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Faculty of Science and Technology
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MASTER'S DISSERTATION

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Theme: Urban integration - Walkability

The project: High school 1000 place - Biskra

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Abstract:

In the residential area located in the northern extension of Biskra city, on the 3rd national road leading to Batna, we face an absence of High School building for the increasing number of population, with a lack of pedestrian’s tracks. Therefore, in search for more urban connectivity from/to and within the proposed High School, we suggest to improve the ability to walk. In this endeavor, what are the best Walkability technics to be applied?

We will apply Walkability technics in a High School project and its surroundings to: have a more 'car free' zones, reduce mechanical noises, reduce CO_2 emissions, ensure pedestrian’s physical safety and sensorial comfort, and encourage physical activity.

Our methodology is based on a documentary research for the theoretical part, while the practical part consists on a preliminary comparison analysis of similar High School projects and others where the focus is on walkability technics.

This thesis aim to ensure an architectural and social connectivity and vitality among pupils, and the local community, and reach a healthier life.

We concluded that Animating the ‘’Walkable paths’’ with trees, water circuits, led lights…, having vital walking tracks on the ground floor, and a walkable roof across a buildings land, are among the effective walkability technics, which have been proven to be useful in a high school project to attain the preset objectives.

Keywords:

Walkability, High School, Pedestrians, Walkable roof, Car free zones, Project’s land.

الملخص:

في المنطقة السكنية الواقعة في الامتداد الشمالي لمدينة بسكرة ، على الطريق الوطني الثالث المؤدي إلى باتنة ، نواجه غيابً مبنى ثانوية للعدد المتزايد من السكان ، مع عدم وجود مسارات مناسبة للمشاة. لذلك، في اطار البحث عن مزيد من الاتصال الحضري من و إلى وداخل المؤسسة الثانوية المراد اقتراحها ، نقترح تطبيق مفهوم تحسين إمكانية المشي. في هذا المسعى، ما هي أفضل التقنيات التي يمكن تطبيقها لتحسين إمكانية المشي ؟

سنطبق تقنيات تحسين إمكانية المشي في مشروع الثانوية والمناطق المحيطة بها من أجل: الحصول على المزيد من المناطق الخالية من السيارات ، تقليل الضوضاء الميكانيكية ، وتقليل انبعاثات ثاني أكسيد الكربون ، وضمان السلامة الجسدية والراحة الحسية للمشاة ، وتشجيع النشاط البدني.

تعتمد منهجيتنا على بحث وثائقي للجزء النظري ، بينما يتكون الجزء العملي من تحليل مقارنة لمشاريع ثانويات مماثلة وغيرها حيث يكون التركيز على تقنيات تحسين إمكانية المشي.

تهدف هذه الأطروحة إلى ضمان الترابط المعماري والاجتماعي ، والحيوية بين التلاميذ والمجتمع المحلي والوصول إلى حياة أكثر صحة.

خلصنا إلى أن احياء "المسارات القابلة للمشي" بالأشجار ، ومسارات للمياه ، وأضواء LED ... ، مع وجود مسارات المشي الحيوية في الطابق الأرضي ، والسقف القابل للمشي عليه عبر أرضية الثانوية ، هي من بين تقنيات تحسين إمكانية المشي الفعالة ، وذلك ما تم إثباته في مشروع الثانوية لتحقيق الأهداف المحددة مسبقًا.

الكلمات المفتاحية:

إمكانية المشي، المؤسسة الثانوية، المشاة، مناطق خالية من السيارات ، السقف القابل للمشي عليه ، أرضية المشروع في بسكرة.

Introductory chapter

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Introductory chapter

Introduction:

Prevailing city design in many countries has created sedentary societies that depend on automobile use. Consequently, architects, urban designers, and land planners have developed new urban design theories, which have been incorporated into the Leadership in Energy and Environmental Design for Neighborhood Development (LEED-ND) certification system.

The LEED-ND includes design elements that improve human well-being by facilitating walking and biking, a concept known as walkability. Despite these positive developments, relevant research findings from other fields of study have not been fully integrated into the LEED-ND. According to Zuniga-Teran (2015), relevant walkability research findings from multiple disciplines were organized into a walkability framework (WF) that organizes design elements related to physical activity into nine categories, namely, connectivity, land use, density, traffic safety, surveillance, parking, experience, greenspace, and community. which can ultimately lead to more active and healthier societies.

Problematic:

Whenever we have a growing neighborhood, the need for public buildings increases,specifically the primary ones in where education buildings are in the top of the list. Their presence is essential for the good of the current youth and the upcoming generations. In the residential area located in the northern extension of Biskra city approximately to the 3rd national road leading to Batna, we face an absence of a high schools for the increasing number of population, and the lack of walking passages and pedestrian’s tracks for residence and future pupils. Therefore, in search for more urban connectivity from/to and within the proposed High School, we suggest to improve the ability to walk, while considering the hot and arid climate of Biskra city, especially when walking outside.

Research question:

In this endeavor, what are the best walkability technics to be applied?

Objectives:

- Ensure better physical activity for residents and pupils.

- Ensure better visual comfort.

- Making residential neighborhood and high-school surroundings more 'car free'

- Reaching a healthier life.

- Pedestrians (residents/pupils) safety.

Work methodology:

In purpose of better characterizing of walkability in relation to the urban and the architecture. This research is based on a methodology mode carry out documentary research.

The theoretical part of this study is based on a bibliographical analysis through the research which consists of a systematic exploration of the documentation for concepts definitions, standards, laws, and other information on the walkability topic and the high school project from: books, technical documents, legislative documents, official sites, theses, articles...

The practical part consists in carrying out a preliminary analysis of similar high school project and other project where the main focus is on walkability, and attaints its objectives.

A comparison study of high school projects samples' analysis of spatial program in conjunction with standards from bibliographical resources is how we can conclude the appropriate program for our case.

As for the case study, visits in situ and photos are needed to be taken on the field site, in activity zone near national road N3 leading to the state of Batna, in addition to the study of urban graphic documents and others.

Memory structure:

In order to achieve the objectives, this thesis is structured in an introductory chapter plus 3 main chapters and general conclusion.

The introductory chapter is dedicated to presenting the topic of thesis, elaborating the problematic and the research question, and then defining the research objectives and work methodology.

The first chapter is devoted to controlling the theoretical framework through documentary research and providing the most important definitions of theoretical concepts related to the topic and the project as follows:

- Firstly, the Topic of Walkability concepts' study according to its various scales of use, urban and architectural.
- Secondly, High school project's theoretical concepts, definitions and standards.

The second chapter is all about the analysis of similar projects in which we can conclude the practical methods of applying the walkability into a public building which is in our case a high school, in both urban and architectural level. In addition to other high school project's samples study to extract the spatial program.

The third chapter is dedicated to the embodiment of the results of previous analysis through the high school project

The general conclusion is where we display the importance of the walkability topic and its objectives' implication in the high school project and affirm our response to the problematic and research question.

CHAPTER I:
Study of concepts

Introduction:

This chapter is important as an opening to what will be presented in the coming chapters so we can build an unambiguous vision of the study content.

We will discover the definitions of basic concepts of walkability as a subject of study in a hand, and high school as a project in another hand, in purpose of having a clear idea of our study, and having a sound starting base for this work.

I.1 Urban integration definition:

A significant requirement of integrated urban is to shape a city, socially and inclusively. This means to counteract segregation of neighborhoods and enable people to participation in civic life, and being more responsive to the social influences, which affect what people do and where they choose to walk, urban planners and leaders could gain valuable information about the way people use the city, and make smarter decisions about what to build, and where. (Ruth Dalton, 2019).

I.2 Walkability:

As more and more people move to cities, the benefits of encouraging people to walk are clear. Aside from making the urban environment more pleasant, safer and less polluted, improving a city's walkability can also ease traffic congestion and improve public health. This is a particular challenge in cities built for cars, so there's been several researches to find out what sort of features make a city more attractive to pedestrians, and encourage them to walk further and more often: whether it's the size of urban blocks, the quality of the pavement, the presence of trees or street furniture or initiatives such as car-free zones (Ruth Dalton, 2019).

Walkability has become one of the important concepts for sustainable urban development in the last few decades. A walkable area is known to be beneficial to health, environment and economy. An increased human activities outdoors also increase the chance of encounters among people in the neighborhood. Even repeated experience of bumping into people, or greeting each other on the street will help people feel connected to other people and the places.

Jan Gehl says that walkability is about accommodating walking, making it easy, efficient and enjoyable. The pace of walking allows for a rich, sensory experience, promoting social interaction as well as connections to the surrounding environment. Urban spaces can be designed to enhance these experiences, improving overall walkability. This means creating comfortable, attractive, and continuous walking surfaces, and spaces that make it safe, easy, and intuitive for diverse groups of pedestrians to move among the other forms of traffic sharing the same spaces (David Sim, 2019).

I.2.1 Definition of Walkability:

A place is most easily understood through walking around it. For Wunderlich, it is "an ordinary activity in our everyday life in the city" and "an unconscious way of moving through urban space, enabling us to sense our bodies and the features of the environment…It is while walking that we sensorially and reflectively interact with the urban environment, firming up our relationship with urban places" (Tight, Kelly, Hodgson & Page, 2004) Walking is how a place is experienced, and therefore the movements both to a place (the flows in and out) and through a place (T.Hall,2009).

I.2.2 Life between buildings:

Jan Gehl developed the theory of human-centered urbanism, as well as a process to incorporate the principles of this ideology into urban design. Gehl's ideas helped transform the notion of vibrant public spaces as being created by luck into a quality that can be actively fostered through good design (Life Between Buildings, 1971).

To come up with the principles of human-centered urbanism (See figure I.1), the success of public spaces, Gehl found, was intricately connected to the levels of pedestrian flow and stationary activity that prompted social interaction. Gehl found that short distances between destinations complemented by street furniture like benches encourage people to linger. He found that "soft edges" between parks and public areas, especially places where people could sit and face the pedestrian flows, created some of the most vibrant areas of the city (Life Between Buildings, 1971).

Figure I.1 human-centered urbanism.

Source: (pinterest.com, June 2021)

I.2.3 The Walking city:

Walking, until the popularity of motorized transport, had been the dominant form of transport in cities since urban settlements began (Crawford, 2002; Kostof, 1992; Newman, 2003; Newman & Kenworthy, 1999) and cities have traditionally developed around walking "the slow pedestrian" as the dominant mode of transport (Burchard, 1957, p.112). Within in this city type, all goods and services needed for daily life had to be within a walkable area, and, therefore, cities developed in quite dense and compact ways (generally over 100 people per hectare) (Crawford, 2002; Kostof, 1992; Newman, 2003; Newman & Kenworthy,1999), accommodating land uses within an average half-hour of walking, approximately 5 km wide, or 'one hour wide'. These centers have become the focus of Gehl's work as they try to reclaim their role as a walking city.

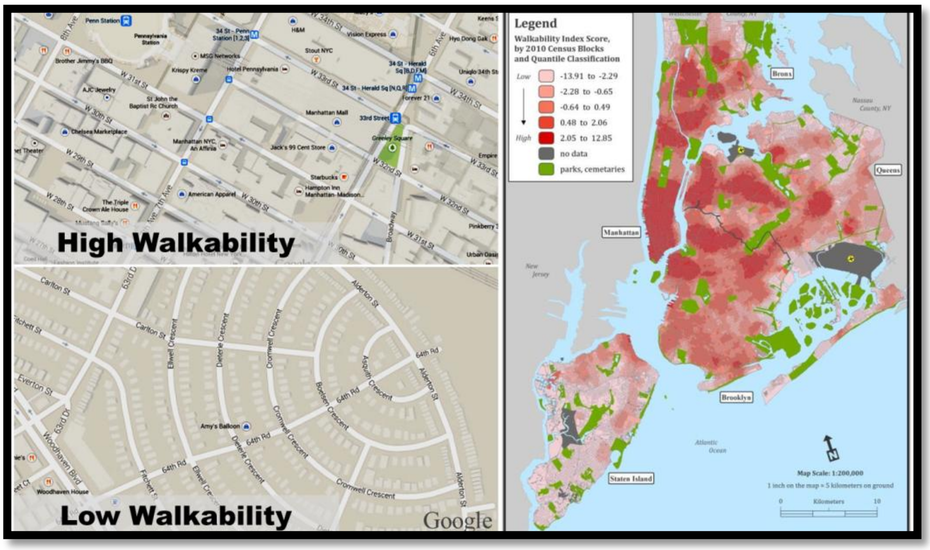


Figure I.2 Walkability according to city type.

Source: (beh.columbia.edu, June 2021)

I.2.4 The Social city:

People navigate using many different types of social wayfinding during the course of their walk. Applications such as Google Maps or City mapper can also be used in a social way: although they're typically designed with a single navigator in mind, in reality it's not unusual for two or more people to be using a device at the same time, passing it around, discussing the instructions and jointly making decisions about where to go. (Ruth Dalton, 2019).

To create walkable cities, of course it's important for planners and city leaders to understand what sort of physical features encourage people to walk more. But acknowledging how social interactions influence people's choices about when and where to walk would give leaders a much more realistic understanding of people's behavior – and put them in a better position to encourage walking as a means of getting around. (Ruth Dalton, 2019).

Understanding how other people influence wayfinding could also clear the way for many exciting technological innovations, which could make cities easier to navigate. Social trails could be mapped by digital applications or physical markers, and signage could be dynamic, possibly even functioning like an online recommendation system – for example, by flagging quieter routes during busy periods of the day. Wayfinding aids such as maps, signage and apps can be tested on groups, as well as individuals, to make them more useful in both settings. (Ruth Dalton, 2019).

I.2.5 Social wayfinding:

The clearest example of social wayfinding is when two or more people are walking together, trying to reach a destination. They might plan where to go, identify landmarks along the way, and discuss their choice of route together.

This activity becomes less social when one person leads the way, and others follow along; whether that's a guide leading a tour, or a person leading a friend to their house. Both of these are examples of "strong" social wayfinding, because decisions about where to go are directly and intentionally influenced by other people. (Ruth Dalton, 2019).

Social wayfinding also happens when pedestrians take hints from others, which influences their choice of route. When a walker believes that other travellers might share the same destination – for example, when they follow fellow supporters from the train station to the football stadium for a match – he or she may simply go with the flow.

Similarly, the movement of people through a gap between two buildings might indicate a shortcut you wouldn't otherwise have noticed. This is what we call "weak" social wayfinding.

Timing also plays a role. For example, directions or guidance can be given before a journey, or while walking (over the phone, for example). It can even be that the past movements of others leave "social trails", which can indirectly inform pedestrians where to go – like the worn tracks across grass, which might hint at a shortcut through a park (Ruth Dalton, 2019).

I.2.6 Urban design as walkability:

According to Wunderlich (2008), walking is a mode of transport, a way of moving through and around places (see figure I.3), and (equally importantly) it "is a 'mode of experiencing place' and 'the city'. It is a multifaceted activity and a temporal practice, which has an impact on design" (Wunderlich, 2008, p.125). In recent times we have seen a reversal of some Modernist approaches to urban planning and an emerging understanding that 'we are all pedestrians'. It is now widely accepted that a central concern of urban design practice is to encourage pedestrian activity (Isaacs,2000).

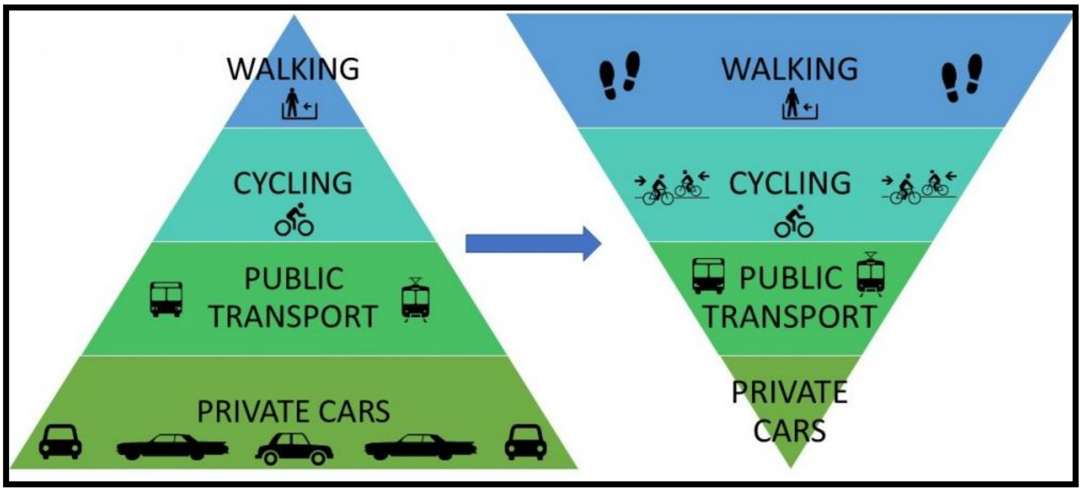


Figure I.3 Into a walkable urban design.

Source: (archdaily.com, June 2021)

Planning for pedestrians and providing appropriate and high-quality pedestrian infrastructure are important, not only from an economic and urban vitality sense, but also from the perspective of environmentally sustainable transport (Newman & Kenworthy, 1999). Sustainable transport options require appropriate pedestrian infrastructure and an attractive pedestrian-friendly urban environment.

Based on the recognition that all trips in a city centre have a walking component, advocating for the needs of pedestrians is a fundamental component of urban design practice. Traditionally, people built cities structured around pedestrian movement needs (Kostof, 1992; Newman, 2003; Newman & Kenworthy, 1999;Pushkarev & Zupan, 1975). We know that pedestrians are the basis of a vibrant city. However, in modern western cities, the pedestrian is often the forgotten factor in transport and urban planning.

The advent of motorized transport resulted in a change from accessibility to mobility, with pedestrians crowded into left over city space. As a result, pedestrians received attention only in terms of safety (and not interrupting motor vehicle movement) (Pushkarev & Zupan, 1975). Calthorpe's call for pedestrian neighborhoods is reflected in a 2011 survey of housing preferences in the US which shows that people are choosing neighborhoods with quality walkable characteristics, particularly abundant footpaths and neighborhoods that had shops, restaurants, schools and local businesses within walking distance from homes. In addition, the survey revealed that people would choose a smaller home if it was in a location that would reduce their commute to less than 20 minutes (National Association of Realtors, 2011). This survey reinforces those by Newman and Kenworthy (2011) and Newman (2006) which show that there has been a marked cultural shift in western cities with residents seeking more urban locations and less car-dependent lifestyles.

The use of cities is constantly in flux—changing and evolving. A major component of urban design practice is responding to these changing needs, particularly to the global expansion of capitalism (Knox, 2002; Lang, 2005). Furthermore, mobility (of people, ideas and goods) has increased, with people, information and capital easily travelling long distances.

As Richard Florida (2002) explains, those who design and manage cities are finding that they need to focus on catering to a 'creative economy' consisting of young highly educated professionals who deliberately choose cities for their amenities and lifestyle choices, not solely for their job market. Cities now market their vibrant, attractive and active centre, using it as competitive milieu—a commodity to meet the demands of this new creative class and to be globally competitive (Knox, 2002; Gospodini, 2002; S. Schmidt & Németh, 2010).

Increasing the creative image of the city, at least in the public realm, is often one of the primary roles of an urban designer, along with regeneration of underutilized spaces within the city. What lies behind the aesthetics of such spaces is the need to create walkable spaces that are attractive to people to walk through and walk to. This idea is linked to the concept of the creative city (Landry, 2000), which looks at the location of creative industries and the relationship between artists, culture, the urban environment and economic development, using the idea of creative culture as an "engine to support a city's image and economic development (Comunian,2011, p.1158).

I.3 High School:

I.3.1 Definition:

High school is a public institution of an administrative character with a financial independence, and placed under the tutelage of the Minister in charge of national education.

The High school is created according to a decree based on the proposal of the Minister, It specializes in education and any use of High school for purposes incompatible with the nature of its educational goals is forbidden (Official Journal n° 40 of May 31st, 2021).

I.3.2 High school's education program in Algeria:

Secondary education lasts three years and is provided in high schools comprising general secondary education and technological secondary education. It is organized into common courses in the first year and into streams from the second year. The end of schooling is sanctioned by the secondary education baccalaureate and by the technician baccalaureate for technical education streams (electronics, chemistry, mechanical manufacturing…).

The missions of secondary education, in addition to the pursuit of the general objectives of basic education: to consolidate and deepen the knowledge acquired in the various disciplinary fields, to develop methods and capacities for personal work and teamwork. and cultivate analytical skills; of synthesis; of reasoning; judgment; of communication and taking responsibility, to offer diversified paths allowing progressive specialization in the various fields in relation to the choices and aptitudes of the pupils, to prepare the pupils for the pursuit of studies or higher training.

The first year of secondary education is based on the principle of teaching the common core: the common core letter (languages and social disciplines), the common core sciences (natural sciences, physical sciences and mathematics) and the common core technology (mathematics, physical sciences, technical drawing and technology), towards the technical or general specialties of secondary education is done at the end of the year, according to their wishes and the results obtained.

At the level of the 2nd and 3rd year, the courses are diversified as follows:

1- General secondary education brings together five specialties: exact sciences, natural and life sciences, letters and human sciences, letters and modern language, letters and religious sciences.
2- Technical secondary education includes the following specialties: electronics, electrical engineering, mechanics, public works and construction, chemistry, accounting techniques.
3- General secondary education and technical secondary education vary in the following specialties: mechanical engineering, electrical engineering, civil engineering, management and economics.

The orientation of the pupils of the common core of the first secondary year towards the technical or general specialties of secondary education is done at the end of the year, according to their wishes and the results obtained. The supervision ratio in secondary education had an overall enrollment of 141,200 teachers in 2010-2011, while it was only 59,964 teachers in 2003-2004. There are 230,989 students admitted to the baccalaureate exam for the promotion of June 2012, a success rate of 58.84%. This promotion is made up of 151,021 girls admitted, i.e. a rate of 65.38% out of all the candidates registered for the exam which was 392,540 and 79,968 admitted among boys (34.62%).

As part of Franco-Algerian cooperation, a French secondary school was created in Algeria, the Alexander-Dumas international high school in Algiers, which opened in 2002.

(World Education Data, 7th ed. 2010/11, en.unesco.org)

I.3.3 Legal procedures for the realization of a High School project:

The construction of a high school project is subject to the requirements of the school map according to schools building model that is determined by the Minister in charge of national education.

Each high school covers a geographical region to enroll students affiliated with it in order to achieve their balanced distribution on school structures. Spaces must be designated to facilitate access for the benefit of students with disabilities (Official Journal n° 40 of May 31st, 2021).

I.3.4 Basic standards of High School:

❖ Urban level:

- Consult the school map
- Geographic zone: respect the regulatory distance of 400 m min, at 1 km max, to be covered by the students in regions with dispersed housing.
- May possibly be located in the main center of small centers.
- Study accessibility and transport services.

- Can be located in the center: in this case, study the urban forms so as to make them an element of animation.
- To be preferably located near business areas on easily constructible land so as not to increase the already high cost of construction.
- In the center of the grouping of neighborhood units.
- Center of a neighborhood unit

(Algeria's equipment grid, calameo.com)

❖ Architecture level:

1-Zoning:

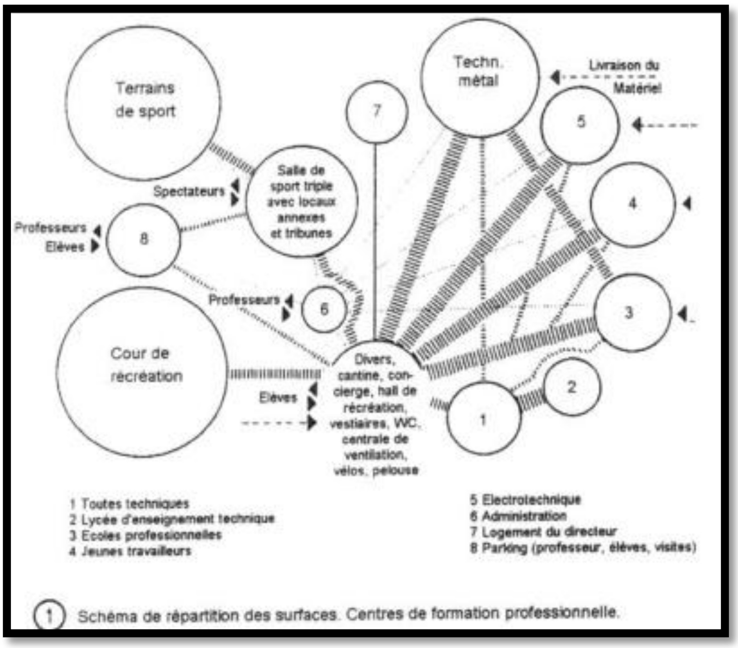


Figure I.4 Radial disposition
Source: (Neufert, 7th edition)

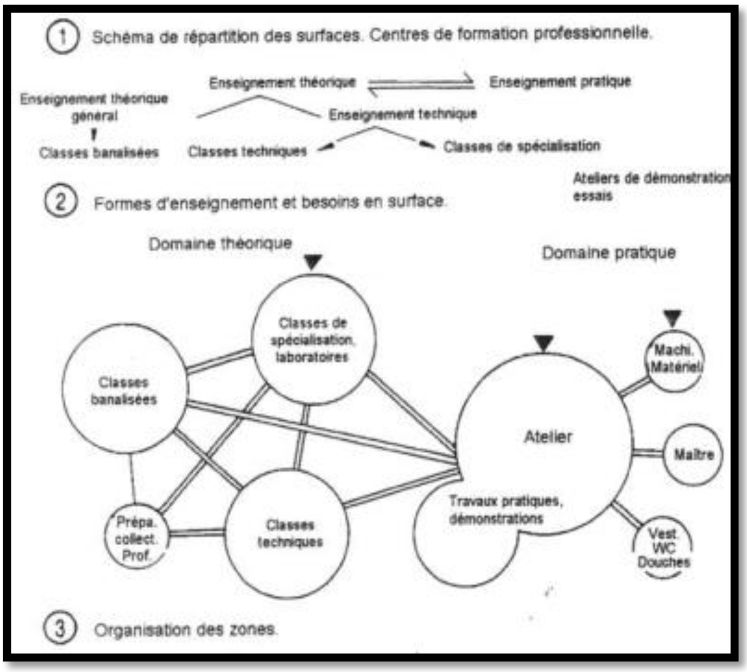


Figure I.5 Decentralized disposition
Source: (Neufert, 7th edition)

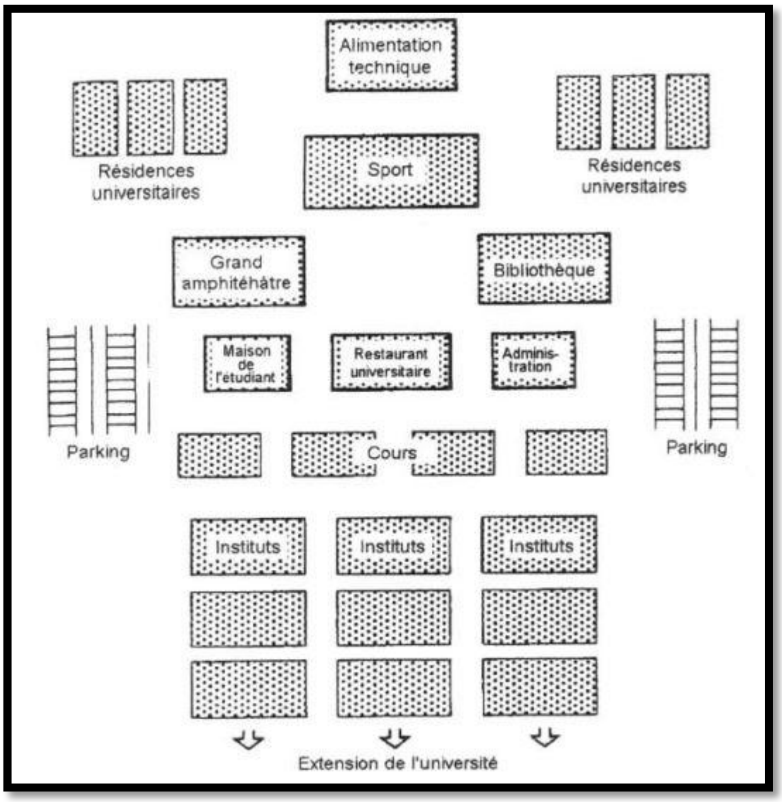


Figure I.6 Centralized disposition
Source: (Neufert, 7th edition)

Central facilities:

- Large amphitheater, administration, libraries, restaurants facilities sports, university residences, car parks.

- Technical installations and central distribution, boiler room, technical distribution. Basic facilities for all disciplines

- Amphitheatres for lectures and lectures, seminar and practical work rooms, computer science rooms.

- Specialized libraries, staff service room's, conference and examination rooms. Specific space requirements for each discipline

- Human sciences: no special requirements

- Artistic disciplines (architecture. Plastic arts, music...): drawing rooms. Workshops, and equipment storage rooms.

- Technical and scientific disciplines (engineering. Physics, machine building. electronics...): drawing rooms. Laboratories. Workshops….

- Disciplines such as life and natural sciences (Chemistry. Biology. Anatomy. Physiology. Hygiene. Pathology ...): laboratories. Scientific workshops. Experimentation and work rooms (Neufert, 7th edition).

2- Classrooms:

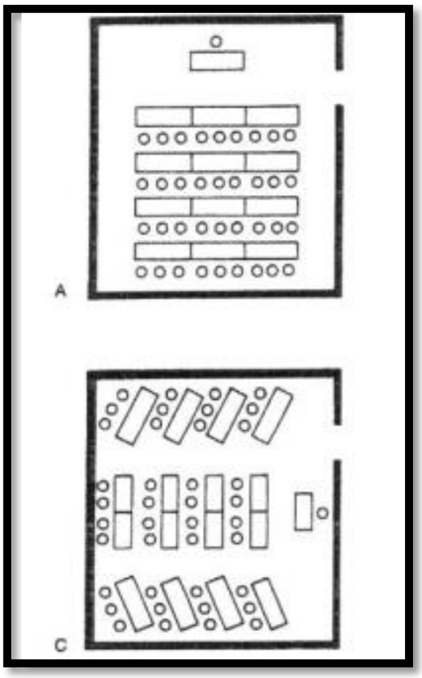


Figure I.7 Standard disposition

Source: (Neufert, 7th edition)

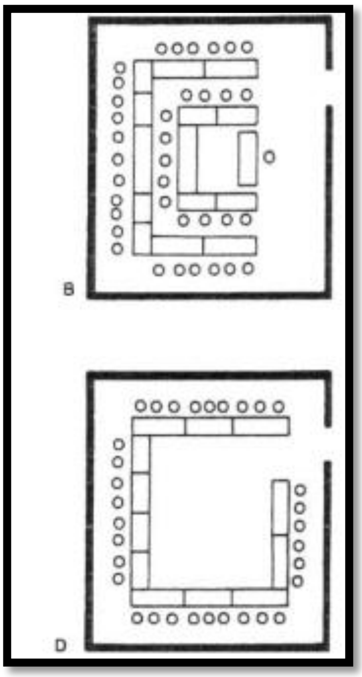


Figure I.8 Annular disposition

Source: (Neufert, 7th edition)

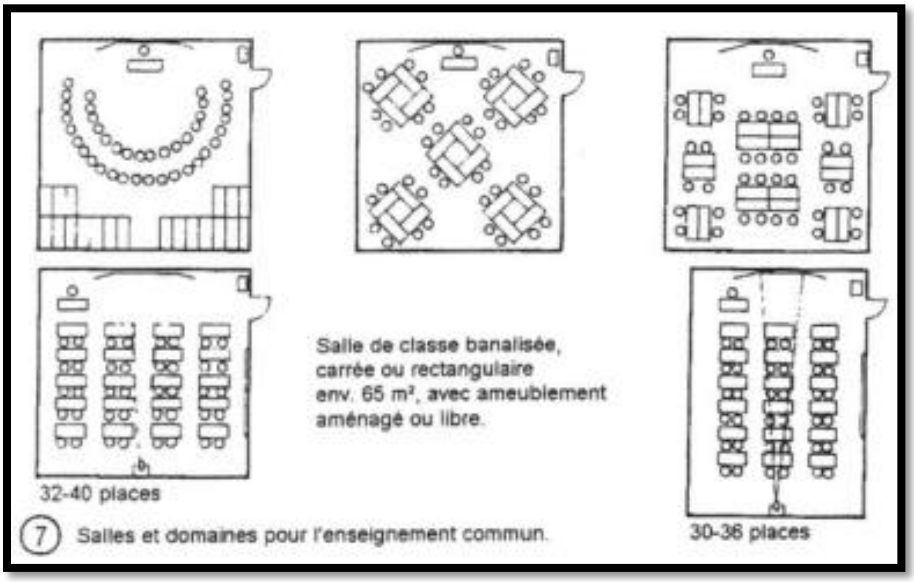


Figure I.9 Different dispositions
Source: (Neufert, 7th edition)

Surfaces Needs in classroom:

- For general education: 2 m² per student place.

- For multidisciplinary teaching: 3 m² per student place.

- For lessons in large rooms, including surfaces annexes necessary for operation: 4.5 m² per place.

Standard surfaces are either rectangular or square (12 x 20.12 x 16.12 x 12.12 x 10 m): thus, for a depth maximum of the piece of 7.20 m. a unilateral row of windows is still possible on average we therefore count:

- For a traditional classroom: from 1.80 to 2 m² per place student.

- For an oversized class: from 3 to 5 m² per student place.

- The free height is from 2.70 to 3.40 m.

(Neufert, 7th edition).

3- Library and media library:

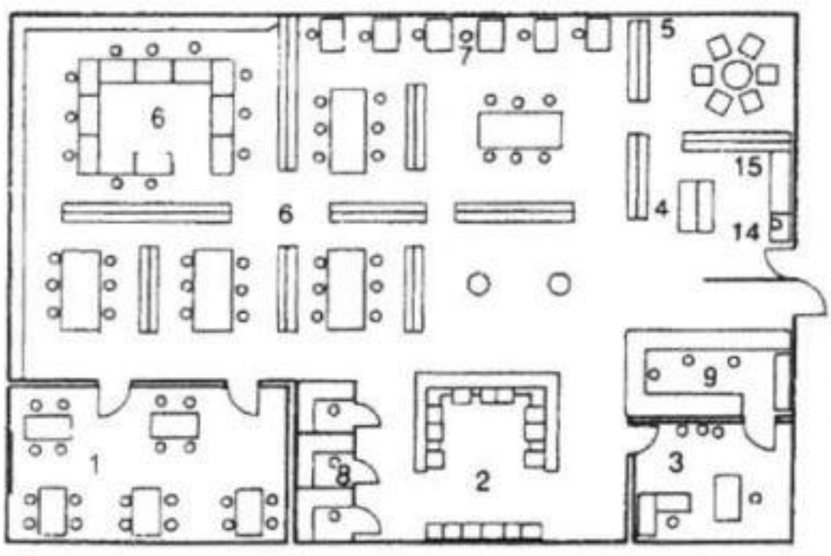


Figure I.10 General dimensions
Source: (Neufert, 7th edition)

Their role is to be a resource and information center for both for school education, training continues only for Hobbies. Users are students and teachers, but can also be extracurricular people.

The library keeps and makes available to students and teachers of books and publications (deposit and loan) and has reading and working rooms. The media library takes a wider range of not just written material but also sound, visual or computerized and can provide recording and listening possibilities (audiovisual materials, stock of video and audio cassettes and software).

Required surfaces (figure I.7):

- Globally, for the library and media library: from 0.35 to 0.55 m² per student.

- Approximately 5 m² per workplace, also including a surface for the general catalog, or from 20 to 40 m².

- Consultation area needs approximately 10 to 20 m² per employee (librarian, documentary list. media technician.

- Storage of books for a 1,000-volume repository, with about 20 to 30 volumes per meter of shelf with 4 m² of free shelf, including access surfaces.

- Reading places and catalogs: for 1,000 volumes of literature and secondary works. Count 20 to 40 m² of area, for 1,000 volumes of reference works. Count approximately 25 m² for 5% of students and teachers, with at least 30 work places of 2 m² each, or 60 m²; work room group for 8 to 10 students, about 20 m² (Neufert, 7th edition).

Conclusion:

As a review of the study of concepts, this Chapter has offered an overview of walkability as an urban and architectural concept, from different theoretical aspects, in addition to the fundamental definitions and principles of high school project and some of its basic architectural and urban standard.

From this chapter we may construct the relation between people and natural environment in a hand which are already the central concern of urban design and the built environment.

In the end we conclude that these relation begins to make sense when architectural design takes in consideration the walkability of the surroundings as well as within the building itself .

These insights inform of the upcoming analytical study in the next chapter.

Chapter II: General analysis study of topic walkability and project high school

Introduction:

This chapter is the second and main step of our procedures of achieving the preset objectives of this thesis mentioned previously in the introductory chapter.

Here we will be analyzing similar high school project, and other examples where walkability concept and technics are applied.

We will also present the case study analysis synthesis which is the proposed land of our high school project, in addition to the high school spatial program concluded after the analysis study.

II.1 Projects analysis synthesis:

II.1.1 Identification card of examples:

First project: Binh Duong junior High School.

Country: Vietnam.

Corporation: Vo trong nghia Architects.

The reason for choosing: a good representation of Walkability in a building.

Figure II.1 Binh Duong junior High School.
Source: (Archdaily.com, December 2020)

Second project: Mansueto High School.

Country: USA.

Corporation: Wheeler Kearns Architects.

The reason for choosing: High School in midtown.

Figure II.2 Mansueto High School.
Source: (Archdaily.com, December 2020)

Third project: Gökçeada High School.

Country: Turkey.

Corporation: PAB Architects.

The reason for choosing: High School in a village.

Figure II.3 Gökçeada High School.
Source: (Archdaily.com, December 2020)

Fourth project: Caneças High School.

Country: Portugal.

Corporation: ARX.

The reason for choosing: An overlap and compatibility between the old and the new.

Figure II.4 Caneças High School.
Source: (Archdaily.com, December 2020)

II.1.2 Projects analysis conclusion:

In this section of our work we decided to have a comparative study between different types of high school projects from different countries in purpose of achieving the best architectural results like the spatial program, and also for our topic of walkability.

The next table illustrates our method. (See table II. 1 and .2) where we have on the right column the essential urban and architectural concepts, and its way of application on each studied example.

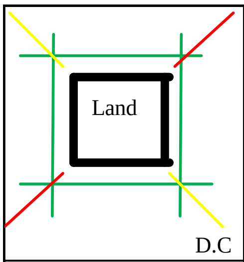
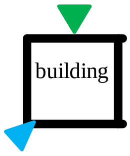
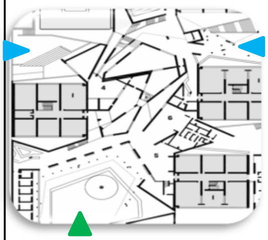
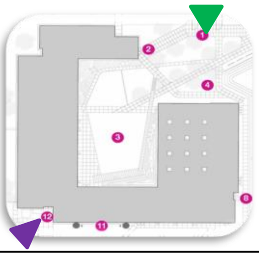
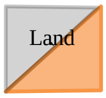
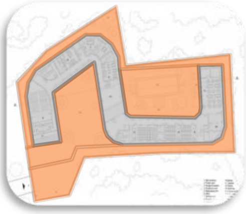
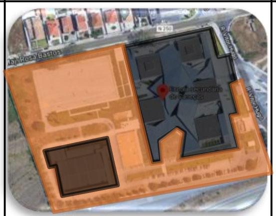
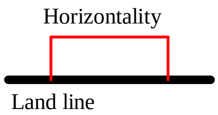
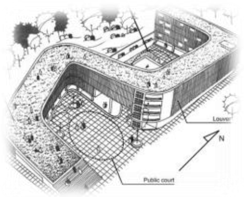
We can summarize from the first table (table II. 1) that: it is necessary for a high school area to be open into the four main directions for better conductivity, and to have at least 2 main entrance one for students, the other for staff.

The land occupation according to the results should be half built-up, the unbuilt half is important For external high school activities.

It is preferable that the high school blocks disposition takes a linear horizontal shape to facilitate students' accessibility to classrooms.

Table II.1 Projects analysis comparison and results 1.

Source: (Author, December 2020)

					Conductivity
 N					Entran/Access
 40 – 50 % N	 75%	 75%	 60%	 50%	Unbuilt space
 N					Volumetry

As for the second table (See table II. 2) we found that: It is recommended to separate the administrative area from the pedagogic one, the same with the walking paths, to avoid congestion and overcrowding of different users.

We may organize the different high school areas in a centralized form, in order to have a central space, like a courtyard, or administration in order to ensure control over the building from various perspectives.

The main used structure in high schools according to the study is column-beam structure for the most building except for sport halls.

Table II.2 Projects analysis comparison and results 2.
Source: (Author, December 2020)

building separation D.C	Overlap	Semi-separation	separation	separation	Zoning
building separation D.C	Overlap	Semi-separation	separation	separation	Circulation
Central D.C	Annular	Pyramidal	Pyramidal Central	Central	Organization
Column-Beam structure D.C	Metal structure	Concrete Columns/bearing walls	Column-Beam structure	Column-Beam structure	Structure

II.2 Examples of applied walkability in projects' analysis synthesis:

II.2.1 Identification card for examples:

First project: Science Hills Komatsu.

Country: Komatsu, Ishikawa, Japan.

Corporation: Mari Ito + UAO.

The reason for choosing: The project is a complex of science museum and communication center.

Figure II.5 Science Hills Komatsu.
Source: (Archdaily.com, December 2020)

Second project: The center for people.

Country: Taguatinga's city center, Brazil.

Designer: Denys Mendes, Universidade Católica de Brasília.

The reason for choosing: Strategies to make city center A more human place.

.

Figure II.6 The center for people.
Source: (Archiprix.org, December 2020)

Third project: The River of Life.

Country: Malaysia, Kuala Lumpur.

Designer: Soon Theng Ooi. University technology, Malaysia.

The reason for choosing: a Fitness circuit as a city center.

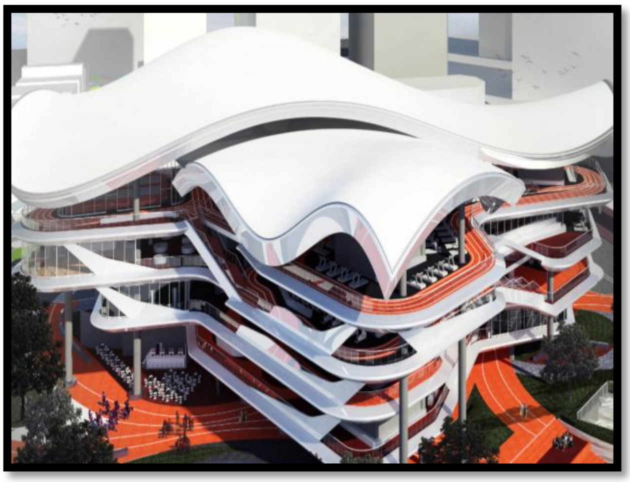


Figure II.7 The River of Life.

Source: (Archiprix.org, December 2020)

II.2.2 Major Problems requiring walkability technics as a solution:

From the analysis' synthesis of examples city buildings and public spaces are for many times:

-Disconnected from the real city planning and functions.

-Without participation of the citizens in their implementation.

-The spaces do not receive the suitable treatment.

-The spaces not acting their role in the urban context.

-The city centers are the most dynamic places in the city, however being a ''city center'' itself is part of the problem by being used as a commercial area.

II.2.3 Objectives of applying walkability technics:

After the analysis' synthesis of examples, the main objectives are:

-Integrate architecture and landscape

-Making cities more human than mechanical places.

-Encourage physical activity.

-Solution to the decay in the quality of daily life.

-Alternative design scheme to revitalize the urban neighborhood.

-Assuring an urban, physical and social vitality among the local community.

-Deliberating to the streets a better characteristic beyond of a simple walkthrough place.

-Rise a challenge to the conventional way on the use of urban public spaces

Creating walkable street environment.

II.2.4 Walkability's main intervention technics:

❖ From the first example's analysis we conclude the use of these technics:

-integrate architecture and landscape as a public roof park where people can walk around.

-low-rise waves blending into the surroundings.

-rooftop gardening at the upper surface of the waves.

-People can stroll freely inside and outside of the broad waves and view exhibits from many aspects. (See figure II.8)

Figure II.8 Waves as hills.
Source: (www.Archdaily.com, December 2020)

-Wind-detecting LED garden lights are located throughout the whole site. (See figure Figure II. 9)

Figure II.9 Waves as hills at night.
Source: (www.Archdaily.com, December 2020)

❖ From the second example’s analysis we conclude the use of these technics:

-Redraw of the: city-center crosswalks and intensive walking tracks.

-Reducing car spaces.

-Reducing Emissions CO_2.

-Reducing Mechanical noise.

-Animating the pedestrian space.

(See figure Figure II.10)

-Adding specific commercial actions.

-Providing playful and sitting spaces, Pavilion, multiactivity place.

(See figure Figure II.11)

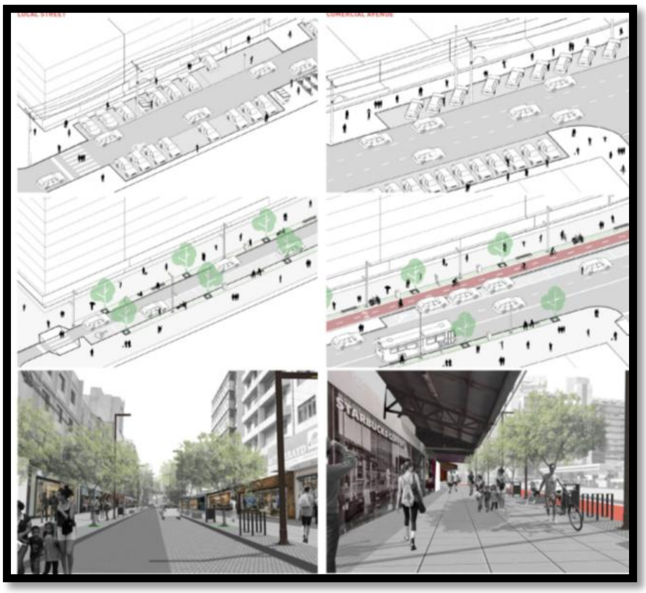


Figure II.10 The streets of center for people after intervention.
Source: (www.Archiprix international.org, December 2020)

Figure II.11 The center for people central space after intervention.
Source: (www.Archiprix international.org, December 2020)

❖ From the third example's analysis we conclude the use of these technics:

-Walkable Building solution

-Implementing the concept of urban walkability into a building.

-The use fluid massing and reflective exterior surfaces.

-Walking tracks on the open ground floor assure the human viscosity from five existing nodes.

(See figure Figure II.12)

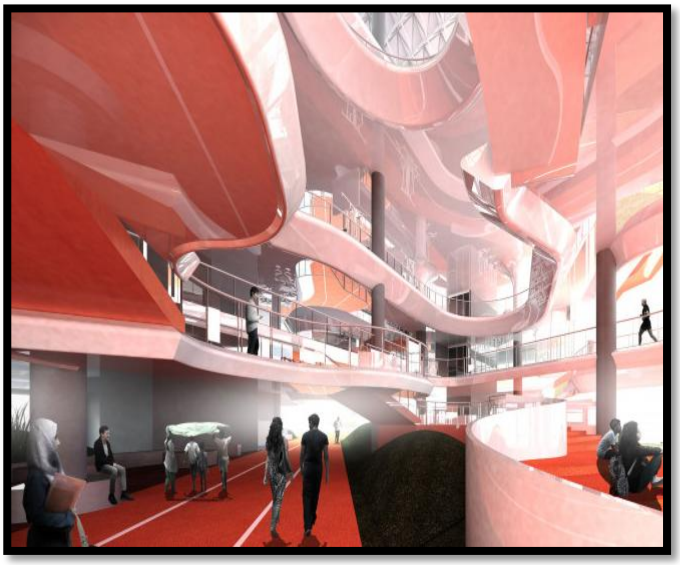


Figure II.12 Walkable Building.
Source: (www.Archiprix international.org, December 2020)

Figure II.13 fluidity through ground floor's Walking tracks.
Source: (www.Archiprix international.org, December 2020)

II.3 Case study's analysis synthesis:

II.3.1 General information:

- The field of study of the area occupancy scheme for the northern expansion is located northwest of the city of Biskra.
- It is bounded to the north by the perimeter road linking National Road No. 03.
- And the road adjacent to the valley, to the east, is the national road No. 03, linking Biskra and Batna.
- To the west is the supplies area, and to the south is the real estate cooperative for workers of the Public Works Directorate.

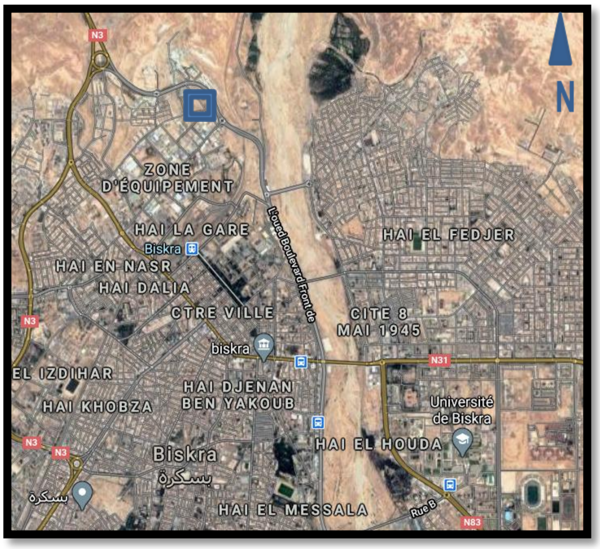


Figure II.14 land's situation.
Source: (Google earth, December 2020)

II.3.2 Conductivity:

There is one type of tracks:
-Visually imperceptible tracks from south and north: structured.

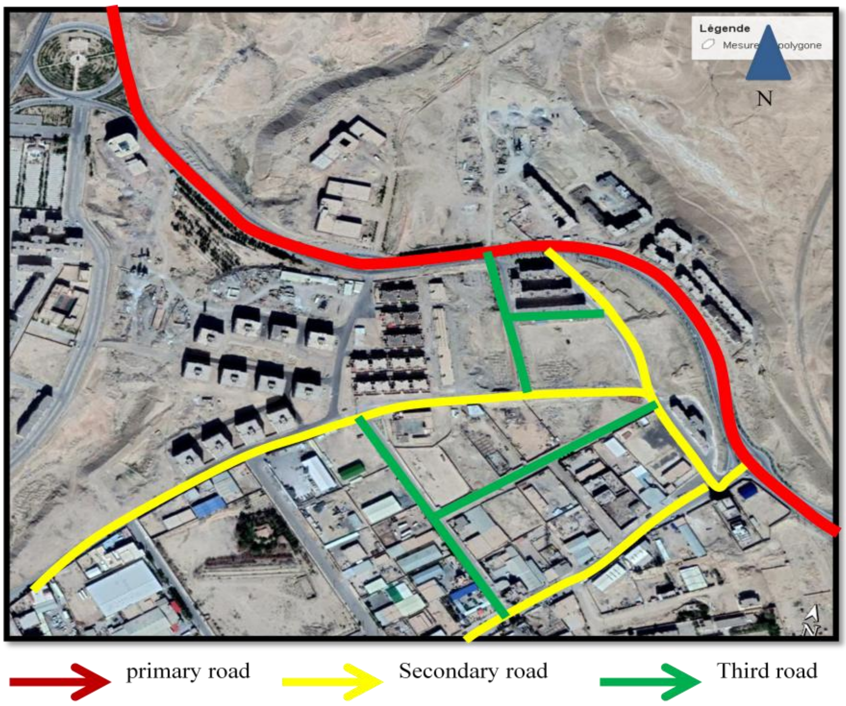


Figure II.15 Conductivity around the land of study.
Source: (Google earth edited by Author, December 2020)

II.3.3 site and land composition:

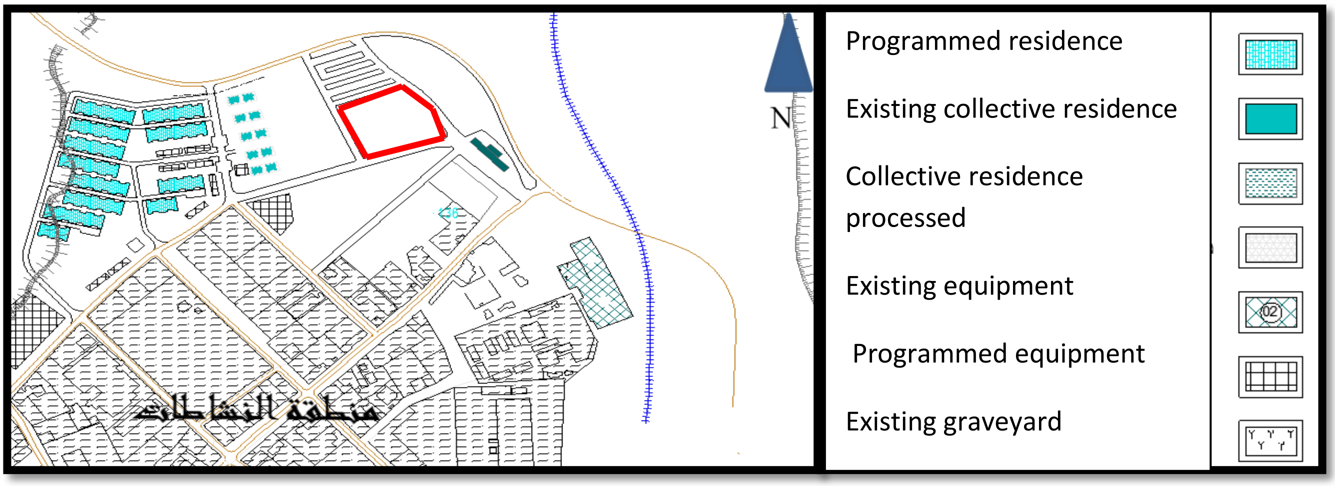


Figure II.16 Composition of land's site of study.
Source: (PDAU, December 2020)

The area takes a shape of Trapezoidal with a surface of 15361.5m2 surrounded by roads from all sides.

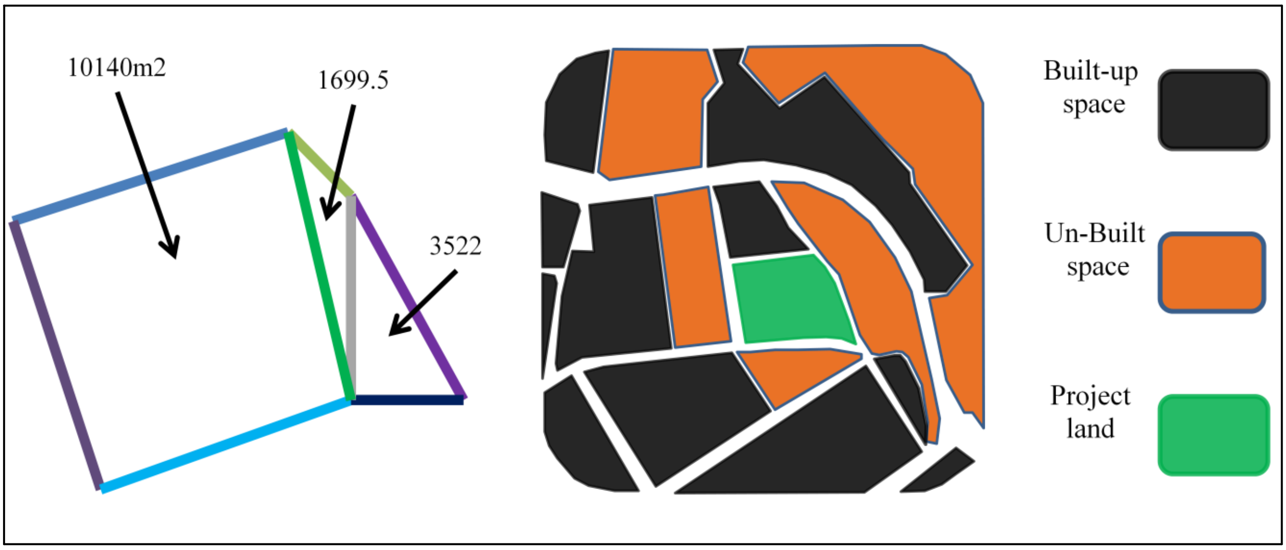


Figure II.17 land of study's Dimensions and currant urban status.
Source: (PDAU, December 2020)

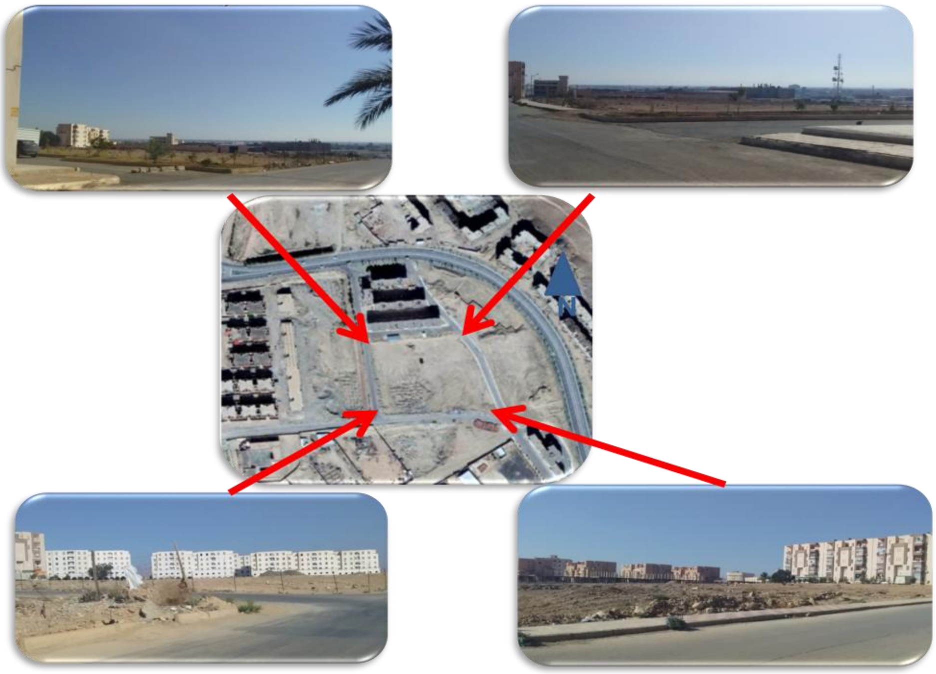


Figure II.18 views of land of study.
Source: (author, December 2020)

II.3.4 Area's strengths and weaknesses:

❖ Land's Strengths:

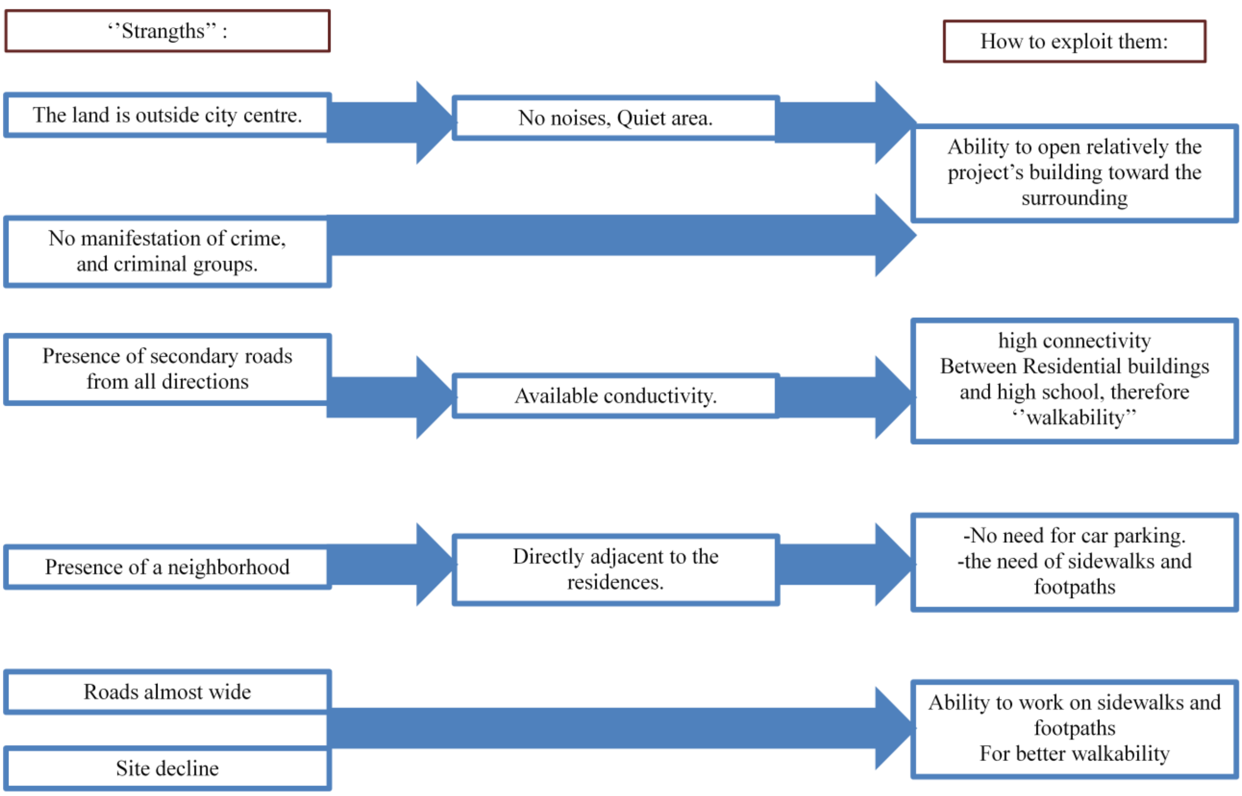


Figure II.19 Diagram of land strengths.
Source: (author, December 2020)

❖ Land's weaknesses:

Figure II.20 Diagram of land weaknesses.
Source: (author, December 2020)

II.4 Proposed High school program:

After the analysis study of the previous high schools examples and the comparison made on the level of architectural programming, in addition to the national and international standards. We propose the following program:

Table II.3 Proposed program for High school 1000 place.
Source: (Author, 2021)

Function /Block	Space	N	Unit area	Total area
Studying (m^2) Educational Block	Classrooms	25	62	1550
	Laboratories	6	65	390
	Computer labs	2	65	130
	deposit	1	15	15
	Drawing Workshop	1	80	80
	Multipurpose hall	1	100	100
	Auditorium 160 place	1	125	125

	Principals office	2	15	30
	Total surface	2420		
Managing (m²) Administrative block	director's office	1	30	30
	secretariat	1	15	15
	b. education counselor	2	16	32
	b. management	1	12	12
	store	1	12	12
	b.Orientation counselor	1	15	15
	teachers room	1	60	60
	Meeting room	1	65	65
	Teacher’s canteen	1	25	25
	canteen	1	60	60
	archive room	1	20	20
	Printing hall	1	15	15
	sanitary bloc	2	5	10
	waiting room	1	5	5
	guardian lodge	1	6	6
	Total surface	382		

Kitchen (m²)	Cooking area	1	25	25
	Preparing area	1	20	20
	Cold room	1	15	15
	Daily deposit	1	15	15
	deposit	1	25	25
	waste area	1	9	9
	Director’s office	1	15	15
	locker room	2	7.25	14.5
	sanitary	2	5	10
	shower	2	16	32
	Total surface	180.5		
Serving (m²) Service block	refectory	1	150	150
	factotum workshop	1	30	30
	Factotum deposit	1	35	35
	sanitary boys	1	45	45
	Sanitary girls	1	45	45
	Total surface	305		
Treatment (m²)	Waiting room	1	15	15

Treatment block	Medicines deposit	1	9	9
	consultation	1	15	15
	Treatment room	1	15	15
	Psychologist	1	15	15
	Total surface	69		
Reading (m²) Library	Reading room	1	80	80
	Loan	1	15	15
	Coding & Indexing	1	15	15
	Books store	1	40	40
	Books Browse	1	20	20
	Director's office	1	15	15
	Printing hall	1	9	9
	Total surface	194		
Treatment (m²) Treatment block	Waiting room	1	15	15
	Medicines deposit	1	9	9
	consultation	1	15	15
	Treatment room	1	15	15
	Psychologist	1	15	15

	Total surface	69		
Reading (m²) Library	Reading room	1	80	80
	Loan	1	15	15
	Coding & Indexing	1	15	15
	Books store	1	40	40
	Books Browse	1	20	20
	Director’s office	1	15	15
	Printing hall	1	9	9
	Total surface	194		
Training (m²) Physical and sportive education	playground	1	605	605
	lobby	1	20	20
	students locker room	2	11.5	23
	teachers locker room	2	7.25	14.5
	local material	1	16	16
	bathrooms	2	8	16
	Total surface	694.5		

Table II.4 General surfaces program for High school 1000 place.
Source: (Author, 2021)

Total surfaces (m²)	spaces surface	4765
	circulation surface	15%
	Total built-up surface	5479.75
	green surface	1140
	parking surface	230
	Courtyard surface	3350
	Omni sport field surface	1280
	Total un-built surface	6000

Conclusion:

In this chapter we studied various examples of high school projects and others from different countries in which walkability concept is applied, parallel to the official standards, in order to have the most effective choices to apply in our project.

Among the urban and architectural outcomes of this analysis study, the distribution of building blocks compared to land and the disposition of entrances in accordance with the walkable tracks leading from neighborhood’s residence buildings to the project and passes across it.

All of these details will be demonstrated furthermore with the transit items in the next chapter, as we establish our high school project.

Chapter III: Project high school 1000 places design stages

Introduction:

This chapter as a final step is where we will pass by the high school design procedures from the beginning of design idea.

We will expound the transit items, general information of the project, and the main graphic document and plans.

The aim as previously said is to attain the preset objectives of this thesis and intentions of our topic and project.

III.1 Objectives and purpose of walkability in the High School:

They can be summarized as follows:

-Encourage physical activity.

-Solution to the decay in the quality in the neighborhood.

-Assuring an urban, physical and social vitality among the local community and pupils.

-Deliberating to the street's footpaths a better characteristic beyond of a simple walkthrough tracks.

-Reducing CO_2 Emissions.

-Reducing Mechanical noise.

III.2 transit items:

III.2.1 Design idea development:

After visiting the proposed area for the design of the High school project, we have taken visual sequences photos and chosen among them the most appropriate one in which we can see clearly the project on its land after execution. (See Figure III.2 and .3 below).

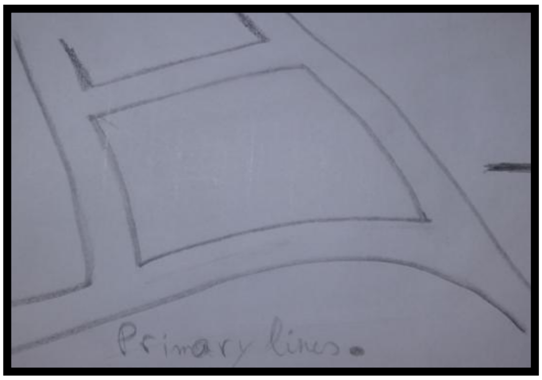


Figure III.1 area's existing outlines.
Source: (Author, February 2021)

Figure III.2 The chosen visual sequence on map.
Source: (Google earth edited by Author, February 2021)

Than we draw the continued axe from the point of view mentioned earlier, across the land of the project (See Figure III.4 below).

Figure III.3 The chosen visual sequence in-situ.
Source: (Author, February 2021)

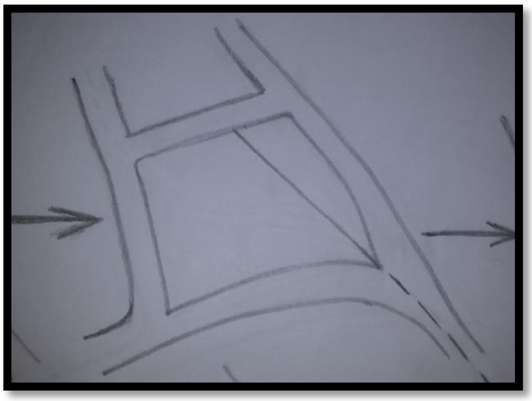


Figure III.4 Axe of design.
Source: (Author, February 2021)

Furthermore we transformed the continued axe from the point of view into a primary walkable path, (See Figure III.5).

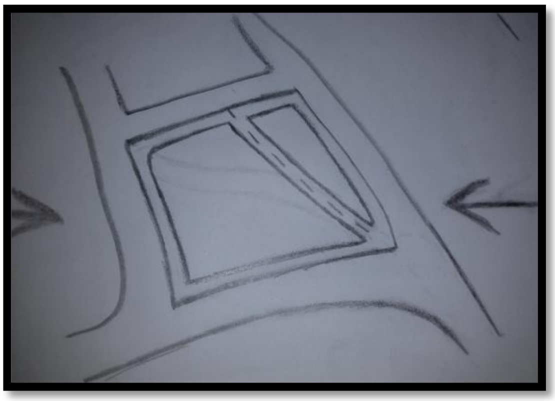


Figure III.5 Primary walkable path of design.
Source: (Author, February 2021)

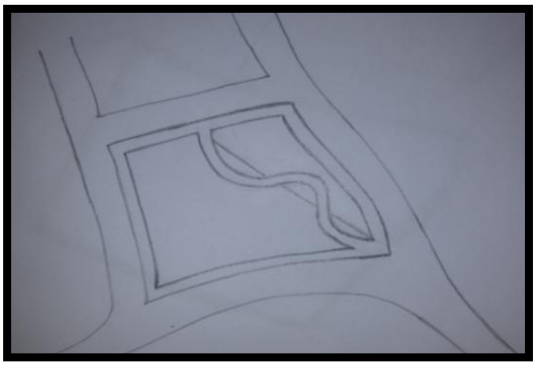


Figure III.6 Curving the walkable path.
Source: (Author, February 2021)

After that, we curved the walkable path along with two abstract semicircles, to add an element of suspense (See Figure III.6).

Finally, we used the walkable path's curved limites as the primary outlines of the High School blocks volumes.(See Figure III.7).

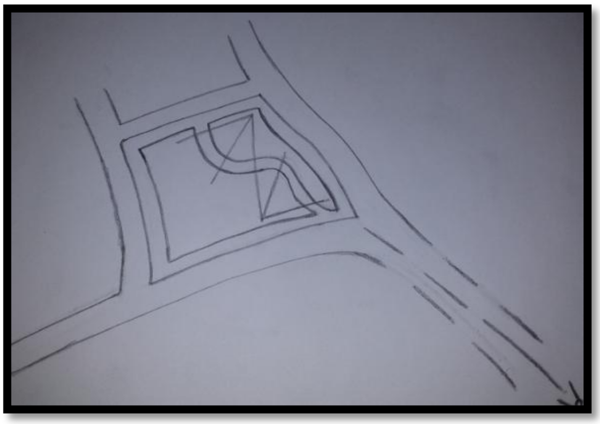


Figure III.7 Blocks extraction from The walkable path. And the abstract centers of semicircles.
Source: (Author, February 2021)

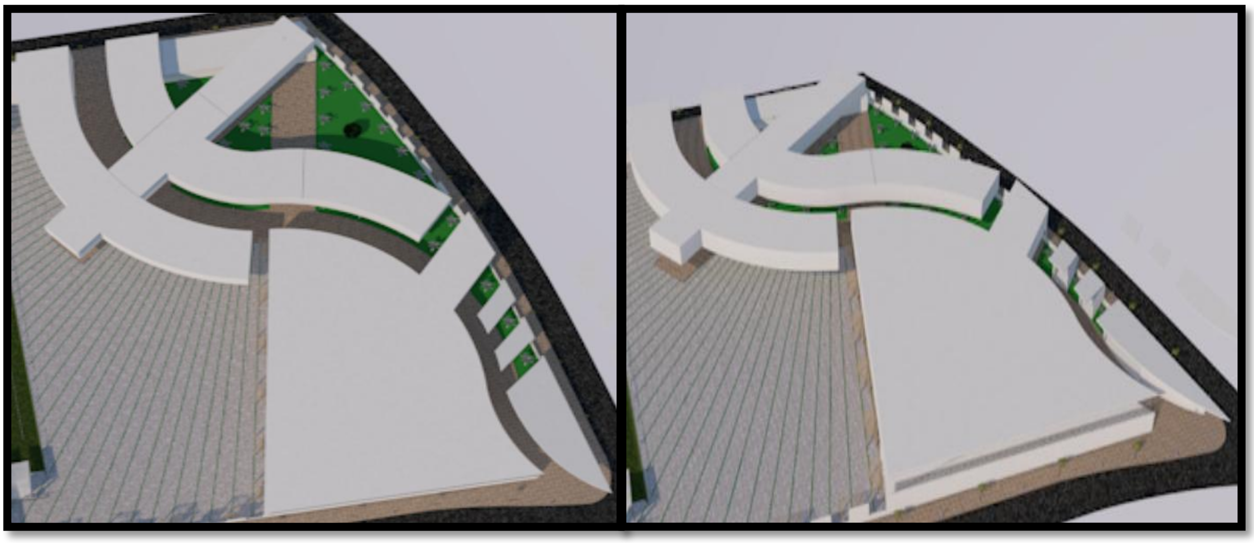


Figure III.8 Primary volumetry
Source: (Author, February 2021)

III.2.2 Technics of applying walkability on the High School project:

We used the following technics as they are illustrated in the figures below:

-Animating the ''Walkable paths'' indoors/outdoors.

-LED garden lights located throughout the footpaths indoors.

-LED garden lights located throughout the footpaths outdoors.

(See Figure III.9).

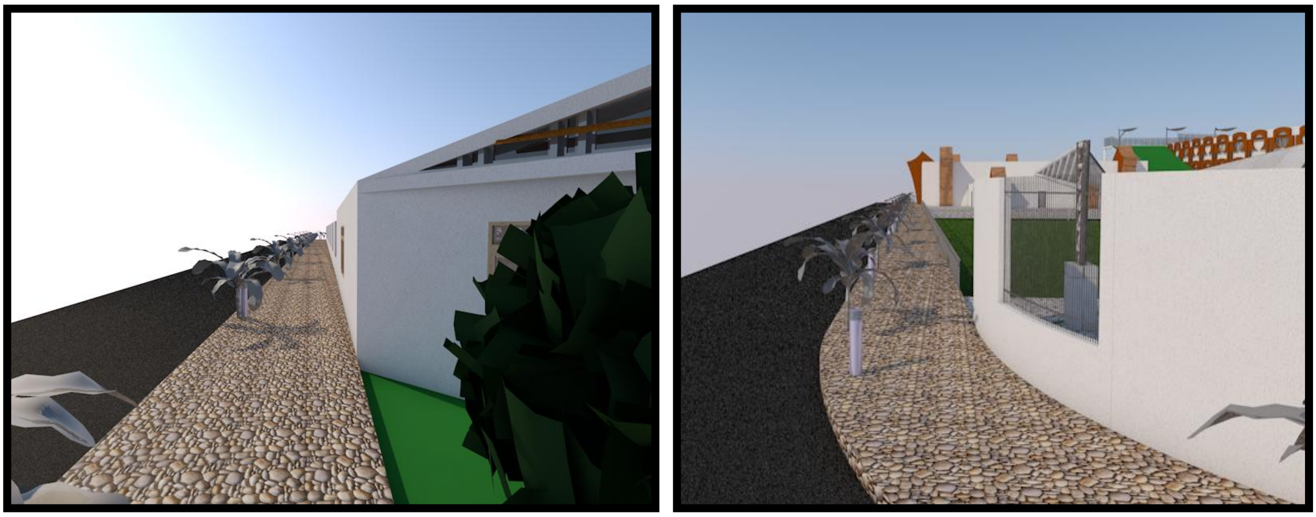


Figure III.9 A walkable path outdoor views.
Source: (Author, February 2021)

-Opening the ground floor.(See Figure III.10).

-Walking paths on the open ground floor assuring human viscosity. (See Figure III.10).

Figure III.10 Ground floor different views.
Source: (Author, February 2021)

-A walkable roof leading to sports field. (See Figure III.11).

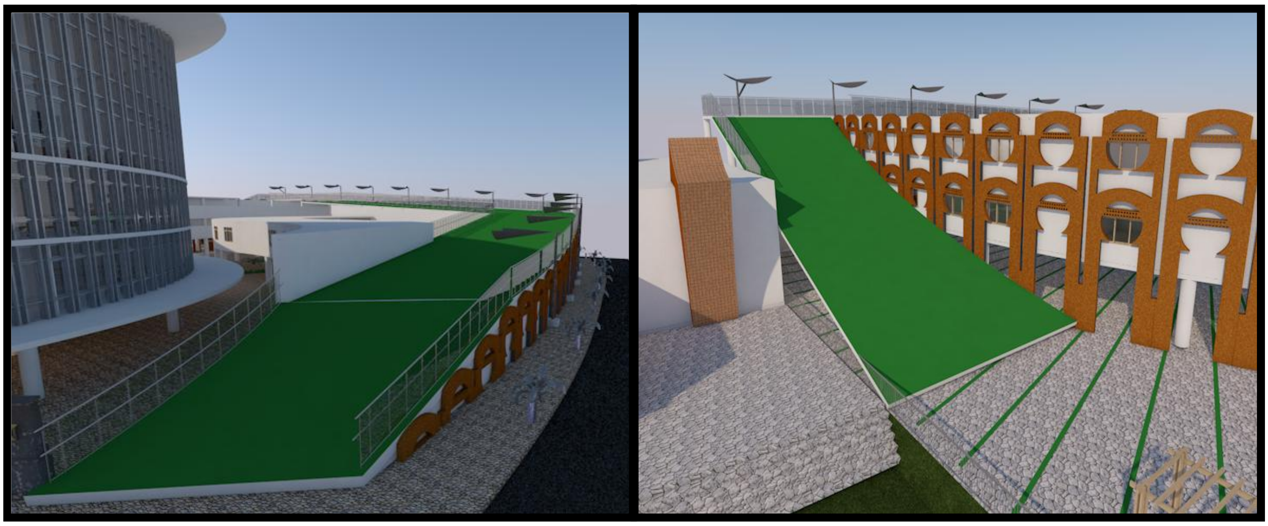


Figure III.11 Walkable roof views.
Source: (Author, February 2021)

III.3 Graphic presentation of the High School:

Our High School project is situated in Biskra city, next to the activities zone on the National Road No.03 leading to Batna, with a capacity of 1000 places, and it is designed as a composition of two main parts, one with 4 levels and the other from 1 to 3 levels, where we followed a semi-separation between the pedagogic zones and service blocks in a part and the administration one in the other.

The project area is situated in Biskra city, next to the activities zone on the National Road No.03 leading to Batna, (See Figure III.12), in a growing neighborhood where the high school will serve its residence.

The area is surrounded by collective buildings from north and east, and semi-collective buildings from west, while from south we have the activity zone.

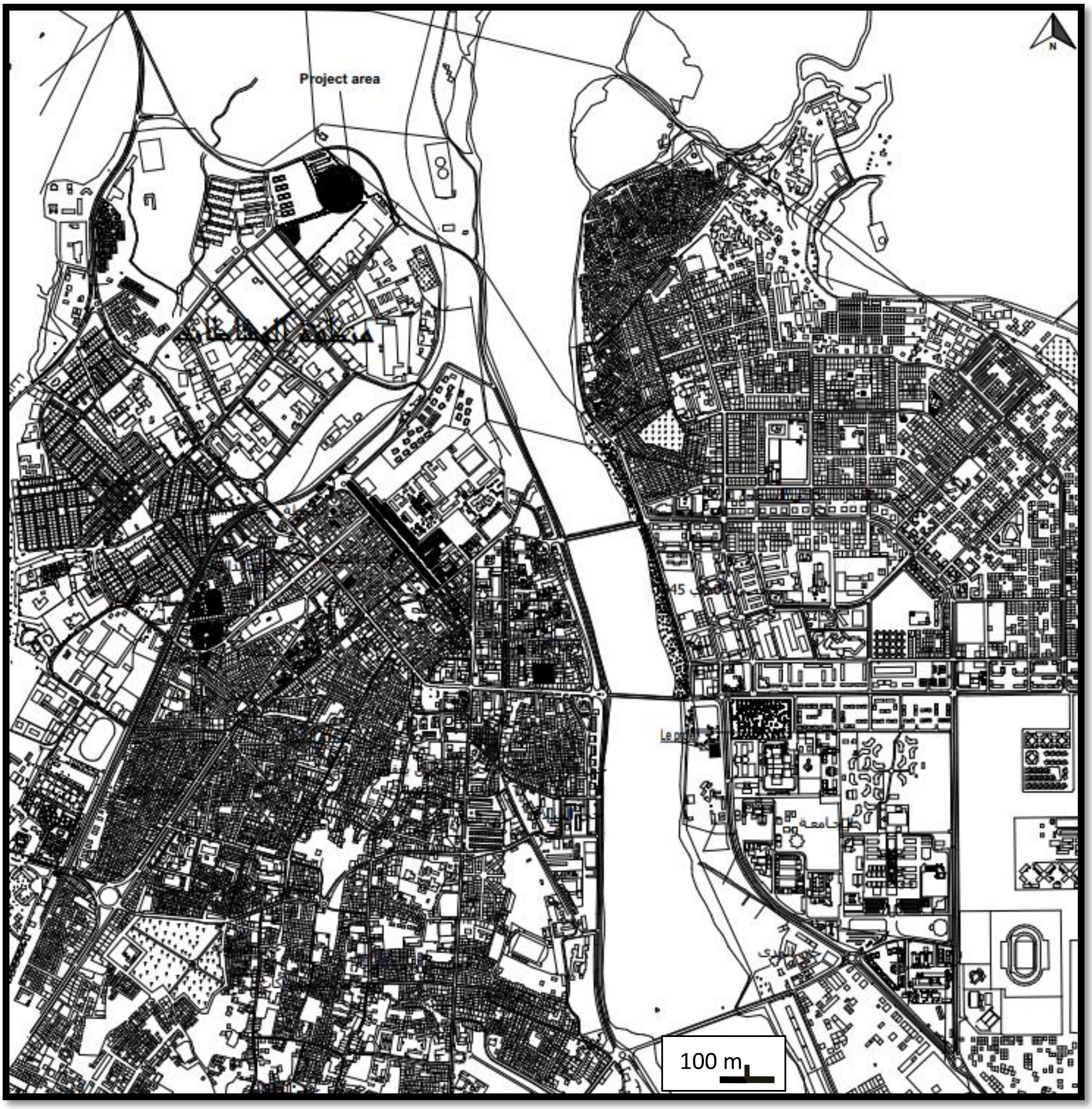


Figure III.12 Situation plan.

Source: (PDAU, June 2021)

The project's land area is about 15 361,5 m², where the Total built-up surface is 5479.75 m² and the un-built surface is about 6000 m².

We have one main entrance from the south-east for students and secondary entrance for staff from north, with a special access to a walkable green roof for student next to the main entrance. (See Figure III.13)

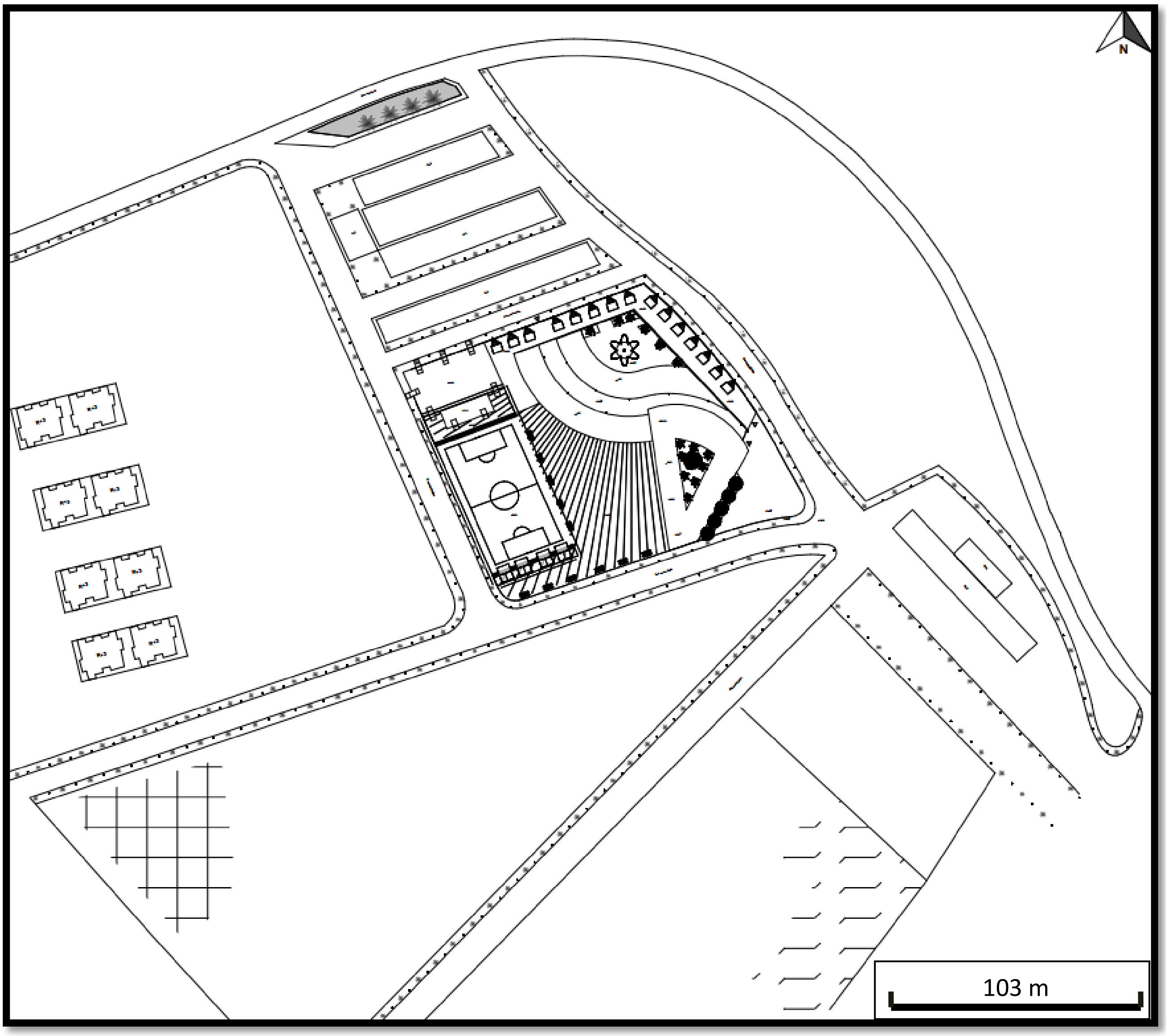


Figure III.13 Mass plan.

Source: (Author, June 2021)

From the assembly plan we see the clear separation between the built-up area limiting the project's land from north and east, and its indirect relation with the un-built spaces where we found exterior pedagogical activities. (See Figure III.14)

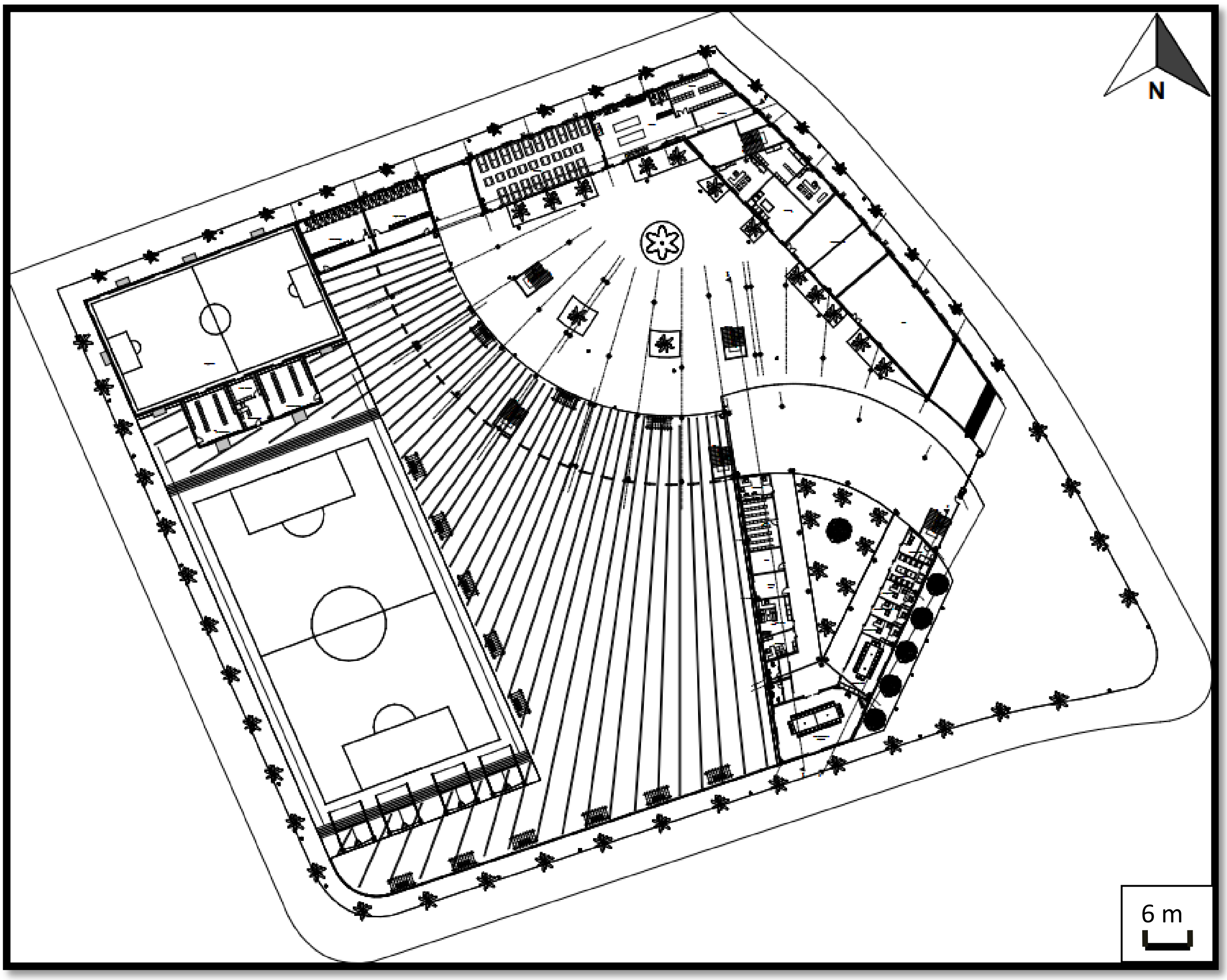


Figure III.14 Assembly plan.

Source: (Author, June 2021)

As for the plans we have 4 levels, ground floor plus 3 levels.

In each level we have a linear distribution of spaces either in the administration block located south, or in service block from north and east. Also in pedagogical levels above in the upper 3 levels.

On the ground floor, we have different administration offices, and other services spaces like infirmary and canteen in the block limiting land from north and east. (See Figure III.15)

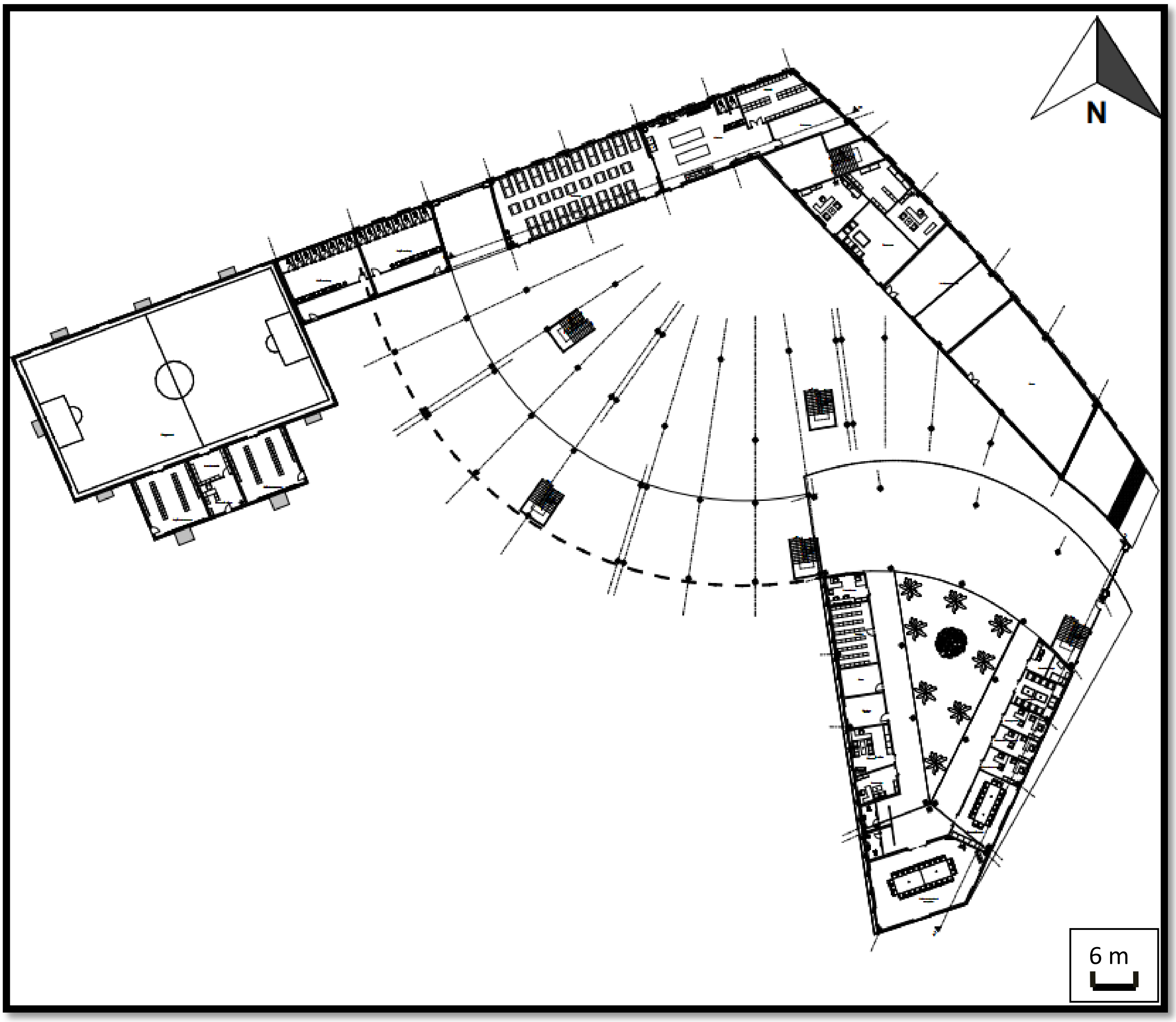


Figure III.15 Ground floor plan.

Source: (Author, June 2021)

First story is dedicated totally to classrooms and laboratories. We see clearly a curved linear distribution of classrooms to conserve walking path for horizontal movement just next to it, which is the main concept of the design idea. Accessible by stairs as a vertical movement from ground floor, stairs are distributed one for each 20 to 25 meters. (See Figure III.16)

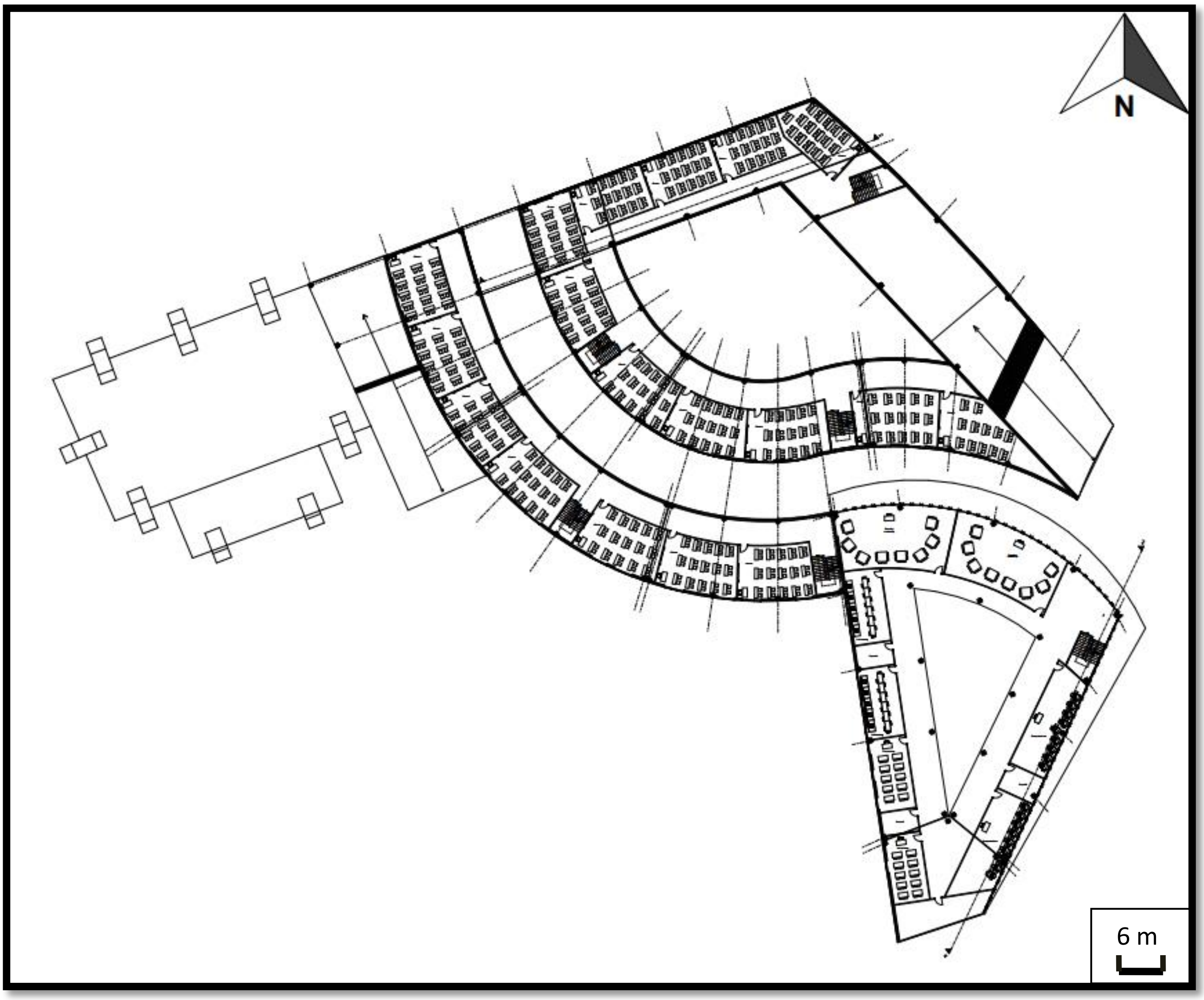


Figure III.16 1st Story plan.

Source: (Author, June 2021)

Same thing here in the second story, classrooms and a library with the curved linear distribution, aligned to the curved walkable path for horizontal movement. This level is accessible by stairs as a vertical movement from first story; stairs are distributed one for each 20 to 25 meters. (See Figure III.17)

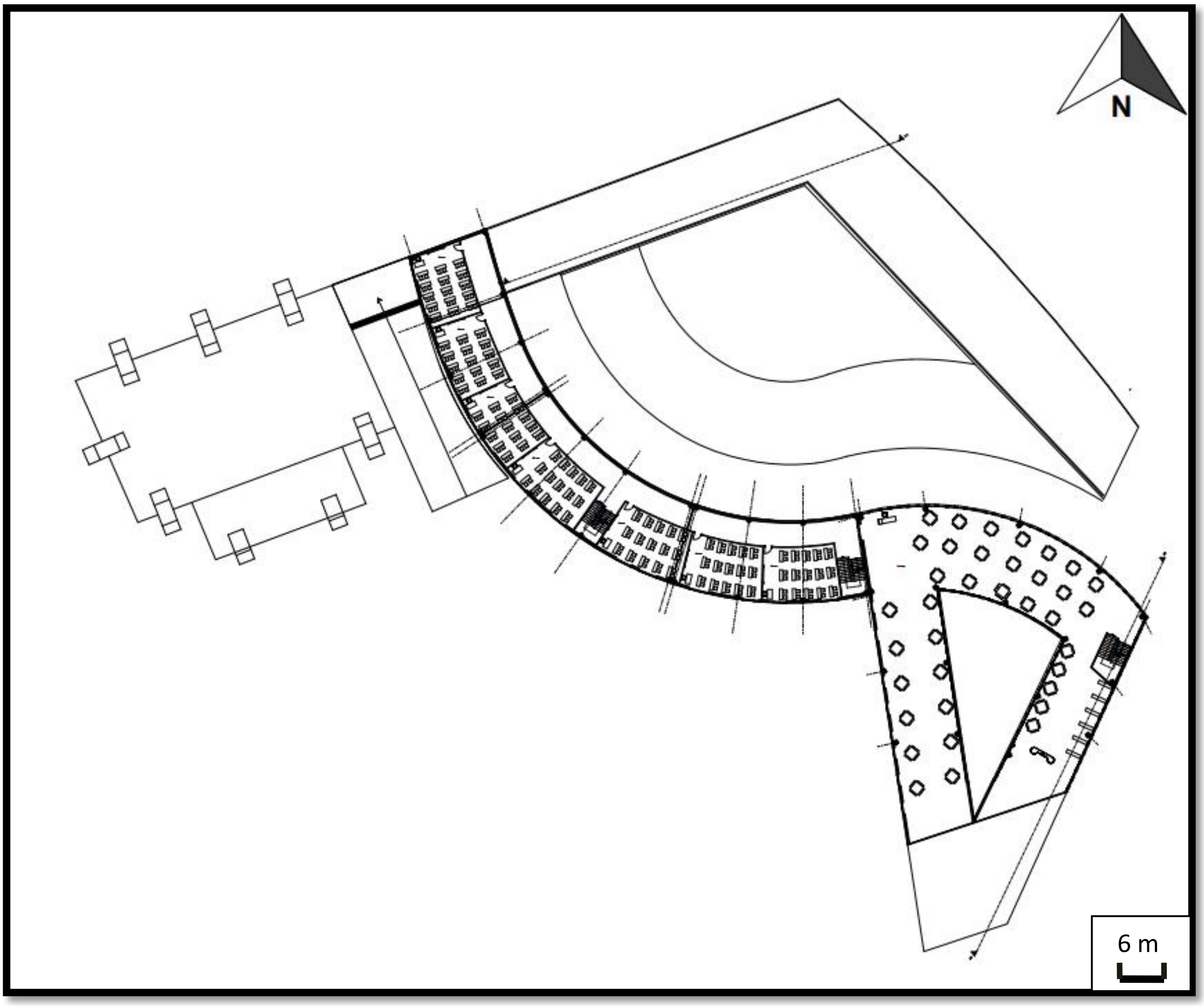


Figure III.17 2nd Story plan.

Source: (Author, June 2021)

The third floor is limited to the southern block, a conference room often used for special occasions, accessible by stairs as vertical movement, and with a workshop. (See Figure III.18)

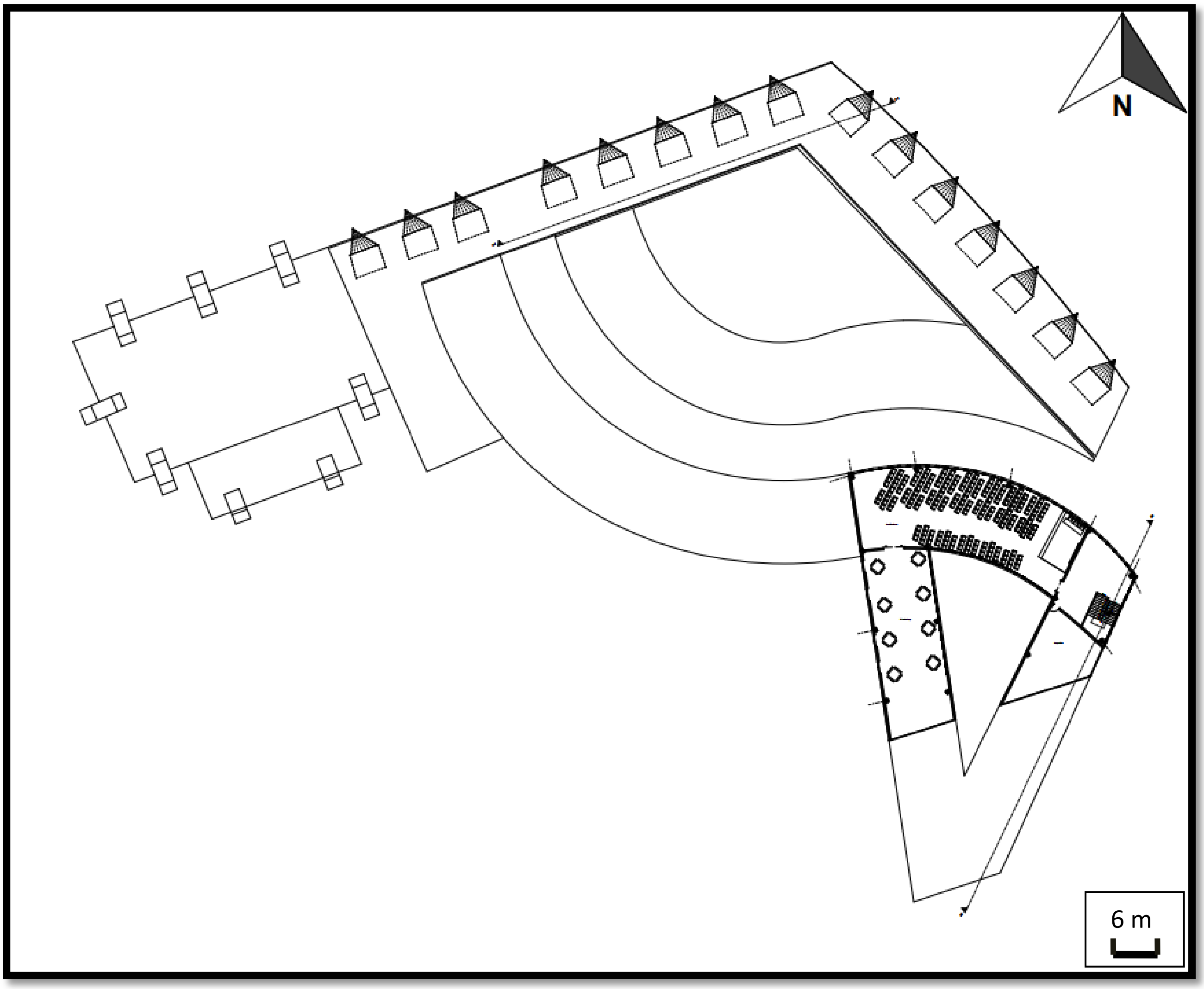


Figure III.18 3rd Story plan.

Source: (Author, June 2021)

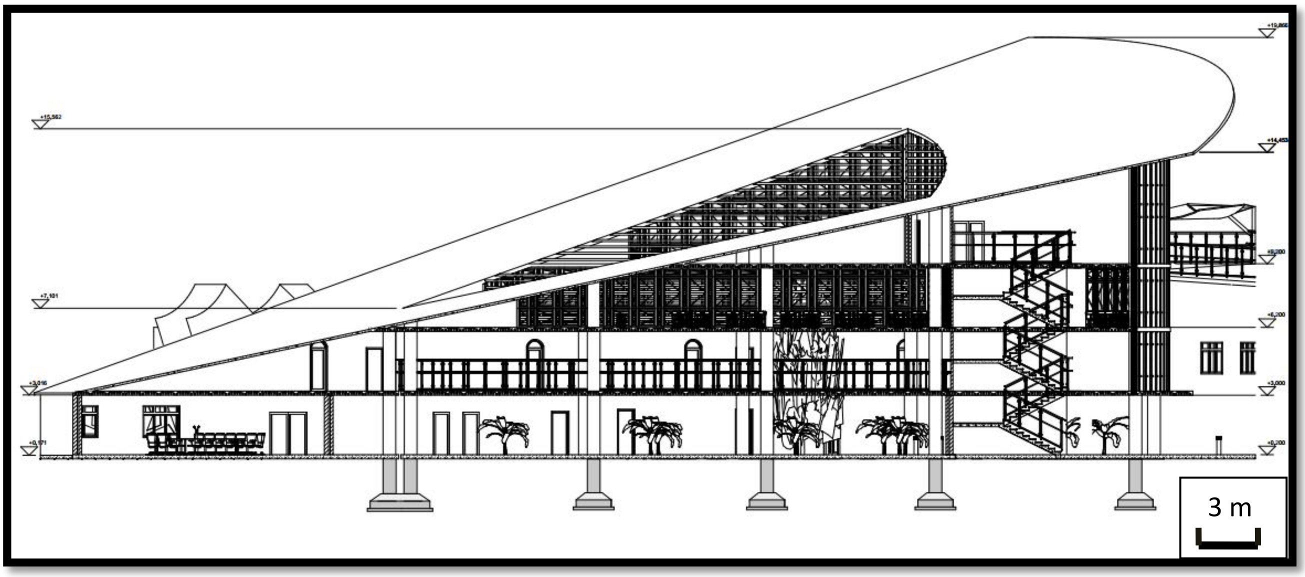


Figure III.19 Section AA.

Source: (Author, June 2021)

We choosed the first section (See Figure III.19), to demonstrate the vertically dominant building, with four levels and an inclined thin reinforced concrete slab. We can see also the stairs for vertical movement. And the distribution of column structures. Each level is 3.00 meters high, and the maximum height of the inclined roof is about 20.00 meters.

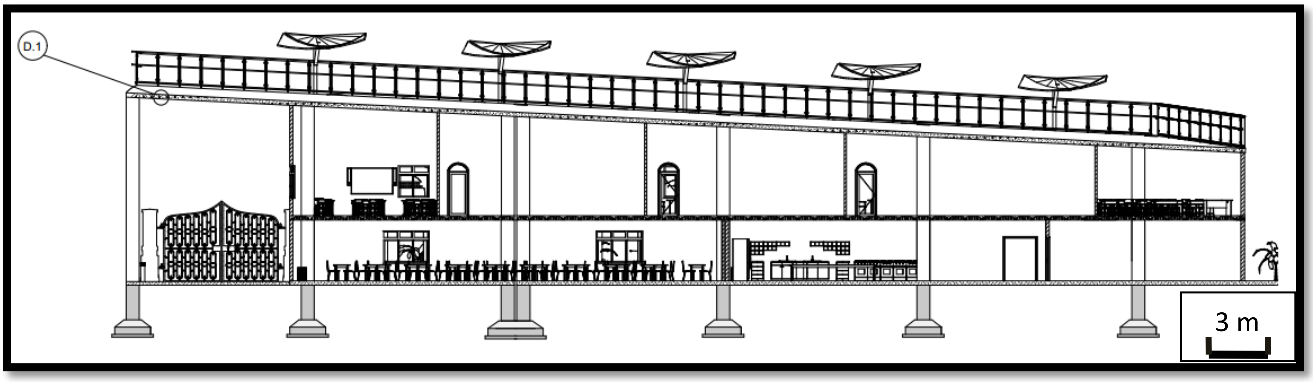


Figure III.20 Section BB.

Source: (Author, June 2021)

We choosed the second section (See Figure III.20), to demonstrate the walkable green roof, which is a main design element for the concept of walkability, we can see this roof's details and composition in the figure below, (See Figure III.21). Each level is 3.00 meters high, and the minimum height of this section of the inclined walkable roof is 6.00 meters and the maximum height is about 8.00 meters.

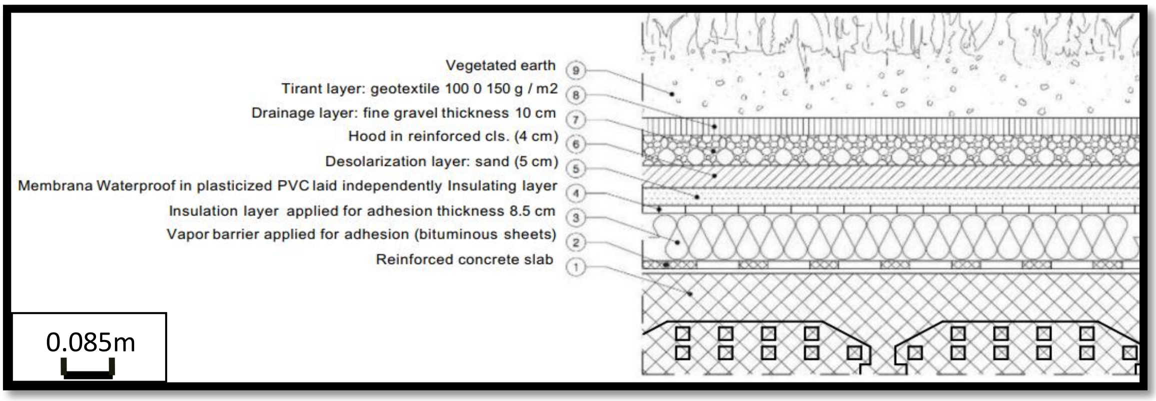


Figure III.21 Walkable green roof detail.
Source: (Author, June 2021)

The north elevation shows a parallel between different project blocks, and an animated skyline.

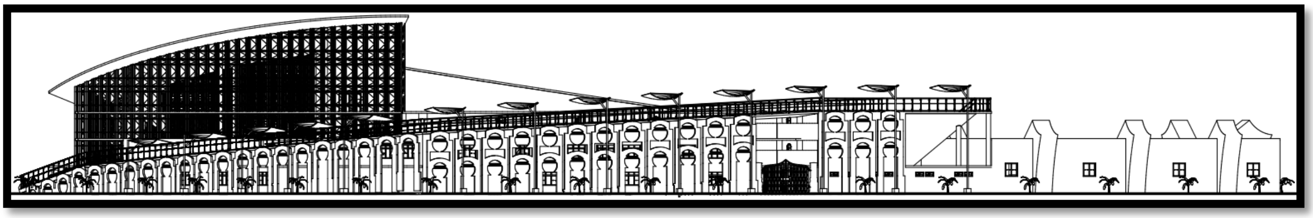


Figure III.22 North elevation.

Source: (Author, June 2021)

The south elevation shows an opposition between different project blocks, and an animated skyline. With arcs as sun breakers.

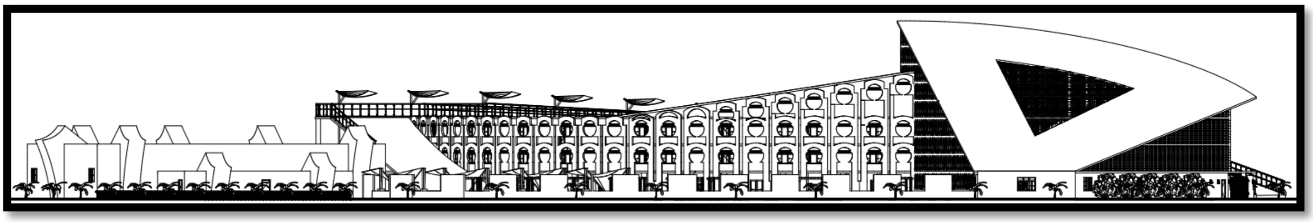


Figure III.23 South elevation.

Source: (Author, June 2021)

The east elevation shows semi-parallel between different project blocks, and an animated skyline. With arcs as exterior decoration.

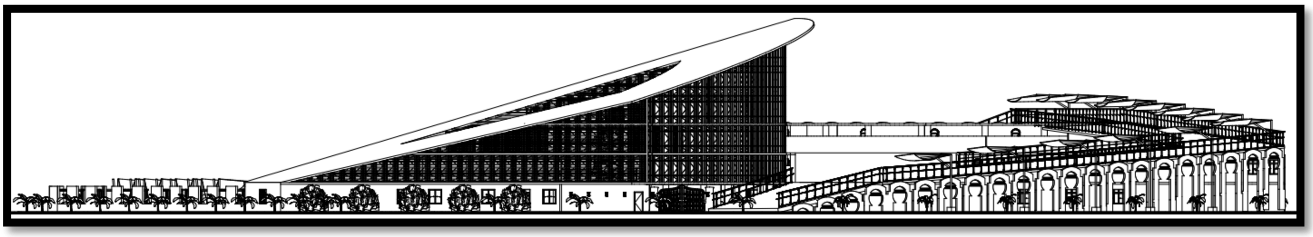


Figure III.24 East elevation.

Source: (Author, June 2021)

The west elevation shows an opposition between different project blocks, and an animated skyline. With perforated wall as sun breaker.

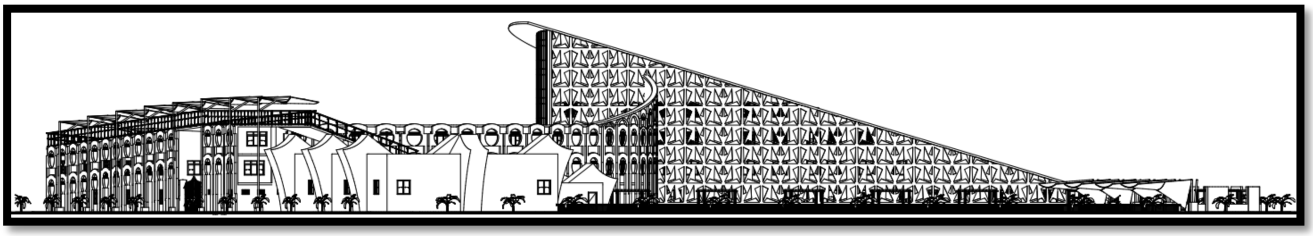


Figure III.25 West elevation.

Source: (Author, June 2021)

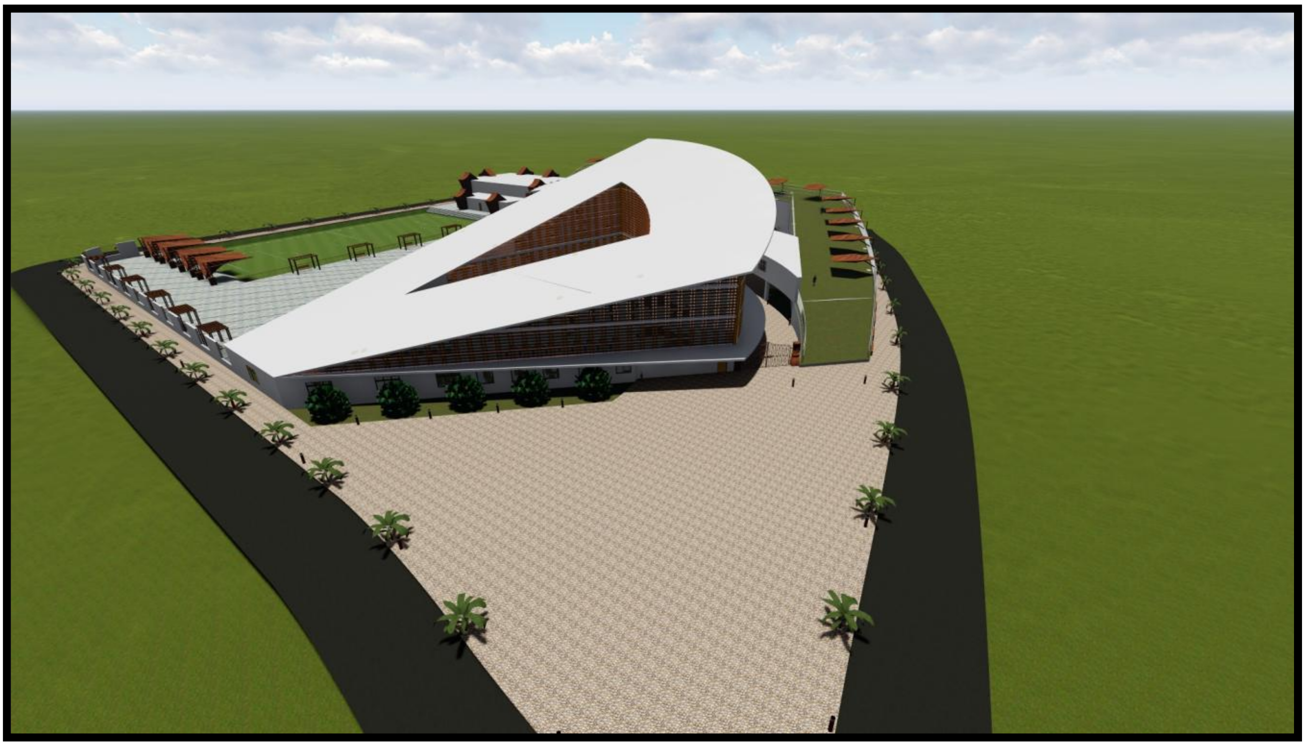


Figure III.26 Sky view of high school at day.

Source: (Author, June 2021)

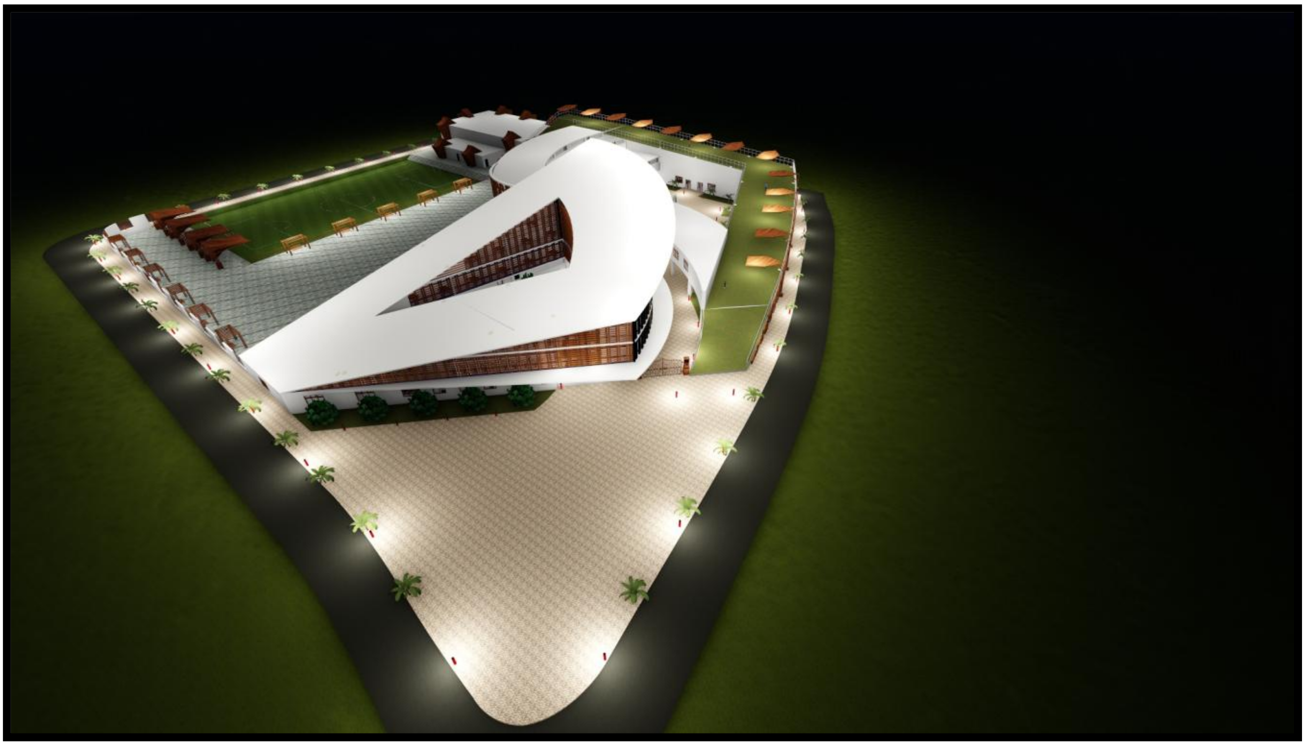


Figure III.27 Sky view of high school at night.

Source: (Author, June 2021)

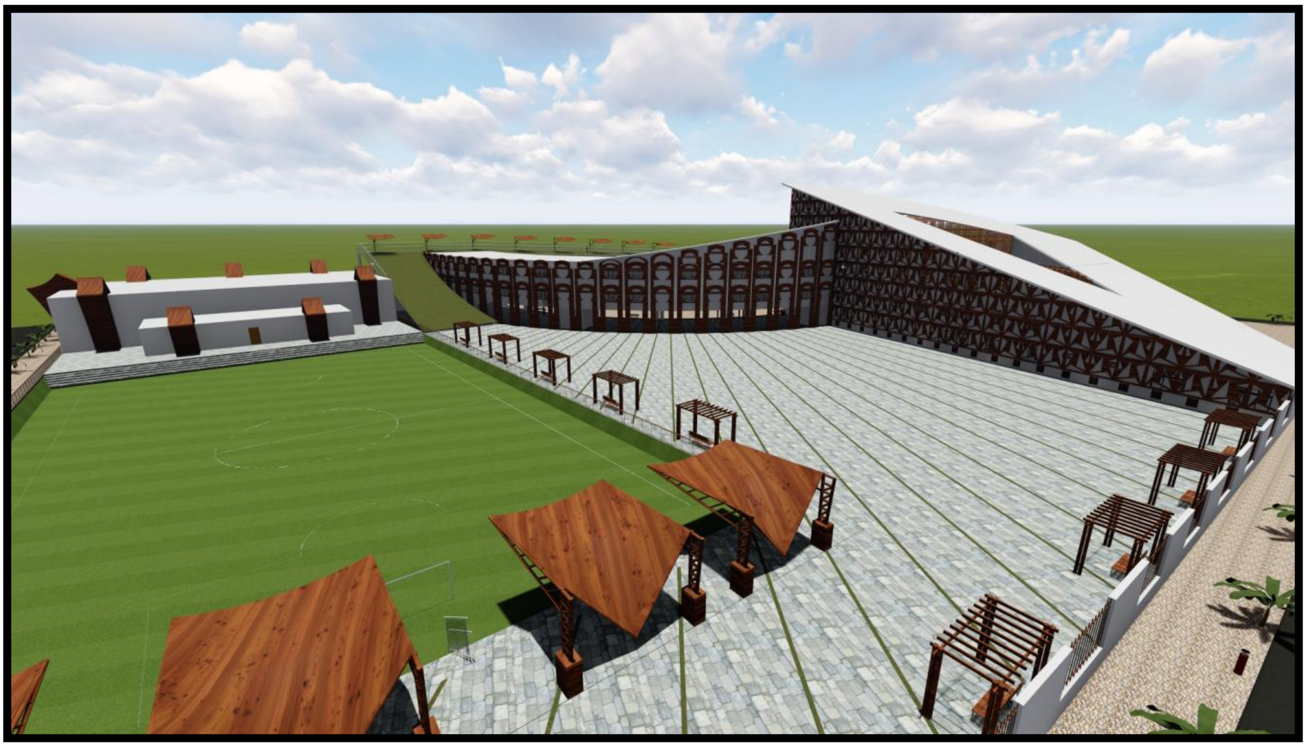


Figure III.28 Courtyard and sports field at day.

Source: (Author, June 2021)

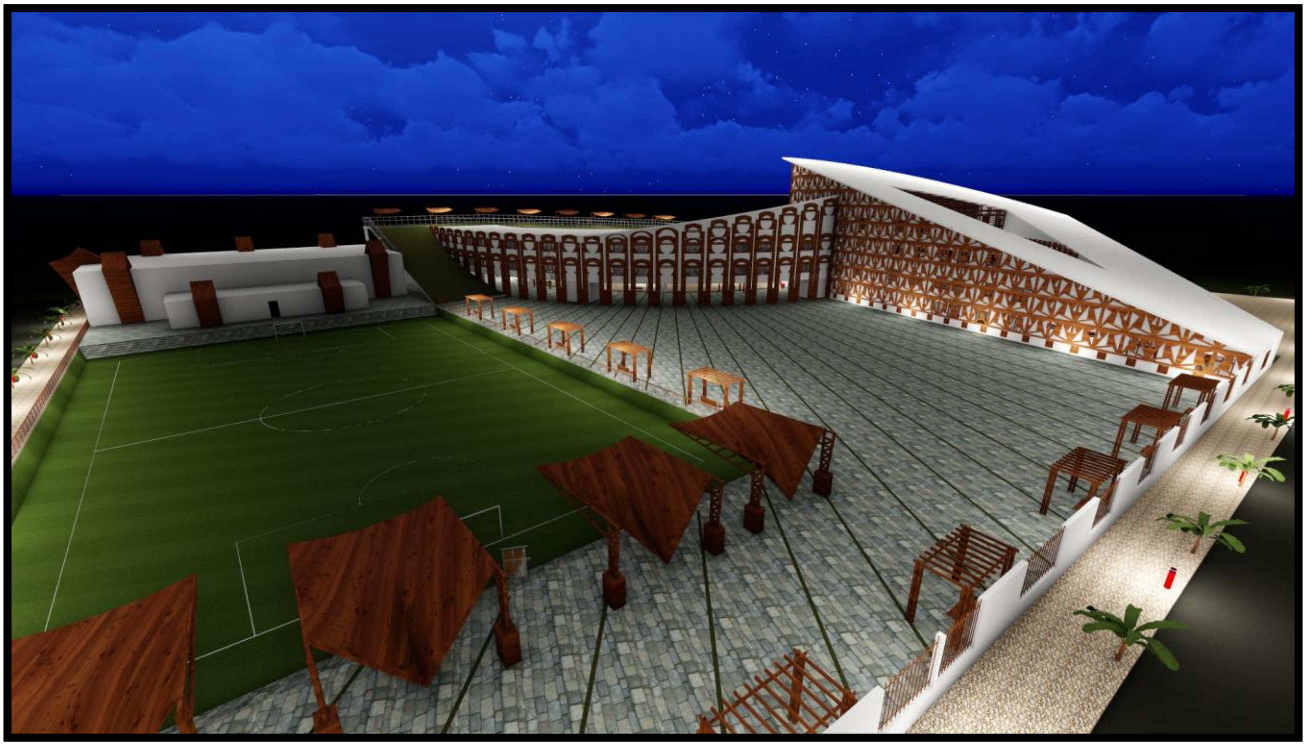


Figure III.29 Courtyard and sports field at night.

Source: (Author, June 2021)

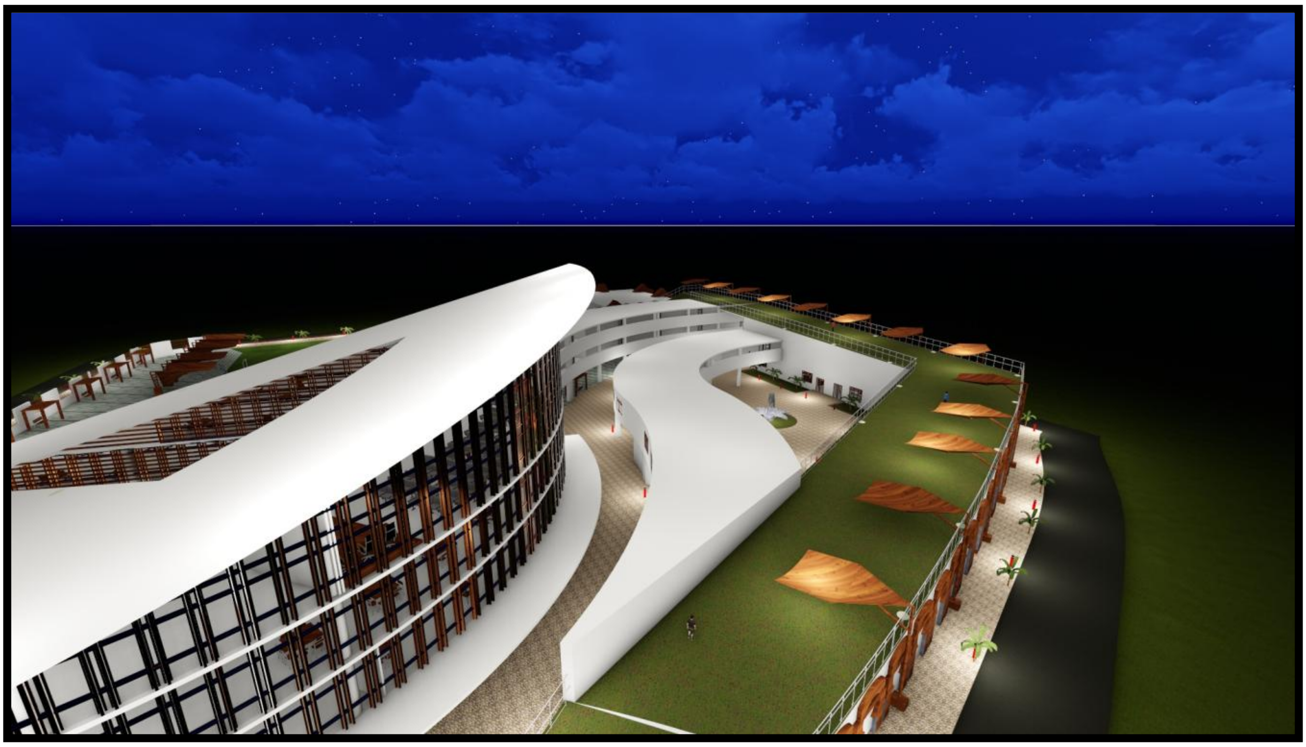


Figure III.30 Walkable roof and main walking path view.

Source: (Author, June 2021)

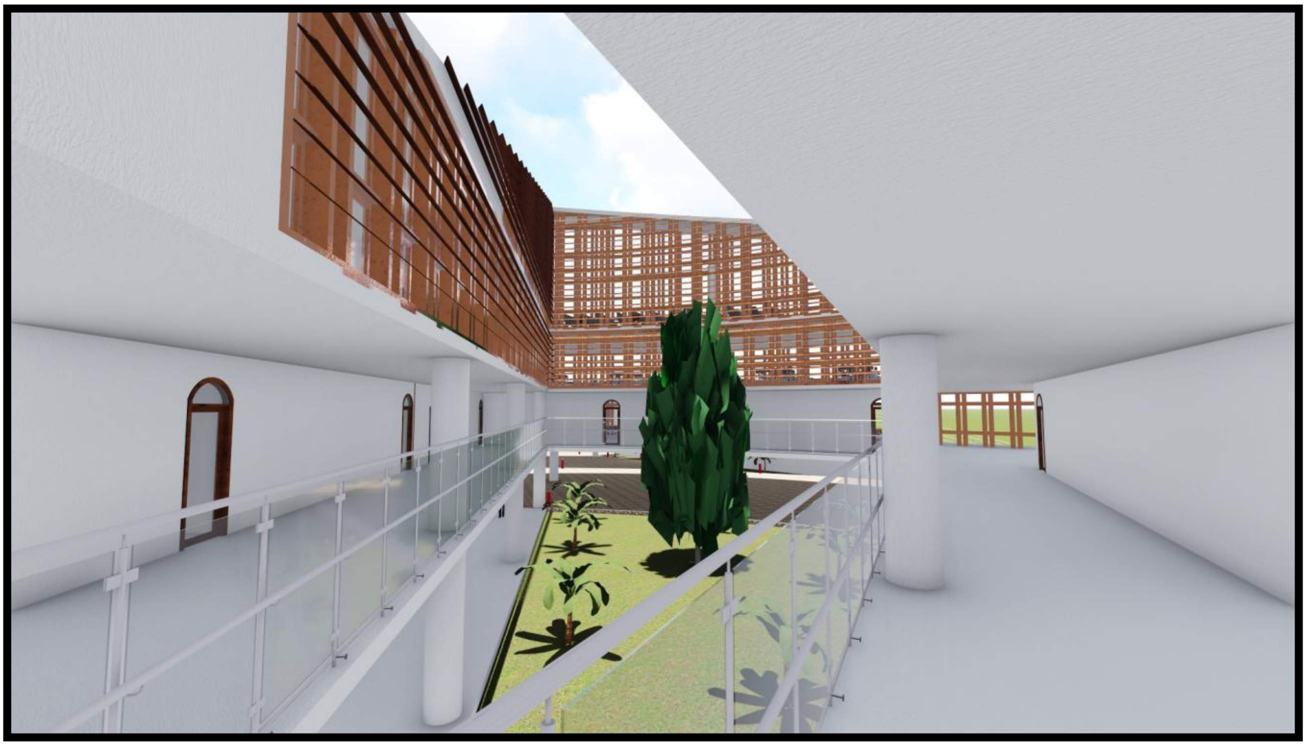


Figure III.31 View from inside administration block.

Source: (Author, June 2021)

Figure III.32 View from inside library.

Source: (Author, June 2021)

Figure III.33 View from walking tracks beside classrooms.

Source: (Author, June 2021)

Figure III.34 View from inside a classroom.

Source: (Author, June 2021)

Conclusion:

In this final chapter we have reminded of the objectives of this dissertation and the intentions of walkability in our high school project such as: Reducing CO2 Emissions, Reducing Mechanical noise and others, in addition to some of the suitable and appropriate technics assuring the preset goals. Rather than the design idea and its procedures.

In the end we concluded by the graphic documents passing by the different plans and the 3d views.

Finally, as the aim was to attain the best exploitation of walkability intentions in our high school project so we assure students, teachers, staff and also neighborhood residents' maximum physical and sensual safety and comfort, and bringing some vitality to the whole neighborhood.

General conclusion:

General conclusion:

The work done in this thesis is focused on the study of walkability and its effects on a high school project in both scales: urban which is in our case a residential neighborhood situated in Biskra city, next to the activities zone, on the National Road No.03 leading to Batna, and architectural which is the high school project itself.

Our High school project is with a capacity of 1000 places, and it is designed as a composition of two main parts, one with 4 levels and the other from 1 to 3 levels, where we followed a semi-separation between the pedagogic zones and service blocks in a part and the administration one in the other.

In purpose of demonstrating the walkability topic as a dominant concept in our work we took it as primary and principal element of the design process as explained previously.

This thesis is composed of an introductory, 3 main chapters, and general conclusion.

We dedicated the introductory chapter to the presentation of the topic of thesis, elaborating the problematic and the research question, and then defining the research objectives and work methodology.

In the first chapter we managed to control the theoretical framework through documentary research and provide the most important definitions of theoretical concepts related to the topic and the project.

As for the second chapter, the work was all about the analysis of similar projects in which we concluded the practical methods of applying the walkability into a public building which is in our case a high school, in both urban and architectural levels. We also extracted the spatial program required our high school project.

The third chapter was dedicated to the embodiment of the results of previous analysis through the high school project, by reminding of our intensions, explaining the design process, and demonstrating the different plans and figures of our designed high school.

In this Endeavour, we preferred a methodology mode carry out documentary research, and a comparison study of high school projects samples' analysis of spatial program, in conjunction with standards from bibliographical resources to conclude the appropriate program for our case.

As for the case study, we visited the land and took photos are of the field, In addition to the study of urban graphic documents and others…

Our purpose as mentioned before was to make residential neighborhood and high-school surroundings more 'car free', which means less CO_2 emissions, ensure Pedestrians safety, while increasing their physical activity, and finally reach a healthier life.

We found from the previous theoretical and analytical studies, that, to Animate the ''Walkable paths'' either indoors of a building or its outdoors, with plants, trees, fountains at cross roads, water circuits, led lights…, opening the ground floor or having a walking tracks on the ground floor assuring human viscosity from various entries, as for applying the concept of walkable roof in a building or across its land, all of these technics of walkability and others are among the most effective ones in the aim of achieving the preset objectives. And which have been proven to be useful in a high school project and in other similar buildings of public use.

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