of Turin in order to know how the building is constructed concerning its most immediate context. Then, taking into account the first implantation in the batch, how this form of implantation influences the context, what is generated and what can be improved.
Going on to talk a little about the numbers identified for the first educational cycle, the classification "Fragmented Urban Fabric" has the highest number of schools, especially in articulated buildings, but there are no buildings with open and close courtyards.
On the contrary, the "Open-plan" are found fairly within the urban fabric, with a number of just 7 in the close courtyards and a big difference with the articulated that has 31 buildings.
Thus, by analyzing the graph of quantities, it is possible to say that the city of Turin has a built complex of first cycle schools in which a fabric that proposes some space that connects with the city prevails, that is, the "Fragmented Urban Fabric".



COMPACT URBAN FABRIC



The first item that appears in the classification of school areas on the urban fabric proposes the definition of “compact” urban fabric. It corresponds to the general classification of the areas that are characterized by a recognizable urban form. The feature that distinguishes this category from the others is the perfect graft of the lot within the urban grid, surrounded, in most cases, by 4 streets, thus generating a block In other words, the urban fabric creates a kind of curtain around the lot, building a very orderly and reticular morphology. The grafting of the area into the urban grid in this way guarantees diversified access from several points in addition to the consequent advantage of providing the school a courtyard inside the building.
It is on this type of terrain that the various types of buildings mentioned above for urban classification are then grafted: open courtyards, closed courtyards and articulated buildings as we can see in the next page some examples of each typology. It is quite common to find oneself with articulated buildings divided into different degrees, as the differentiated accesses allow a better management of flows, but there are also the exceptional cases of structures in themselves conceived in this way in the historic center. Looking this type of urban fabric classification in terms of open space is possible to think that there is not enough space to create outdoor learning but this could be solved from the interior or as we mentioned the open or close courtyards that are provided from the diversity of the school building construction.

CLOSE COURTYARDS

OPEN COURTYARDS

ARTICULATED BUILDING

OPEN-PLAN URBAN FABRIC

The second solution adopted was the “Open-plan urban fabric” areas, where is possible to recognize the urban form This solution concerns those open spaces that surrounds the building before the lot ends in almost all the faces of the buildings, that can also share closed side with another building.There is no shortage of cases in which, instead of bordering these buildings there are parks and public areas such as squares and pedestrian paths, which enrich schools with a greater amount of open space and design hypotheses. This typology also identifies the city of expansion, that is, those spaces that, having a large amount of usable free space, can be modified in the future and thus modify the city and grow exponentially. However, the buildings are spread in the urban soil without an order in the city.
Talking about the open spaces, with this type of classification is possible to see and understand by the urban grill that there is a space next to the building that gives to the school and also the morphology less density and more open learning spaces to change the teaching way and making it more experimental for the students. In general, closed courtyard buildings are located in compact urban fabrics as they complete the block in a reticular way so there are not located on this soil typology. Instead, there are mostly open courtyard buildings that are also articulated. counting as potential the amount of open space around the buildings that are within the lot.

OPEN COURTYARDS

OPEN COURTYARDS

ARTICULATED BUILDING

FRAGMENTED URBAN FABRIC

The third classification is “Fragmented” areas, those that stand out in the urban grid, breaking up the regular subdivision of the blocks. In these houses, the school’s areas are inserted between the roads and the properties without a precise rule, but respecting the distance from the adjacent buildings. This typology doesn´t have a specific grill or is not definible so it can be well-known as fragmented or discontinous. The multiplicity of accesses guarantees a good distribution of flows. The shape of the buildings grafted into this type of area is so curious, and the way they interact with their surroundings creating spatiality and a difference of the normal grill of the urban morphology. On the other hand, this typology is a mix, so it´s possible to see both the compact and open-plan urban fabric but the only thing is that it doesn´t follow an specific order.

Taking into account that this classification includes the route it can provide different ways to see the open spaces near to the school building that are a complement for the new ways of citizen interaction. In general, closed courtyard buildings are located in compact urban fabrics as they complete the block in a reticular way so there are not located on this soil typology.

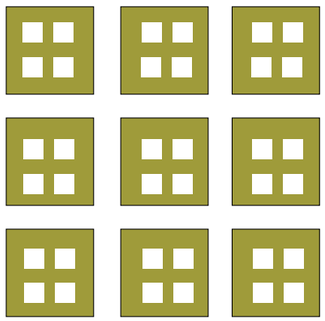
Instead, there are mostly open courtyard buildings that are also articulated. counting as potential the amount of open space around the buildings that are within the lot.

OPEN COURTYARDS

OPEN COURTYARDS

ARTICULATED BUILDING

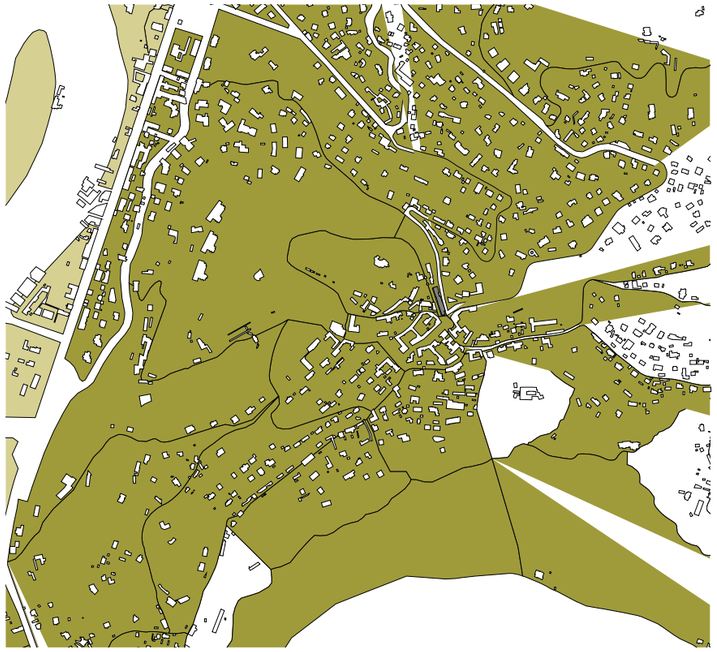
GARDEN CITY

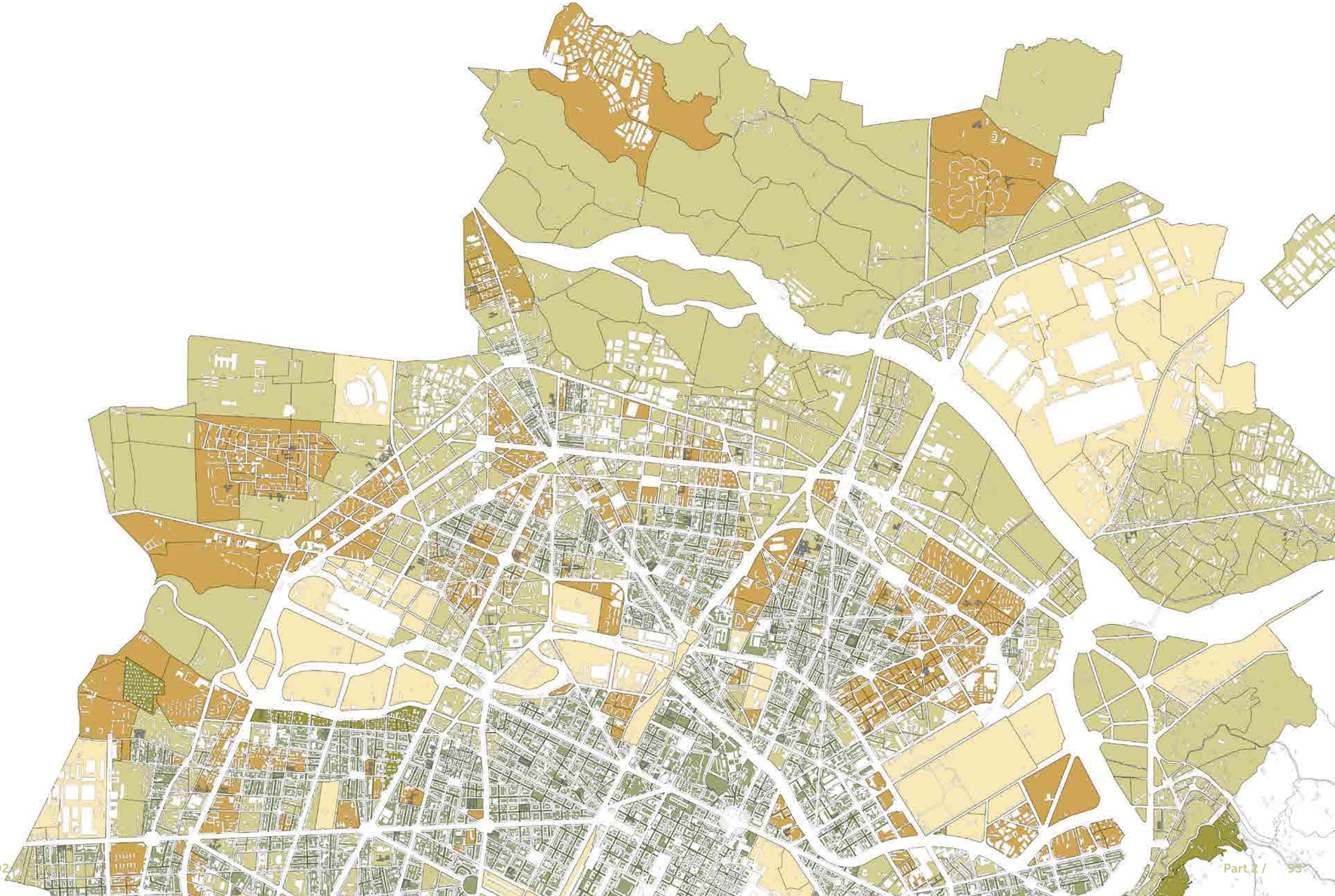


This soil classification is characterized by having preferably private open spaces endowed with nature. They are found mainly in residential areas, that is to say, that the buildings are primary residences that start from a model or design module that is repeated in the following blocks of the block. This typology does not house any educational building. However, it is worth highlighting it to understand how those areas and green spaces that are generally seen on the map can be classified as neither parks nor public areas. These private areas have enough space to materialize an idea or project improvement intervention at the level of open space.
The green city can also be in the hill of Turin, where it is possible to find the big Villages with a lot of green private space in the surroundings.

PRIVATE GARDENS

THE HILL OF TURIN





Classification by urban fabric

- Compact urban fabric
- Open-plan urban fabric
- Fragmented urban fabric
- Garden cities
- Service blocks (barraks, hospitals, parks, etc.)
- First cycle schools

PART 3

DEISGN PROPOSAL

3 - 1

3 cases of study for three recurring types

According to the previous classification, a selection is made of three case studies representing each typology, the Islands, Peninsula and Full, to understand how can be re-design the outdoor space and how is the relation with the city. Those open spaces are a potential for regeneration that could improve the quality of education and forms of experiential learning and the quality of the environment, context, neighbourhood and citizen interaction. The cases are spread in diverse and far areas of Turin to study different places with different contexts and activities, also seeing how the building is constructed on the urban grill. The first case is located in the North, in Aurora´s neighbourhood, the second one in the south near the big green area of the East of the city and the third case is located on Vanchiglia, where the grill is compact and dense.

This selection was started with some questions as:
- How is the accessibility to the school, and where are the entrances located?
- Which are the supportive activities for the school? Is the building able to host sports and cultural functions?
- Are the surroundings activities and services enough to improve the quality of the neighbourhood and student environment? If yes, how can we connect it with the school?
- Is there an excellent public transportation system?
- Is there free space for the parents to live and pick their children during the most trafficked hours in the post-pandemic city?
- Is there enough green space in the surroundings of the school?

According to those questions, the design work should take care of those answers and move the steps to improve the school building from the outdoor space to the classroom, providing a better quality of learning for the students.

#1

Scuola elementare e media Parini
Via Antonio Cecchi, 16
Quartiere Aurora
Turin, Italy

Plot Surface: 14.594,36 m²
Building: 6.403,25 m2
Open space: 8.191,11m2

Clasification by urban typology
Island - Articulated building

Clasification by Urban Fabric:
Mainly Compact urban fabric

The building is located in the North of Turin in the Aurora neighbourhood that borders the Dora River. At an urban and typological level, the building is classified as "Island" since concerning the lot, it is isolated from the perimeter, generating a wide-open space for school use and is considered "Articulated" because it generates one or more flexible spaces that allow the building to relate to its immediate surroundings. Speaking of morphological fabric, it is a building classified as "Partials" since it continues with a logic of the place but does not occupy the entire lot. On the map, it is possible to see the facilities and services closest to the building. For example, at a commercial level, it is very well equipped, there are also many restaurants, and it is close to green areas and parks that are a potential for transformation. In the same way, after about five minutes of walking, there are some abandoned areas where in the future could be considered what to put there that complements the area and expands the project much more at the urban level. The building has ample open space within its area that could be used in a better way to meet some of the proposed goals.

- Connect the school with the essential neighbouring points at an urban level
- Revitalize the Aurora area, improving the quality of life and generating a social impact
- Generate new forms of experiential learning for children at school
- Make good use of open space both in terms of the user (student) and in terms of the city
- Are the surroundings activities and services enough to improve the quality of the neighbourhood and student environment? If yes, how can we connect it with the school?
- Is there an excellent public transportation system?
- Is there free space for the parents to live and pick their children during the most trafficked hours in the post-pandemic city?
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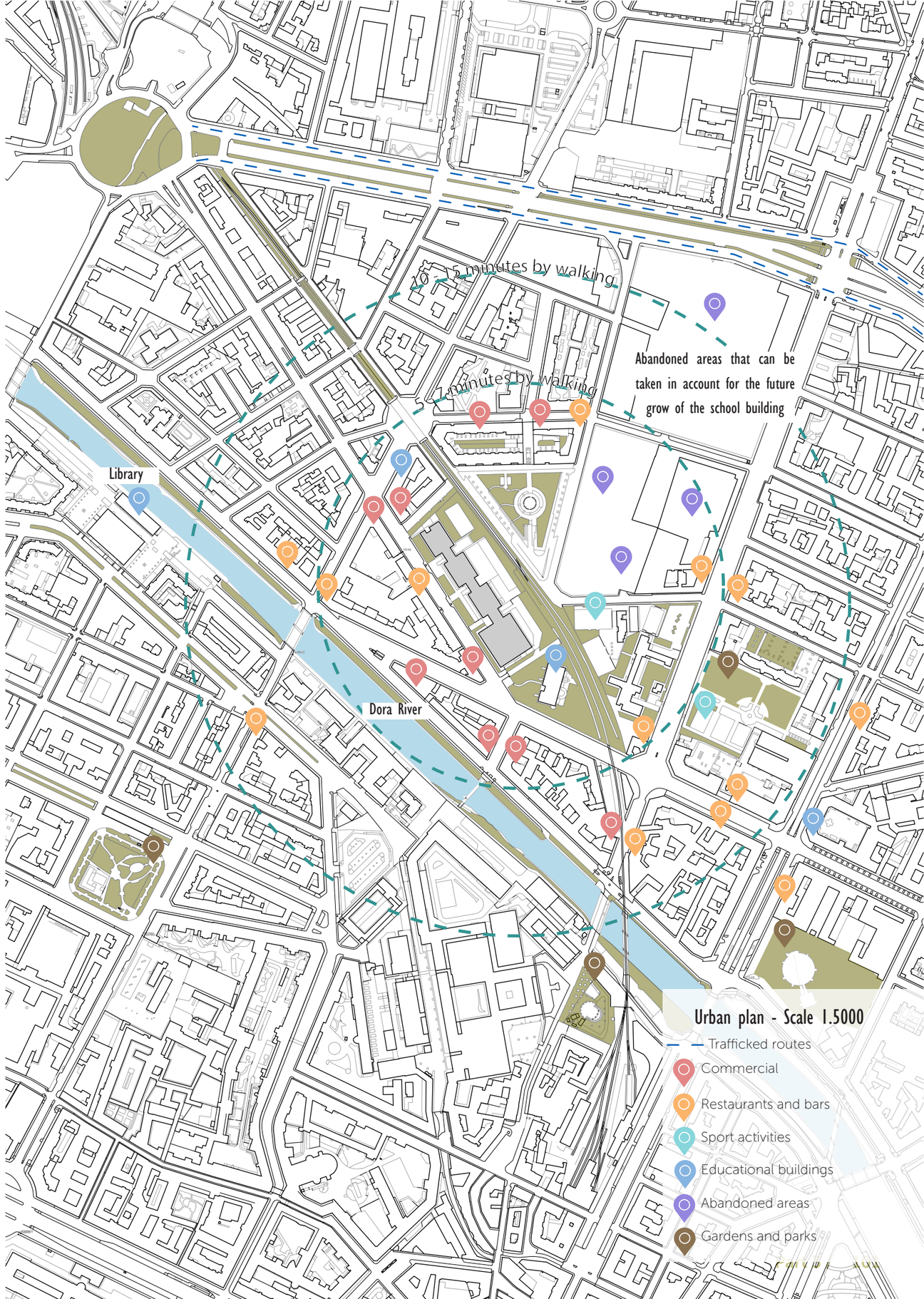
According to those questions, the design should take care of those answers and move the steps to improve the school building from the outdoor space to the classroom, providing a better quality of learning for the students.

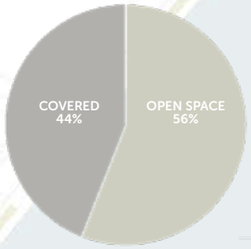


Actual situation of the building

The building has a green area surrounding the perimeter and complements a sports building with a student field. It has an athletics track that can be potentiated for communal use, opening it to the adjoining park.

In statistical terms, the open space it has is approximately 7.719,77m2, which concerning the Plot surface is the half and being close to a park such as the Via Saint Bon park has more potential to regeneration and create outdoor activities that also takes the sportive building.

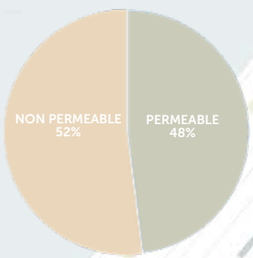
On the other hand, by the articulated typology, the flexible space created by the bridges that connect the buildings generates multiple ways of taking advantage of the open space through the architecture.



OPEN SPACES

Open Space
8.191,11 m2
56%

Plot Surface
14.594,36 m^2
100%



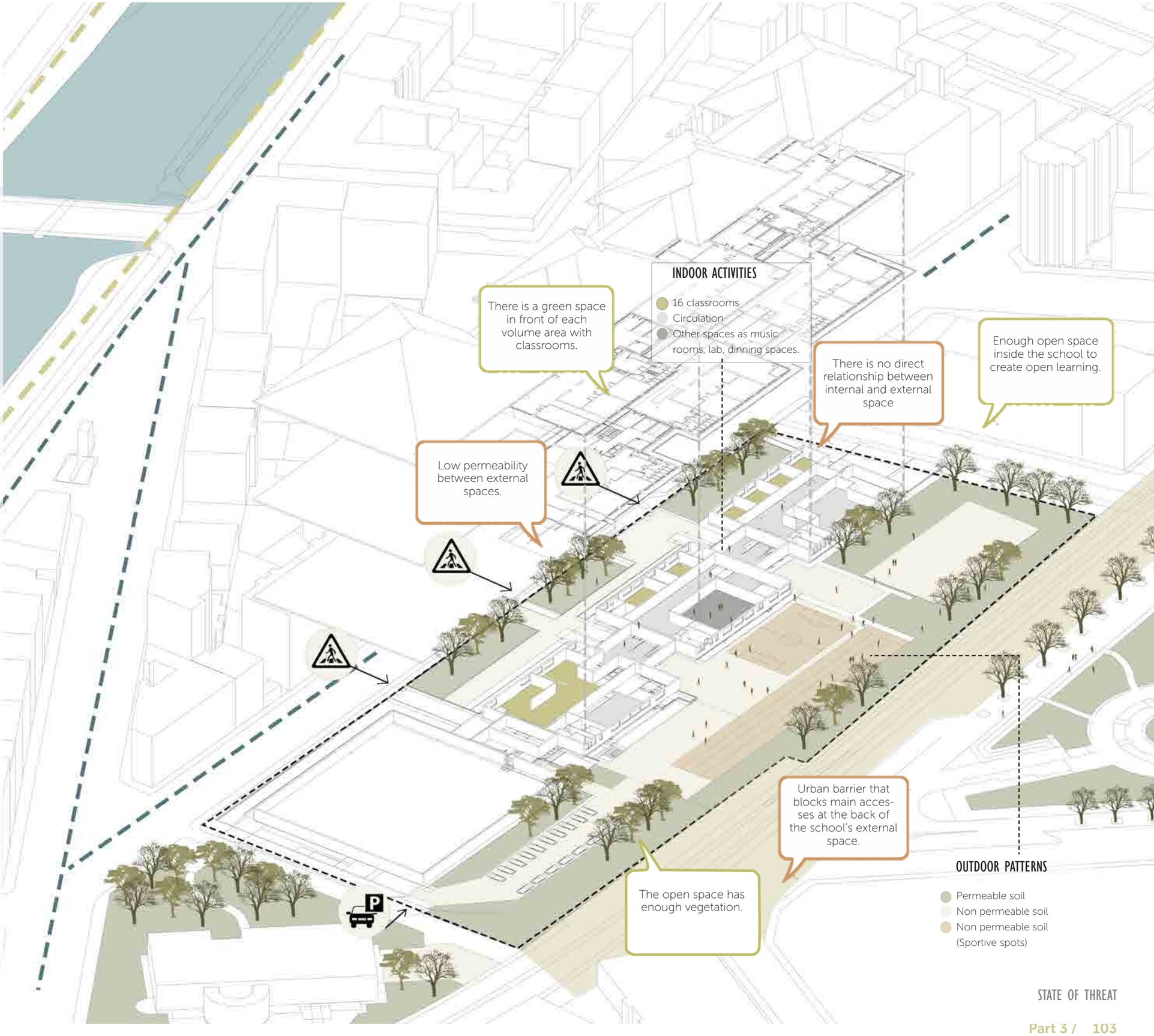
PERMEABILITY

Permeable soil
3.935,87 m2
48%

Non permeable soil
4.255,24 m^2
52%

Analyzing in percentages the amount of green space or permeable area and that which is not, an adequate proportion must be managed, for only a few m2 of difference, the non-permeable quantity can be more significant.

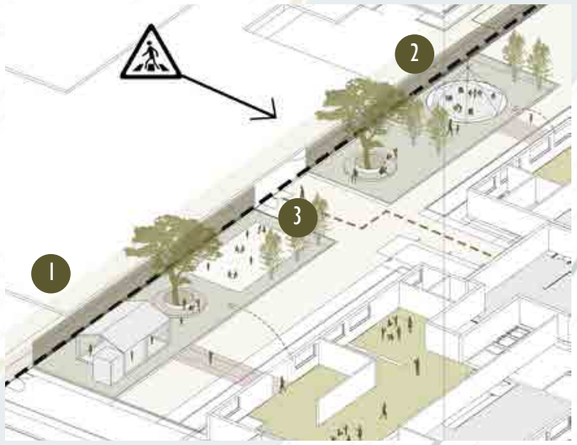
This percentage is potential because the vegetation and these areas provide comfort and promote a good design of the school's open space.



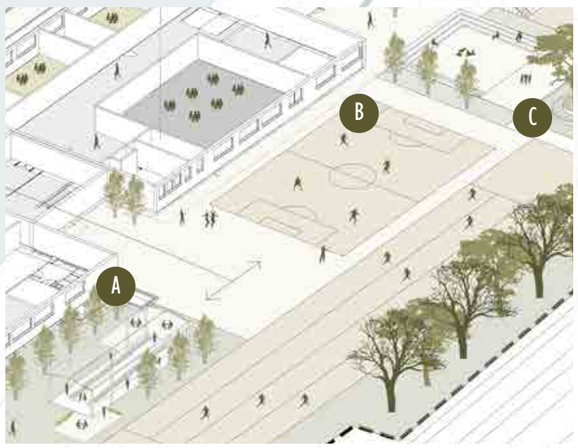
Project - Aurora´s Primary School

According to references that start from the patio theory, at the project level, it seeks to generate these spaces between one volume and another, with vegetation and suitable furniture promoting learning activities and outdoor sports.

In the same way, it is intended to be a sports space connecting vacant spaces such as access to the park in front of the project. For this reason, this space of soccer fields and athletics track is connected with shared living areas and the connection with this green space. Finally, sustainable learning activities are proposed in areas of orchards and natural spaces



1 Outside classroom
2 Outside laboratory
3 Dinner tables for the outside spaces



A Sustainable outside learning spaces (gardens)
B Football and athletic field
C Theater

INTERNAL OPEN SPACE THAT CREATES RELATION BETWEEN THE 2 SPACES

Spatial device that creates a laboratory in the outdoor space of the classrooms

Spatial device that creates an outdoor classroom

Integrate stairways in a sportive area

Cultural activities in a theater at the open space in front of a natural spot.

Spatial device of Green gardens for experimental processes

OUTDOOR PATTERNS

- Permeable soil
- Non permeable soil
- Sportive spots

#2

Comprehensive School “Peyron - King Umberto I”
Via Valenzai, 71
10127
Turin, Italy

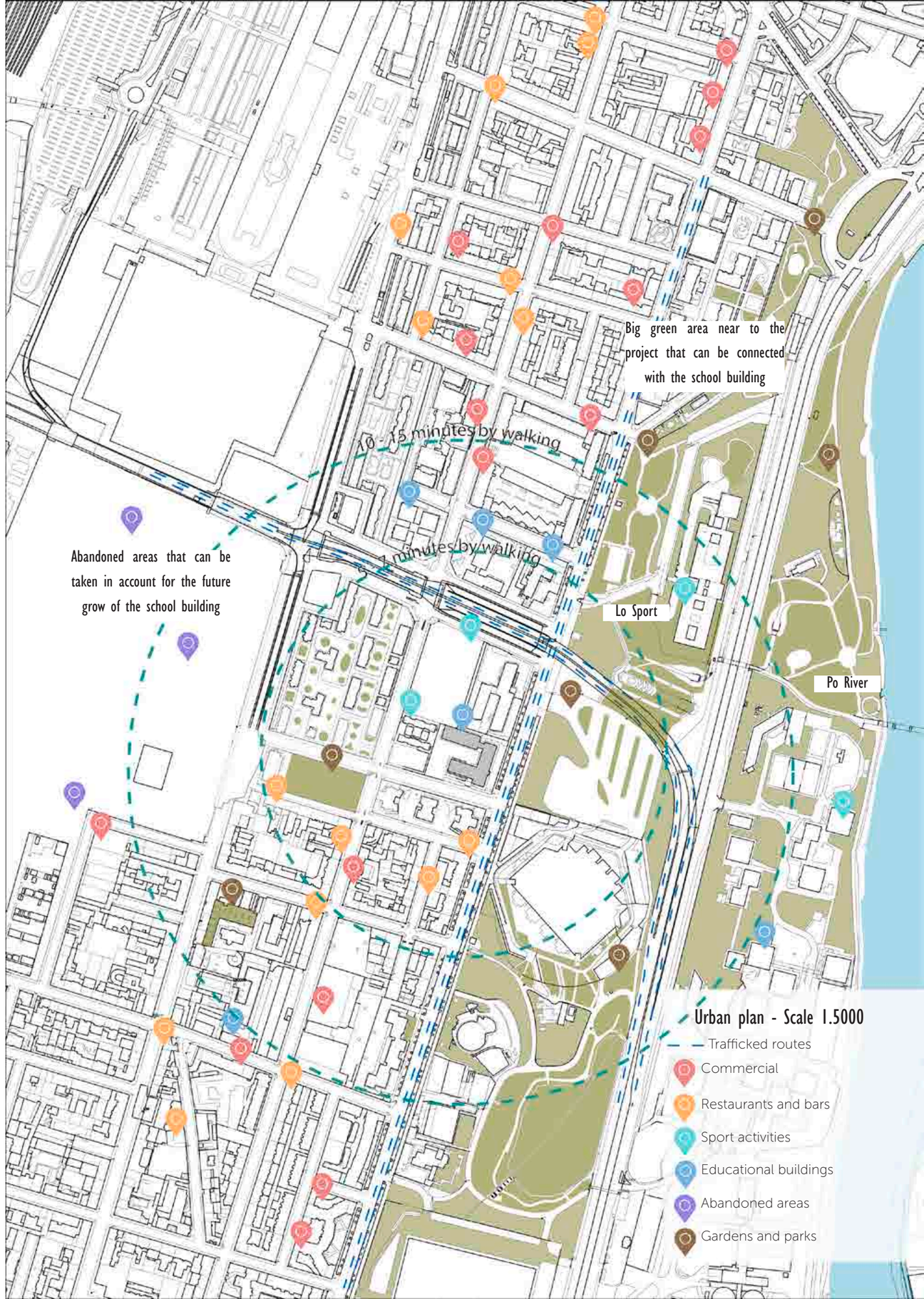
Plot Surface: 4.821,00 m²
Building: 1.699,00 m2
Open space: 3.122,00 m2

Clasification by urban typology
Peninsula - Open courtyard

Clasification by Urban Fabric:
Mainly Open - plan urban fabric

The building is located in the South East of the city of Turin in the Lingotto neighbourhood near the Corpo Italiano di Liberazione park and the Po River. At an urban and typological level, the building is classified as a “Peninsula” since, concerning the lot, it touches the perimeter almost in one facade, generating enough open space for school use on the other three sides. As previously analyzed, the school is a repetitive model in Turin and can be considered “Open Court” because it generates one open space that invites students and people to enter the building, always keeping a solid relationship with the exterior and the city.

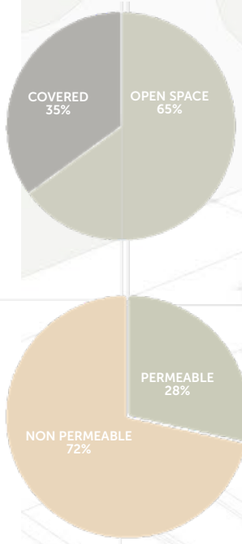
Its location has the Giuseppe Levi park in front, which is a great natural potential that we can think of taking to the courtyard of the building. In the same way, its vast perimeter space allows generating an adequate reception space that helps to comply with security measures to avoid problems with the post-pandemic situation. *Morphological fabric* is a building classified as “Regular”, grafting the area into the urban grid, creating different access from several points and providing the school with more open space.



Actual situation of the building

As a streight of the school, the development of the activities promote culture and education, with a good formal distribution.
From the main entrances it is possible to arrive inside the building to the administrative part or to the internal courtyard that from one side is open to the city. This court is visible for all the school inside having a climate potential to the architectural development of the building in terms of climate confort.

Since the sport´s building is lower than the school it is possible to think how the volumes invites the students to this heart of the school that would be the internal, open courtyard.



OPEN SPACES

Open Space
3.122m2
65%

Plot Surface
4.821 m²
100%

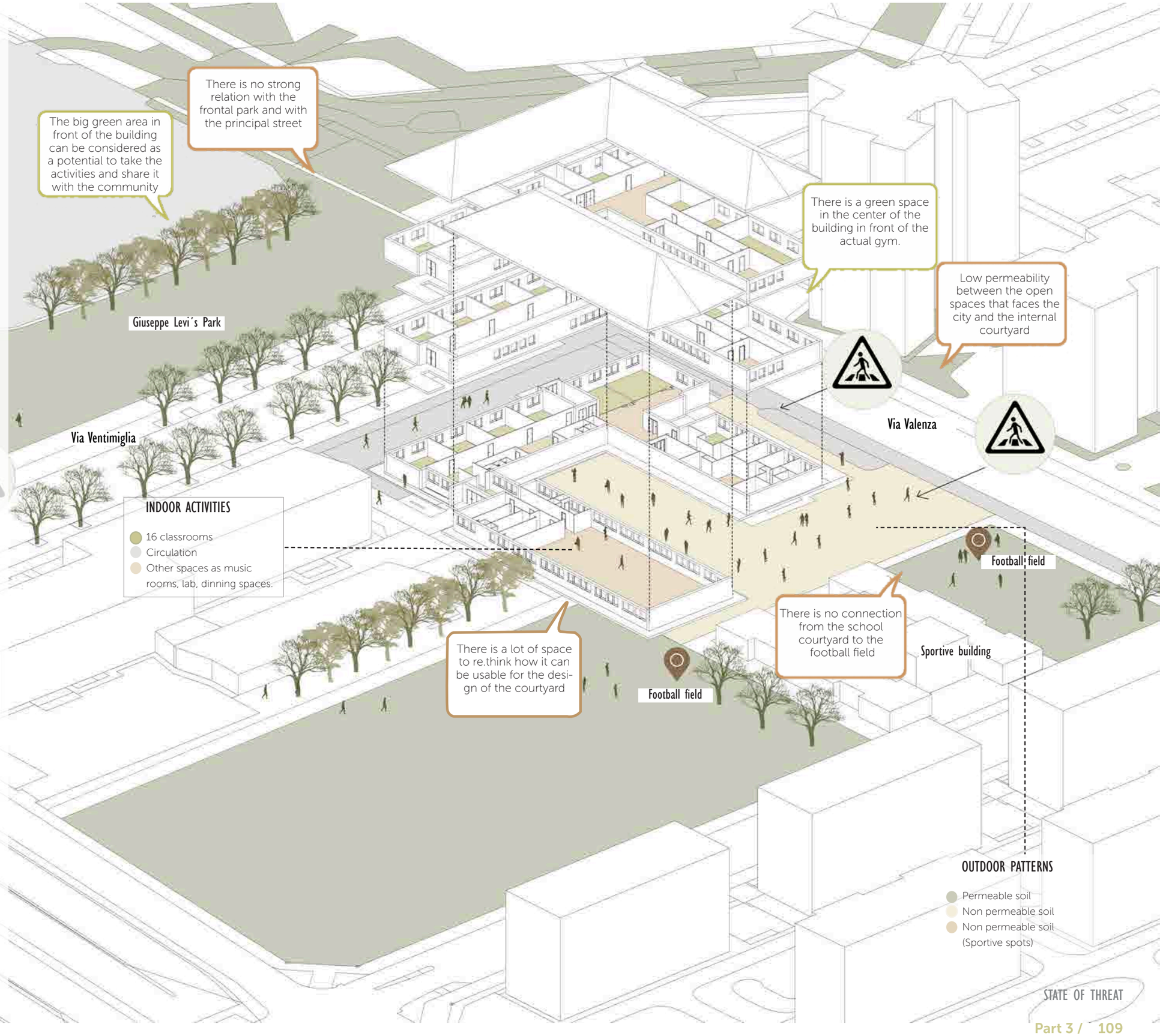
PERMEABILITY

Permeable areas
602,22 m2
28%

Non permeable areas
1.513,52 m²
72%

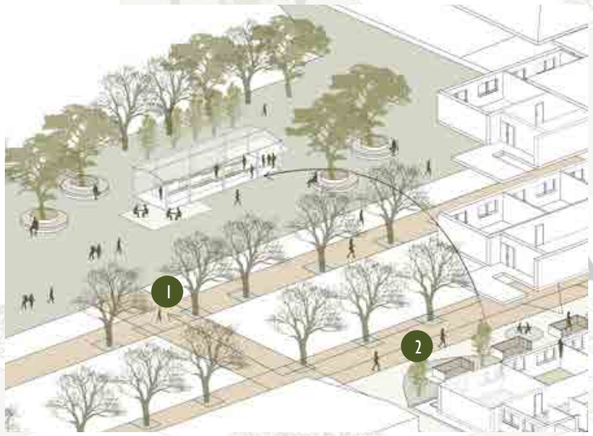
According to the statistical graphs, it is possible to analyze that the open space does not have many green areas, although abundant vegetation surrounds it, as can be seen in the context.

For this reason, it is proposed to develop the spaces to plant the appropriate vegetation within the patio and, in the same way, relate it to flexible activities such as those proposed in what would currently be a gym.

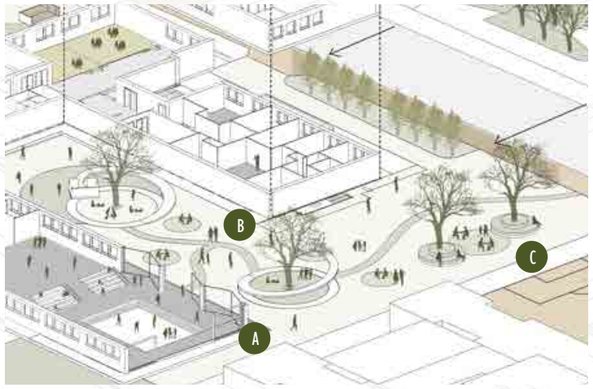


Project - Peyron´s Elementary School

At the project level and according to references that start from the patio theory, it seeks to generate these spaces between one volume and another, with vegetation and suitable furniture promoting learning activities and outdoor sports. In the same way, it is intended to be a sports space that connects with vacant spaces such as access to the park in front of the project. For this reason, this space of soccer fields and athletics track is connected with common living areas and the connection with this green space.
Finally, sustainable learning activities are proposed in areas of orchards and natural spaces.



1. Urban extension with the frontal park
2. Balconies to have a visual relation with the green house that is in the park



A. Integrate stairways surrounded by reading and relaxing spaces
B. Following the shape of the nature create a new path
C. Natural spots to relate different spaces

At the urban level, a direct connection with the Giuseppe Levi park proposes a green garden for the community.

Spiral balconies in the central courtyard

Relation of the lot with the football field

Extension of the classrooms with the balconies that have a natural view to the park

Contrast through the organic shapes to invite students to a journey from the outside.

Spatial device of integrated stairs that surrounds a central spot as a common space for many uses.

INDOOR ACTIVITIES

- 16 classrooms
- Circulation
- Other spaces as music rooms, lab, dinning spaces.

OUTDOOR PATTERNS

- Permeable soil
- Non permeable soil
- Sportive spots

#2

Elementary School Leone Fontana
Via Michele Buniva, 19
10124
Turin, Italy

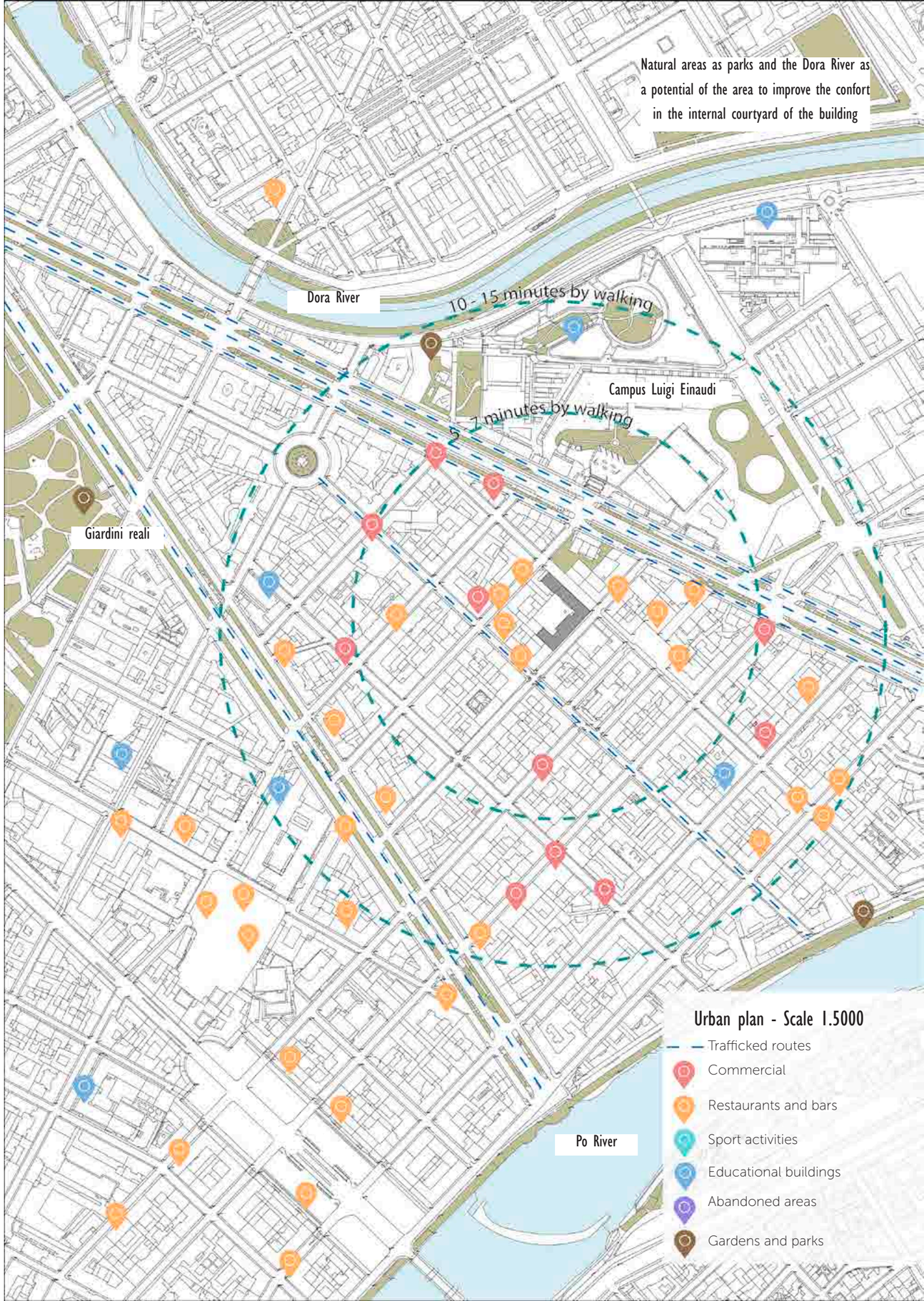
Plot Surface: 1.614,97 m²
Building: 472,77 m2
Open space: 1.142 m2

Clasification by urban typology
Full - Open courtyard

Clasification by Urban Fabric:
Mainly Compact urban fabric

The building is located in the city centre of the city of Turin in Vanchiglia´s neighbourhood near to the "Giardini real" and the Dora River. At an urban and typological level, the building is classified as a "Full" since, concerning the lot, it touches the perimeter in all the facades, having just an internal courtyard that can be improved.
This building has a slightly deteriorated front that would be worth working on, checking if it is possible to open the field and expand the space in front of this school, thus generating a much more urban transformation. The building has an internal open space that opens to the city through a wing that continues in a narrow street that is connected to a cultural and sports space such as a gym and theatre that, when transformed, can enhance the entire area.

Its location has the University of Turin - Campus Luigi Einaudi near, which is a great educational potential talking about services, so it is also possible to understand more or less the type of people surrounding the area. *Morphological fabric* is a building classified as "Compact urban fabric" where the built space touches all the perimeter, creating a type of courting and completing the block of the city space. Otherwise, it has such a public area like sport or cultural buildings and pedestrian paths that enrich schools to have a good answer for the city from the architectural design hypotheses.

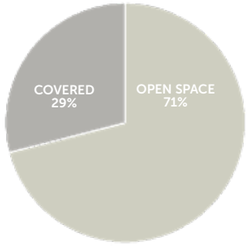


Actual situation of the building

Building whose typology is a key to determine the urban and sustainable intervention that takes into account the closest neighbors and an exclusively pedestrian path that can be potentiated.

This leads to a street where there is access to a sportive center, which strengthens the activities to be proposed in the internal courtyard, promoting culture and recreation. In terms of area, the open and built space ratio is quite similar with a difference of only 10% of the total area of the lot.

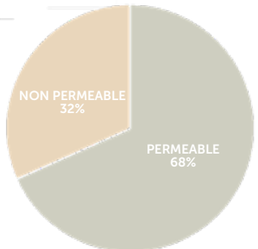
This building looks crowded from the perspective of the city, so what could be the intervention that will give way to the new learning methodologies?



OPEN SPACES

Open Space
1.142,20 m2
71%

Plot Surface
1.614,97 m²
100%



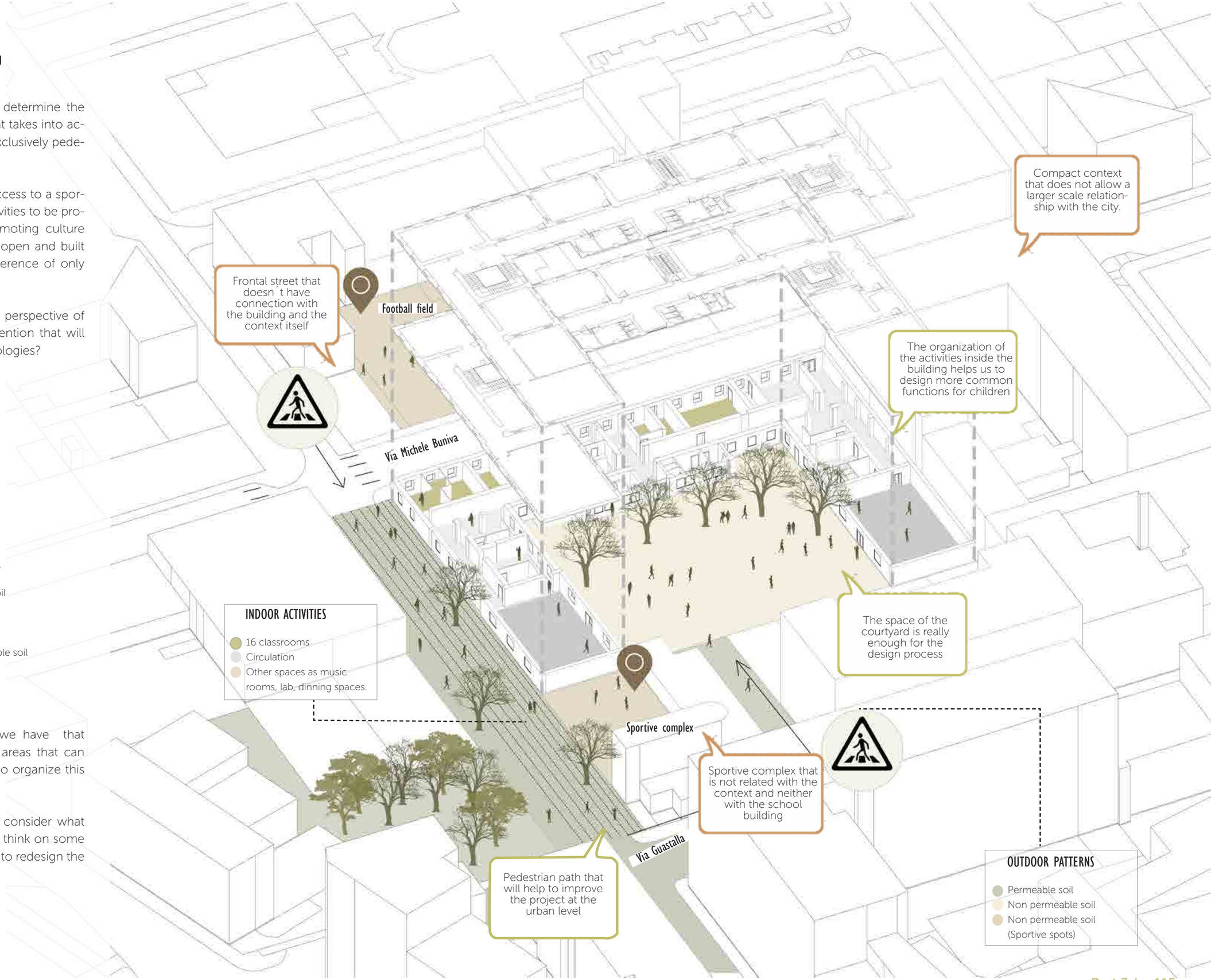
PERMEABILITY

Permeable soil
780,34 m2
68%

Non permeable soil
361,86 m²
32%

According to the statistical graphs, we have that the open space has enough green areas that can be rethinked to decide the best way to organize this courtyard that of the school building.

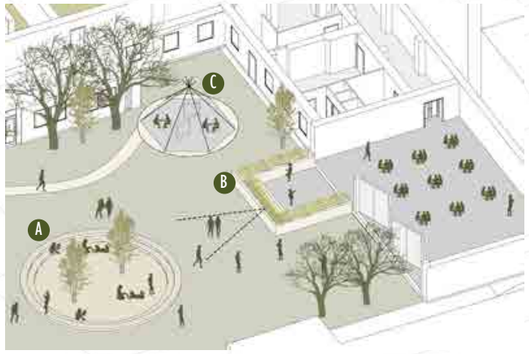
On the other hand it is important to consider what to do with the trees inside, so we can think on some spatial devices that perhaps take them to redesign the space.



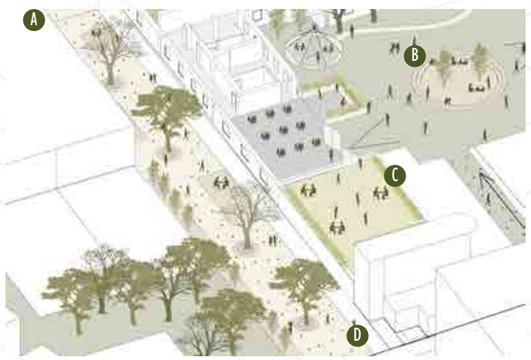
Project - Leone Fontana´s Elementary School

Taking into account the rigid and compact context, it is sought that through the design of the open space it is contrasted with the shapes, seeking to generate different sensations in the users.
The stairways that function as a reading or study space and the spots that become spaces for interaction between the students themselves.

Similarly at the city level, an adaptation of the pedestrian path is projected with an orderly tree planting, meeting points and a fluid circulation that is connected to the outskirts of the streets allowing shelter through the pavement textures most of the project and intervention, generating an urban transformation.



A New spaces for learning outside
B Extension of the classroom with a green garden
C Experimental laboratory for the outdoor space



A Urban paviment that invites to the project
B Internal courtyard, space for studying in a stairway
C Green roofs to create climate confort inside
D Pedestrian street that connects the school with the city

Same color of the pedestrian path to invite people to the urbanization of the street.

Laboratory in the outdoor space as a spatial device.

Green garden as an extension of the classroom area with flexible panels that open or close the space

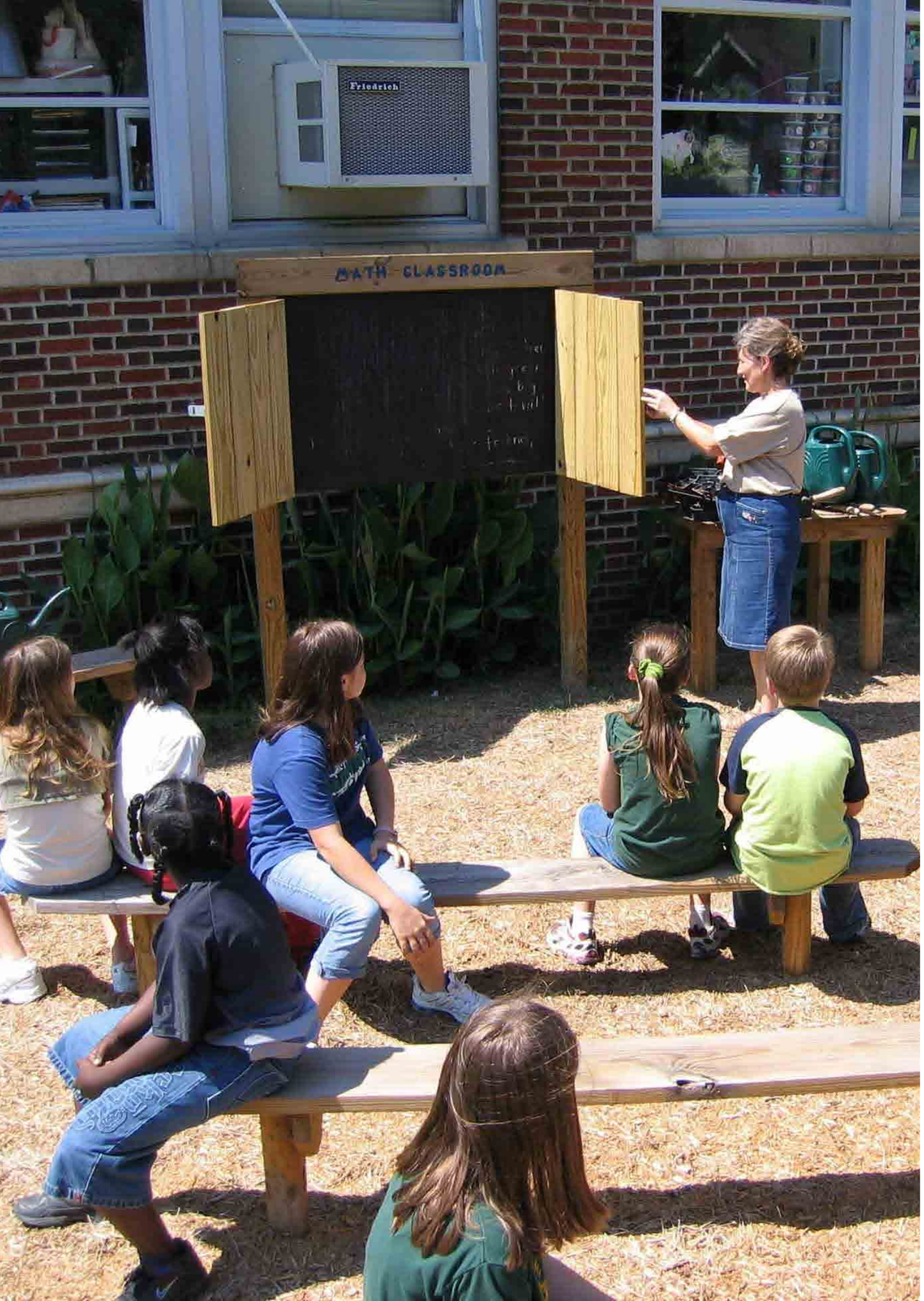
Integrated stairway to seat and get relax in the middle of the courtyard.

Panels for the interior facade that make the space more flexible to the courtyard and also take more light for the classroom.

Green roof of the near sportive building to connect the school with the equipments in the surroundings.

OUTDOOR PATTERNS

Permeable soil
Non permeable soil
Sportive spots



PART 4

RETHINKING OUTDOOR SPACES IN SCHOOL BUILDINGS

An early spatial toolkit

Going through theoretical, urban and morphological analysis, applied in the case study of Turin, a selection is made thanks to the mapping of the schools of the first educational cycle selected through the criterion of representing each previous typology. In the design experiences on the three school areas in Turin the outdoor spaces were considered a starting point for regeneration, to face the pandemic emergency and to integrated innovative educational activities.

Thanks to the project development, a Manual better known as "Toolkit" was created, designed for the post-pandemic era that has changed the way of thinking about many aspects of life, starting with the architectural one where the use of space is questioned. And its use, as well as the involvement of nature as a fundamental pillar today.

They know the current situation of children after the pandemic and the urgency with which spaces must be re-thought to improve techniques and ways of learning. Child students can think that learning in open space is a decisive issue that must be valued to promote a more experimental education, with contact with nature without losing sight of the relationship between building and city. Although, knowing how interventions are carried out in the building, this thesis contributes to the city, making the closest context a pleasant environment within and around each school.

Now, knowing this and continuing with the typologies worked on within the thesis work, it is clear that each typology has points that must be analyzed to enhance them and know what type of free space is available to carry out an intervention or develop a project.

That is why this research wants part of the end of this thesis to contain summary information of the analysis that is useful for future projects that want to comply with the same parameters or want to follow the same lines of architectural design and thinking. Therefore, it has to consider it as a kind of "Manual" where the points to be taken into account and what could be design strategies for this new post-pandemic era, and what it has brought with active and experimental learning in open space are clearly explained.

4 - 1

3 schools, 3 ideas, 3 projects

Among the reasons why I selected the schools and previous projects is because they represent each typology based on the open space and the surface of the lot. In the same way, each one has an interesting immediate context that allows us to go beyond an intervention only of the school but also takes part and intervention with the city, generating spaces for citizen interaction and educational opportunities for children in the new era.

Taking into account all the bibliographic information studied for the development of these projects, it´s possible to think on strategies that can be replicated in other models or typologies such as those exemplified in the thesis among which they find each other:

- Review what is being done with the open space that belongs to the city on the main street, considering it as a management resource for the entry and exit flows of students, avoiding the accumulation of people in the same space.

- Review what can be done with the internal space or patio of the school that lends itself to the development of educational activities, whether experimental, sports or cultural learning that can be developed temporarily, generating flexibility and achieving that at certain times the students can be divided between these internal and external spaces.

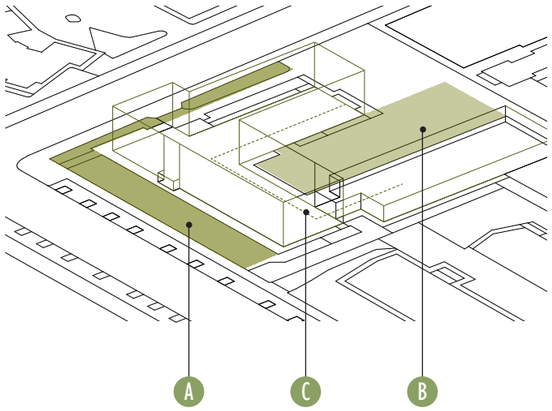
- Check the relation between the interior and exterior circulation of the building and the open spaces, both stairs and corridors and corridors, as these are the meeting points and the greatest pedestrian flow.

These first points generate an unknown that can become common in many buildings depending on the context in which it is found. For this reason, a kind of manual or Toolkit is created that contains those strategies or points in common that solve a problem, that solve variables and determinants of place, climate, comfort, in the case of schools of education and that seek to improve spatial quality transcending the thought of a closed space full of people to a flexible space that can be converted into a multipurpose space and that promotes culture, art, sports and sustainable education.

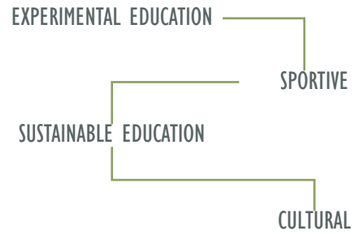
So, what is possible to re - think at the urban level?

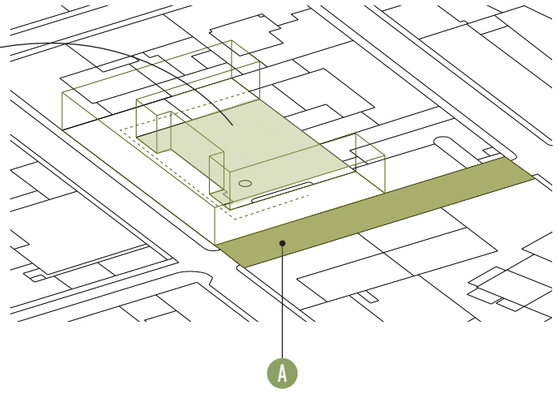
- A School access space (open)
- B Which activity could be apply in the courtyard of the building
- C Both internal and external circulation

Starting with the building-city analysis, the following points begin to substantially improve the quality of the open space, the functionality and flexibility that is given to it.



Which activities are allowed to promote in the internal close courtyards?



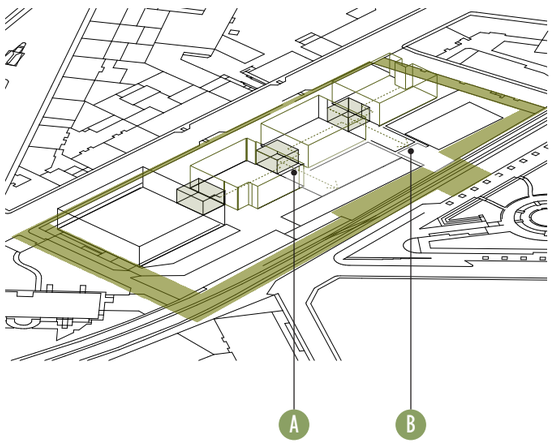


How could be the relation school/city when is a close block (close courtyard)

- A Pedestrian paths that creates an urban connection

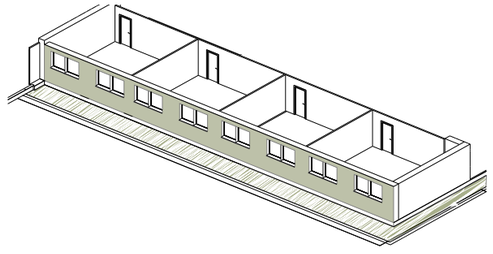
How it´s possible to start from the building circulation to define the intervention path and organize the spaces from the inside to the outside?

- A Circulation blocks where to start the outdoor design of the school
- B Green paths that comes out from the project to the city to connect them and create new citizen interaction spaces and make alive some death points of the context.

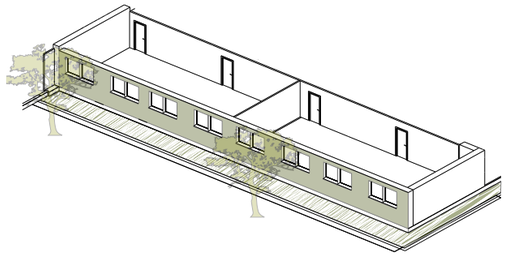


Starting from the natural and green exterior theme, it is necessary to analyze how we could bring that exterior to the interior, not only for a post-pandemic era, but so that these modifications last over time and improve the quality of space and life in each school .
Initially we could mention some spatial strategies among which are:

Classrooms with adequate ventilation and an external pedestrian space that faces the city.



The vegetation classrooms is added in the pedestrian strip for greater climatic comfort inside the classrooms.



The design criterias include some strategies to regenerate the first-cycle school buildings in the post-pandemic city where it´s important to high light some of them to start re thinking a school from the relation with the city until the indoor relation with the exterior and in terms of typology with the different types of courtyards.

1. Use large circulations for temporary activities of small groups of people (spaces over 4.5m)
2. Accompany the educational spaces of nature and furniture that promote a sustainable education.
3. Use street furniture suitable for open spaces, promoting sustainable education and caring for the environment
4. Organize the school route from the entrance through the design of the building's entrances, creating spaces where children can wait for their parents or can even have enough space upon arrival.
5. Rearrange large internal spaces for greater functional flexibility
6. Through vegetation, generate spatial comfort both indoors with the help of windows and outdoors
7. Extend the classrooms in the same internal courtyard space.

4 - 2

THE TOOLKIT

After analyzing the study cases and the experimental part in the three projects located in Turin, we have the starting point for outlining some evidence. Moreover, the analysis structure is meant to be extendable to other analyzed in the future or make the toolkit more precise and statistically based. Finally, these results have been written in a matrix to collect spatial and architectural devices that could be used for another applicable regeneration case of the outdoor spaces in the school buildings throughout the world.

The main objectives of this transformative model are to face the post-pandemic situation in the education field but not only for this opportunity. Instead, the toolkit gives us ideas of temporary and flexible devices and light interventions that could be inserted in an open space to improve the relationship between interior and exterior and, of course, be prepared for another kind of emergency. Also, from the analysis of the problem, one of the main approaches is to provide more experimental activities for children, changing the way of learning to one that could be more practical, related to nature and the outdoor spaces. It is what we defined in the first chapter as outdoor learning, so these devices should create new spaces for different activities that promote the sensory development of the children and, of course, allow them to have more didactical spaces as the interior classroom.

Talking about the applicability of this toolkit and following the criteria of the inspiration of references worldwide, it's possible to say that those strategies are not only applicable in Italy. Instead, It could be a starting point to discuss the regeneration of open spaces in existing school building in similar situations to the Italian one, with some discaimer at least about: the climate condition in which the school is located. Most of this design ideas could be easily applied in temperate climate, and have to be rethinked or improved for too rigid or tropical); the context in which the school is located (not just in terms of architectural and morphological condition, but also in terms of regulation system and urban rules that could limit or expand the range of design possibilities.In other words, the climate conditions of the site and of course the urban responses of the building to the city are crucial points to analyze to choose the correct spatial devices and improve much more the school building.

Following this speech line, we can ask ourselves, who can apply this toolkit? or for who it has been designed?. We can say that there are many ways to use this toolkit. Firstly, we can mention the architects and professional urban designers who want to make a regeneration work with existing school buildings, creating new outdoor spaces that could host part of the class to make it different. In this sense, the urban designers can try to understand and analyze the relationship between the building and the city. Knowing if there are courtyards, how are the citizen's interact in the surroundings and the accessibility of the school are essential facts to know which spatial devices can be applied.

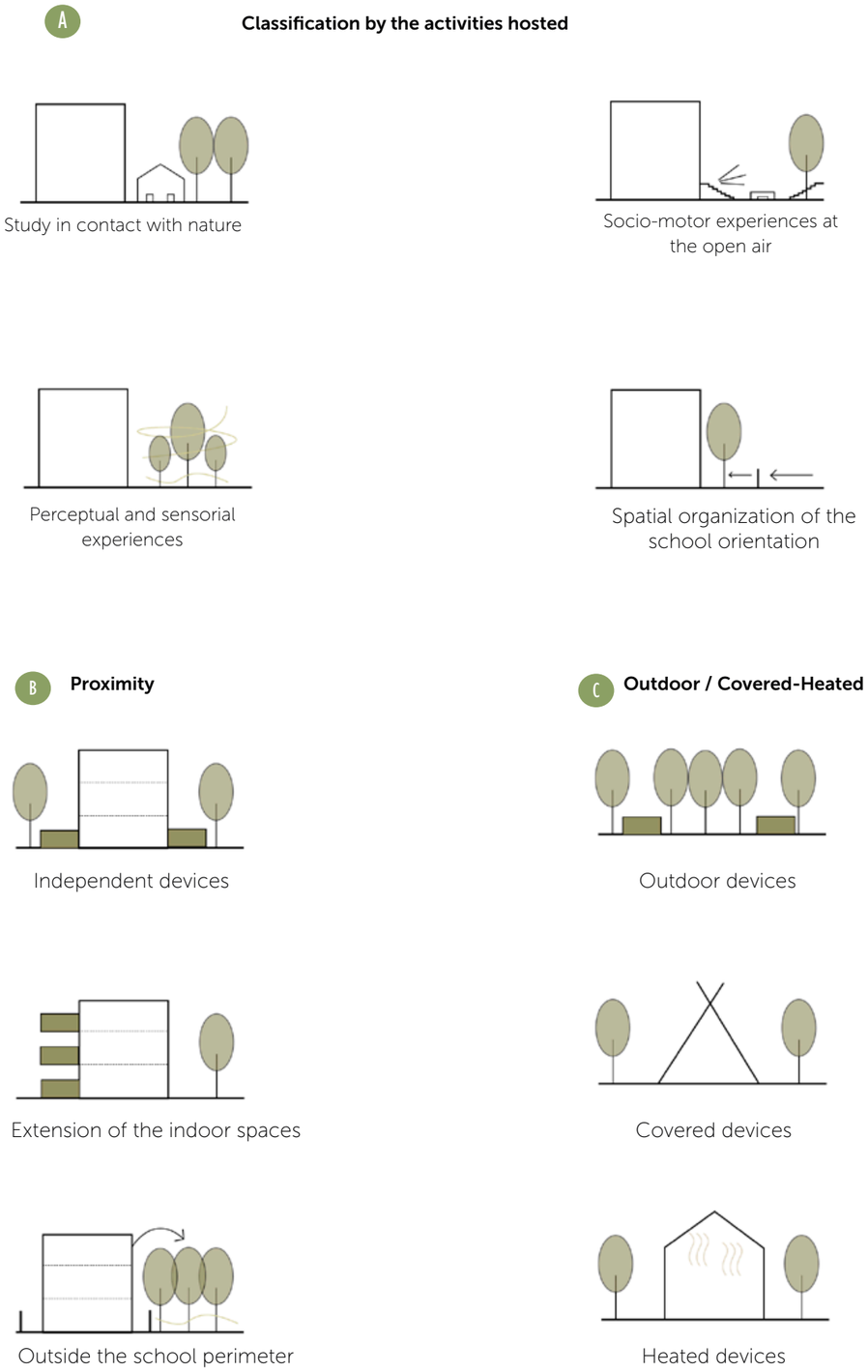
Also, for the teachers and school principals that can talk to the Municipal Administration to promote the use of those devices to create new ways of teaching in the outdoor space improving the quality of education to make it more experimental and change the area to open the children's minds to new knowledge. Finally as we already mentioned, the Municipal and public authorities could be another user of this tool to see the potencialities of the outdoor spaces and not also seeing the toolkit, but also the analysis of the statistics and measures of Turin to understant the situation and the proportions more applicable.

The toolkit is divided into three parts, following the main fields founded during this research work:
A- By the activities hosted
B- By the Proximity within the city and the building itself.
C- Outdoor / Covered-heated.

The first classification collects the evidence that emerged in the cases related to the learning process that will work on the socio-motor experience (physical activities open-air from play to sport, walk, etc.) and the perceptual-sensorial experiences (educational garden, educational woods). The spatial devices suggested that concrete spaces host those activities and improve outdoor learning. With the title of Proximity, it is intended those strategies that go more for the architectural and urban issues that improve the accessibility to the school building, the classroom extensions to teach about planting and make firm the relationship between the learning process and the contact with the green and natural spaces.

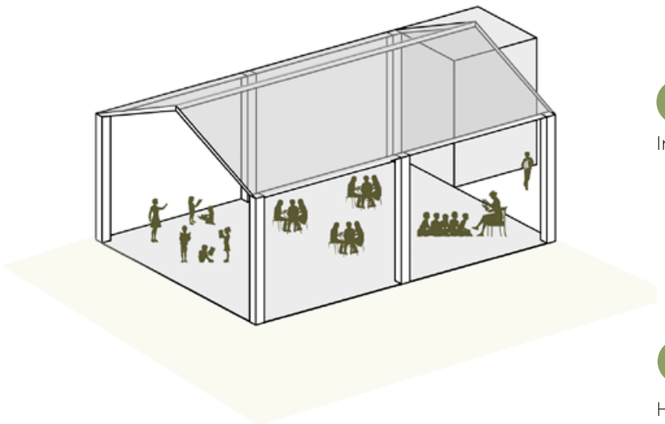
Classifying the spatial devices in the categorization of outdoor or covered-heated spaces is easy to know which strategies to use for the outdoor areas and for which type of climb or location. Also, climate comfort is a crucial point to consider that is applicable worldwide and valuable in all seasons of the year, thanks to the flexibility of the spatial devices.

Furthermore, graphs and schemes are reported to strengthen the present idea and clarify when and how to use each spatial or architectonical device in the future. The main reason the spatial devices are classified following these criteria is to know where and how it is possible to apply them. It gives us the standardization of the main points to follow them and decide in plans the excellent choice of the device.



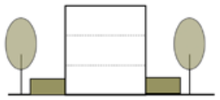
A1

Study in contact with nature

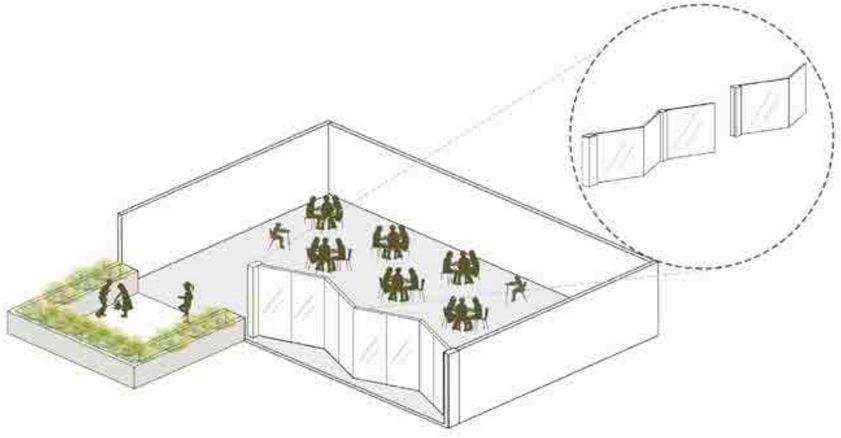


Outdoor classroom located in front of each indoor classroom to have an open experience for students.

B
Independent devices



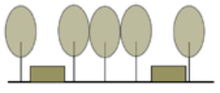
C
Heated devices



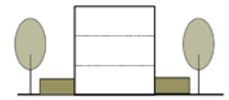
Project solution of a classroom space that uses flexible panels to facilitate the indoor-outdoor relationship, generating an extension of the classroom to have a relationship with nature and more experimental learning. This type of extension hosts an orto where is possible to teach children how the plants' growing process is, having an experimental experience near to the class.

B
Extension of the indoor spaces

C
Outside devices

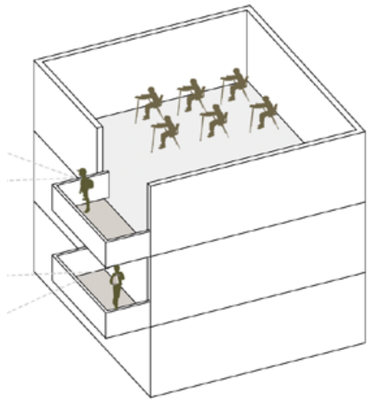


B
Independent devices



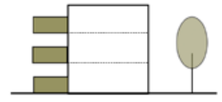
C
Heated devices

Outdoor laboratory located in front of the classroom so it is possible to make experiments in there.

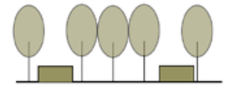


New environments on the upper floors that relate the building to the city and the near context as for example green areas or parks Balconies to extend the classroom and relate the interior and exterior in the visual and spatial way.

B
Extension of the indoor spaces

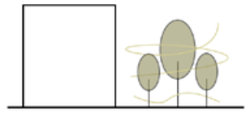


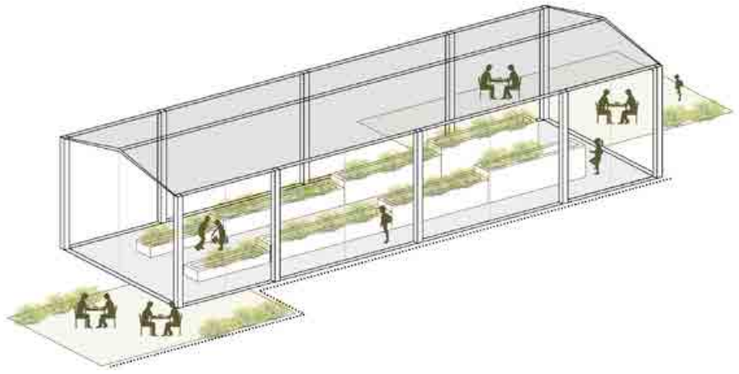
C
Outdoor devices



A2

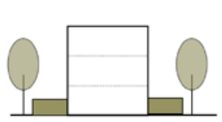
Perceptual and sensorial experiences



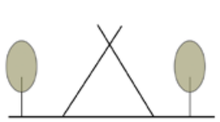


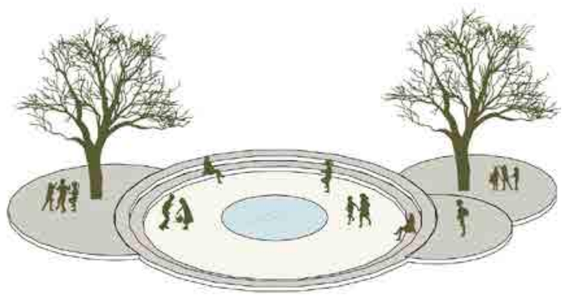
Educational garden that can be used for the school building in the internal courtyard or also for the community in the outside and surroundings of the school. It is well-known as green learning gardens surrounded by common spots to study and stay what children already experiment.

B
Independent devices



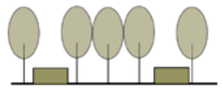
C
Covered devices



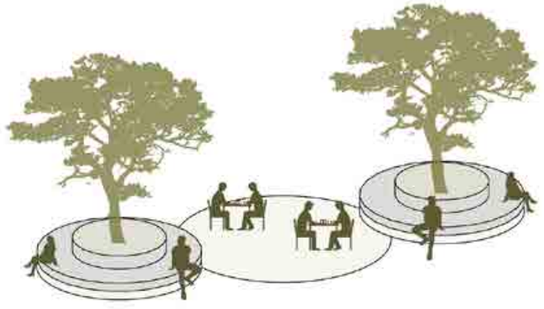


B
Independent devices

C
Outdoor devices

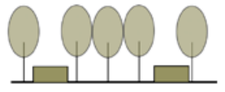


Bodies of water surrounded by vegetation for children's interaction with natural resources and having different activities outdoors.

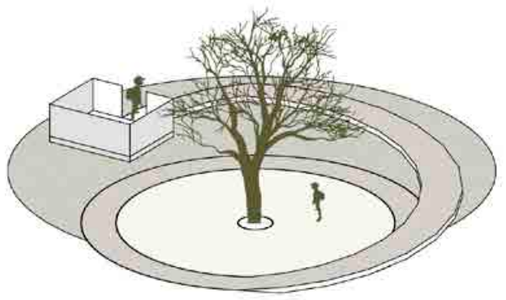


B
Independent devices

C
Outdoor devices

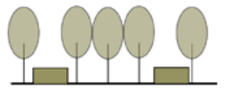


Wooden furniture containing trees and vegetation. A living center is surrounded by nature, being an activity that promotes various natural sensations.



B
Independent devices

C
Outdoor devices



Balconies that surround a tree enhancing visuals and creating different paths.

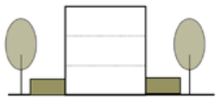
A3

Socio-motor experiences at the open air

Multipurpose space with the main function of being sporty. The football field has bleachers and a green space that generates comfort around it.

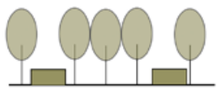
B

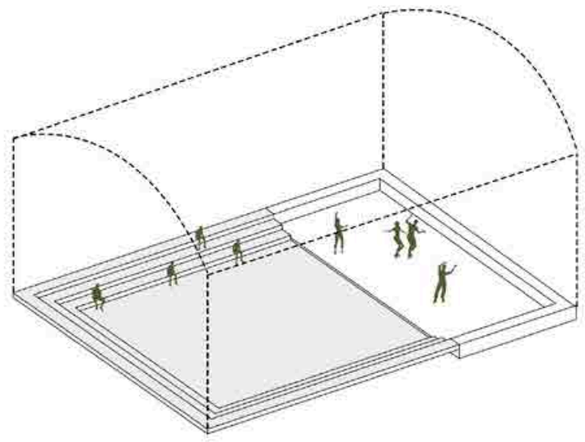
Independent devices



C

Outdoor devices





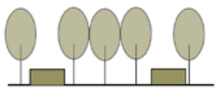
An outdoor theatre where cultural activities are developed for students and citizens when school hours are over. It can be considered as multipurpose space so it could be closed or not, so it is flexible for the use in different climates.

B

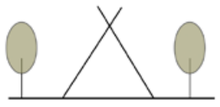
Independent devices

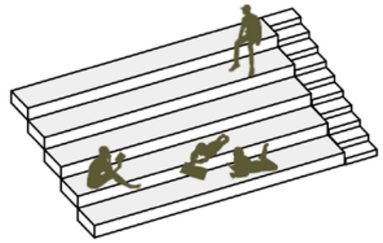
C

Outdoor devices



Covered devices





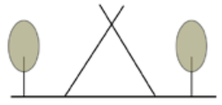
Integrated stairway to read and stay inside an educational space. It could be located in one big room or can be used to read or just relax and stay a little.

B

Independent devices

C

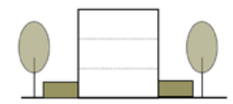
Covered devices



Stairway space device in a circle way to contrast the regular and compact building morphology. It is a playground to play, read or observe around the outdoor space. It could be a complement of another activity or just a big space to spend the common time with the students

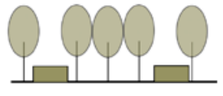
B

Independent devices



C

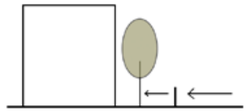
Outdoor devices



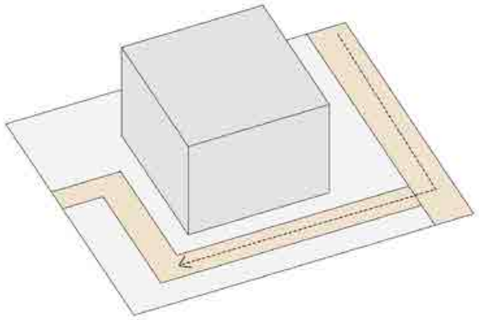
A4

Spatial organization of the school orientation

Flux of enter/exit the school



This last classification exemplifies ways to orient and organize the flow of accessibility to the building from the city to the interior using signalling strategies, colours or even vegetation, always depending on the closest context.

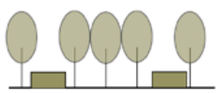


B

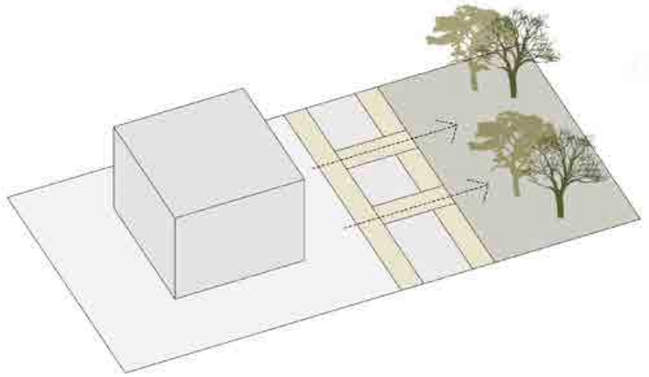
Independent devices

C

Outdoor devices

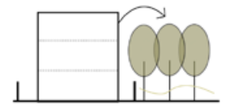


Signage through the use of colors on the pavement both near the main street and on the platform adjacent to the school creating not only a school component but also an urban one. Relate internal circulation flows with external ones to create greater flexibility through demarcated green areas in the open spaces of the schools, clarifying where the entrances are and which is the route to enter the building.



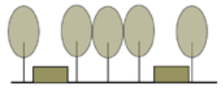
B

Outside the school perimeter

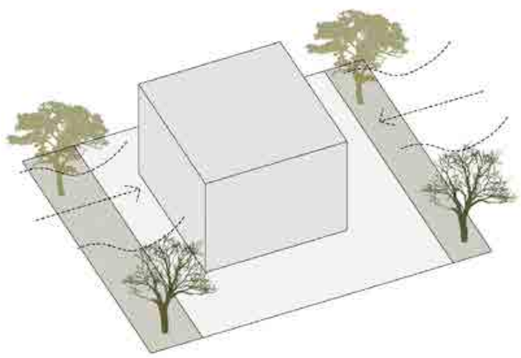


C

Outdoor devices



Demarcate the connections between the school building and some important urban point that you want to connect at the urban level, marking accesses and direct relationships with green areas. The signage can be done with symbols or even with pavement colors that accompany the route.



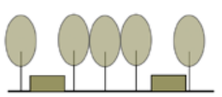
Use of outdoor vegetation to provide climatic improvements on the main facades of the schools and make the journey on the platform more enjoyable.

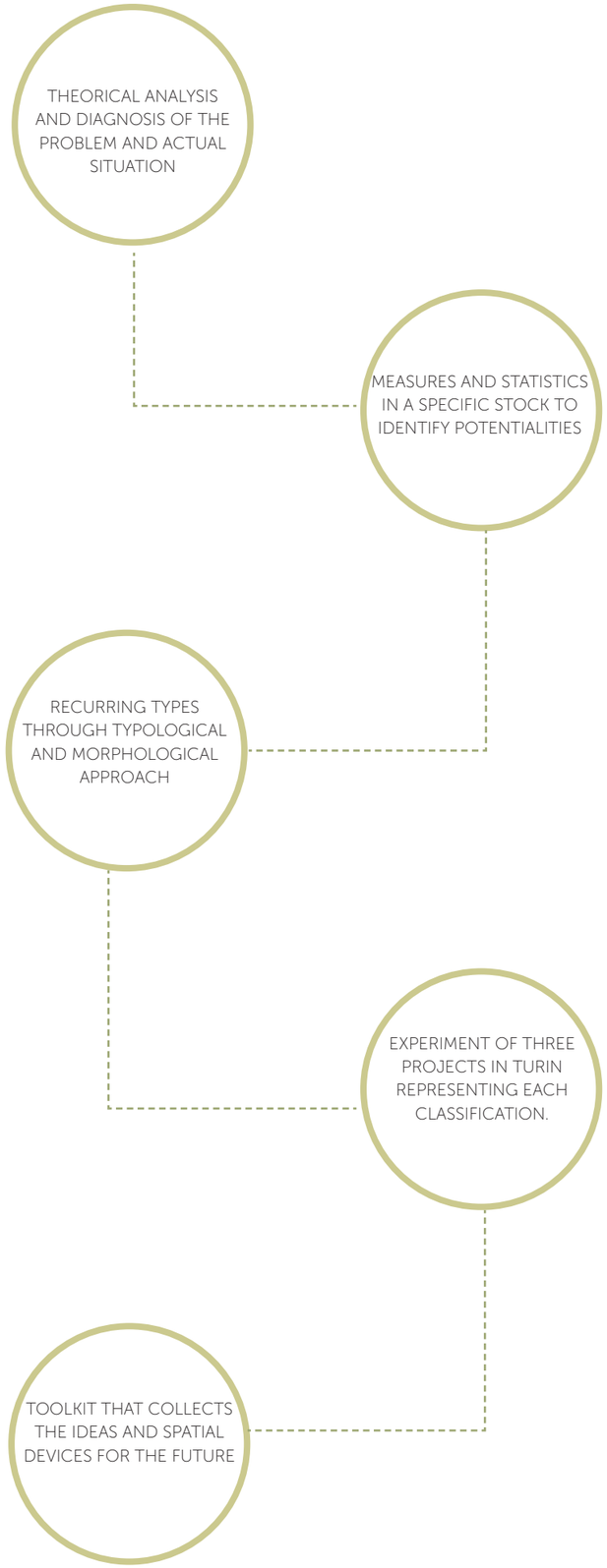
B

Independent devices

C

Outdoor devices





Conclusions

Having lived and experienced the Covid 19 pandemic has been a source of inspiration and motivation to analyze the school situation and its impact, especially on children. We, those already finishing our educational stage, can handle the virtual situation very well and everything technology has brought. Still, there are so many limitations that children and high school students live and continue to experience to access an education.

From the measure of the potential of open spaces in a specific stock applyed in Turin-Italy, identifying recurring type through the typological and morphoological approach is possible to understand how big the open space of a school building is and its relation with the near context. For example, does it have a courtyard or outdoor spaces that could be use for outdoor learning or other activities? The building typology classification defines how to design and act when is the time to project and create new spaces for the school buildings. It helps to evaluate strategies starting from entrances and circulation to create a correct route within the building accompanied by a development of the internal courtyard and its relationship with the city.

Thanks to the detailed analysis of the figures, statistics, and the theory supporting that pedagogy and architecture are closely linked, three project interventions are carried out at the urban level, which transcends to a new outdoor learning space. Three projects, three ideas, three ways, three solutions. After having developed them as an experiment, spatial devices generally applicable to any intervention in a similar school to the italian conditions and the cases already mentioned are collected in a matrix table. These spatial devices are devided according the activities that are hosted, the proximity of the building and the covered condition, if it is heated or an outdoor activity. In other words, the main idea of the toolkit is to provide readers with spatial design tools and criterias to define what can be done and how to improve the urban and internal quality of the building. It could be integrated with a wide range of actions for actors involved in decision-making and thinking in the future, the research could be oriented to integrate and expand this preliminary conceptual toolkit to turn it into a more operative and replicable set of tools and devices for designers, architects, urban planners, stakeholders, developers, teachers and public authorities.

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My passion for architecture, art, music, sustainability and education since I was a child has made me get the best out of each step in developing this thesis, both from the academic side and from experience in Turin during its development. As a lover of art in all its forms, I seek that through projects, culture is inspired, different sensations are generated, which I desire with each thing I design and each line that I draw.

All this makes us reflect and think from the architecture; how can I contribute? What interventions can I make to mitigate the situation a bit and at the same time improve a space in every sense of the word? Since my career at the university, I have been faithful to my concept and argument of sensations because I know that a well-distributed and functional space generates different perceptions in users. With this thesis, I learned that these sensations transcend from a classroom, passing through an internal courtyard that may or may not be open to the city, trying to connect the building typologies with the context.

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Andrea Rodriguez Ramirez

Architect with emphasis in Bioclimatic and sustainability