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Department of Architecture

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Workshop Theme: Urban Architecture

A Counter-Project for a Low-Rise, High-Densification as an Alternative to AADL Mass-Housing. The Case of Sidi Serhane, New Bouinan, W. Blida.

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’Urban Architecture’’ workshop presentation

Urban architecture focuses on the design, planning and development of urban spaces, such as cities, districts and public spaces. It is a discipline that combines elements of architecture, urban planning, landscape and engineering to create functional, aesthetic and sustainable urban environments.

Urban architecture is first and foremost functional. It aims to create spaces and buildings that meet the needs of the city's inhabitants, by ensuring efficient infrastructures, accessibility, the movement of people and vehicles, and the availability of services.

Urban architecture must reflect the cultural and historical identity of the town or district. This often means preserving historic monuments, integrating public art and respecting local architectural styles.

Sustainability is an essential aspect of urban architecture. This is expressed through the integration of ecological solutions such as green spaces, the use of streets and squares as air channels, the efficient management of resources, and the use of sustainable and eco-responsible materials.

The aesthetic values and visual appearance of urban spaces are crucial. Good urban architecture must provide attractive and harmonious environments, taking into account the beauty of buildings, public squares and parks.

Good urban planning promotes fluid connectivity between different parts of the city, with well-designed transport networks, cycle paths and pedestrian walkways. It must also promote social inclusion by creating spaces that are accessible to all, regardless of age, economic status or physical ability.

Urban spaces must be designed to withstand challenges such as natural disasters, such as floods and earthquakes, climate change, and growing demographic pressures.

(Pr. Benhamouche, 2024).

Dedication:

I dedicate this work to my **beloved parents**, whose unconditional love, sacrifices, and unwavering support have been my greatest source of strength. Their belief in me has been my driving force throughout this journey.

To my **dear brothers and sisters**, for their constant encouragement, love, and support. Your presence has made every challenge easier to overcome.

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MIAD AMINA

Abstract:

This research offers a critical reflection on contemporary urban development models in Algeria, particularly those based on vertical densification and large-scale planned cities, such as mass housing programs like AADL. While efficient in terms of capacity, these models often lead to disconnection from local contexts, loss of identity, and high environmental and economic costs.

As an alternative, the study explores horizontal densification as a more flexible and sustainable approach, better suited to local urban and semi-rural contexts. It focuses on intermediate housing models, such as Dense Individual Housing (HID) and Mixed Housing (MH), which offer a balance between density, privacy, and spatial appropriation, while avoiding uncontrolled urban sprawl. Through a contextual analysis of Sidi Serhane (Bouinan) and international case studies (e.g., Vauban, Borneo-Sporenburg, BedZED), the research develops a strategic framework based on land adaptability, social cohesion, place-based memory, and self-building logics. The findings demonstrate that horizontal densification can produce affordable, ecologically sound, and culturally embedded housing, responding effectively to today's housing challenges.

The study aims to contribute to the redefinition of urban paradigms in Algeria, moving away from imposed vertical models to support a more contextual, participatory, and gradual urbanization. It serves as a strategic tool for planners, architects, and decision-makers seeking to produce housing that is resilient, inclusive, and truly rooted in place.

Keywords: Horizontal densification, sustainable urbanism, intermediate housing, site integration, alternatives to AADL projects.

RÉSUMÉ:

Cette recherche propose une réflexion critique sur les modèles contemporains de développement urbain en Algérie, en particulier ceux fondés sur la densification verticale et les villes planifiées à grande échelle, tels que les programmes de logements massifs de type AADL. Bien qu'efficaces en termes de capacité d'accueil, ces modèles entraînent fréquemment une déconnexion des contextes locaux, une perte d'identité et des coûts environnementaux et économiques élevés.

En alternative, l'étude examine la densification horizontale comme approche plus flexible et durable, mieux adaptée aux contextes urbains et semi-ruraux locaux. Elle se concentre sur des modèles d'habitat intermédiaire, notamment l'Habitat Individuel Dense (HID) et l'Habitat Mixte (HM), qui offrent un équilibre entre densité, intimité résidentielle et appropriation spatiale, tout en évitant l'étalement urbain non maîtrisé. Par une analyse contextuelle de Sidi Serhane (Bouinan) et d'études de cas internationales (ex : Vauban, Borneo-Sporenburg, BedZED), la recherche élabore un cadre stratégique fondé sur l'adaptabilité foncière, la cohésion sociale, la mémoire des lieux et les logiques d'auto-construction. Les résultats démontrent que la densification horizontale peut générer des solutions de logement abordables, écologiquement responsables et culturellement ancrées, répondant efficacement aux défis actuels du logement.

Cette étude vise à contribuer à la redéfinition des paradigmes urbains en Algérie, s'éloignant des modèles verticaux imposés pour soutenir un processus d'urbanisation plus contextuel, participatif et progressif. Elle constitue un levier stratégique pour les planificateurs, architectes et décideurs engagés dans la production d'habitats résilients, inclusifs et authentiquement intégrés au territoire.

Mots-clés : Densification horizontale, urbanisme durable, habitat intermédiaire, intégration au site, alternatives aux projets AADL.logement.

الملخص

تتناول هذه الدراسة نقدًا معمقًا لنماذج التنمية الحضرية السائدة في الجزائر، وخصوصًا تلك المعتمدة على التكثيف العمودي وإنشاء مدن مخططة كبرى، مثل برامج السكن الجماعي من نوع .AADL ورغم فعاليتها من حيث العدد، فإنها غالبًا ما تؤدي إلى فقدان الاتصال بالمكان، وانعدام الهوية المعمارية، وارتفاع الكلفة البيئية والاقتصادية.في هذا السياق، تقترح الدراسة التكثيف الأفقي كبديل مرن ومستدام، أكثر انسجامًا مع الواقع المحلي، خصوصًا في أطراف المدن والمناطق نصف الريفية. وتعتمد هذه المقاربة على نماذج السكن المتوسط الكثافة مثل السكن الفردي المكثف (HID) والسكن المختلط(HM) ، مما يتيح التوازن بين الكثافة والخصوصية والتملك المكاني، ويحد من التمدد العشوائي .انطلاقًا من تحليل موقعي دقيق لمنطقة سيدي سرحان (بوعينان)، وبالاعتماد على دراسات حالات دولية مثلVauban ، Borneo، (BedZED، تقدم الدراسة إطارًا استراتيجيًا للتدخل الحضري يستند إلى مرونة استعمال الأرض، والاندماج الاجتماعي، وذاكرة المكان، وممارسات البناء الذاتي. وتؤكد النتائج أن هذا النوع من التكثيف يمكن أن يوفر سكنًا ميسورًا، بيئيًا، ومتجذرًا ثقافيًا.وتهدف الدراسة إلى إعادة صياغة النموذج الحضري في الجزائر، والابتعاد عن التصورات المفروضة، لصالح تحضر تشاركي تدريجي قائم على السياق. وتُعد هذه المقاربة أداة تخطيطية للمعماريين وصناع القرار الباحثين عن حلول مرنة، شاملة، وذات هوية محلية.

الكلمات المفتاحية: التكثيف الأفقي، العمران المستدام، السكن المتوسط، الاندماج في الموقع، بدائل مشاريع.AADL

List of acronyms:

AADL – National Housing Development and Improvement Agency

POS – Land Use Plan

PDAU – Master Plan for Development and Urban Planning

PLU – Local Urban Plan

RNU – National Urban Planning Regulations

VRD – Roads and Utilities (Infrastructure)

ZNIEFF – Natural Zone of Ecological, Faunistic and Floristic Interest

EPAU – Polytechnic School of Architecture and Urbanism

MIPIM – International Real Estate Professionals Market

HQE – High Environmental Quality

TVB – Green and Blue Network

SDAT – National Tourism Development Scheme

UG – Management Unit

SLD – Local Development Scheme

CNL – National Housing Fund

R+1 – Ground Floor plus One Floor

TOS – Land Occupation Ratio

COS – Floor Area Ratio (FAR)

ZAC – Joint Development Zone

CU – Urban Planning Certificate

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Chapter 1: Introductory chapter

1. General introduction

Urbanism in Algeria has undergone profound transformations since independence, shaped by political decisions, demographic pressures, and socio-economic shifts. Like many developing nations, Algeria faces accelerated urbanization driven by population growth, rural-to-urban migration, and changing lifestyles (UN-Habitat, 2020). This rapid urban expansion has redefined territorial organization, generating opportunities for development but also exacerbating challenges in spatial equity, infrastructure capacity, and environmental sustainability (Djelloul, 2015).

Historically, Algerian urban planning has been characterized by centralized, top-down interventions prioritizing quantitative housing delivery over qualitative urban integration (Addi, 2010). Government initiatives—such as the National Agency for Housing Improvement and Development (ANADL) and the Participatory Social Housing (LSP) program—have focused on mass housing production, often resulting in peripheral urban expansions disconnected from existing social and environmental fabrics (Benouar & Abdi, 2012; Ministère de l'Habitat, 2019).

A dominant strategy in this framework has been vertical densification, aligned with modernist ideals of zoning, infrastructure efficiency, and compact development (Jenks & Burgess, 2000). While theoretically advantageous for land optimization, its implementation in Algeria has revealed critical shortcomings:

Social-spatial deficiencies: Monotonous designs, lack of identity, and inadequate public amenities erode community cohesion and everyday livability (Boudiaf & Bennadji, 2016; Gehl, 2011; Talen, 2019).

Environmental trade-offs: High-rise structures often intensify energy consumption, urban heat island effects, and stormwater runoff, conflicting with climate resilience goals (Fraker, 2013; Beatley, 2011).

In response, contemporary discourse increasingly advocates for sustainable, context-sensitive models, as reflected in Algeria's National Spatial Planning Scheme (SNAT 2030). Emphasizing mixed-use zoning, human-scale neighborhoods, and ecological integration (Dovey et al., 2018; Talen, 2019), these approaches signal a shift toward adaptive, participatory planning. Yet, persistent gaps between policy aspirations and implementation

realities underscore the need for critical evaluation.

2. Research problem

Within this national context, Within Algeria's national urban trajectory, the locality of Sidi Sarhan (Wilaya of Blida) constitutes a strategically significant case study for re-evaluating contemporary housing strategies. Characterized by semi-mountainous topography, traditional settlement morphologies, and proximity to expanding urban centers, this territory faces intensifying pressures from demographic growth and spatial expansion. While vertical housing models continue to dominate Algeria's urban development paradigm, their applicability to contexts with distinct geographical and ecological sensitivities—exemplified by Sidi Sarhan—remains empirically contested and theoretically unresolved.

In response, horizontal densification—defined here as low-rise, compact, and human-scaled urban form—emerges as a theoretically grounded alternative. This model prioritizes social cohesion, environmental integration, and spatial adaptability (Dempsey et al., 2012; Gehl, 2011), offering advantages for fragile settings through:

- Enhanced community interaction and place attachment,
- Reduced disruption to natural topography and cultural landscapes,
- Improved resident-environment relationships (as visually substantiated in Figure 1.1).

Nevertheless, the implementation of horizontal densification in rapidly urbanizing contexts characterized by finite land resources necessitates critical scrutiny of both its feasibility—requiring careful balancing of density targets against land consumption imperatives—and its long-term sustainability, particularly regarding the mitigation of infrastructural inefficiencies and risks of peri-urban sprawl (Neuman, 2005). The viability of horizontal densification further hinges on reconciling three intersecting dimensions:

- Economic/Infrastructural: While potentially fostering social inclusivity, its reliance on expansive land use demands rigorous cost-benefit analysis of service delivery, long-term maintenance, and public expenditure (Neuman, 2005).
- Environmental: In ecologically sensitive zones like Sidi Sarhan, urban strategies must prioritize biodiversity conservation, climate resilience, and deforestation minimization. Horizontal models—if contextually calibrated—may offer superior

energy performance and hydrological management (Fraker, 2013), yet require empirical validation against local biophysical constraints.

This study therefore interrogates: **To what extent does vertical densification constitute a spatially appropriate and environmentally sustainable urban strategy within Algeria's contemporary urbanization context, particularly in geographically distinctive regions?**

This central problem is operationalized through four sub-questions:

- Spatial-Environmental Efficacy: Can horizontal densification achieve comparable density targets while better integrating with semi-mountainous landscapes and preserving ecological functionality?
- Socio-Spatial Performance: How might horizontal models enhance architectural diversity, place identity, and community resilience relative to vertical typologies?
- Implementation Frameworks: What economic and infrastructural limitations constrain horizontal densification, and through what planning mechanisms might they be ameliorated?
- Climate Resilience: Does horizontal development offer demonstrable advantages for long-term sustainability in climate-vulnerable regions like Sidi Sarhan?

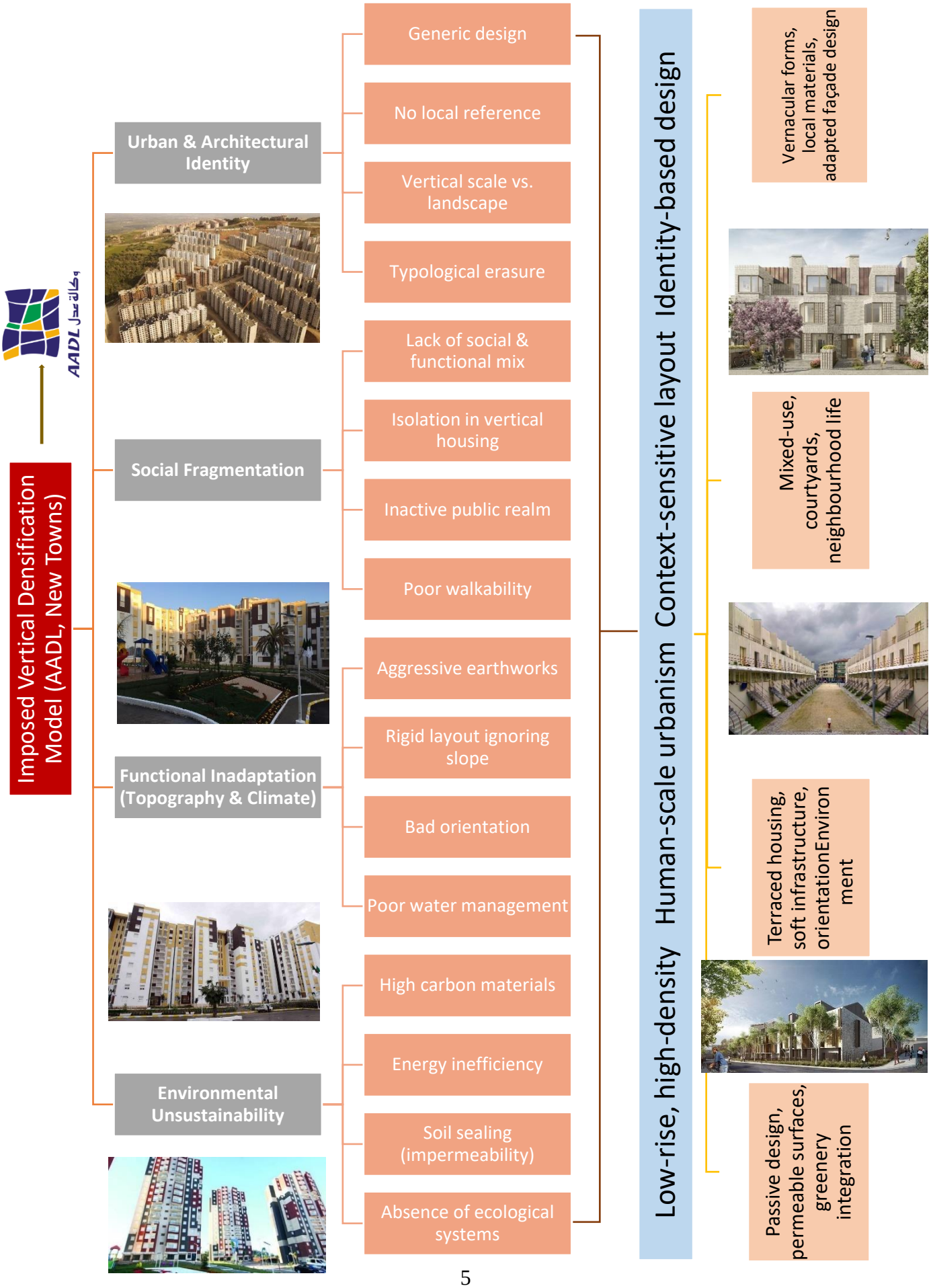


Figure 1.1 Problematic Context of Urban Densification. SOURCE : authors , 2025

3. Hypotheses

- ✓ **Hypothesis 1:** Horizontal Horizontal densification offers a more sustainable and socially cohesive alternative to vertical housing in contexts like Sidi Sarhan by fostering human-scale interactions, strengthening community bonds, and enabling deeper integration with natural landscapes.
- ✓ **Hypothesis 2:** While vertical densification demonstrates advantages in infrastructure cost-efficiency, it inadequately addresses the geographical specificities and socio-cultural fabric of semi-mountainous territories such as Sidi Sarhan.
- ✓ **Hypothesis 3:** Contextually adapted horizontal densification models can enhance *environmental preservation* and *resident well-being* in Sidi Sarhan, though land scarcity and sprawl risks necessitate strategic mitigation frameworks.

4. Research objectives

The primary objective of this research is to evaluate the viability of horizontal densification as an alternative to vertical housing in the context of Algeria's rapid urbanization. As urban expansion continues, it is essential to assess housing models that balance population growth with sustainable development. Our specific objectives are as follows:

- ➢ Assess socio-spatial impacts: Analyze how horizontal densification fosters community cohesion, place identity, and quality of life relative to vertical models in Sidi Sarhan.
- ➢ Quantify trade-offs: Compare economic costs (infrastructure, land use) and environmental outcomes (biodiversity, microclimate) of both densification strategies.
- ➢ Develop terrain-responsive frameworks: Propose planning protocols for horizontal densification that optimize land efficiency in semi-mountainous settings while minimizing ecological disruption.
- ➢ Formulate policy recommendations: Generate context-adaptive strategies for integrating horizontal models into Algeria's national urban policy (e.g., SNAT 2030 implementation).Motivating factors for thematic choice

5. Motivating factors for site choice

This research responds to critical gaps in Algeria's urban policy, where vertical

densification remains dominant despite documented socio-environmental trade-offs (Benouar & Abdi, 2012; Charmes, 2019). Thematic focus on horizontal alternatives is motivated by:

- The urgency of reconciling mass housing delivery with climate resilience in semi-arid regions (Neuman, 2005).
- Emerging global evidence that low-rise, compact forms enhance livability in topographically complex areas (Dempsey et al., 2012; Gehl, 2011).
- Policy windows opened by SNAT 2030's emphasis on "context-sensitive development" yet unmet in practice (Talen, 2019).

As for selecting Sidi Sarhan as an archetypal critical case, the main reasons are due to:

- **Biophysical sensitivity**: Semi-mountainous terrain exacerbating erosion risks and infrastructure costs.
- **Socio-cultural significance**: Traditional settlement patterns threatened by standardized vertical expansion.
- **Policy relevance**: Embodies SNAT 2030's mandate for "regionally adapted planning" amid Blida's urban growth pressures.
- **Scalability**: Lessons applicable to similar secondary cities across Algeria's Tell Atlas region.

6. Research methodology

To investigate the suitability of vertical and horizontal densification models in the context of Sidi Sarhan, this study employs a mixed-methods research approach. This methodology allows for a comprehensive evaluation that integrates both spatial and human dimensions of urban development. **Geographic Information Systems (GIS)** will be used to conduct spatial analyses of topography, land use, and settlement patterns. This tool is particularly relevant given the semi-mountainous nature of Sidi Sarhan, as it will help to assess how terrain constraints influence urban form and the feasibility of different housing typologies. In addition to GIS, **photographic surveys and field observations** will document the physical characteristics of existing developments, including building heights, street widths, green spaces, and infrastructure layout. These observations will support the visual analysis of how vertical and horizontal models integrate with the surrounding environment. To understand social dynamics and user perceptions, the study will include **semi-structured interviews** with key stakeholders such as urban planners, architects, local

authorities, and residents. This qualitative component will explore perceptions of livability, accessibility, and social cohesion in different housing configurations.

Lastly, a **comparative matrix** will be developed to evaluate both housing models across environmental, social, and economic criteria. This tool will facilitate a systematic analysis of advantages and limitations of each approach. By triangulating these various methods, the study aims to produce well-rounded insights that can inform more context-sensitive and sustainable urban planning strategies (Yin, 2018; Dovey et al., 2018).

7. Thesis Structure:

To achieve the objectives outlined above, our research will be structured into three main chapters, followed by a conclusion. as shown in the figure below (figure 1.2)

First Chapter: General Introduction

This chapter introduces the thematic approach and outlines the research problem, including the choice of topic, the research hypothesis, and the objectives of the study. It will also provide a brief overview of the content of each subsequent chapter.

Second Chapter: Thematic Reading

This chapter is divided into two main sections:

- ✓ **First Section:** This theoretical section provides a comprehensive review of the key concepts of the theoretical framework, drawing from reference works, scientific reviews, publications, and master's theses. It explores the notions of "habitat" and "to inhabit," and delves into the concept of individual housing within Dense Individual Housing (DIH). The section examines the historical emergence of DIH, its defining characteristics, and its relationship with density and other indicators (present and future).
- ✓ **Second Section:** This section presents a thematic analysis of four examples of dense individual housing projects. These examples are selected to support the theoretical framework discussed earlier and provide a deeper understanding of how such housing is structured to maintain intimacy while promoting density. This part also aims to identify the mechanisms and success factors behind these housing models.

Third Chapter: Case Study

This chapter focuses on the study of Bouinan as the case area and is divided into three parts:

- ✓ **First Section:** A presentation of the city of Bouinan and its geographical context.
- ✓ **Second Section:** A diachronic analysis of Sidi serhan , examining the historical influences that have shaped its urban and architectural development.
- ✓ **Third Section:** An analysis of the city's growth through the morphological framework of Philippe Pannier, providing recommendations for future urban planning projects.
- ✓ **Fourth Part: Project**
- ✓ In this section, we will formalize the project based on the findings from the previous chapters. The principles of intervention will be discussed, addressing the issues identified and the recommendations made. This part will include the layout principles for the project, as well as the graphic documentation such as layout plans, cell designs, facades, and other related elements.

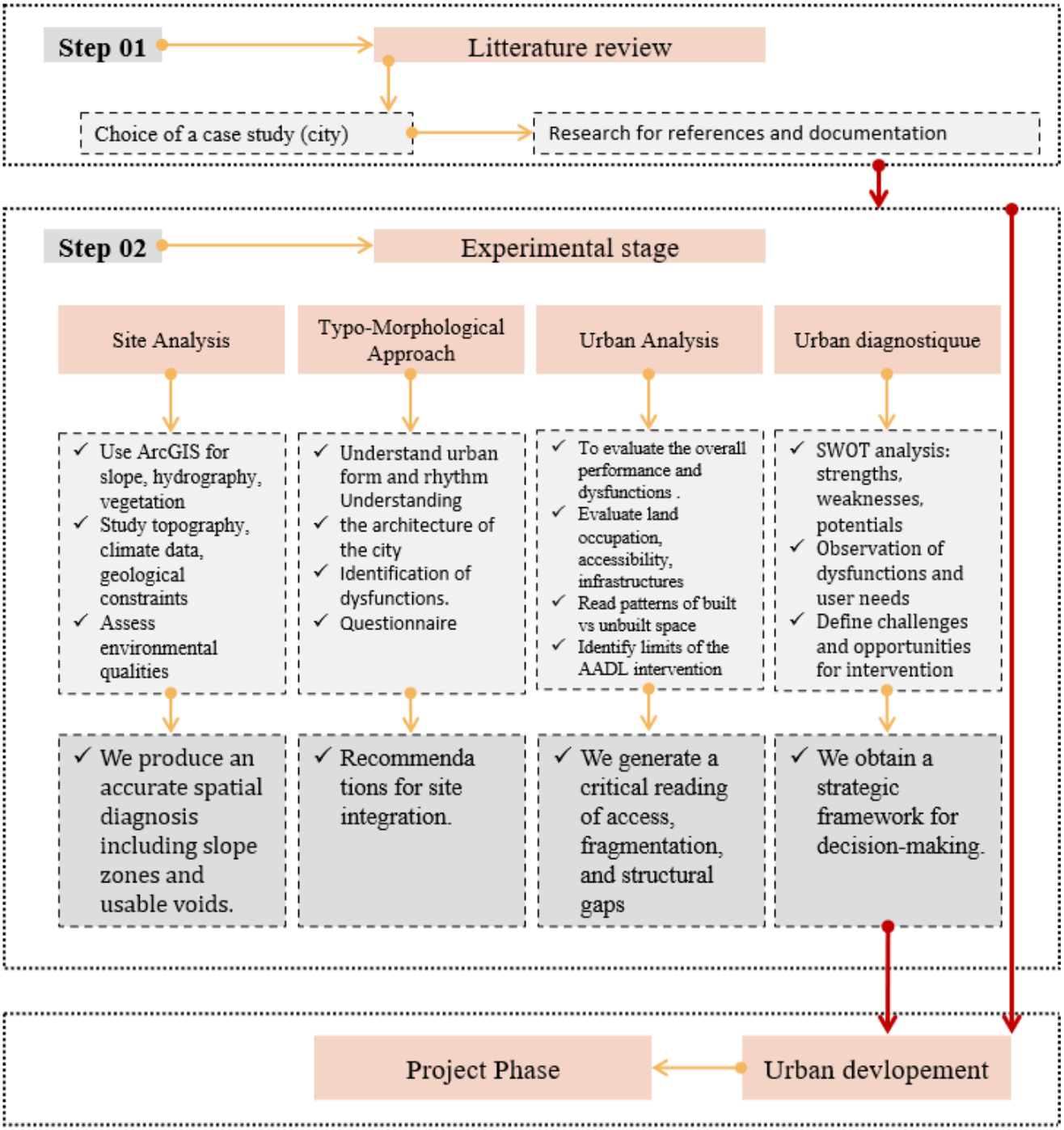


Figure 1.2 Structural Diagram of the Research Approach

Source: Author, 2025

Chapter 2:

Theoretical background & case studies analysis

Introduction:

Contemporary urban development must balance rapid population growth with environmental sustainability and social cohesion (UN-Habitat, 2020; Dempsey et al., 2012). In Algeria, vertical densification—especially through state-led programs like AADL—has dominated planning policies (Boudghene-Stambouli, 2003; Ministry of Housing, 2019). However, this model often results in social disconnection, design monotony, and environmental stress (Gehl, 2011; Fraker, 2013). As an alternative, **horizontal densification** promotes human-scaled development better suited to natural landscapes and local identities (Newman & Kenworthy, 2006; Talen, 2012). It enhances walkability, neighborhood interaction, and ecological integration (Jacobs, 1961; Beatley, 2000). This chapter explores theoretical concepts underpinning such alternatives. It first defines the **counter-project**—a participatory and context-sensitive approach that challenges conventional urbanism (Harvey, 2008; Lefebvre, 1991; Sandercock, 1998). Next, it examines **urban density** through morphological, functional, and perceptual lenses (Alexander, 2020; Dovey & Pafka, 2016), supported by metrics like FAR and population density (Berghauser Pont & Haupt, 2010; Jenks & Dempsey, 2005). The chapter also compares vertical and horizontal **densification** models and highlights **low-rise, high-density housing** as a more adaptable option for sites like Sidi Serhane (Hakim, 2014; Oliver, 2003; Gehl, 2011). Finally, it introduces **urban compactness**, which integrates density, sustainability, and inclusion (Ratti & Claudel, 2016; Talen, 2005; Beatley, 2000), forming a conceptual foundation for evaluating Algeria's urban planning strategies.

1. Literature review & key concepts:

1.1. Counter-Projects in Urban Planning

1.1.1. Definition of a Counter-Project

In urban planning, a counter-project is an alternative proposal or intervention designed to challenge, refine, or reframe prevailing development paradigms. Counter-projects emerge as critical responses to mainstream planning approaches—often those that prioritize rapid densification or standardized development. Rather than simply opposing existing proposals, counter-projects aim to introduce innovative spatial, social, and environmental solutions that address local needs and contextual peculiarities. They are typically rooted in participatory processes, engaging community stakeholders to articulate visions that contrast with top-

down planning practices (Harvey, 2008). as shown in the figure (figure 2.1)

A counter-project can serve several functions: it might offer a reimagined urban design that promotes inclusivity and sustainability; it may highlight the shortcomings of existing projects, such as the loss of public space or social fragmentation; or it may propose hybrid strategies that integrate both vertical and horizontal densification while preserving ecological integrity and cultural identity. In essence, counter-projects are about fostering alternative narratives in urban development that are responsive to socio-environmental challenges and local aspirations (Lefebvre, 1991).

Figure 1-1 example of a Counter-Project

Source : Jeff Goldberg/ESTO, 2020

1.1.2. Principles Underpinning Counter-Projects

Counter-projects in urban planning rest on several core principles that distinguish them from conventional planning initiatives: as shown in the figure below (figure 2.2)

- **Context-Sensitivity:** Counter-projects prioritize local context—cultural heritage, environmental conditions, and community dynamics—over generic, one-size-fits-all models. They aim to create spaces that resonate with the identity and history of a place (Harvey, 2008).
- **Participatory Engagement:** A hallmark of counter-projects is their collaborative nature. By actively involving local communities, these projects seek to democratize the planning process, ensuring that development meets the real needs and aspirations of residents (Sandercock, 1998).

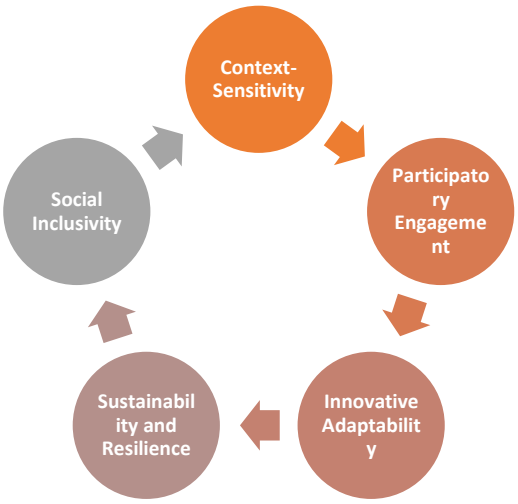


Figure 1-2 : Principles Underpinning Counter-Projects

Source : Author, 2025.

- **Innovative Adaptability:** Counter-projects embrace flexibility and innovation, often incorporating adaptive design strategies that can evolve over time. This approach recognizes that urban environments are dynamic, and planning interventions must be capable of adjusting to changing conditions (Lefebvre, 1991).
- **Sustainability and Resilience:** Sustainability is central to counter-projects. They advocate for environmentally sound practices, such as green infrastructure, renewable energy integration, and water-sensitive urban design, to reduce ecological impacts while enhancing urban resilience (Beatley, 2000).
- **Social Inclusivity:** Counter-projects emphasize the creation of inclusive, mixed-use environments that foster social interaction and equity. By integrating diverse housing typologies and public spaces, these projects work to counter social fragmentation and promote community cohesion (Jacobs, 1961).

1.1.3. Typologies of Counter-Projects

Counter-projects manifest in various forms, each tailored to specific urban contexts and objectives. Some common typologies include:

- **Community-Led Redevelopment:** These initiatives are driven by local residents and grassroots organizations. An example is the transformation of derelict urban areas into community gardens, cultural hubs, and cooperative housing, which challenge traditional top-down redevelopment models.
- **Eco-Urban Interventions:** Focused on sustainability, these counter-projects integrate green infrastructure and ecological design principles. Projects like the High Line in New York City, which repurposed an abandoned elevated railway into a vibrant public park, exemplify how counter-projects can redefine urban spaces in environmentally innovative ways (Lindsey, 2012).
- **Cultural and Creative Districts:** Counter-projects can also emerge as efforts to preserve and revitalize cultural heritage. In many European cities, initiatives aimed at repurposing historic buildings for creative industries and community spaces serve as counterpoints to uniform urban regeneration schemes.
- **Hybrid Urban Models:** Some counter-projects blend elements of both vertical and horizontal densification while incorporating public and green spaces. These hybrid models strive to maintain urban vibrancy and social interaction, countering the isolating effects sometimes observed in high-rise developments (Talen, 2012).

1.2. From density…

1.2.1. The Concept of Density

Density refers to the measurable relationship between a given element—such as population, employment, or built space—and a defined area. It is a multifaceted concept that can be understood from several perspectives: the physical (morphological), the functional (usage), and the perceptual (how crowded an area feels). In urban planning, these distinctions are crucial because density directly influences spatial organization, infrastructure efficiency, and overall urban quality of life (Alexander, 2020; Dovey & Pafka, 2016).

Morphological Density relates to the physical extent of the built environment. Metrics such as the Floor Area Ratio (FAR) and Net Density indicate how much of a given land area is built up, thereby influencing the urban form and land-use efficiency. **Functional Density** covers aspects like population and activity density. Population density—defined as the number of inhabitants per unit area—affects social interactions, demand for services, and transportation efficiency (Jacobs, 1961). Activity density, on the other hand, measures the concentration of economic, social, and cultural activities, which can enhance neighborhood vibrancy and accessibility (Gehl, 2010). **Perceptual Density** is the subjective experience of crowding or openness, which does not always directly correlate with measured physical density. This dimension highlights that two areas with similar quantitative density can feel

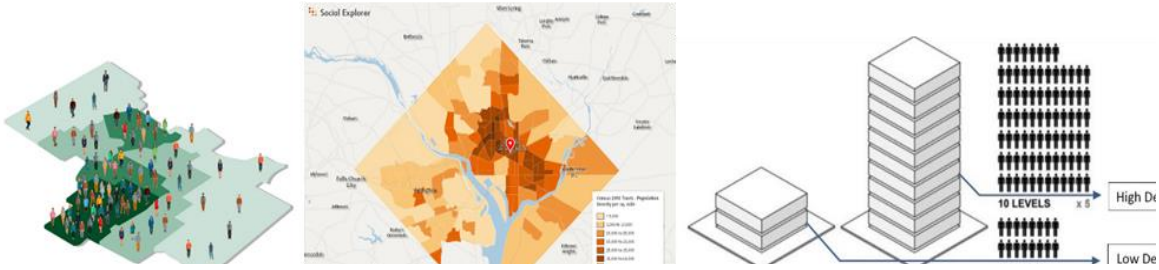


Figure 2.3 : Density Typologies in Urban Studies: Population, Activity & Perceptual Linkages
source : Digital image from usp100.weebly.com

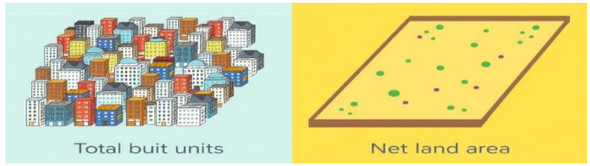
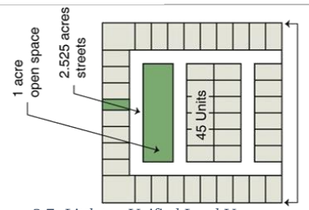
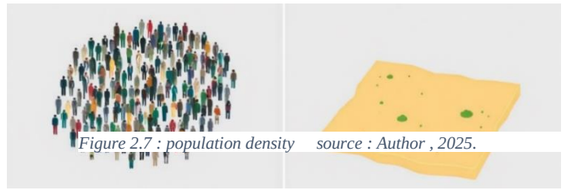
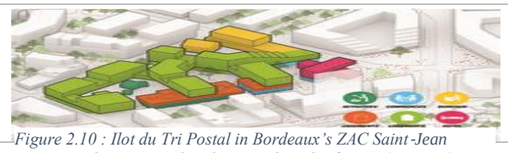
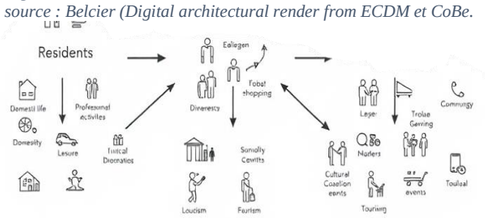
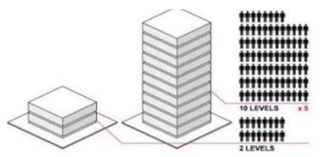
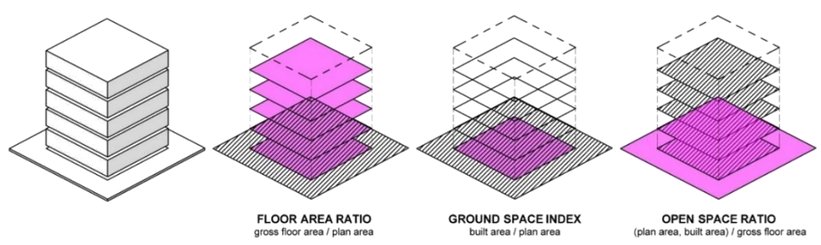
very different depending on design, layout, and the provision of public spaces. (figure 2.3)

Understanding these diverse aspects is essential for urban planners aiming to create cities that are both efficient and livable.

1.2.2. Measuring Urban Density

Urban density is measured through key indicators, each reflecting a different urban dimension. (table 1)

Table 1 urban density, measures and caractersticsz

	Definition	Formula	Key Characteristics
Gross Density	Measures the total number of inhabitants or built units over a defined land area, including streets, public spaces, and infrastructure. It offers a general overview of urban concentration **(Angel et al., 2012)** (figure 2.4).	Gross Density = Total Population or Units / Total Land Area  *Figure 2.4 : gross density source :* Author, 2025.  *Figure 2.5: Screenshot of Dayton source : Texas UDC document viewer*	- Includes all land uses (residential, roads, parks, etc.)- Useful for large-scale urban comparisons- May overestimate intensity in areas with extensive non-built land **(Angel et al., 2012) (figure 2.5).**
Net Density	Focuses on land designated for specific uses such as residential, commercial, or institutional, excluding public and infrastructural spaces. It gives a clearer picture of functional land use **(Jenks & Dempsey, 2005; Alexander, 1993)** (figure 2.6).	Net Density = Total Built Units or Area / Net Land Area  *Figure 2.6: net density source :* Author, 2025.  *Figure 2.7: Littleton Unified Land Use source : Code Interface*	- Excludes streets and public open spaces- Better for neighborhood or site-scale planning- Helps optimize infrastructure and services **(Jenks & Dempsey, 2005; Burton, 2002) (figure 2.7).**
Population Density	Represents the number of people living per unit of land area, typically expressed in inhabitants per hectare. Used to guide infrastructure and public service planning **(Jacobs, 1961; Burton, 2002)** (figure 2.7).	Population Density = Inhabitants / Land Area (ha)  *Figure 2.7 : population density source : Author , 2025.*  *Figure 2.8 : pop density*	- Core metric for demographic analysis- Influences transport, utilities, and amenities- High density supports walkability and services **(Jacobs, 1961; Burton, 2002) (figure 2.8).**
Content	Refers to the physical mass or volume of built form within a given area, regardless of how many people occupy it **(Dovey & Pafka, 2016)** (figure 2.9).	 *Figure 2.9 : content density*  *Figure 2.10 : Ilot du Tri Postal in Bordeaux's ZAC Saint-Jean source : Belcier (Digital architectural render from ECDM et CoBe.*	- Measures the extent of construction- Indicates physical urban intensity- High content density can still be underutilized **(Dovey & Pafka, 2016) (figure 2.10).**
Use Density	Measures the number of people using or occupying a built environment (residents, workers, visitors). It reflects human activity, regardless of built form **(Boyko & Cooper, 2011; Talen, 2005)** (figure 2.11).	 *Figure 2.11 : use density source : Author , 2025.*  *Figure 2.12 : use density source : Author , 2025*	- Measures intensity of use, not built mass- Essential for evaluating vitality and liveliness- Balanced via Land Use Coefficient (LUC) **(Boyko & Cooper, 2011; Talen, 2005) (figure 2.12).**
Floor Area Ratio (FAR)	Indicates the total usable floor area of a building relative to the size of its land parcel. It helps determine how intensively land is developed **(Berghauser Pont & Haupt, 2010; Alexander, 2012)** (figure 3.8).  *Figure 2.14 density in a residential devlopement source : Digital image from usp100.weebly.com*	FAR = Total Floor Area / Total Land Area  *Figure 2.15 : floor area source : Digital image from usp100.weebly.com*	- Higher FAR = more vertical development- Commonly used in zoning codes- Directly affects urban form and density **(Berghauser Pont & Haupt, 2010; Alexander, 2012) (figure 2.14) .**  *Figure 2.14 : floor area source : Digital mockup from Mathys Ringard's 2024 portfolio*

1.2.3. Density and Urban Form: Typological Implications

While density is often represented through numerical indicators—such as Floor Area Ratio (FAR), net residential density, or population per hectare—its real impact is most visible in the **physical configuration of the urban fabric**. This is where **urban form typologies** play a crucial role in translating quantitative density into tangible environments that affect how people live, move, and interact (Alexander, 2020; Dovey & Pafka, 2016). Urban density can be realized in multiple morphological expressions, ranging from **high-rise, low-density (HRLD)** developments—where population is concentrated vertically over large open spaces—to **low-rise, high-density (LRHD)** configurations that emphasize compactness, walkability, and human-scale environments. Each model represents a distinct spatial logic, with unique implications for **livability, infrastructure performance, and environmental sustainability** (Gehl, 2010; Talen, 2012).

1.2.4. Linking Density Measures to Urban Form

In practice, the choice between HRLD and LRHD is context-dependent. Urban environments like Sidi Sarhan in Bouinan, for example, face unique challenges due to their semi-mountainous terrain and ecological sensitivities. In such cases, adopting an LRHD model may offer a more context-sensitive solution. By concentrating development horizontally rather than vertically, (figure 2.15) planners can maximize land use without sacrificing the environmental and social benefits associated with a human-scale urban form. Conversely, in metropolitan areas where land is scarce and demand for premium housing is high, High-Rise, High-Density (HRLD) models may offer a viable solution. These vertical configurations maximize land use efficiency and accommodate growing populations within limited footprints. However, such models require careful integration of green spaces, communal areas, and essential services to mitigate the potential downsides, including social isolation, increased infrastructure pressure, and loss of human-scale urbanity (Glaeser, 2011; Alexander, 1977). Their success depends largely on thoughtful urban design that fosters livability and social interaction. (table 2)

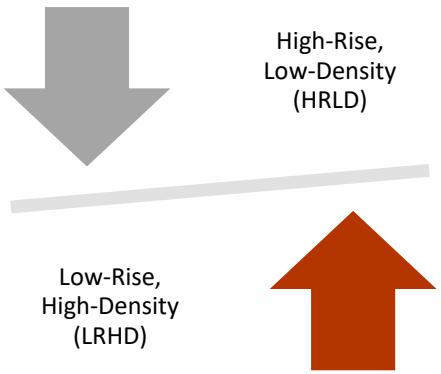


Figure 2.15 : Linking Density Measures to Urban Form
source : Author , 2025.

Table 2 Comparative Analysis of Urban Forms HRLD vs LRHD vs MRMD

	Définition	**Avantages**	**Contraintes**	**Contexte d'application**
HRLD *(High-Rise, Low-Density)*	Ce modèle se caractérise par la construction de tours de grande hauteur contenant un nombre limité d'unités par étage. Il privilégie l'exclusivité résidentielle, les vues panoramiques et la présence d'espaces verts importants au sol (Glaeser, 2011) (figure 2.16).  *Figure 2.16 : Low-Rise, High-Density Housing Schema Source: Wikipedia, n.d.*	Il offre une qualité de vie élevée grâce à des logements spacieux, des équipements haut de gamme et une forte présence végétale. Les charges sur les réseaux sont réduites, et l'environnement urbain est souvent perçu comme apaisé (Beatley, 2000 ; Talen, 2012) (figure 2.17).  *Ronacrete Promotional Leaflet Source: Sika – Ronacrete, 2023.*	Ce modèle génère souvent un isolement social dû à la faible densité au sol et une animation urbaine limitée. Il peut entraîner un sous-usage des infrastructures et une dépendance à la voiture (Alexander, 1977 ; Carmona et al., 2010) (figure 2.18).  *Figure 2.18 : High-rise buildings in urban setting Source: TungCheung/Shutterstock (via Cruise Critic), 2019.*	–Adapté aux métropoles où le foncier est rare, ou aux projets de prestige (tours résidentielles, éco-resorts). Il convient également aux zones à préserver écologiquement tout en construisant en hauteur (Glaeser, 2011). (figure 2.19)  *Figure 2.19: Recent City Wallpaper Source: WallpapersCraft, n.d.*
(MRMD) *Mid-Rise Moderate-Density*	RMD includes buildings of 4–8 stories, balancing vertical and horizontal development. It supports compact, livable cities without extreme height or sprawl. The model enables sustainable growth at a human scale, adaptable to various urban fabrics (Gehl, 2010; Carmona et al., 2010) (figure 2.20).  *Figure 2.20 : 26 Millwood – Four-Storey Low-Rise Housing in Toronto Source: Smart Density, pre-construction.*	RMD includes buildings of 4–8 stories, balancing vertical and hor compact, livabl sprawl. The mo a human scale, a (Gehl, 2010; Ca (figure 2.21).  *Figure 2.21 : FE Magazine Spring 2024 Feature Source: FE Magazine, 2024.*	RMD includes uildings of 4–8 tories, balancing ertical and horizontal levelopment. It upports compact, ivable cities without extreme height or sprawl. The model enables sustainable growth at a human scale, adaptable to various urban fabrics (Gehl, 2010; Carmona et al., 2010) (figure 2.22).  *Figure 2.22 : Studio JCI "Missing Middle" Developments Source: Studio JCI, 2023.*	RMD includes buildings of 4–8 stories, balancing vertical and horizontal development. It supports compact, livable cities without extreme height or sprawl. The model enables sustainable growth at a human scale, adaptable to various urban fabrics (Gehl, 2010; Carmona et al., 2010) (figure 2.23).  *Figure 2.23 :*
LRHD(*Low-Rise, High-Density*)	Ce modèle privilégie des bâtiments de faible hauteur (1 à 3 niveaux), organisés de manière dense et compacte, permettant une occupation rationnelle du sol tout en respectant l'échelle humaine (Newman & Kenworthy, 2006) (figure 2.24).  *Figure 2.24 : 19th-Century Row Houses in Toronto source: Khajenoori (Bardiak), 2007.*	Il favorise la mixité fonctionnelle et sociale, encourage les mobilités douces et facilite l'interaction entre habitants. Il est aussi plus facilement adaptable aux contextes topographiques complexes (Talen, 2012) (figure  *Figure 2.25 : "The Residences at Sandford Lodge" Source: Jamie Hackett Photography for Shay Cleary Architects, 2023.*	Un  *Figure 2.26 : Australian Low-Rise, High-Density Housing Examples Source: Users on SkyscraperCity forum, ~2015* mauvais agencement peut engendrer une densité étouffante. Le besoin d'un bon équilibre entre espaces bâtis et ouverts nécessite une planification précise (Carmona et al., 2010). La pression sur les services peut être forte si la densité est mal maîtrisée (figure 2.26).	Idéal dans les villes de taille moyenne, zones semi-rurales ou à forte identité locale. Il est recommandé dans les contextes culturels ou naturels qui limitent l'expansion verticale, comme à Bouinan ou Sidi Serhane (Newman & Kenworthy, 2006). (figure 2.27)  *Figure 2.27: McGrath Road "Casbah" Social Housing Source: Morley von Sternberg / The Guardian, 2018.*

1.3. … to densification

1.3.1. The Concept of Densification

Urban densification has long been employed as a strategy to manage population growth and optimize land use. Since the Industrial Revolution, cities have increasingly densified to accommodate economic expansion and the influx of rural-to-urban migrants (Hall, 1998). In Algeria, densification accelerated after independence, particularly through state-led housing programs such as AADL and LSP, which aimed to counter rapid urbanization and address housing shortages (Boudghene-Stambouli, 2003) (figure 2.28).

Figure 2.29 : FE Magazine Spring 2024 Feature
Source: FE Magazine, 2024.

Densification, in essence, involves increasing the built environment within a given area to maximize land efficiency while curbing urban sprawl (Awotona, 2000). It entails the intensification of residential, commercial, or mixed-use developments with the goal of creating more sustainable and livable urban spaces (Tracada & Ostwald, 2010). In urban planning, densification is understood as a deliberate increase in urban density to support efficient public transport, stimulate economic activity, and foster social interaction (Punter, 2015). This process can take various forms—from low-density suburban housing to medium-density townhouses and ultimately to high-density high-rise constructions (Smith & Jones, 2018). Key drivers include population growth, land scarcity, environmental concerns, and the demand for affordable housing (Newman & Kenworthy, 2006). In Algeria, planners face the challenge of balancing densification with social cohesion, infrastructural capacity, and environmental sustainability (Angel, 2012).

1.3.2. Reasons for Urban Densification

Urban densification has emerged as a crucial response to rapid population increases and the consequent need to optimize land use. Historically, cities expanded outward to accommodate growth; however, without proper planning, this resulted in urban sprawl and inefficient infrastructure (Angel et al., 2011). Limited land availability further necessitates compact urban development to improve resource management and ensure accessibility

(Newman & Kenworthy, 2006).

Beyond the spatial benefits, densification supports environmental sustainability by reducing travel distances, encouraging the use of public transport, and lowering overall energy consumption (Ewing & Cervero, 2010). Higher-density neighborhoods tend to foster walkability, enhance social interaction, and improve access to services—key factors in promoting urban livability (Gehl, 2010). Moreover, increasing housing supply within existing urban fabrics can help address affordable housing challenges, making cities more inclusive and economically viable (Burchell & Mukherji, 2003).

1.3.3. Methods of Densification

Urban densification refers to strategies aimed at increasing the number of people or housing units within a given urban area, without expanding the city's physical boundaries. It is a critical response to challenges such as rapid urban growth, land scarcity, and environmental degradation. Densification can occur through various methods, including vertical densification, which involves building upwards using high-rise structures, and horizontal densification, which increases density by infilling vacant plots or transforming existing low-density areas with more compact housing models (Jenks & Burgess, 2000) (figure 2.29).

Figure 2.29 : . The Interlace, Singapore. Photograph by Iwan Baan. Source : Ole Scheeren's vertical village wins World Building of the Year,Dezeen, 2015

. Another approach, mixed-use densification, integrates residential, commercial, and public functions within the same built environment, promoting vibrancy and reducing reliance on car travel (Talen, 2005). Each method has specific implications on urban form, infrastructure, social cohesion, and environmental impact. For instance, vertical densification often leads to more efficient land use but may risk alienating residents if not accompanied by green and communal spaces (Glaeser, 2011). Conversely, horizontal models may preserve human scale but demand more land and careful planning to avoid sprawl (Alexander, 1977). The choice of densification method should therefore be context-sensitive, balancing population needs, cultural values, and ecological resilience. (table 3)

Vertical Densification

Horizontal Densification

Definition

Vertical densification refers to the process of increasing population and functional density by building upward, typically through the development of high-rise buildings. This model enables cities to accommodate growing populations on limited land parcels while limiting the spatial expansion of urban areas. It is particularly beneficial in metropolitan regions with high land value and limited buildable space (Newman & Kenworthy, 2006; T

Figure 2.30 : Cité Radieuse of Briey (Val de Briey) Source: Humbert / Meurthe-et-Moselle Tourism,

Horizontal densification involves increasing the intensity of land use by promoting compact, low-rise development. Instead of expanding upward, this strategy builds outward within an existing urban footprint to preserve the human scale of neighborhoods. It enhances community life, accessibility, and walkability while preventing vertical alienation and architectural rupture (Talen, 2012; Newman & Kenworthy, 2006) (figure 2.31) .

Figure 2.31 : Curated Architectural Moodboard Source: Pinterest, n.d.

Key Principles

- **Efficient Land Utilization**: High-rise structures are designed to occupy minimal land area while providing extensive floor space across multiple levels (Newman & Kenworthy, 2006). - **Mixed-Use Integration**: Vertical densification often combines residential, commercial, and office spaces in one structure, thereby reducing commuting times and encouraging local economies (Carmona et al., 2010). - **Connectivity and Transit-Oriented Development**: These developments are typically centered around major public transport hubs to reduce car reliance and improve accessibility (Cervero, 1998).(figure 2.33)- **Technological and Structural Innovation**: The success of high-rise living depends on advanced construction materials, smart systems, and energy-efficient design (Beatley, 2000). - **Green and Shared Spaces**: To mitigate the impact of verticality, public areas such as rooftop gardens and communal terraces are included to enhance social interaction and environmental performance (Montgomery, 2013).

Figure 2.32 : High-rise structures Source: CITY Linked team page, n.d.

- **Efficient Land Use through Compact Layouts**: Low-rise structures are densely arranged to maximize land use without compromising outdoor access or spatial quality (Newman & Kenworthy, 2006). - **Functional and Social Diversity**: Horizontal models promote mixed-use zoning where residential, recreational, and economic activities coexist within short distances, supporting vibrant urban life (Gehl, 2011). - **Active Mobility and Connectivity**: Emphasis is placed on pedestrian-friendly and bicycle-friendly infrastructure, limiting car dependency and enhancing accessibility for all users (Cervero, 1998). (figure 4.5)- **Social Inclusion**: By incorporating various housing typologies, horizontal densification accommodates different income levels and family types, reinforcing social equity and cohesion (Jacobs, 1961). - **Environmental Integration**: These projects integrate sustainable practices like stormwater management, native vegetation, and passive solar design to ensure ecological balance (Beatley, 2000) (figure 2.32).

Figure 2.33 : Belgravia Ace – Modern Strata-Landed Residences, Singapore Source: JGP Architecture Pte Ltd (for Tong Eng Group), 2024

Urban Typologies

- **High-Rise Residential Towers**: Common in dense cities like Hong Kong or New York, these towers offer compact units that address the need for high-capacity housing within constrained footprints (Glaeser, 2011).
- **Mixed-Use Skyscrapers**: These are vertical buildings combining apartments, offices, retail, and hotels in one structure, providing 24/7 activity hubs (Levine, 2005) (figure 2.33).
- **Podium Towers**: Featuring commercial functions at the base and residential or office spaces above, podium towers activate the street level while supporting high density (Carmona et al., 2010) (figure 2.34).
- **Vertical Urban Villages**: Inspired by community-oriented living, these towers include shared amenities such as co-working spaces, communal kitchens, or gyms (Register, 2006).
- **High-Rise Superblocks**: As seen in urban renewal plans in Barcelona or Seoul, these include clusters of towers with shared open spaces, courtyards, and transit access (Talen, 2012).(figure 2.36)

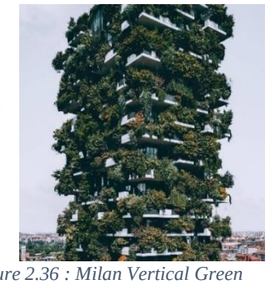


Figure 2.36 : Milan Vertical Green Façade Source: Acosta, 2023.

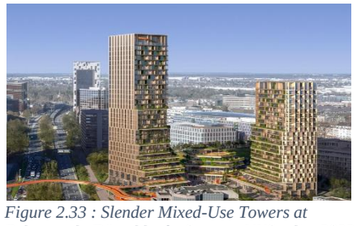


Figure 2.33 : Slender Mixed-Use Towers at Belsenpark, Düsseldorf Source: UNStudio, 2022.

Figure 2.34 : Grand Tower – Skyline Plaza, Frankfurt Source: Daniel Šafárik & Magnus Kaminiarz & Cie Architektur,

Figure 2.35 : Barcelona from Above Puzzle Source: Ravensburger, 2019.

- **Townhouses and Row Houses**: These compact, attached homes are arranged in rows with private or shared outdoor spaces, offering a high density of units while maintaining individuality and street continuity (Scheer, 2010).)(figure 2.37)
- **Cluster Housing and Courtyard Blocks**: Dwellings are grouped around shared green spaces or courtyards to encourage neighborly interaction. Historical precedents include riads in North Africa or siheyuans in China (Hakim, 2014).(figure 2.38)
- **Garden Apartment Communities**: Low-rise buildings are distributed around central gardens or courtyards, combining the benefits of open space with moderate density (Garnett, 2015). (figure 2.39)
- **Linear Urban Villages**: These settlements develop along major transport corridors, enabling easy transit access and supporting walkable neighborhoods, especially in Scandinavian countries (Cervero, 1998).- **Zero-Lot-Line Housing**: This typology places homes at or near the edge of property lines, maximizing usable land and increasing the total number of units on a site (Southworth, 2003).

Figure 2.37: Urban Regeneration Typologies in Dalang (PRD) Source: Qu, 2023.

Figure 2.38 : Adaptive Architecture Moodboard Pin Source: Pinterest, n.d.

Figure 2.39 : Versatile Cluster Housing Prototype Source: WHA Blog, 2020.

Table 3 Comparative Analysis of Vertical and Horizontal Densification

1.4. Concept of Compactness in Urban Habitat

1.4.1. Definition

Compactness in urban habitat refers to an efficient land-use model that concentrates residential, commercial, and public spaces within a well-connected, walkable, and transit-oriented framework. By reducing urban sprawl, compact urbanism maximizes the utilization of infrastructure, energy, and services while fostering environmental sustainability and social cohesion (Newman & Kenworthy, 2006) (figure 2.40). Historically, this approach is rooted in traditional urban forms found in medieval European cities, Islamic courtyard housing, and traditional Asian settlements—contexts in which limited land prompted high-density, mixed-use development (Hakim, 2014). Today, cities such as Tokyo, Copenhagen, and Singapore employ compact urban strategies through vertical urbanism, mixed-use zoning, and smart infrastructure to enhance both efficiency and livability (Ratti & Claudel, 2016).

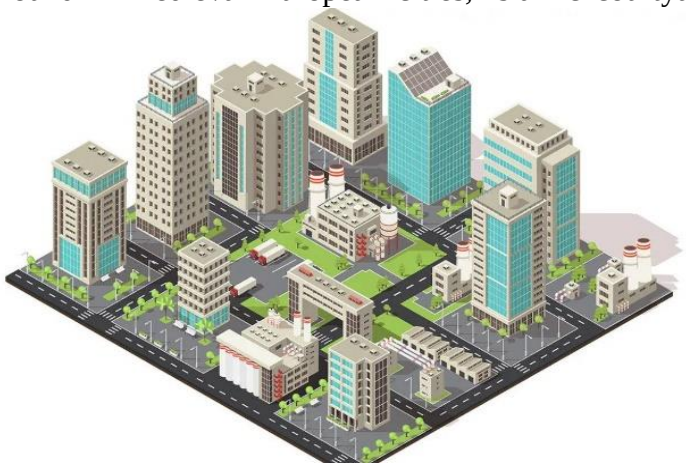


Figure 2.40 : Compact Urban Illustration of compact urban form. Source : Compact Urban Form," by Hazal Koç, Urban Design Lab, 2023

1.4.2. Key Characteristics and Principles

Compact urban environments are characterized by several key features that guide their design and functionality. High density is prioritized to optimize land use while avoiding overcrowding. Mixed-use development integrates residential, commercial, and cultural spaces, fostering vibrant and active neighborhoods (Jacobs, 1961). Walkability and connectivity are essential, with pedestrian-friendly streets and robust public transportation networks emphasized to reduce car dependency. Environmental sustainability is achieved through green infrastructure, renewable energy, and water-efficient design (Beatley, 2000). Social inclusivity is also a core principle, providing diverse and affordable housing options that support varied demographic groups.

The principles underpinning compact urban habitat further elaborate on these characteristics. Efficient land use through densification limits urban sprawl and protects natural landscapes, as exemplified by Hong Kong's high-rise housing near transit hubs (Talen, 2012). Mixed-use integration reduces commuting distances and fosters community vitality, as seen in Copenhagen's Finger Plan (Jacobs, 1961). Transit-oriented development prioritizes mass transit, cycling, and pedestrian routes, effectively reducing reliance on private vehicles—Barcelona's Superblocks illustrate this well (Cervero, 1998). Sustainability is embedded via eco-friendly materials and water-sensitive designs, demonstrated by Singapore's green buildings (Beatley, 2000). Social interaction is encouraged by designing shared public spaces and social housing, with Parisian perimeter blocks being a notable example (Gehl, 2011). Lastly, adaptive and resilient design ensures urban forms can adjust to climate change, demographic shifts, and economic transformations, such as Tokyo's evolving micro-apartments (Brand, 1994) (figure 2.41).

Figure 2.41 : Haussmannian apartment interior in Paris, featuring ornate moldings, parquet flooring, and tall windows. Source : Haussmannian Apartment in Paris: What Makes It So Special? Book

1.4.3. Typologies of Compact Urban Habitat

- Dense Residential Typologies

– **Perimeter Block Housing:** Buildings arranged in rectangular or square formations that enclose a central courtyard. Forexample (figure 2.42)Parisian Haussmann-style blocks maximize density while providing communal green spaces (Carmona et al., 2010).

Figure 2.42 :joint building ventures source : a new way to build and live together," Scan Magazine, 2024.

– **Courtyard Housing:** Residences organized around an internal courtyard, enhancing privacy and promoting passive climate control. Traditional Moroccan riads and Chinese siheyuan exemplify this typology (Hakim, 2014) (figure 2.43).

Figure 2.43 : Traditional Moroccan riad courtyard. Source : "What Is a Riad? Your Guide to Morocco's Unique Stays," Open Doors Morocco, 2024.

- **Terraced Housing:** Row houses that share walls to optimize land use while preserving individual outdoor spaces. The Victorian terraces in the UK are a classic example (Whitehand, 1992) (figure 2. 44)
- **Cluster Housing:** Homes arranged around shared green courtyards, balancing high density with opportunities for social interaction. Scandinavian co-housing communities highlight this approach (Kelbaugh, 2002).
- **Mixed-Height Blocks:** Developments that combine low-rise, mid-rise, and high-rise structures to create a varied yet compact urban fabric. Berlin's adaptive housing models illustrate the successful blending of multiple typologies (Montgomery, 2013).

- Mixed-Use and Transit-Oriented Typologies

- **Live-Work Units:** Spaces that combine residential and commercial functions, reducing commute times and fostering entrepreneurial activity (figure 2.45). New York's loft apartments are a prominent example (Levine, 2005) .

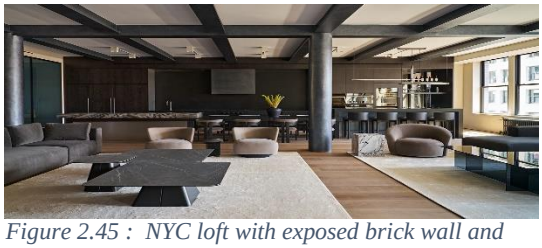


Figure 2.45 : NYC loft with exposed brick wall and open plan. Source : "NYC Loft Design Ideas," by Jorge Fontan, Fontan Architecture, 2023.

- **Pod Housing (Co-Living Spaces):** Small, modular units designed for affordability and flexibility, often arranged in co-living formats (figure 2.46). Tokyo's capsule hotels and San Francisco's micro-units offer innovative solutions in compact urban living (Glaeser, 2011).

Figure 2.46 : Interior of a Japanese capsule hotel. Source : "Staying at a Japanese Capsule Hotel: 'Is It Really This Compact?!'," by Sohail Oz Ali, LIVE JAPAN, 2024

- **Garden Apartment Communities:** Low-rise apartments integrated within landscaped environments that balance built density with green space (figure 2.47). Projects by Singapore's Housing Development Board (HDB) demonstrate this balance (Garnett, 2015).

Figure 2.47 : Public housing blocks in Singapore. Source : "Singapore to tackle public housing worriesafter surge in prices," Yahoo Finance, 2023

- **Transit-Oriented Developments (TOD):** High-density hubs built around public transport nodes, which minimize reliance on private vehicles. Stockholm's metro villages successfully merge rail connectivity with residential areas (Cervero, 1998).

- High-Rise and Vertical Typologies

✓ **Vertical Mixed-Use Developments:** Skyscrapers that combine residential, office, and commercial spaces to achieve a compact urban footprint (figure 2.48). Hong Kong's high-rise mixed-use towers are prime examples of this typology (Schmitz & Scully, 2006).

Figure 2.48 :International Commerce Centre (ICC), Kowloon Station, Hong Kong. Source : "International Commerce Centre, Kowloon Station," Wong & Ouyang, 2011

✓ **Eco-Towers and Green High-Rises:** High-density buildings that incorporate green technologies, such as vertical gardens and solar facades (figure 2.49). Bosco Verticale in Milan demonstrates how integrated greenery can improve urban microclimates and energy efficiency (Register, 2006).

Figure 2.49 : Bosco Verticale (Vertical Forest), Milan. From "Vertical Forest in Milano with Eterno Ivica," Pedestal Eterno Ivica, 2022

✓ **Permeable High-Rise Clusters:** Configurations of high-rise towers designed to allow adequate airflow, daylight, and social space. Singapore's Pinnacle@Duxton illustrates how careful arrangement of towers can maximize both density and quality of life (Ratti & Claudel, 2016).

1.4.4. Comparative Analysis of Dense and Mixed Horizontal Housing Models

In response to the spatial, social, and climatic specificities of Sidi Serhane, this section explores two complementary low-rise alternatives to vertical densification: **Dense Horizontal Housing (DHH)** and **Mixed Horizontal Housing (MHH)**. These typologies promote human-scale living, territorial integration, and spatial flexibility. The comparative table below outlines their principles, typologies, and potential application in the project, illustrating how each supports a sustainable and culturally rooted urban form.

Table 4 Comparative Table: Dense vs Mixed Horizontal Housing — With Principles, Typologies, and Application to Sidi Serhane

Dense vs Mixed Horizontal Housing

	Dense Horizontal Housing (DHH)	Mixed Horizontal Housing (MHH)	Application in Sidi Serhane
Definition	Dense Horizontal Housing refers to a low-rise housing model focused on ground contact, privacy, and community integration (figure 2.50). It reduces building height while maintaining a compact layout through patios and clustering. This model optimizes land use while preserving human scale and cultural continuity. (Gehl, 2011; Oliver, 2003).  *Figure 2.50 : Hobsonville Points residents' source : regulations screenshot*	Mixed Horizontal Housing combines residential and non-residential functions within the same low-rise structure (figure 2.51). It supports live-work configurations, small-scale commerce, and social services. The model increases vibrancy and functional diversity at the ground level, reinforcing a walkable, interactive, and flexible urban fabric. (Jacobs, 1961; Montgomery, 2013).  *Figure 2.51 : London's narrowest source : house for sale*	Sidi Serhane's slope and fragmented morphology favor DHH for residential continuity and intimate scales. MHH introduces adaptable units in transitional zones—along pathways or nodes—offering economic opportunities, cohabitation, and dynamic street life. Together, they reinterpret local logics through modern low-rise solutions anchored in terrain and culture.
Principles	DHH applies principles such as privacy through inner patios, climate-responsive orientation, and adaptability to sloped topography. Homes are grounded, using terraces and subtractions to create harmony with landscape and heritage. Shared courtyards enhance social interaction while preserving individual autonomy. (Hakim, 2014; Cervero, 1998).	MHH is based on principles of hybrid functionality, spatial modularity, and user appropriation. It prioritizes street activation, economic resilience, and the overlap of domestic and productive spaces (figure 2.52). Its flexibility enables community services and evolving uses, supporting long-term adaptability. (McCamant & Durrett, 2011; Beatley, 2000).  *Figure 2.52 : Scandi-Style Cohousing Source: Scottish Sun, 2025.*	In Sidi Serhane, DHH structures follow slope lines and generate shared transitions between homes. MHH strategies apply in edge conditions—near open plazas or shared routes—allowing both permanent and temporary uses. These principles enhance resilience, reinforce social ties, and support gradual neighborhood evolution.
Typologies	• Patio houses (figure 2.52). • Terraced houses along slopes • Courtyard clusters (figure 2.52). • Narrow row homes (figure 2.52)  *Figure 2.53: Zillow listing source : 2899 Eddy Dr townhouse*  *Figure 2.54 : London's narrowest source : house for sale*  *Figure 2.55: Tomohiro Hata's source : "Complex House" in Nagoya, Japan*	• Duplexes with integrated shops/studios,(figure 2.56) • Triplex units with flexible ground floors (figure 2.57). • Artisan homes with shared patios (figure 2.58). • Co-housing with common services .  *Figure 2.58 : Co-housing communal living illustration source : Paese Italia Press*  *Figure 2.56 : Foundations House Source: Bicubik Photography / Holger Cuadrado, 2024*  *Figure 2.57 : Vibrant Andalusian Courtyard Source: Author, 2025.*	• DHH is deployed along the slope using patio and terraced house typologies. • MHH is introduced at higher nodes and paths with duplexes, workshops, or ground-level services. • Typological diversity responds to both terrain and social program, creating balanced, layered settlements.
Site Integration	DHH supports a walkable, shaded, and socially cohesive urban structure. Its compact form reduces energy needs and aligns with local morphology (figure 2.59) . Green courtyards and porous layouts improve microclimate while referencing traditional medina logic. It enables incremental growth without losing spatial harmony. (Register, 2006; Talen, 2005).  *Figure 2.60 : Historic Fifth Avenue Residence Source: StreetEasy, n.d.*	MHH reinforces mixed-use corridors and community nodes. It encourages short-distance mobility, localized economies, and multifunctional environments. The overlap of functions supports circular urban systems, waste reduction, and increased social interaction. MHH offers ecological and social resilience in dynamic urban contexts. (Levine, 2005; Gehl, 2011).	DHH allows climate-responsive massing, earth integration, and layered privacy in Sidi Serhane. MHH adds vitality to underused edges and enhances services accessibility. The combination ensures a low-carbon, adaptive settlement model that respects the site's physical constraints and cultural memory while preparing for future community evolution.

1.4.5. Arguments for Urban Densification

Urban densification refers to strategies aimed at increasing the number of people or housing units within a given urban area, without expanding the city's physical boundaries. It is a critical response to challenges such as rapid urban growth, land scarcity, and environmental degradation. Densification can occur through various methods, including vertical densification, which involves building upwards using high-rise structures, and horizontal densification, which increases density by infilling vacant plots or transforming existing low-density areas with more compact housing models (Jenks & Burgess, 2000). Another approach, mixed-use densification, integrates residential, commercial, and public functions within the same built environment, promoting vibrancy and reducing reliance on car travel (Talen, 2005). Each method has specific implications on urban form, infrastructure, social cohesion, and environmental impact. For instance, vertical densification often leads to more efficient land use but may risk alienating residents if not accompanied by green and communal spaces (Glaeser, 2011). Conversely, horizontal models may preserve human scale but demand more land and careful planning to avoid sprawl (Alexander, 1977). The choice of densification method should therefore be context-sensitive, balancing population needs, cultural values, and ecological resilience (figure 2.61).

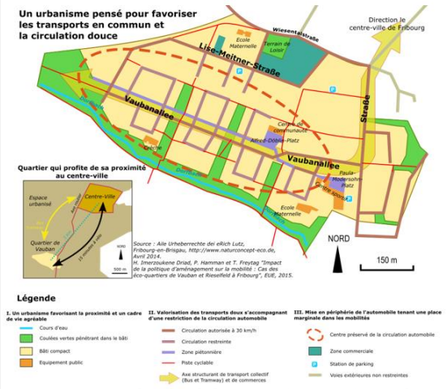
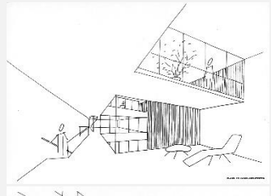
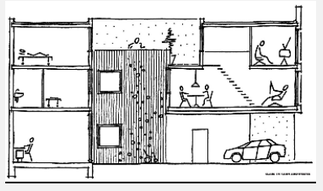
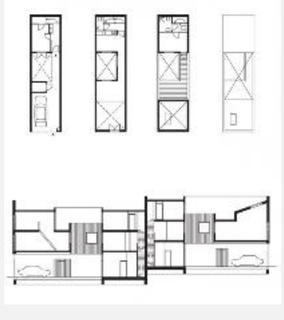
Figure 2.61 : Toronto Row Houses

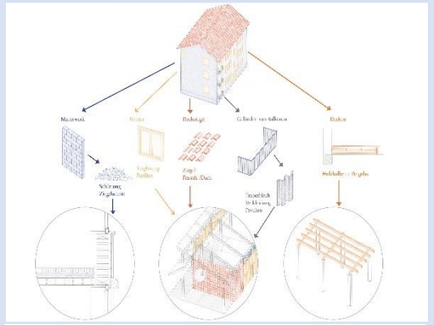
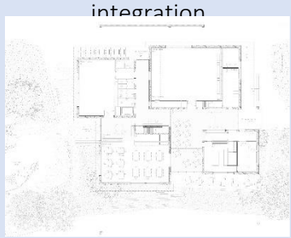
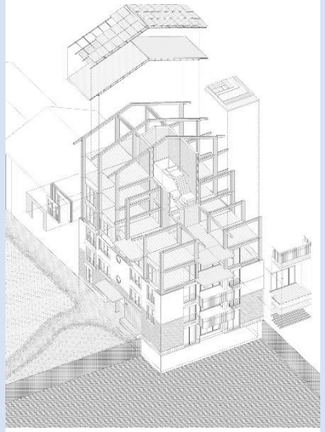
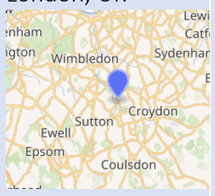
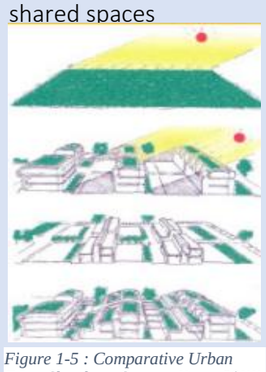
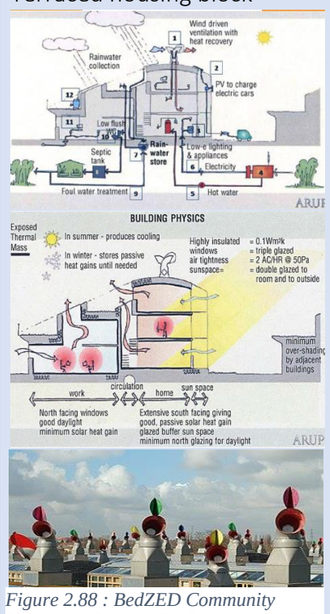
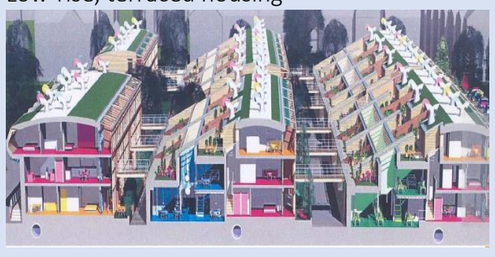
Source: Bardiak, 2007.

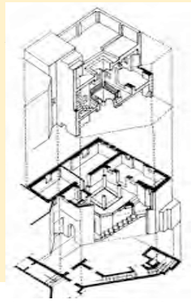
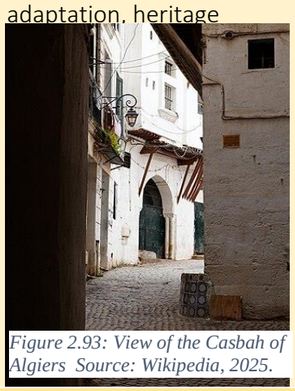
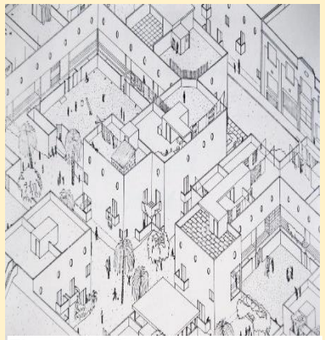
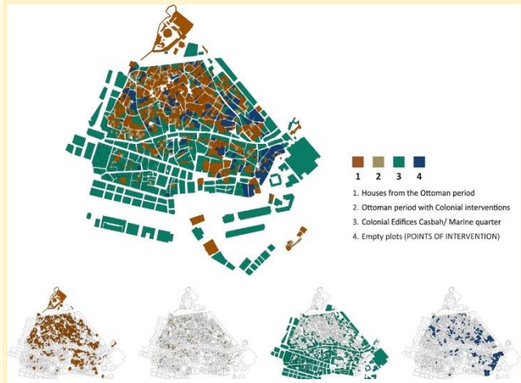
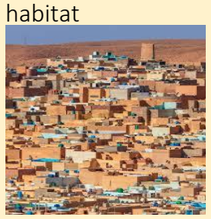
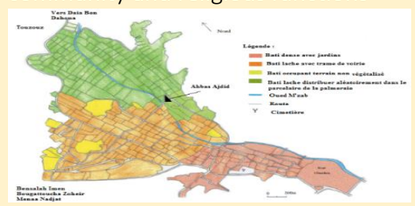
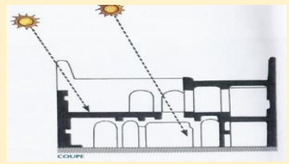
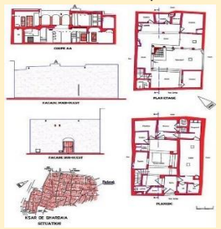
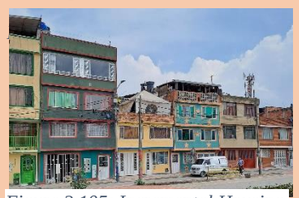
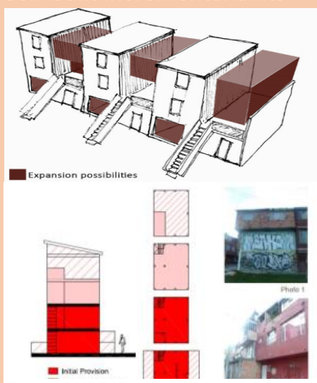
1. Case studies analysis :

This section offers a comparative reading of emblematic projects that have adopted horizontal densification as a sustainable urban planning strategy. Using a technical analysis framework, it highlights diverse approaches based on geographic contexts, housing typologies, and urban forms. Each case reveals specific solutions in terms of structure, spatial organization, and social or environmental resilience. These examples provide a critical basis for identifying transferable principles and lessons applicable to the case of Sidi Serhane, while considering its topographical constraints and territorial challenges. as shown in the table below (table 5)

Table 5 example analysis

Project (technical sheet)	Location	Typology	Urban & Architectural Organization	Key Characteristics	Architectural Unit	Structural Type
Vauban District - Eco-participatory neighborhood - Linear structure around a central green avenue - Ribbon housing blocks - Social and typological mix - Peripheral parking - Passive buildings, cohousing, soft mobility, shared green spaces - Favors local autonomy and slope adaptation	Freiburg,  *Baden-Württemberg Map Source: Wikimedia Commons, n.d.*  *Figure 2.63: Barcelona Superblocks Overview Source: Urban Design Lab, 2024.*	Eco-participatory neighborhood   *Figure 2.64: Freiburg-Haslach Panorama Source: Joergens mi, 2007.*	Linear structure around a green avenue, ribbon housing blocks, social and typological mix, peripheral parking  *Figure 2.65: Vauban Mobility Map Source: Quentch, 2019*	Passive buildings, cohousing, soft mobility, shared green spaces   *Figure 2.66 : Sustainable City Podcast Source: Euradio, 2019.*	Ribbon housing block   *Eco-Home in EVA-Lanxmeer Source: Lamiot, 2009.*	Low-rise, terraced housing  *Figure 2.68 : Higher-Density Open Space Guide Source: City of Charles Sturt, 2012.*
Lessons for Sidi Serhane	and adapts well to sloped sites					
Borneo-Sporenburg - Compact townhouse blocks on 2–3 levels - Very narrow plots - Alternation of solids/voids for light & ventilation - Varied facades, patios, continuous pedestrian paths - Vibrant waterfront - Dense model without verticality, human scale  *Figure 2.69 :*	Amsterdam, Netherlands  *Figure 2.70 : Netherlands Provinces Map Source: Alphathon, 2011.*  *Amsterdam Location Map Source: Condor3d, 2018.*	Compact townhouse housing  *Figure 2.72 : Borneo-Sporenburg Housing Source: KAAN Architecten, 1997.*	Very narrow plots, 2–3 level terraced houses, alternation of solids and voids to maximize light and natural ventilation  *Figure 2.73 : DEVLOPEMENT PLAN of Borneo Sporenburg Housing Source: KAAN Architecten, 1997.*	Varied facades, patios, continuous pedestrian paths, vibrant waterfront   *Figure 2.74 : Borneo-Sporenburg Panorama Source: Matexi, 2017.* 	Terraced house   *Figure 2.75 : Borneo-Sporenburg Housing plan et coup Source: KAAN Architecten, 1997.*	Low-rise, terraced housing   *Figure 2.76 : Borneo-Sporenburg Housing unit .* *Source: KAAN Architecten, 1997.*
Lessons for Sidi Serhane	Density model without verticality, ideal for human scale fabric					

Le Hameau de Lausanne - Grouped individual housing - Parallel bands layout - Shared streets, communal gardens - Controlled private/collective limits - Privacy and strong social cohesion - Excellent landscape integration	Lausanne, Switzerland  *Figure 2.77 : Geographic Map of Switzerland Source: Marc Mongenet / Swisstopo, 2004.*  *Figure 2.78 : Urbanisation Trends Visual Source: Gazel & Moriconi-Ebrard, 2012.*	Grouped individual housing   	Parallel band layout, shared streets, communal gardens, controlled private and collective boundaries   *Figure 2.79 : Exnal Urban Design Source: Espazium, 2014.*	Privacy preserved, strong community cohesion, excellent landscape integration  *Figure 2.80: Travertine-Clad Housing plan. Source: Régis Colay / Federal Studio, 2023.*	Detached individual house  *Figure 2.81: Brunnenhof Renovation Strategy Source: Espazium, 2025.*	Low-rise, detached housing  *Figure 2.82 : Le Mont-sur-Lausanne Triplex* *Source: Realestate.com.au, 2025.*  *Figure 2.83 : Eikenøtt Ecoquartier Source: Ferrari Architectes, 2015*
Lessons for Sidi Serhane	Strong landscape integration, replicable in mixed residential areas					
BedZED - Compact eco-residential quarter - North-south grid - Adjoining buildings with shared inner courtyard - Natural ventilation via solar chimneys - Energy self-sufficiency - Bioclimatic architecture - Shared spaces for social interaction	London, UK   *Figure 2.84 : Pink Connect Richmond BrandingSource: Pink Connect, 2025.*	Compact eco-residential quarter  *Figure 2.85: BedZED Eco-Village Source: VoirVert, n.d.*	North-south grid, adjoining buildings, shared inner courtyard, natural ventilation via solar chimneys  *Figure 2.86 : Sustainable Districts Graph Source: AREC Île-de-France, 2005.*	Energy self-sufficiency, bioclimatic architecture, shared spaces  *Figure 1-5 : Comparative Urban Form Sketches Source: Yang, 20XX.*  *BedZED Community Housing Source: En.Chaigneau, 2007.*	Terraced housing block  *Figure 2.88 : BedZED Community Housing Source: En.Chaigneau, 2007.*	Low-rise, terraced housing   *Figure 2.89: BedZED Community Housing Source: En.Chaigneau, 2007.*

Casbah of Algiers - Dense traditional Mediterranean habitat - Labyrinthine organization, narrow shaded streets - Low-rise contiguous buildings - Semi-private outdoor spaces (terraces, courtyards) - Climate protection - Strong social and heritage roots	Algiers, Algeria  *Algerian Ensign (French Period) Source: Unlisted author, FR pre-1910.*	Dense traditional habitat  *Figure 2.91 : Patio and Ventilation in Casbah House Source: Teshnehdel, Soflaei & Shokouhian, 2020.*	Dense small-scale fabric, winding streets, closely built structures for shading and ventilation  *Figure 2.92 : Map of the Casbah of Algiers Source: UNESCO Retrospective Inventory, 2013.*	Mixed private/collective use, strong climate adaptation, heritage  *Figure 2.93: View of the Casbah of Algiers Source: Wikipedia, 2025.*	Contiguous low-rise houses  *Figure 2.94: Sketches from Algiers – Student Notebook Source: Voelcker, 2021.*	Low-rise, dense urban fabric  1 2 3 4 1. Houses from the Ottoman period 2. Ottoman period with Colonial interventions 3. Colonial Edifices Casbah/ Marine quarter 4. Empty plots (POINTS OF INTERVENTION) *Figure 2.95: Re-Imagining Counter-Spaces in the Casbah Source: Faïdi, 2017.*
Lessons for Sidi Serhane	Model of climatic and social adaptation, strong territorial integration					
Beni Mzab - Fortified collective Berber habitat - Villages organized in terraces on slopes - Stone construction, optimized orientation - Well-hierarchized public and private spaces - Traditional hydraulic system - Strong cultural identity	M'zab Valley, Algeria  *Figure 2.96 urban situation of beni mezab Source: FAO, 2024.*	Fortified collective habitat  *Figure 2.97: Ghardaïa Oasis Panorama Source:Konstantin_Novakovic, 2016.*	Terraced villages on slopes, narrow alleys, spatial organization centered on community and religious functions  *Figure 2.98 : M'zab Valley Urbanization Process Source: Bensalah et al., 2018.*	Durability, water management, desert climate adaptation, strong social cohesion  *Figure 2.99: Traditional Mozabite House Entrance and Courtyard Source: At Mzab, n.d. (in French)*	Terraced compact units  *Figure 2.100: Borujerdi Courtyard House Instruments Source: Teshnehdel et al., 2020.*	Low-rise, terraced collective units  *Figure 2.101 : Ghardaïa Oasis Panorama Source:Konstantin_Novakovic, 2016.*
Lessons for Sidi Serhane	Exemplary resource management and social cohesion					
Incremental / Self-built housing Ciudad Bachué - Popular housing built step-by-step according to residents' resources - Flexible, extendable plots - Modular spaces, possible addition of floors - Often informal but functionally logical organization	Bogotá, Colombia  *Figure 2.102: Revivir Centre Staff at Public Mesa Source: ICBF, 2024.*	Incremental popular housing  *Figure 2.103: Incremental Housing in Bogotá – Ciudad Bachué Source: Silva, 2024.*	Extendable plots, varied materials, strong local adaptation - Often informal urban layout with narrow or improvised access paths  *Figure 2.104 : Bogotá Centro Masterplan Source: Carlos Arnaiz Architects (CAZA), 2014.*	Flexibility, economic adaptation, strong social appropriation, self-managed extensions  *Figure 2.105: Incremental Housing in Bogotá – Ciudad Bachué Source: Silva, 2024.*	Self-built incremental units  Expansion possibilities Initial Provision *Figure 2.106: Incremental and Self-help Housing Typology in Urbanizing Contexts Source: Pinterest, n.d.*	Low-rise, flexible modular housing  *Figure 2.107: Incremental Housing in Bogotá – Ciudad Bachué Source: Silva, 2024.*
Lessons for Sidi Serhane	Example for Sidi Serhane: integrate flexibility and progressive evolution, respect residents' economic capacities					

Horizontal Densification as a Counter-Project

KEY CONCEPTS OF URBAN FORM

DENSITY MODELS

HRLD – High-Rise Low-Density Tall buildings, few units, luxury use (Glaeser, 2011)

LRHD – Low-Rise High-Density Compact low-rise layout, human-scale, walkable (Newman & Kenworthy, 2006)

MRMD – Mid-Rise Moderate-Density Balanced height, efficiency, moderate compactness

DENSIFICATION TYPES

Vertical Densification: AADL model – tower blocks, centralized, detached from site

Horizontal Densification: Ground-based units, closer to tradition, supports local integration

COMPACTNESS

Urban principle aiming for efficient land use, continuity of built forms, short distances, and multifunctionality.

→ Foundation of DHH and MHH

REFERENCE PROJECTS & EXAMPLES

NTERNATIONAL CASES

Vauban Germany DHH

Eco-neighborhood, dense but green, community-led

Borneo_Sporenbug Netherlands

High-density row housing, waterfront adaptation

Hameau de Lausanne Switzerland

Low-rise typology, courtyard houses

BedZED UK

Energy-positive, clustered low-rise homes.

VERNACULAR & CONTEXTUAL CASES

Casbah of Algiers

Algeria Incremental urbanism Dense fabric, patios, human-scale adaptation

Beni Mzab Algeria

Vernacular compact city Modular planning, slope adaptation

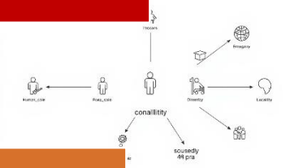
Incremental Housing (Self-built)

Global South Participatory, phased Flexibility, affordability, community-based

Ciudad Bachué Colombia

Mixed typology & increment State-led + participatory adjustment

COUNTER-PROJECT APPROACH



Repenser les modèles dominants (AADL, densification verticale) en intégrant :

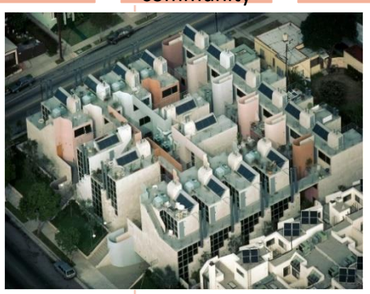
- Le site
  - l'échelle humaine,
  - l'identité locale.
- la mémoire

HOUSING CONCEPTS DERIVED FROM COMPACTNESS

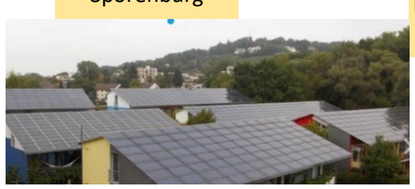
DHH – Dense Horizontal Housing

Compact low-rise homes clustered with shared spaces.

Human scale, slope adaptability, sense of community



E.g. Vauban, Borneo-Sporenburg



MHH – Mixed Horizontal Housing

Diversity of typologies and functions at low height

Supports both public and private dynamics

E.g. Hameau de Lausanne, BedZED

Figure 2.108 : Conceptual Synthesis of the Literature Review on Urban Densification Models ***source****: Author, 2025*

Conclusion

This chapter laid the conceptual groundwork for rethinking urban development models in Algeria, particularly in regions where vertical densification has proven to be socio-environmentally limiting. Through the exploration of **counter-projects**, we emphasized the importance of participatory planning, contextual sensitivity, and spatial innovation as tools to challenge rigid and top-down approaches. The **notion of density**, in its morphological, functional, and perceptual forms, was discussed in depth, providing analytical tools to measure and evaluate the intensity of urban development. This was followed by a comparative reading of **vertical and horizontal densification**, with special attention to **low-rise, high-density housing typologies** (such as Dense Individual Housing and Mixed Horizontal Housing), which offer alternatives more suited to complex terrains and socio-cultural realities like those found in Sidi Serhane. We concluded with the concept of **urban compactness**, which synthesizes density, accessibility, and sustainability in coherent urban forms that respect both human scale and environmental constraints.

Chapter 3: Low-Rise, High-Density city of Sidi Serhan

Introduction:

This chapter presents a detailed and multidimensional analysis of the Sidi Serhane site, envisioned as a strategic testing ground for implementing an urban alternative based on horizontal densification. The objective is to go beyond the conventional models of vertical expansion and large-scale housing programs, such as AADL, by exploring a development strategy more attuned to local realities (Newman & Kenworthy, 2006; UN-Habitat, 2020). By conducting a territorial, historical, morphological, and environmental reading of the area, the chapter aims to uncover the underlying physical, social, and landscape characteristics that shape and inform the site's identity (Lynch, 1960; Hillier & Hanson, 1984).

This comprehensive approach allows for a nuanced understanding of the site's urbanization dynamics, spatial patterns, and geographical constraints—including topography, hydrography, and vegetation (Alexander, 1977; Rapoport, 1977). Particular attention is paid to the local heritage, settlement history, and informal urban growth, which all contribute to the complexity of Sidi Serhane's current urban fabric (Hakim, 2007). These elements are essential for identifying opportunities and limits in relation to future urban interventions.

The analysis also considers the potential for integrating a sustainable and resilient urban model—one that aligns with both environmental preservation and social inclusion (Gehl, 2010; Beatley, 2011). Ultimately, this contextual investigation provides a critical foundation for developing an architectural and urban planning proposal that is coherent, place-sensitive, and human-centered. It serves as a bridge between theoretical research and concrete spatial strategies rooted in the site's unique identity and challenges.

1. Territorial & Historical Context of Sidi Serhane

1.1.Location and Boundaries

Sidi Serhane is strategically situated between the Mitidja plain and the first foothills of the Tell Atlas, benefiting from both agricultural land and proximity to urban centers (Remini & Achour, 2010), making it ideal for integrated urban development. (figure 3.1)

Figure 3.1 : territorial situation of sidi serhan Source: vecteezy.com, retrieved June 2025

On a regional level, Sidi Serhanne is part of the Blida province, an important area for agriculture, industry, and natural resources. Sidi Serhanne's proximity to cities like Bouinan (about 10 km) and Blida (approximately 30 km) places it in a context of rapid urban development (figure 3.2) .

Locally, Sidi Serhanne is situated southeast of Bouinan, approximately 10 km away, surrounded by the neighborhoods of Mellaha and Hassainia. This position makes it an extension of the urban zones of Bouinan (figure 3.3) . In proximity to key locations such as Sidi Abdellah, Blida, Boumerdes, and the capital, it enjoys a significant advantage due to its regional connectivity with neighboring cities . Bouinan, located in Blida province, is 25 km east of Blida and 35 km southwest of Algiers, poised to host urban functions and benefiting from regional connectivity (figure 3.4).

Figure 3.2 : Regional situation of sidi serhan
Source: algerie-focus.com, retrieved June 2025

Figure 3.3: local situation of sidi serhan source :author, 2025

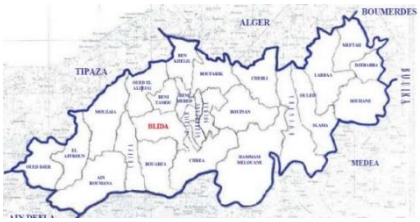


Figure 3.4 : administrative division of blida
Source: vecteezy.com, retrieved June 2025

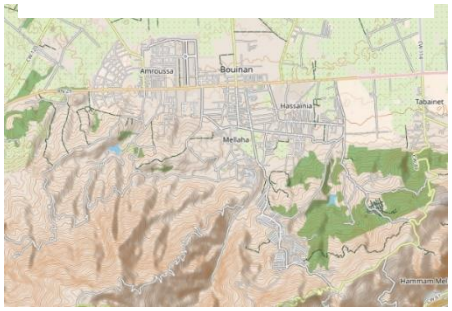


Figure 3.5 : forest as nutural boundries
Source: openstreetalgeria.org, retrieved June 2025

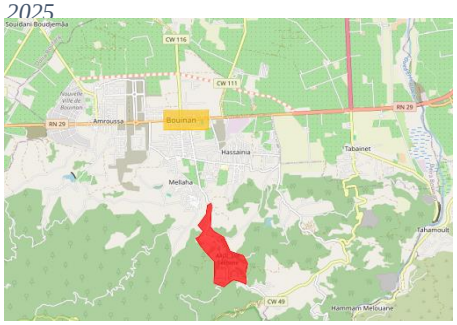


Figure 3.6 : chrea as nutural boundries
Source: openstreetalgeria.org, retrieved June 2025

1.2.Historical Evolution of Sidi Serhan

The city of Sidi Serhan had witnessed many phases through its historical evolution that we have synthesized in table 6.

Table 6: Chronological Evolution of Sidi Serhan's Urban Landscape (Pre-1830 to 2025)

Pre-colonial Period (before 1830)

Traditional organization around agricultural and pastoral villages with dispersed housing.
- Few formal infrastructures; circulation based on paths.
- Strong connection to the natural landscape respecting natural boundaries (rivers, reliefs).
- The Chréa massif forms a natural barrier limiting expansion (figure 3.17) .

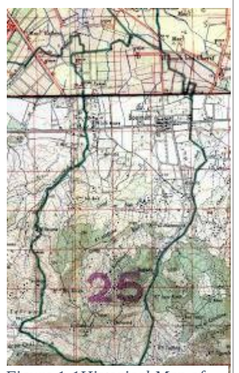


Figure 1-1Historical Map of Bouinan, 1830 Gallica.bnf.fr, retrieved June 2025

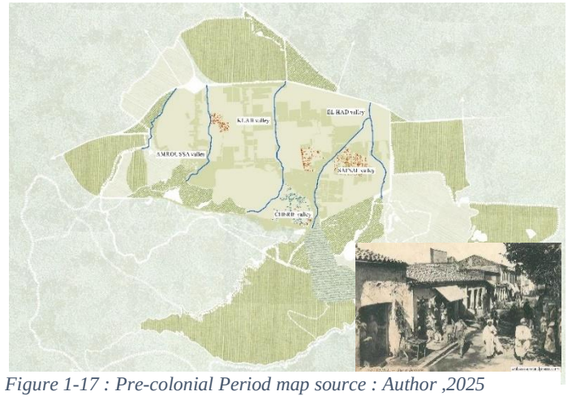


Figure 1-17 : Pre-colonial Period map source : Author ,2025

Accelerated Urban Development (1980-2000)

- Rapid demographic growth and urbanization.
- Multiplication of subdivisions and peripheral neighborhoods.- Urban extension along RN29.
- Beginning of AADL housing projects in the area.
- Pressure on agricultural and natural spaces, with progressive reduction of green zones (figure 3.20

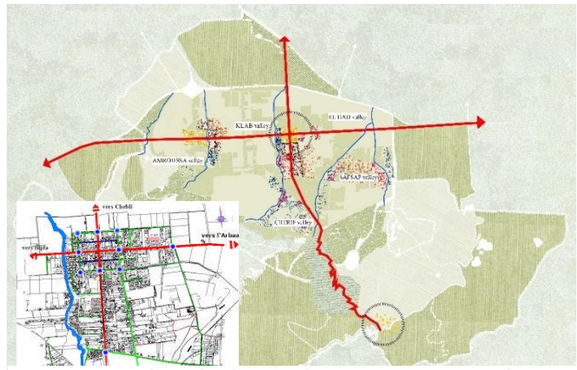


Figure 1.20: Accelerated Urban Development map source : Author, 2025

Colonial Period (1830-1962)

- Introduction of formal urban planning.
- Construction of Bouinan's historic center according to colonial standards (figure 3.118)
- Development of road infrastructure including RN29, becoming a major structuring axis.
- Beginning of urbanization around the new center.- Progressive expansion linked to road axes.

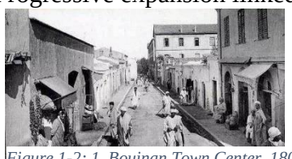


Figure 1-2: 1. Bouinan Town Center, 1800 2. Bouinan Tertiary Road Wikimedia Commons, retrieved June 2025

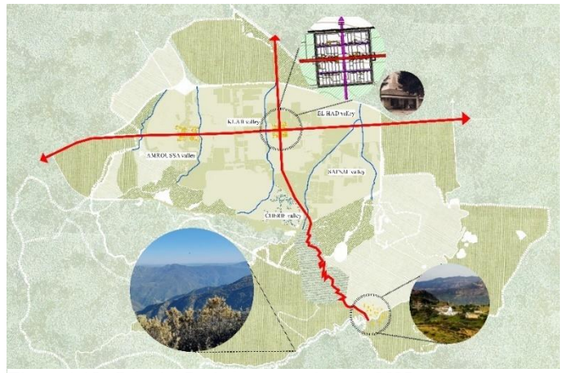


Figure 1.18: Colonial Period source : Author, 2025

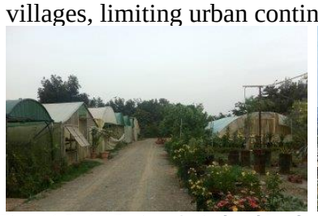
Contemporary Development (2000-2025)

- Horizontal and vertical densification with AADL projects in Sidi Serhane and Bouinan.
- Planned urban extension towards Maana Larebaa and Amroussa supérieur.
- Efforts to integrate natural boundaries into sustainable urban planning.
- RN29 remains the central structuring axis facilitating connectivity between old and new neighborhoods.
- Attempts to control natural limits in urban projects (figure 3.21.22.23.24.) .

Figure 1.21 : Multiple Perspectives of the AADL Residential Development in Bouinan, Blida Source: facebook.com/SidiSerhanCity, retrieved June 2025

Post-Independence Period (1962-1980)

- Slow urbanization with initial expansions around Bouinan and satellite villages (figure 3.19)
.- Consolidation of basic infrastructure and road networks.
- RN29 becomes a vital circulation axis between Bouinan and hamlets.
- Conservation of agricultural spaces between villages, limiting urban continuity.



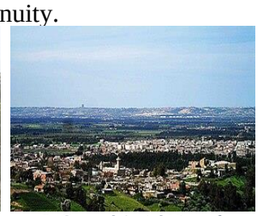


Figure 1-3 1 . Bouinan Agricultural Landscape 2. General Aerial View of Bouinan, Blida Province Source: Wikipedia.org, retrieved June 2025

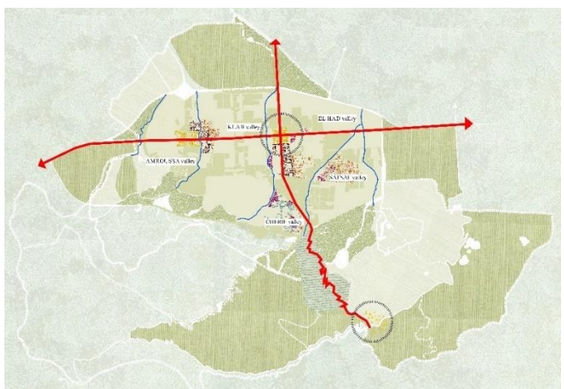


Figure 1.19: Post-Independence Period map source : Author, 2025

Figure 1.22 : 3D Digital Model of Bouinan Urban Fabric Source: univ-blida.dz, retrieved June 2025

Figure 3.23 : Panoramic View of Sidi Serhan District, Bouinan – A Spatial Perspective Source: facebook.com/SidiSerhanCity, retrieved June 2025

Figure 1.24 : Contemporary Development map source :Author, 2025

2. Natural & Morphological Analysis

1.1. Topography and Geology

The Topography and geology critically shape urban development potential and constraints. Slope gradients directly influence accessibility, drainage, infrastructure, and built form (Lynch, 1981), while soil composition and stability dictate construction feasibility and natural hazard risks (Burdett & Sudjic, 2007; Bell, 2007; Fookes, 1997). Steep or complex terrain amplifies challenges—increasing costs, complicating road networks, and accelerating erosion (Jabareen, 2006; Table 6). Clay soils, fractured bedrock, or unstable substrates further threaten structural integrity through subsidence, landslides, or water infiltration. The synthesized terrain and geological data (Tables 7-8) provide essential guidance for risk-aware planning and sustainable development (McHarg, 1992; UN-Habitat, 2012). . See annexe 3

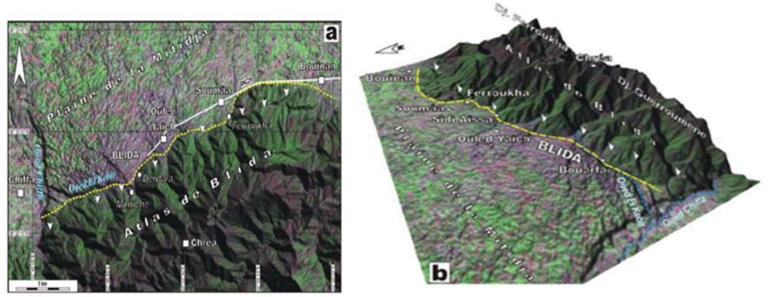
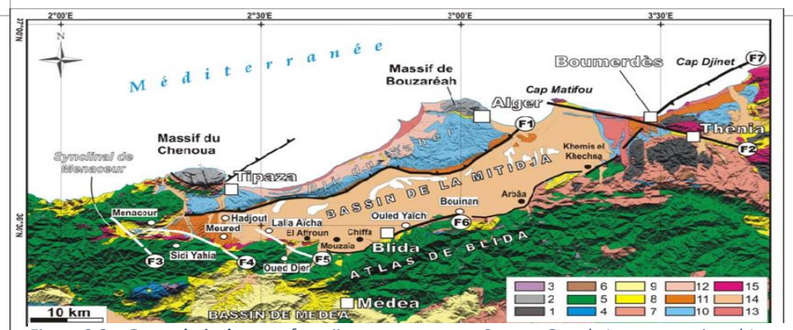
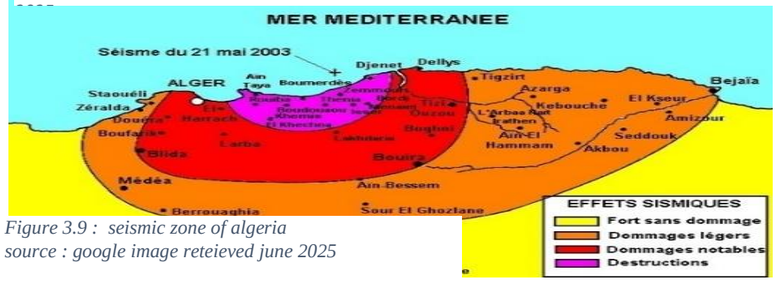
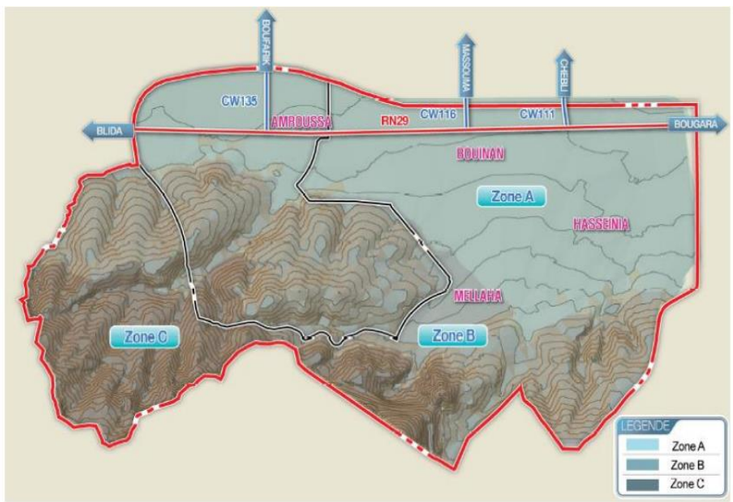
Table 7 Terrain and Soil Characteristics: Risks and Planning Considerations

Aspect	Potential Problems	Impacts on Urban Planning
Steep Slopes	- Difficult construction conditions - Risk of landslides and erosion	- Increased building costs - Limits to building density and road layout
Irregular Terrain	- Complex leveling requirements - Drainage challenges	- Need for specialized engineering - Higher infrastructure cost
Clay or Unstable Soils	- Soil expansion/shrinkage - Poor load-bearing capacity	- Foundation instability - Risk of structural cracks
Rocky Substrates	- Hard excavation work - Blasting sometimes required	- Delays and higher construction expenses
Water Table / Groundwater	- Infiltration and flooding risks - Difficult foundation drainage	- Need for waterproofing - Long-term maintenance challenges

1.2. Relief:

The surrounding hills and mountains strongly shape the urban morphology of Sidi Serhanne, limiting expansion to the south and east, where the —terrain is more rugged. Bouinan is a municipality in the Blida province, located at the foothills of the Blidean Atlas, on the edge of the Mitidja plain, 25 km east of Blida and 35 km southwest of Algiers. It is poised to accommodate urban functions currently concentrated in Algiers (figure 3.6).

Table 8 Topographical and Geotechnical Constraints in Bouinan and Their Adaptation in bouinan source : Author,2025.

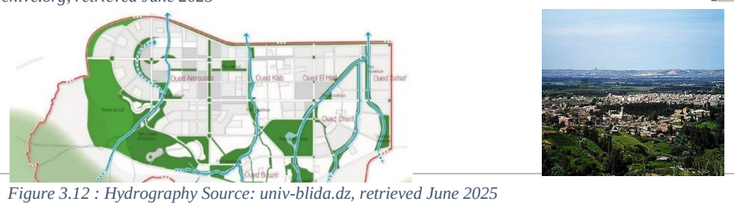
Aspect	Description	Illustration	Risks / Constraints	Construction Recommendations	Adaptation in Sidi Serhane
Slopes and Topography	Bouinan presents a topographic gradient ranging from the flat Mitidja plain (approx. 70 m) to mountainous formations exceeding 1000 m in the south. The area of Sidi Serhane lies on the edge of this transition, where slopes range between 5% and 25%, mostly directed north to south (Bouinan Municipality, 2022) (figure 3.7).	 *Figure3.7 : Urban Morphology of a Suburban Area Source: Google Images, retrieved June 2025*	Risk of erosion, runoff concentration, difficult accessibility for steep zones, and potential instability in poorly compacted slopes.	Limit development to moderate slopes (<15%). Use terraced urban design. Maintain natural water pathways and vegetation buffers to stabilize soil.	In Sidi Serhane, urban planning must follow **topographic sensitivity**. Construction should be limited to plateaus and moderate inclines. Incorporating **green terraces** and **natural drains** can mitigate erosion. Road networks should follow contour lines to reduce earth movement. Integration of soft landscaping and pedestrian routes is essential to adapt to the slope (Hadj-Hamou & Maachi, 2020).
	The region sits on **plio-quaternary alluvial formations**, rich in clay, sand, and gravel. The presence of the **Souma-Bouinan fault** generates a vertical shift (~50 m) between the plain and hills (ANRH, 2019). Soil is moderately plastic, with localized risks of liquefaction and shrink-swell behavior.(figure 3.8)	 *Figure 3.8 : **Geotechnical** map of metija Source: Google Images, retrieved June*	Ground instability, moderate bearing capacity, landslides on escarpments, and swelling clays. Areas near faults pose high seismic sensitivity.	Implement reinforced foundations, conduct detailed **soil surveys**, and use geotextiles or stone mattresses to enhance ground stability. Avoid heavy loads on soft soil.	For Sidi Serhane, priority must be given to **geotechnical testing before any construction**. For housing clusters, adopt **strip foundations or deep piles**, depending on soil depth and plasticity. Low-rise, lightweight construction with modular materials can reduce pressure on the subsoil. Buildings should avoid alignment with visible fault traces (Bouchair & Bekkouche, 2017).
Seismicity	Bouinan lies in **Seismic Zone II**, with medium seismic hazard. Activity is mainly due to nearby tectonic faults (Souma, Blida, and Mitidja). The CRAAG (2020) indicates regular micro-seismic movements in this region. The risk increases toward the southern slopes and hills (figure 3.9) .	 *Figure 3.9 : seismic zone of algeria source : google image reteieved june 2025*	Structural collapse during earthquakes, particularly in non-reinforced masonry. Higher vulnerability in taller or poorly braced buildings.	Design must follow **RPA 2003 standards**: braced frames, limited building heights (GF+1), seismic joints, symmetrical plans, and flexible structures.	In Sidi Serhane, all residential buildings should be limited to **one or two stories maximum**. Use of **ductile materials** (e.g., steel-reinforced concrete) and design for **base isolation** or **energy dissipation** is strongly advised. Public spaces (e.g., the central alley) can serve as **evacuation points**. Maintain 10–15 m buffers between housing blocks for safety (Meghraoui et al., 2015).
Micro-zoning and Land Suitability	A geotechnical micro-zoning study (OPU, 2020) classified Bouinan into: ◆ **Zone A** – stable, shallow soil, slopes <5% (ideal for dense housing). ◆ **Zone B** – moderate slopes (5–15%), deeper mixed soil (requires reinforcement). ◆ **Zone C** – steep terrain (>25%), unstable, rocky or landslide-prone (not buildable without heavy stabilization) as in the figure (figure 3.10).	 *Figure 3.10 : Micro-zoning and Land Suitability Source: univ-blida.dz, retrieved June 2025*	Increased cost and complexity in Zones B and C. Greater infrastructure needs (retaining walls, special drainage, etc.). Inappropriate site use can lead to accidents or rapid deterioration.	Urbanization should focus on Zone A. Use Zone B only with controlled density and reinforced infrastructure. Zone C should be kept for nature, agriculture, or passive uses. 	In Sidi Serhane, **Zone A** (flat and accessible terrain near the central corridor) should be prioritized for the **group of 12 housing units**. Zone B can host **community gardens, light pavilions**, or be left as **green spaces**. Avoid permanent construction in Zone C. A **GIS-supported land suitability analysis** should be done prior to any further densification (Bensaada et al., 2021).

1.3. Hydrology & Ecology:

a) Forests:

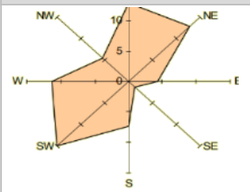
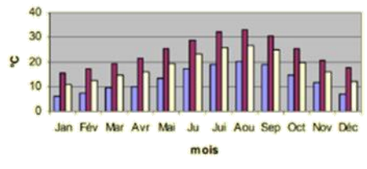
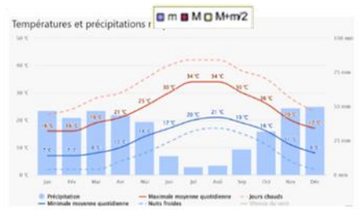
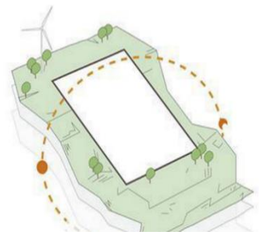
The presence of forests to the south and east acts as a natural barrier, influencing population density and the distribution of residential areas. These forests also serve as a buffer zone, preventing excessive urbanization (figure 3.5).

Table 9: Environmental and Ecological Profile of Sidi Serhane

Environmental and Ecological Profile of Sidi Serhane – Adaptation Insights for Urban Design				
	Analysis	**Illustration**	**Key Indicators**	**Ecosystem Services**
Vegetation and Biodiversity	The southern hillsides of Bouinan, particularly around Sidi Serhane, lie at the foot of the Blidean Atlas and host **dense Mediterranean forests** composed of **holm oak, Aleppo pine, juniper**, and **aromatic shrubland**. These well-preserved green belts are home to a **rich and fragile ecosystem**, supporting numerous **endemic and migratory species (figure 3.11)** .	 *Figure 3.11 : Planned Urban Layout of a Residential District Source: kuppaswany-iyengar-archive.org, retrieved June 2025*	- Dominant flora: Holm oak, Pine, Juniper- Dominant fauna: Wild boar, fox, hedgehog, hawks, night owls, thrushes- Forest cover: dense, continuous on slopes	- Biodiversity reservoir- Microclimate regulation- Carbon sink and soil retention- Habitat provision- Noise and air filter
Hydrography	The area is crossed by four seasonal watercourses: **Oued Safsaf, Oued El Had, Oued Amroussa**, and **Oued Klab**, all descending from the Atlas Mountains. These **ephemeral rivers** are mostly dry in summer but experience **flash floods and waterlogging** during winter rains (figure 3.12).	 *Figure 3.12 : Hydrography Source: univ-blida.dz, retrieved June 2025*	- 4 wadis from Blidean foothills- Winter flood risk- Summer dryness- Localized pollution by urban runoff	- Groundwater recharge potential- Landscape structuring- Climate buffer and drainage lines

1.4. Climate & Microclimate:

Climatic features of Sidi Serhan are summarized in table 10.

Climate & Microclimate				
	Analysis		**Key Indicators**	**Ecosystem Services & Relevance**
Climate Conditions	The region has a **Mediterranean climate** with sharp seasonal contrasts: **cold, humid winters** and **hot, dry summers**. Temperature ranges between **5.9°C in winter** and **33.2°C in summer**, with occasional peaks above 35°C in July–August (figure 3.13).	 *Figure 3.14 : Wind Resource Potential Mapping Source: An-Najah University, retrieved June 2025*   *Figure 3.14 : climat condition of bouinan Source: wilaya-blida.dz, retrieved June 2025*	- Winter avg: 10.7–12.3°C- Summer avg: 23–26.7°C- Peaks: up to 34°C- Rainfall: winter 315 mm, summer 31 mm	- Influences vegetation cycles- Thermal comfort constraints- Evapotranspiration and water stress
Winds & Ventilation	Wind data indicate the dominance of **Southwest (14.9%)**, **North (12.9%)**, and **Northeast (12.8%)** directions. These prevailing winds shape **thermal dispersion** and the need for **urban porosity (figure 3.14)**.		- Dominant winds: SW, N, NE- Wind corridors through valleys- Average speed: 3–5 m/s	- Natural cooling- Pollution dispersion- Orientation of streets and patios
Solar Exposure	The site receives **abundant solar radiation**, especially during **July and August**, with sunshine duration exceeding **2800 hours/year**. This influences **material aging**, **cooling strategies**, and **urban morphology**.	 *Figure 3.15 : abundant solar*	- High solar gain in summer- Risks of heat islands- Design need for shading and green buffers	- Passive solar heating in winter- Summer overheating risk- Need for thermal regulation

Vitesse / Direction	N	NE	E	SE	S	SW	W	NW
01-05 m/s	**8.9**	**8.4**	**3.3**	**1.1**	**6.3**	12.8	**7.1**	**3.0**
06 – 10 m/s	**3.9**	4.2	**0.9**	**0.2**	**1.1**	**2.1**	4.2	**2.3**
11 – 15 m/s	**0.1**	0.2	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
≥ 16 m/s	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total	12.9	12.8	4.3	1.3	7.4	14.9	11.3	5.3

3. Socio-economic analysis

<table>
<tr><th></th><th>Analysis</th><th>Illustration</th><th>Key Indicators</th></tr>
<tr><td>Demographics</td><td>Bouinan has a population of 60,730 inhabitants spread across 135 km², giving a density of 451 inhabitants/km². This urban expansion threatens agricultural and ecological zones, especially in fertile plains (figure 3.16)</td><td>
<table>
<tr><th>1867</th><th>1884</th><th>1892</th><th>1902</th><th>1912</th><th>1923</th><th>1936</th><th>1954</th><th>1960</th></tr>
<tr><td>252</td><td>445</td><td>628</td><td>942</td><td>1 258</td><td>1 136</td><td>1 354</td><td>-</td><td>2 908</td></tr>
<tr><th>1966</th><th>1977</th><th>1987</th><th>1998</th><th>2008</th><th>-</th><th>-</th><th>-</th><th>-</th></tr>
<tr><td>*[10]</td><td>*[10]</td><td>8 129</td><td>15 209</td><td>35 254</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
</table>
Figure 3.16 : Cover of Algerian National Report on the New Urban Agenda (Mars 20 Source: Ministère de l'Habitat, de l'Urbanisme et de la Ville, Algeria – Urban Agenda Platform.
</td><td>Population: 60,730; Area: 135 km²; Density: 451/km².</td></tr>
<tr><td>Human Activities</td><td>The Mitidja plain, benefiting from a Mediterranean climate, supports rich agriculture. Industrial growth has also been noted, including chemical, pharmaceutical, food, and biotech industries near urban centers.</td><td></td><td>Agricultural zones in plains; industrial activities in specific zones.</td></tr>
</table>

4. Urban analysis of Sidi Serhan

4.1.Accessibility

Sidi Serhane, located in the southern zone of Bouinan municipality, benefits from a strategic location within a developing urban framework. Its accessibility can be analyzed on three interconnected levels: territorial, regional, and local. (Figure 4.38)

Figure 4.38 Territorial Accessibility map source : author, 2025.

At the territorial scale, Sidi Serhane is connected to Algeria's major cities and infrastructure through a system of national roads and highways: RN 29 (Route Nationale 29): This is the primary axis that crosses Bouinan, connecting Blida to Algiers, and forming the main north-south backbone for movement across the Mitidja plain. Highway Access (Autoroute Est-Ouest): The site is indirectly connected via the nearby interchanges at Boufarik and Beni Mered, providing fast links to the national motorway network and to Houari Boumediene International Airport. Future projects: Planned infrastructure includes a direct axis from Boufarik and Beni Mered to the airport and a potential connection from Bouinan to Birtouta via Aïn Allah, reinforcing Sidi Serhane's integration into the Greater Algiers metropolitan system.

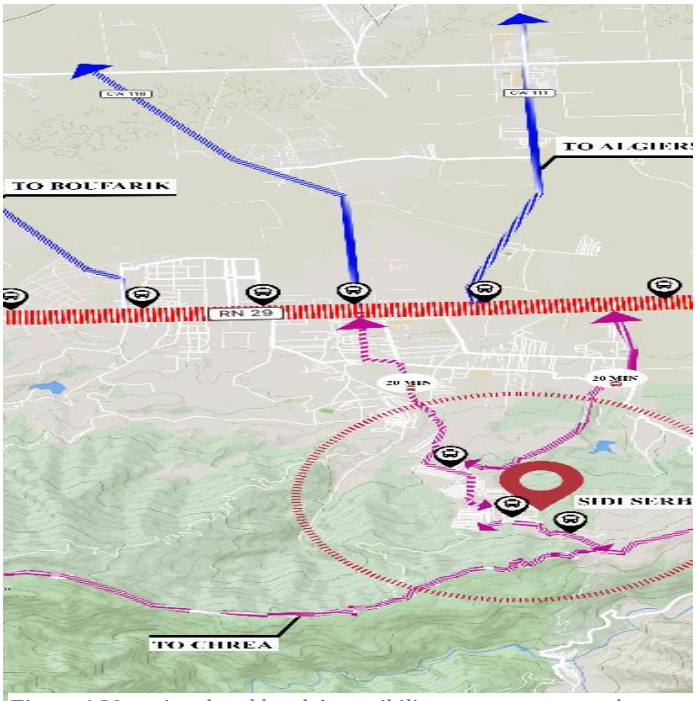


Figure 4.39:regional and local Accessibility map source : author, 2025.

At the regional level, Sidi Serhane is served by a network of wilaya roads (CW – chemins

de wilaya) that link it to surrounding towns and urban developments:

- ✓ CW 135: Connects Bouinan to Boufarik, serving as a westward regional route.
- ✓ CW 42: Extends southward towards Chréa, providing access to forested and mountainous areas.
- ✓ CW 11: Links Bouinan with Chebli, integrating the municipality with southern settlements.
- ✓ CW 111: Supports the connection between the new city of Bouinane and neighboring communes, enhancing the regional articulation of new urban poles.

Locally, the road system within Bouinan ensures direct access to Sidi Serhane through a hierarchical network:

- ✓ Main Roads: These are the primary arteries that connect different sectors of Bouinan, designed for heavy and continuous traffic. One of these leads southward to Sidi Serhane, acting as a local backbone.
- ✓ Secondary Roads: These facilitate movement between residential areas and connect to the main axes. Sidi Serhane is accessible from the town center via such secondary roads.
- ✓ Tertiary Roads: These ensure functional access to public amenities and agricultural zones, some of which surround Sidi Serhane's southern limit.
- ✓ Service Roads: Provide direct access to private properties and parcels within the rural and peri-urban zone of Sidi Serhane. (Figure 4.39)

Accessibility

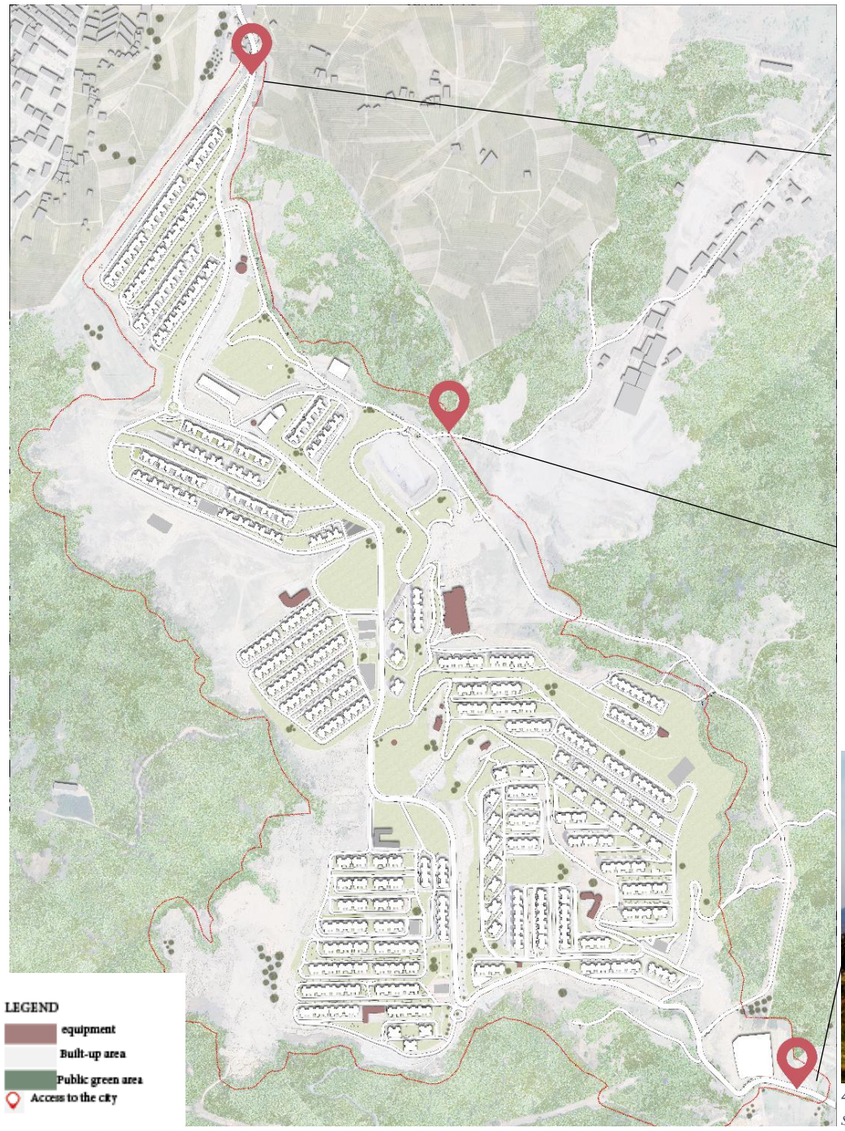


Figure 4-3Accessibility Author2025

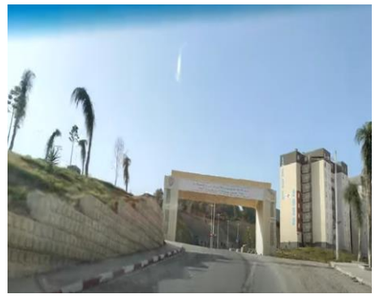


Figure 3.46 : general view of AADL sidi serhan source : TEAF Wiansa SARL

4-2general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.

4-1general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.

Analysis:

Sidi Serhane benefits from **three main access points**:
North: via the RN29 from Bouinan town centre.
South: via local roads from the original village of Sidi Serhane.
East: connection to the adjacent industrial zone

Synthesis:

An unstructured, fragmented urban morphology without identifiable neighbourhood units or central nodes.

Project Adaptation:

Establish a **looped internal road network** to interlink access points.
Prioritise **pedestrian and cycling pathways** across the site.
Integrate **multi-modal transport options** to reduce car dependency.

Street Network

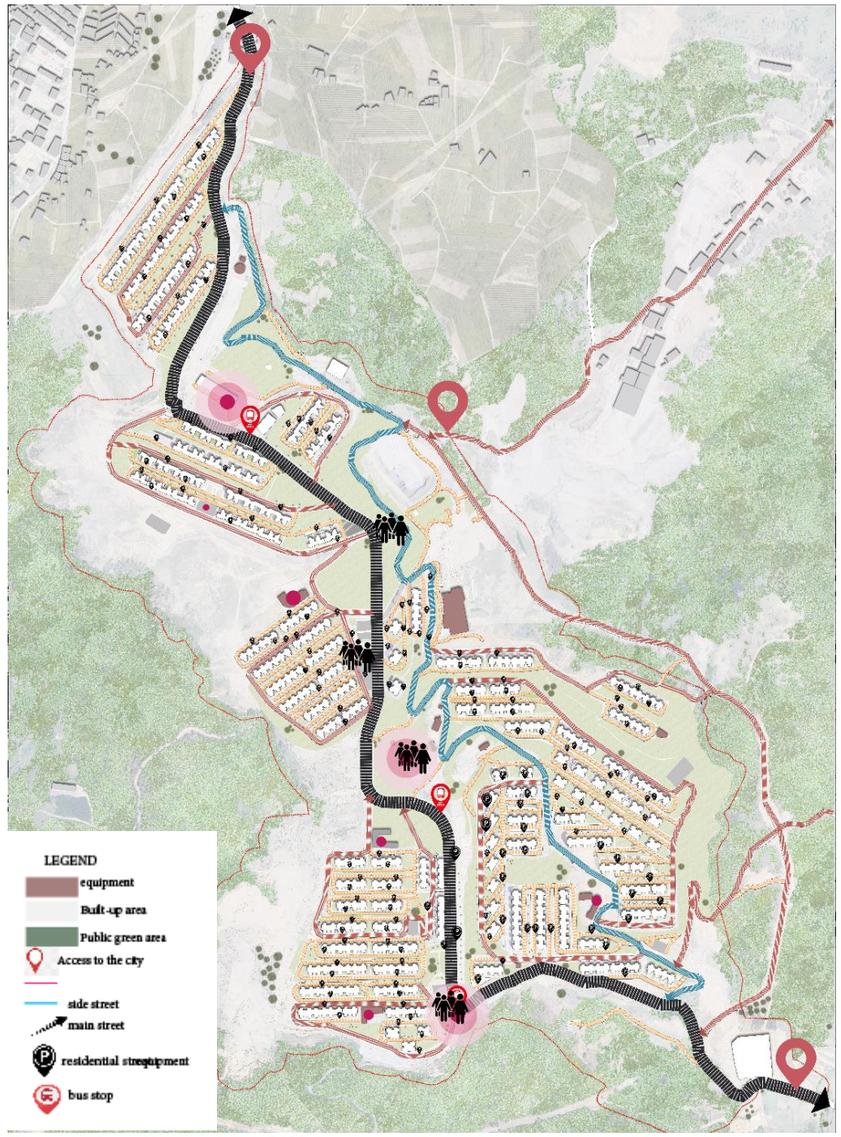


Figure 4-4Street Network Author2025

Figure 3.47 general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.

Figure 3.48 : general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.

Figure 3.49 : general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.

Analysis:

The existing street layout is mainly based on a linear and vehicular-centric system. The hierarchy between primary, secondary and tertiary roads is vague, and **pedestrian movement is marginalised**.

Synthesis:

Undifferentiated road hierarchy and lack of pedestrian infrastructure.

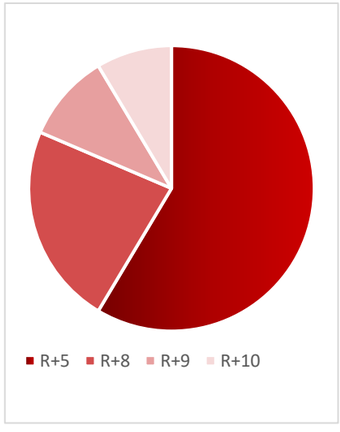
Project Adaptation:

Introduce a **structured street hierarchy** with designated lanes for cars, cycles and pedestrians.
Encourage **fine-grained access** to housing clusters.

4.2.Buildings state

4-5general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.

4-6general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.



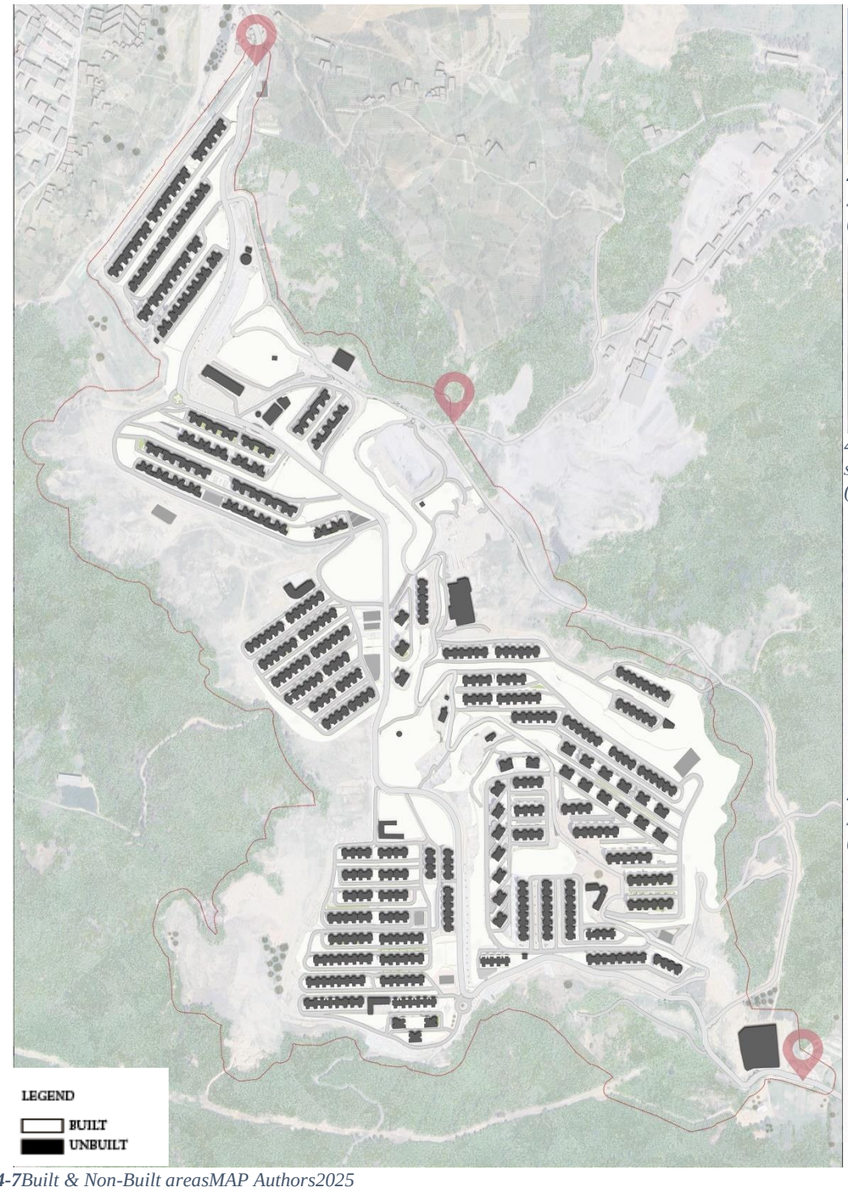
4-11Buildings Condition MAP Authors2025

Analysis:
The majority of buildings are **recently constructed**, mainly through the AADL programme. Despite their newness, they exhibit signs of poor finishing and a lack of maintenance, affecting user satisfaction and long-term sustainability

Synthesis:
New but **functionally and spatially inadequate** housing stock.

Project Adaptation:
Improve future designs with **better spatial quality and adaptability**.
Promote **user-centric design**, allowing customisation and extensions.
Use **locally sourced, durable materials** to reduce maintenan

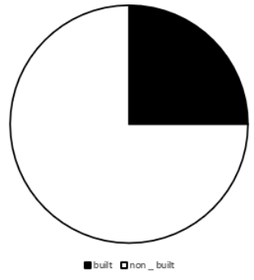
4.3.Built-up & non built areas



4-9*general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.*

4-10general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.

4-8general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.



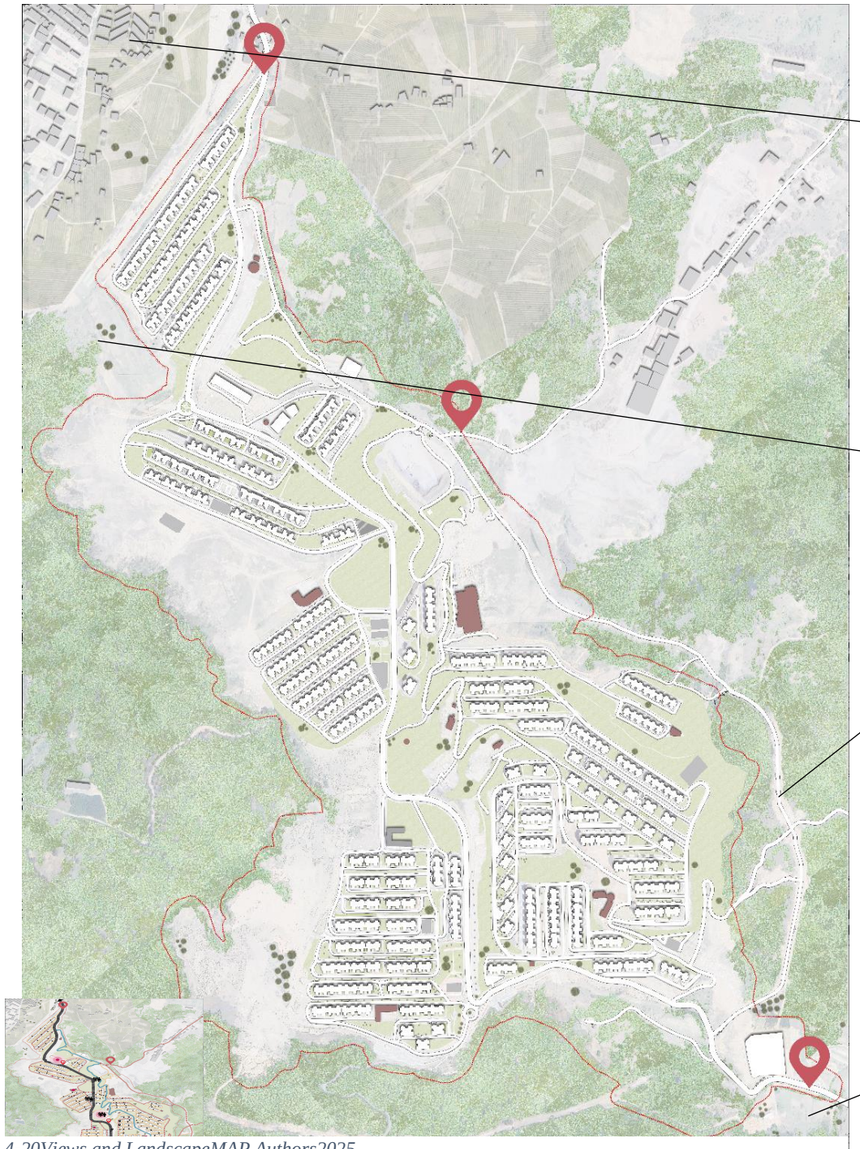
4-7*Built & Non-Built areasMAP Authors2025*

Analysis:
The area includes a **seasonal hydrographic system**, with temporary streams and **a shallow**

Synthesis:
Site prone to **hydrological constraints** and surface water accumulation.

Project Adaptation:
Integrate **Sustainable Drainage Systems (SuDS)** such as swales, retention basins, and permeable pavements.
Preserve and enhance **natural drainage paths**.
Avoid construction on zones with high water retention potential.

4.4.**Views and Landscape**



4-15general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.

4-14general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.

4-13general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.

4-12general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.

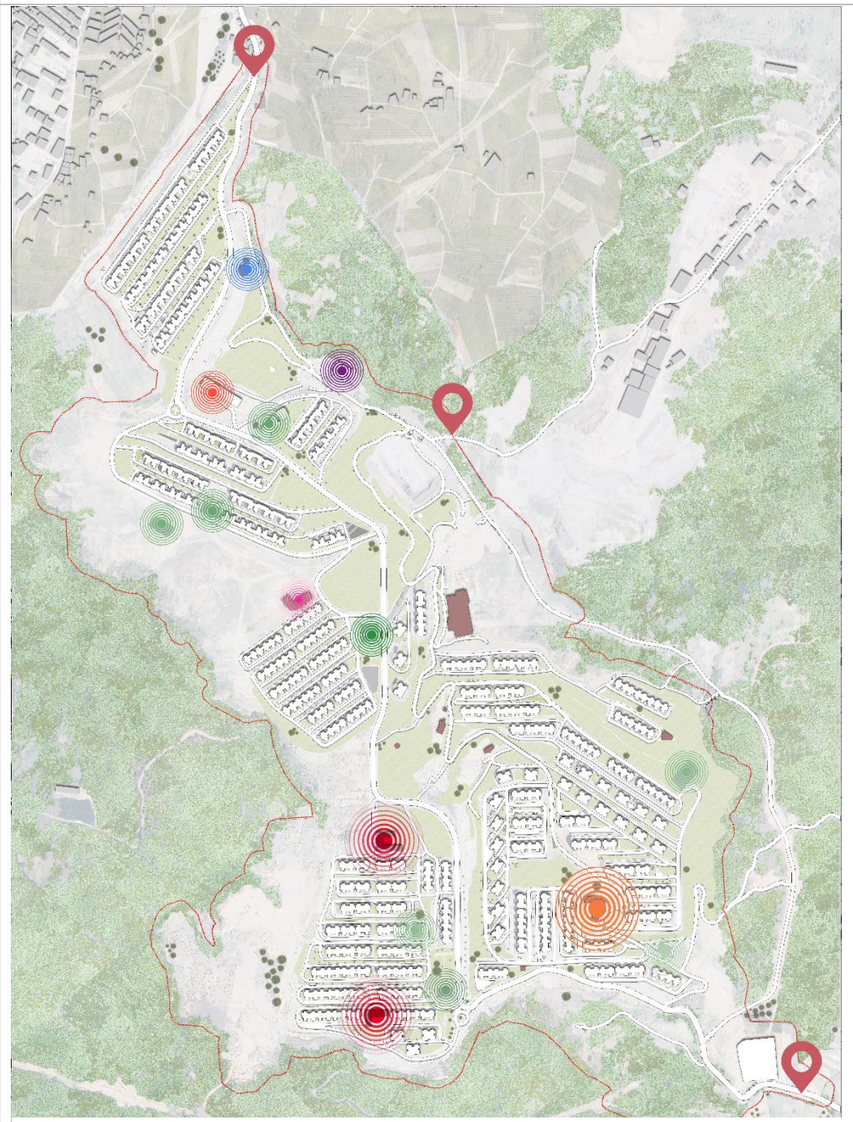
4-20Views and LandscapeMAP Authors2025

Analysis:
The site offers panoramic views toward the Mitidja plain in the north and the mountain ranges in the south. These natural assets remain unexploited in the current urban layout.

Synthesis:
High **landscape potential** currently overlooked.

Project Adaptation:
Orient housing and public spaces to **frame key vistas**.
Create **scenic walkways and lookouts** at elevated points.
Emphasise **visual permeability** and preserve view corridors.

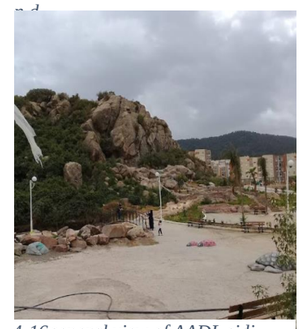
4.5.**Servitudes and Environmental Constraints**



4-17Servitudes and Environmental Constraints MAP Authors2025

4-19general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.

4-18general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook),

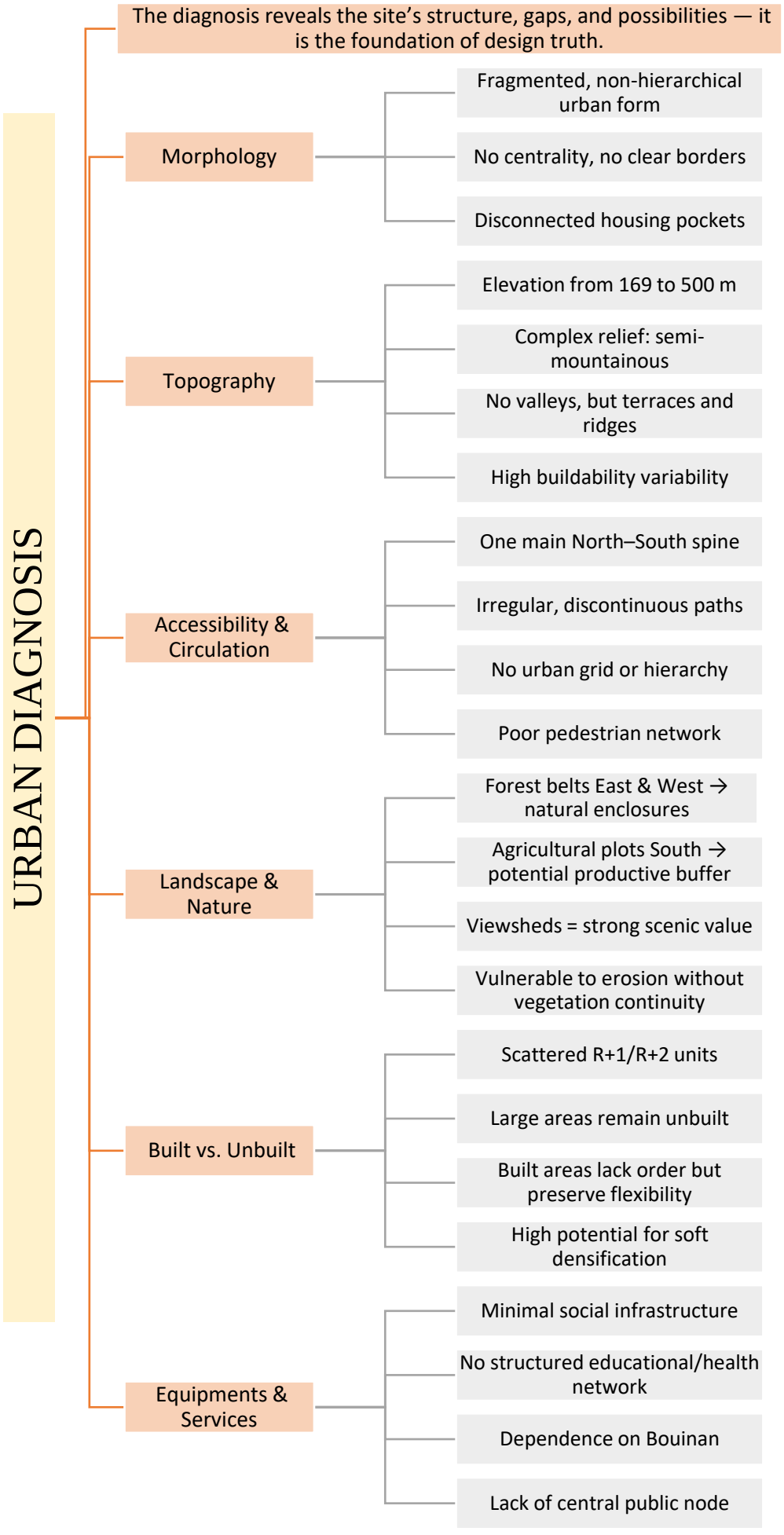


4-16general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook),

Analysis:
This absence affects daily life, limits community interaction, and highlights a disconnected planning approach ignoring users' real needs.

Synthesis:
The AADL project in Sidi Serhane, Bouinan, suffers from a serious lack of basic equipment and public facilities.

Project Adaptation:
Our project integrates shared amenities and cultural spaces, ensuring functionality, identity preservation, and a better quality of life..


URBAN DIAGNOSIS
The diagnosis reveals the site's structure, gaps, and possibilities — it is the foundation of design truth.
Morphology
Fragmented, non-hierarchical urban form
No centrality, no clear borders
Disconnected housing pockets
Topography
Elevation from 169 to 500 m
Complex relief: semi-mountainous
No valleys, but terraces and ridges
High buildability variability
Accessibility & Circulation
One main North–South spine
Irregular, discontinuous paths
No urban grid or hierarchy
Poor pedestrian network
Landscape & Nature
Forest belts East & West → natural enclosures
Agricultural plots South → potential productive buffer
Viewsheds = strong scenic value
Vulnerable to erosion without vegetation continuity
Built vs. Unbuilt
Scattered R+1/R+2 units
Large areas remain unbuilt
Built areas lack order but preserve flexibility
High potential for soft densification
Equipments & Services
Minimal social infrastructure
No structured educational/health network
Dependence on Bouinan
Lack of central public node

5. Critical Deficiencies of the AADL Project in Sidi Serhan

The AADL programme (National Agency for Housing Improvement and Development), launched in 2001, aims to meet the growing demand for housing through the mass production of residential units. In Bouinan, particularly in the district of Sidi Serhane, this programme has resulted in **rapid urbanisation** on a semi-mountainous site of high ecological and agricultural value.

5.1.Territorial Implantation and Landscape Integration

The AADL project in Sidi Serhane is located on a **peripheral site**, to the south-east of Bouinan's town centre, on **sloped terrain**. While the location offers open views and natural surroundings, it also presents several **integration issues**:

- A **clear disconnection** from Bouinan's historical urban fabric;
- **Disregard for the natural topography**, with rigid grid-like layouts that ignore the site's contours;
- **Partial deforestation** and **alteration of water drainage patterns** in a fragile environment.

This approach represents an imported, non-contextual urbanism, conflicting with site-sensitive planning principles.

5.2.Architectural Typology and Density

The AADL model is primarily composed of **multi-storey housing blocks (G+4 to G+5)** arranged in **parallel bars** with standardised spacing**(** Figure 3.49**)**. This configuration results in:

Figure 3.49 : general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.

- ✓ **High vertical density**, but **low functional density**;
- ✓ **Undefined interstitial spaces** (courtyards between blocks with no real function);
- ✓ **Lack of spatial hierarchy** between private, semi-public, and public areas;
- ✓ **Anonymous façades** and **monotonous volumes**.

Figure 3.50 : general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.

In theory, the project yields optimal indicators such as **Floor Area Ratio (FAR)** and **Land Occupation Coefficient (LOC)**, but in practice, the **quality of use and liveability remains poor**.

5.3.Accessibility, Mobility, and Infrastructure

Due to its peripheral location, the Sidi Serhane site suffers from:

- ⇨ **Weak public transport connectivity** (no Transit-Oriented Development planning);
- ⇨ A **road network with cul-de-sacs** or poor integration with the existing urban grid;
- ⇨ A **lack of local amenities and public infrastructure**, including schools, markets, and community facilities.

⇨ The result is a dormitory settlement that increases car dependency and undermines social sustainability.

5.4. Social Cohesion and Neighbourhood Life

Despite accommodating thousands of residents, the AADL compounds fail to support:

- ✓ **Informal social interaction** (no squares, neighbourhood shops, or community hubs);
- ✓ **Social diversity**, due to monofunctional and monotypical planning;
- ✓ Appropriation of shared spaces, which are often neglected or informally privatised.

⇨ These shortcomings hinder the development of a sense of belonging and encourage a standardised lifestyle that is out of sync with the Algerian social context.

5.5. Environmental Dimension

Although south-facing orientations are generally favourable, the AADL project:

Figure 3.50 : general view of AADL sidi serhan source : TEAF Wiansa SARL (Facebook), n.d.

- Ignores **prevailing winds** and **soil erosion risks** caused by sloped terrain;
- Overlooks **stormwater management** (no rainwater harvesting or greening systems);
- Creates a **high degree of surface impermeability**, increasing runoff hazards;
- Minimises **vegetation coverage**, limited to decorative plantings.

The AADL project in Sidi Serhane reflects a **mechanical transposition of a standardised housing model** into a complex local environment. It exposes the **limitations of vertical densification**, particularly on uneven terrain with high landscape value and weak infrastructural links. **(** Figure 3.50**)**

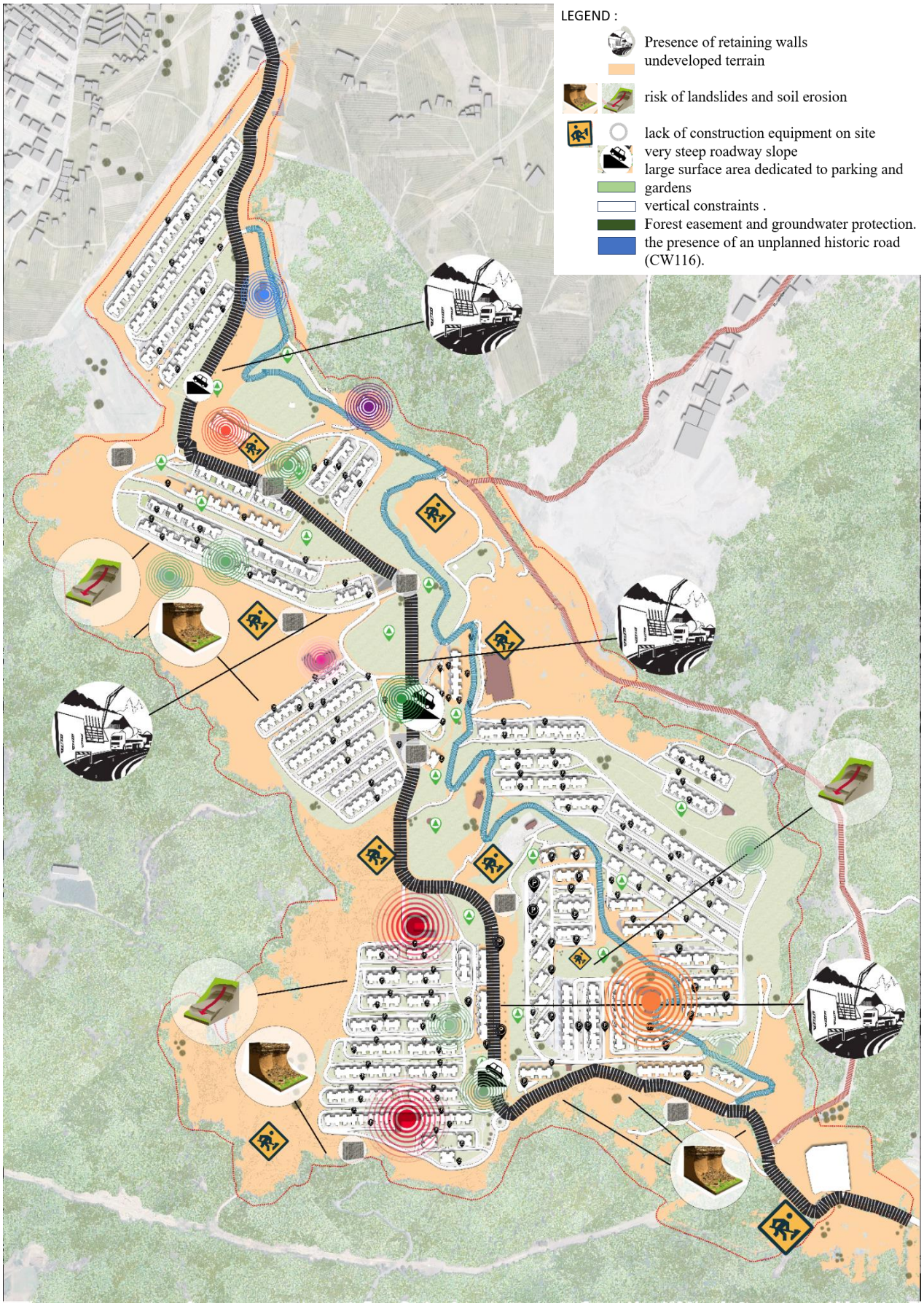


Figure 3.51: synthesis of the issues and servitudes in Sidi Sehan. source : author

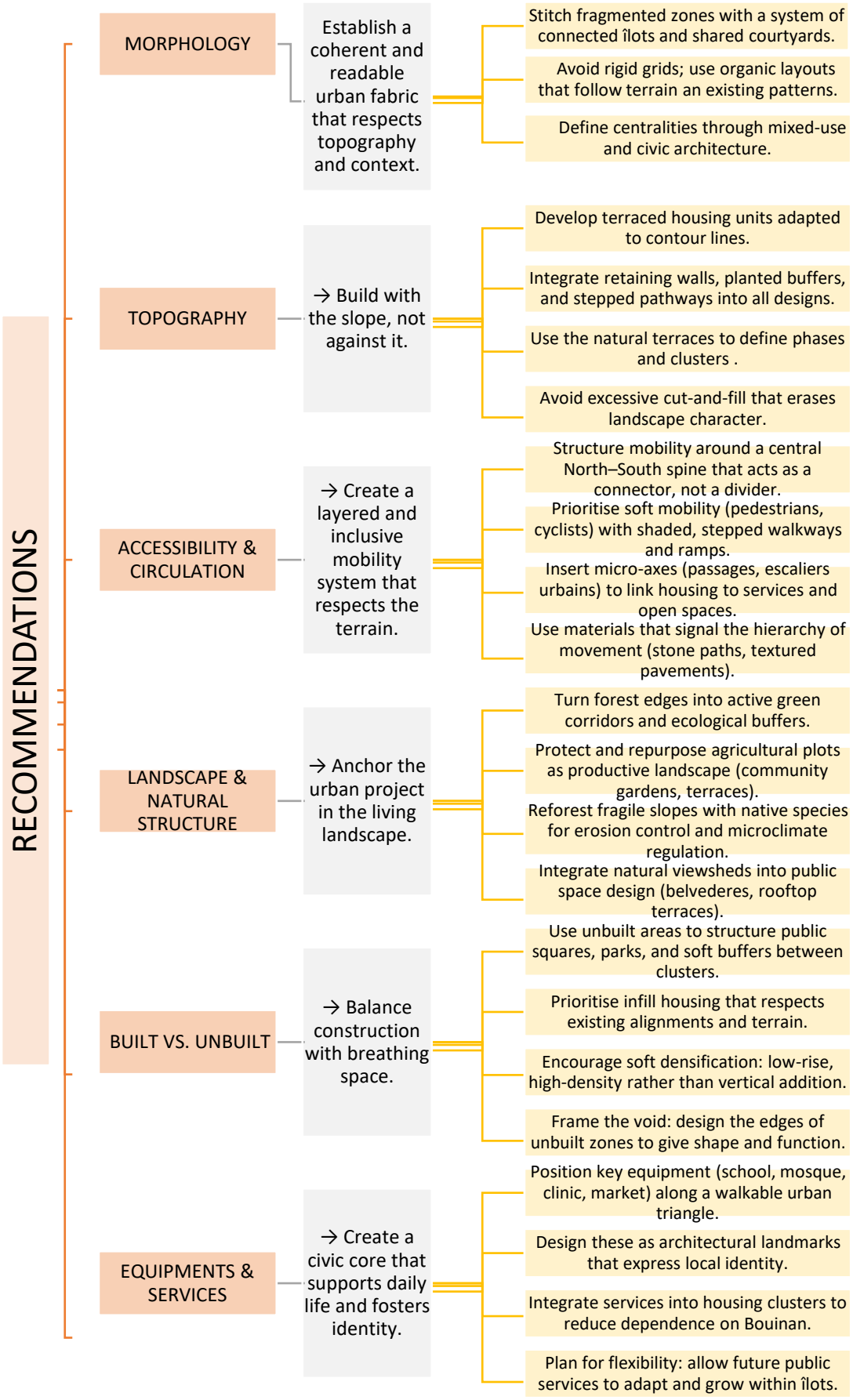


Figure 3.52 : Urban Recommendation Scheme source : author

6. Spatial Strategy to address the identified issues in Sidi Serhan

This alternative proposal positions itself as a **response to the vertical and standardised AADL model**, favouring a strategy of **horizontal densification** that is adapted to the **topographical, social, environmental, and cultural characteristics** of Sidi Serhane. The aim is to develop an **integrated, resilient, and sustainable urbanity**, structured by design principles that enhance:

- The **natural landscape** (slopes, forests, watercourses);
- The **social fabric** and local practices;
- The **architectural and territorial identity**;
- A **controlled, human-scale density** (Low-Rise High-Density model).

6.1. Project Principles

6.1.1. Topographical Integration

The proposal follows **contour lines** to determine the placement of housing units, thus avoiding extensive earthworks. This allows for:

- ⇨ Seamless **integration into the landscape**;
- ⇨ Improved **rainwater management**;
- ⇨ Preservation of **panoramic views**.

6.1.2. Human-Scale Typologies

The proposed housing types are varied but consistently **low-rise**:

- ⇨ **Row houses and patio dwellings** on sloped plots;
- ⇨ **Duplex houses with private gardens** in flatter areas;
- ⇨ **Small collective units (G+1 to G+2)** arranged around small squares and alleys.
- ⇨ These typologies achieve a density comparable to the AADL scheme, without compromising **intimacy or liveability**.

6.1.3. Organic and Connected Street Network

The project adopts an **organic street pattern** that responds to the site's terrain:

- ⇨ Clear **hierarchy of circulation**: primary roads, alleys, pedestrian paths;
- ⇨ **Inter-neighbourhood pedestrian routes**;
- ⇨ Emphasis on **soft mobility**, with shared parking solutions.

6.1.4. Place-Based Public Spaces

The scheme includes a diversity of **integrated public spaces**:

- ⇨ **Shaded neighbourhood squares**;
- ⇨ **Playgrounds and community gardens**;
- ⇨ **Local markets, cafés, mosques, and schools** forming social anchors within neighbourhood clusters.
- ⇨ These elements enhance **social interaction**, **diversity**, and **community ownership**.

6.1.5. Integration of Local Identity

a. Reinterpretation of Vernacular Architecture

The design draws inspiration from the **vernacular typologies** of the Blida region:

- ⇨ Organisation around **interior courtyards** (patios, "haouch");
- ⇨ Use of **local materials**: stone, rammed earth, perforated brick, natural plasters;
- ⇨ Incorporation of **vegetated boundary walls** for privacy and thermal comfort.

b. Architectural Language with Identity

Facades reflect a restrained **Mediterranean vocabulary**:

- ⇨ Filtered openings (modern **mashrabiyas**, perforated screens);
- ⇨ Sloped roofs with red tiles in designated zones;
- ⇨ **Earth-toned and neutral colour palette** integrated with the landscape.

This approach counters the anonymity of the AADL housing model and enhances the **visual identity of Sidi Serhane**.

6.1.6. Community-Scale Urbanism

- ⇨ The basic urban unit is the **"neighbourhood cell"**, composed of 6 to 12 dwellings arranged around a **shared communal space**: courtyard, garden, square, or multipurpose room.
- ⇨ This reinforces the **social role of housing** beyond its private function.
- ⇨ Resilience, Sustainability, and Land Management
- ⇨ **Rainwater management** via swales, green roofs, and rainwater harvesting systems;
- ⇨ Use of **bioclimatic, reversible materials** to support local maintenance and adaptation;
- ⇨ Creation of **continuous green networks** functioning as ecological corridors;
- ⇨ **Flexible zoning**: neighbourhood units designed for incremental expansion or division based on evolving needs.

7. Conceptual Framework : Alternative Masterplan

The principle diagram of Sidi Serhane presents a strategic urban vision that balances continuity, function, ecology, and livability. Rather than imposing a rigid layout, the plan embraces the existing landscape, the historical fabric, and the ecological structure to guide urban development.

7.1.Core Principles

7.1.1. Strengthening Historical and Spatial Continuity

The project seeks to reconnect the historic center of Bouinan with the old village of Sidi Serhane. This is achieved through two main axes:

- A **structural axis** that organizes the city spatially.
- A **historical axis** that preserves memory and guides movement along traditional paths.

Together, these routes create a dual structure that defines urban hierarchy and ensures cohesion between past and present.

7.1.2. Functional Division for a Mixed Urban Fabric

The city is divided into distinct zones:

- **Residential areas** for housing.
- **Mixed-use zones** combining homes, shops, and services.
- **Industrial zones** positioned on the periphery to reduce conflict with daily life.

This structure supports social diversity, local economies, and efficient land use.

7.1.3. Sequencing the Structuring Axis

The main road is segmented into **three sequences**, each adapted to the changing topography of Sidi Serhane. This ensures fluidity of movement, continuity in urban form, and responsiveness to natural slopes.

7.1.4. Ecological Corridor and Natural Integration

An ecological corridor is preserved around the city, protecting:

- ✓ The **forest**
- ✓ **Agricultural land**

- ✓ The **aquifer**

This green framework defines city boundaries, enhances environmental resilience, and offers recreational and ecological value.

7.1.5. Strategic Distribution of Public Facilities

Public facilities such as schools, health centers, mosques, and administrative buildings are positioned along the main urban axes. This improves:

- ✓ **Accessibility**
- ✓ **Visibility**
- ✓ **Urban efficiency**

These nodes become anchors for community life and service delivery.

7.1.6. Creating Active Nodes and Commercial Atmosphere

The plan introduces **urban nodes**—lively intersections with active frontages, pedestrian movement, and commercial activity. These enhance walkability, promote social interaction, and energize public life.

7.1.7. Horizontal Densification

Instead of vertical expansion, the plan opts for **horizontal densification**, preserving human-scale, low-rise housing while increasing urban density in a controlled and respectful manner.

7.1.8. Central Green Spaces

Urban parks and green areas are developed within the city center to Improve quality of life , Support ecology and Provide spaces for leisure and gathering.

This diagram outlines the core planning strategies for Sidi Serhane's development. It connects the historic center of Bouinan to the village through structural and historical axes, organizes land use by function, and integrates natural features via an ecological corridor. The aim is to guide sustainable, walkable, and landscape-sensitive urban growth (figure 3.54) .

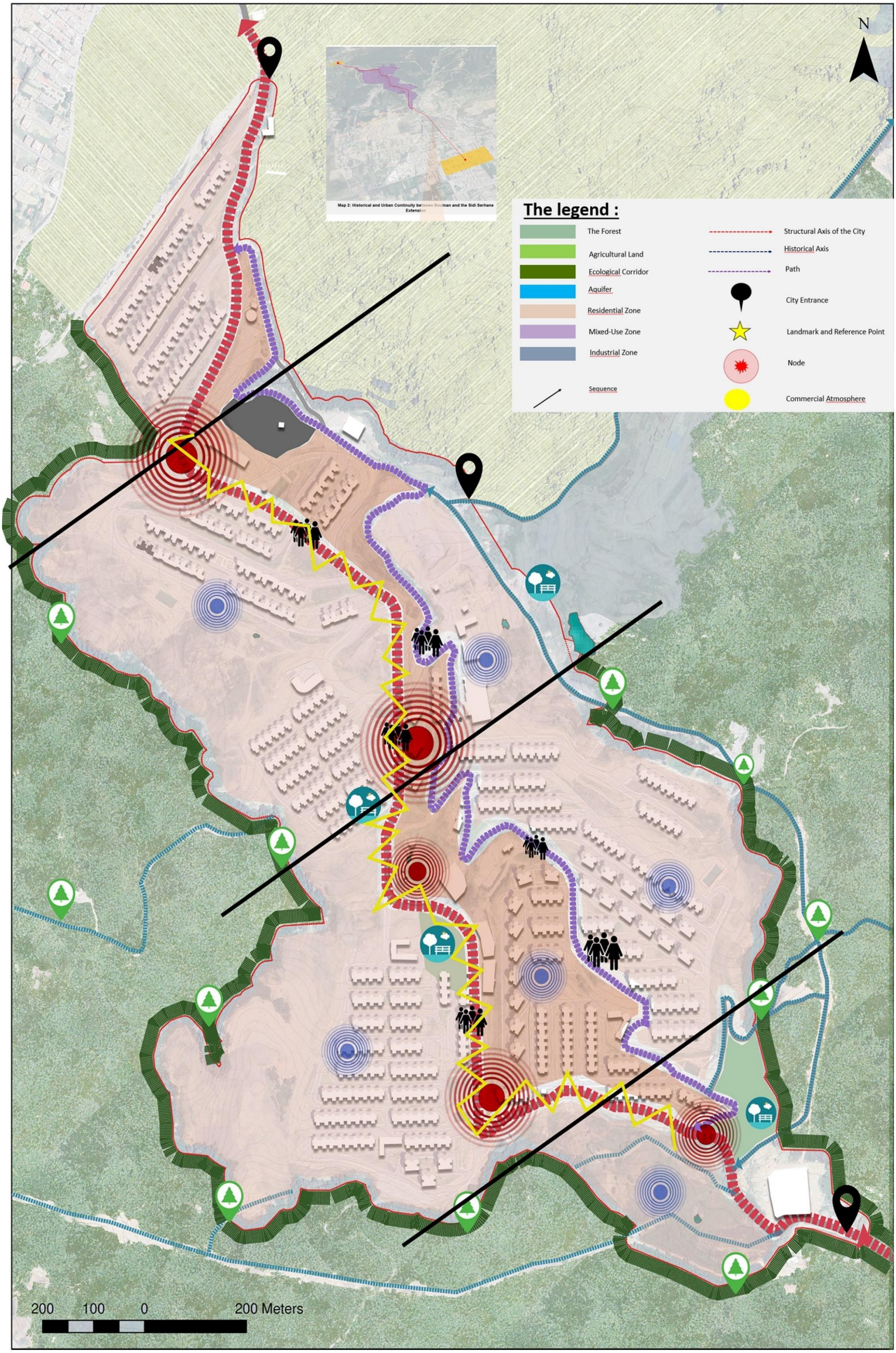


Figure 3.54 : Principle Diagram of Sidi Serhane source : author,2025.

7.2.Programmatic Distribution

7.2.1. Overall Housing Strategy

The revised masterplan proposes **7,500 housing units** organised into **eight urban neighbourhoods**. The residential fabric is composed of repetitive **urban blocks (îlots)**, each containing **24 dwelling units**, divided into two groups of 12 by a central **urban stairway** that adapts to the topography.

The housing offer is based on **six typologies**, varying by:

Surface area: 70 m², 80 m², 100 m², and 120 m²

Function:

- ⇨ Standard residential
- ⇨ Residential with integrated garage
- ⇨ Mixed-use with **commercial ground floor (shop)**

These six typologies are systematically repeated across the city, creating **coherence and modularity**, while maintaining diversity in form and usage.

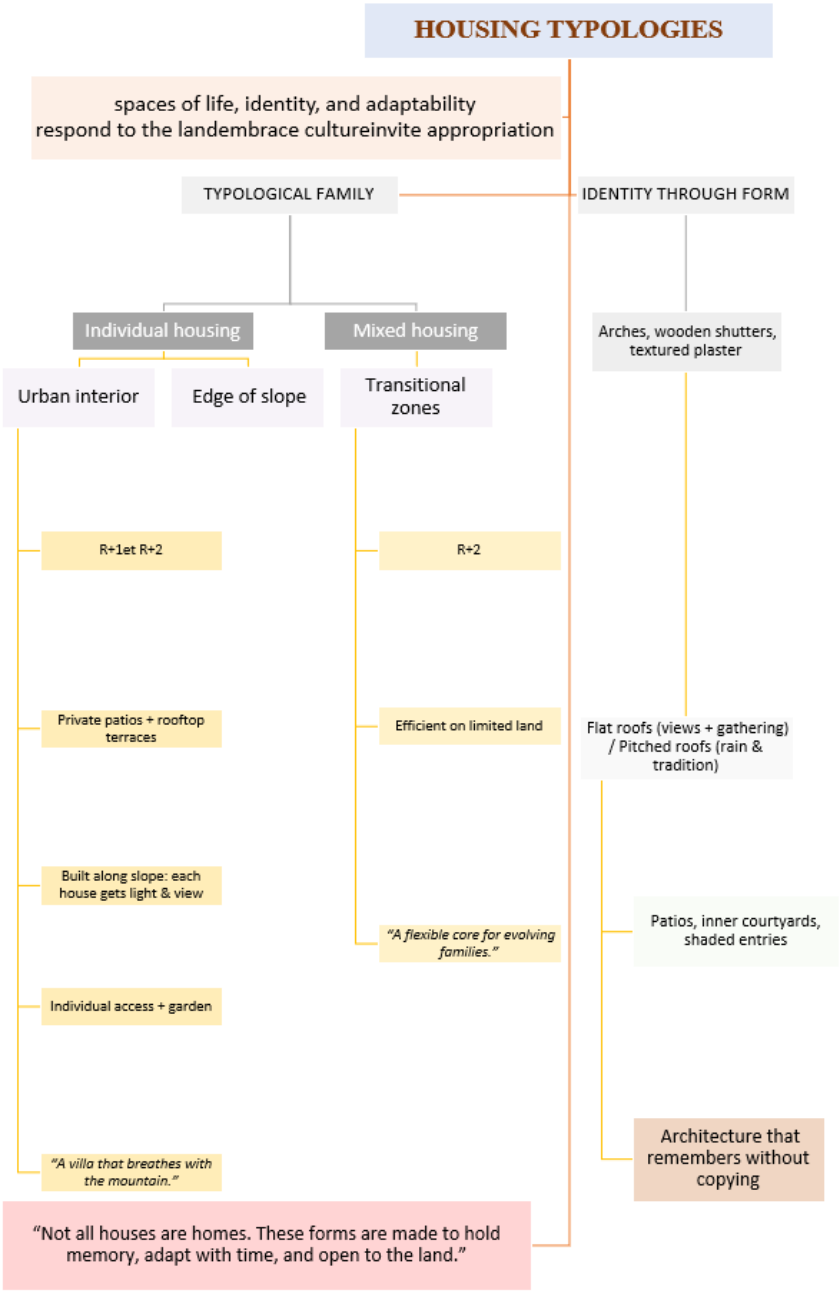


Figure 3.55 : housing typologies source : authors,2025.

Only the **mixed-use dwellings with retail** are located along the **main urban axis**, creating a linear commercial strip and ensuring **active frontages (figure 3.53)** .

7.2.2. Urban Equipment Integration

The distribution of public facilities across Sidi Serhane is based on accessibility, terrain

adaptation, and population coverage. Facilities are located according to a hierarchy of service: neighbourhood-level (schools, playgrounds), inter-district (CEMs, clinics), and city-scale (lycée, Friday mosque, fire and police stations). All are placed in relation to the topography — flat or gently sloped plots, visible or central positions — and respect functional buffer zones of 300 m, 600 m, and 1,000 m. This system creates a balanced, resilient, and human-centred city structure, ensuring that every inhabitant is within walking distance of education, health, religion, and administration (table 15 et 16) .

Table 10 : Urban Equipment Program – Summary Table according to CNERU

Equipment	Surface (m^2)	Capacity	Floors	Urban Location	Service Radius
Primary School (x8)	2,500–3,000	350–400 pupils	R+1	Inside each residential sector	300–500 m
Middle School (CEM x3)	5,000–6,000	500–700 pupils	R+1	Between sectors, accessible nodes	800–1,000 m
High School (x1)	8,000–10,000	800–1,200 pupils	R+2	On large flat area near main road	1,200–1,500 m
Mosalla (x2)	1,200	~600 people	R+1	Inside neighbourhoods	500–600 m
Jumu'ah Mosque (x1)	1,800	1,000+ people	R+1	Elevated, central, visible location	700–1,000 m
Clinic (x2)	800–1,000	60–80 patients/day	R+1	Along primary road	~1,000 m
APC Annex (x2)	600–1,000	Admin services	R+1	Near central square or clinic	~1,000–1,200 m
Post Office (x2)	500–700	Public service	R+1	At commercial crossroads	~1,000 m
Playground (x8)	100–200	Children (2–10)	Ground	Within each îlot/residential cluster	~50–70 m
Mini-Stadium	1,000–1,500	Youth recreation	Ground	At îlot edges or flat terraces	400–600 m
Fire Station (x1)	800–1,200	Fire services	Ground	Junction near primary road	>1,500 m
Police + Gendarmerie (x2)	1,000–1,500	City security	Ground	Periphery/entry points	>1,500 m

Table 11. Global Land Use Programme – New Urban District of Sidi Serhane (approx. 100 ha) source : author,2025.

Category	Components	Estimated Surface	% of Total Urban Area
Built Area (Residential)	7,500 housing units: - 24 units per block (îlot) - 6 typologies (70–120 m²) - G+1 to G+2 (low-rise high-density) - 8 neighbourhoods	~35 ha	35%
Circulation Infrastructure	- Primary roads (loop system) - Secondary roads - Tertiary alleys - Roundabouts, sidewalks - Public transport corridors	~15 ha	15%
Green and Open Spaces	- 3 public parks (5,000–6,000 m² each) - Pocket gardens - Ecological corridors - Tree-lined streets and buffer zones	~20 ha	20%
Public Facilities	- 8 primary schools - 3 middle schools (CEM) - 1 lycée - 3 mosques - 2 clinics - 2 APC annexes - 2 post offices	~8 ha	8%
Commercial and Mixed-use	- Ground floor shops on main road (Typology E/F) - Markets - Weekly souk areas	~5 ha	5%
Parking and Mobility Nodes	- Semi-public parking (2 units/îlot) - Public car parks - Bus stops and drop-off zones	~5 ha	5%
Pedestrian + Cycling Network	- Dedicated pedestrian paths - Cycle lanes along green corridors - Ramps/stairs in sloped zones	~2 ha	2%
Residual / Technical Areas	- Waste collection points - Technical infrastructure - Water retention basins / SuDS - Safety/service buffers under powerlines	~10 ha	10%

7.2.3. Strategic Equipment Buffering in Sidi Serhane:

In the proposed counter-project for Sidi Serhane, the implantation of public facilities is guided by a context-sensitive approach that balances accessibility, functionality, and equity. Instead of a rigid layout, we developed a buffer-based equipment strategy, rooted in the idea that each facility should serve its population efficiently within an optimal influence radius.

The methodology begins by classifying equipment by typology and hierarchy. Primary schools, with a radius of 300 to 500 meters, are distributed near housing clusters to ensure every child can access school easily. Each school was sized to meet defined capacity limits, avoiding overuse.

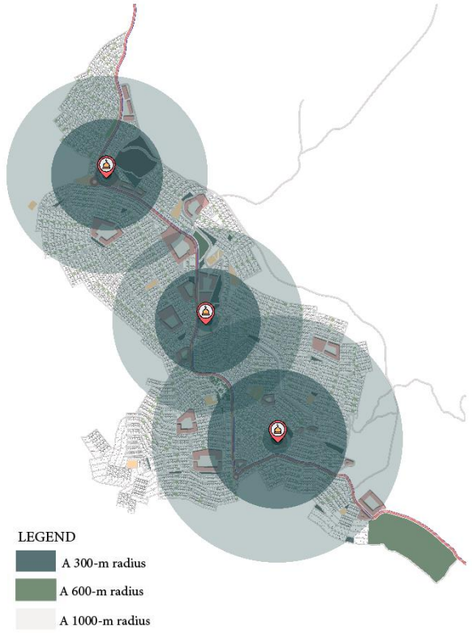
Secondary schools and health centers, with influence radii of 800 to 1000 meters, serve broader segments and are located centrally between clusters. Their placement is informed by pedestrian accessibility, road connectivity, and terrain. This ensures reduced travel time, service efficiency, and coherent distribution (figure 3.56 et 57 et 58 et 59) .

Larger facilities, like APC annexes, mosques, and sports fields, are set within wider buffers of 1 to 1.5 kilometers. Positioned along the main loop road or at strategic nodes, they function as civic anchors. Their siting also considered visibility, slope, and the potential for shared open spaces that encourage social interaction.

To ensure adaptability, reserved plots allow future expansion of public facilities as population needs evolve. This strategy guarantees long-term flexibility without disrupting the urban fabric or quality of life. Green buffers and open spaces are placed around equipment to enhance microclimatic comfort, visibility, and multipurpose use. These areas serve as ecological corridors and pedestrian paths linking neighborhoods and public services, promoting both accessibility and environmental value. This approach combines quantitative planning—based on service radius and population—with qualitative factors like topography, walkability, and spatial identity. Equipment is not only functionally located but spatially integrated within the landscape and community life. Through this strategy, Sidi Serhane's development departs from generic zoning models and builds a more coherent, inclusive, and human-scaled urban fabric—one that is rooted in the needs of its people and the logic of its place.

At the urban scale, three mosques are distributed across the city to ensure spiritual accessibility for all users:

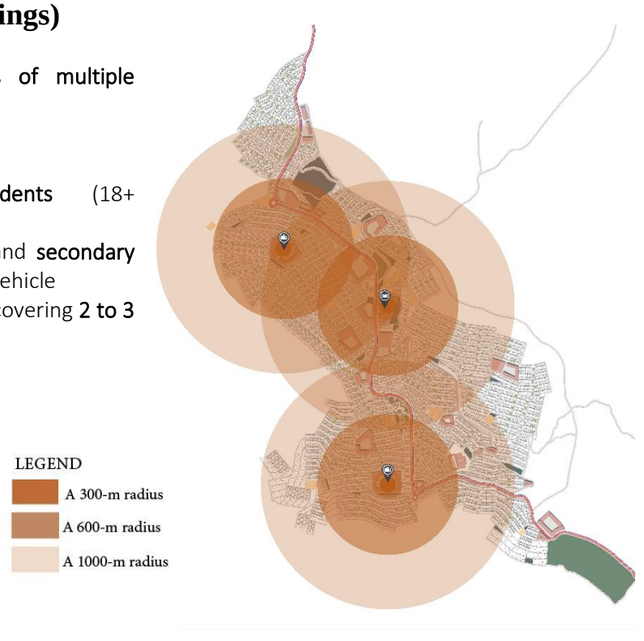
- ✓ **2 daily mosques (mosala)**: ~1 200 m² each
- ✓ Capacity: **500–600 worshippers**
- ✓ Location: positioned **within neighbourhood centres**, on **semi-elevated platforms**, ensuring proximity within a **500–600 m buffer**
- ✓ **1 Jumu'ah mosque (main Friday mosque)**: ~1 800 m²
- ✓ Capacity: **800–1 000 people**
- ✓ Location: placed near the **urban centrality**, visible from the main road, and accessible to all eight districts within a **1 000 m buffer**
- ✓ Positioned on a **dominant plateau** to symbolise spiritual and civic presence in the urban composition



Middle Schools – CEM (3 buildings)

CEMs are placed at the **intersections of multiple neighbourhoods** to ensure shared use:

- ✓ Surface: **5 000–6 000 m²**
- ✓ Capacity: **~600–700 students** (18+ classrooms)
- ✓ Placement: near **local hubs** and **secondary roads**, accessible by foot and vehicle
- ✓ Service buffer: **800–1 000 m**, covering **2 to 3 adjacent neighbourhoods**



High School (Lycée – 1 building)

The lycée is treated as a **central educational landmark**:

- Surface: **8 000–10 000 m²**
- Capacity: **~1 000 students**
- Location: on a **broad plateau adjacent to the main urban loop road** (RN29 axis)
- Service radius: **1 200–1 500 m**, which includes the whole urban zone
- Structure: **R+2**, including classrooms, sports courts, laboratories and amphitheatre

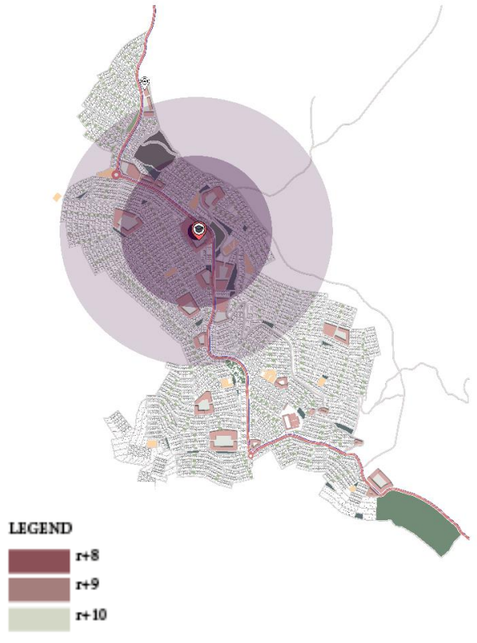


Figure 3.56 : High School (Lycée – 1 building) , Author

Primary Schools (8 buildings)

Each of the 8 districts includes one **primary school**, ensuring walkable access:

- Surface: **2 500–3 000 m²** per school
- Capacity: **~300–400 pupils** (10–12 classrooms)
- Placement: **flat or gently sloped inner parcels**, within the heart of each neighbourhood
- Service radius: **300–400 m**, ensuring that **every child lives within 5–7 minutes walking distance**

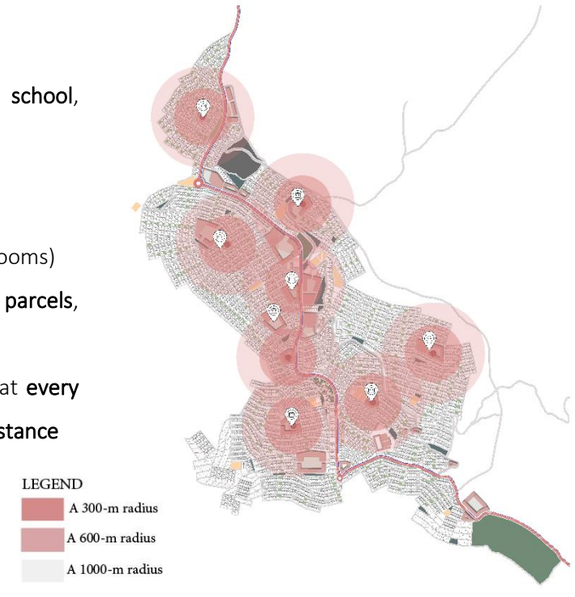


Figure 3.57 : Primary Schools (8 buildings Author

Clinics (3 health posts)

Two **proximity health clinics** are strategically positioned:

- ✓ Surface: **800–1 000 m²**
- ✓ Capacity: **~60–80 consultations per day**
- ✓ Location: near **main roads**, ensuring **vehicle and emergency access**
- ✓ Each covers a **1 000 m radius**, offering basic health care within **walking distance**

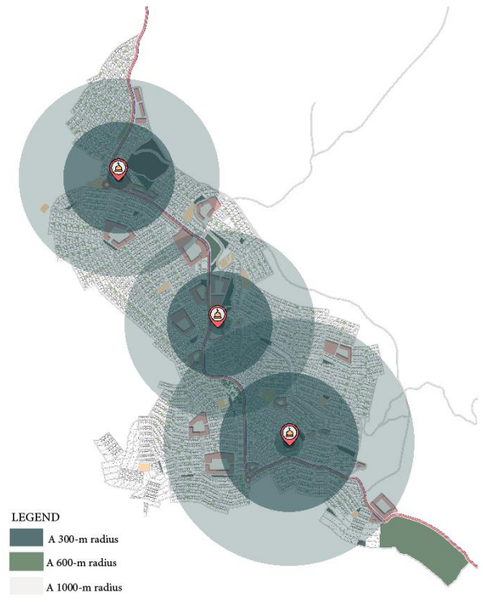


Figure 3.58:Clinics (2 health posts, Author

APC Offices (3 municipal annexes)

Administrative annexes of the commune are integrated into central nodes:

- Surface: **600–1 000 m²**
- Functions: civil registry, permits, local governance
- Location: close to the **clinic or civic plazas**
- Each covers a **service zone of ~1 200 m**, facilitating quick access to civic services

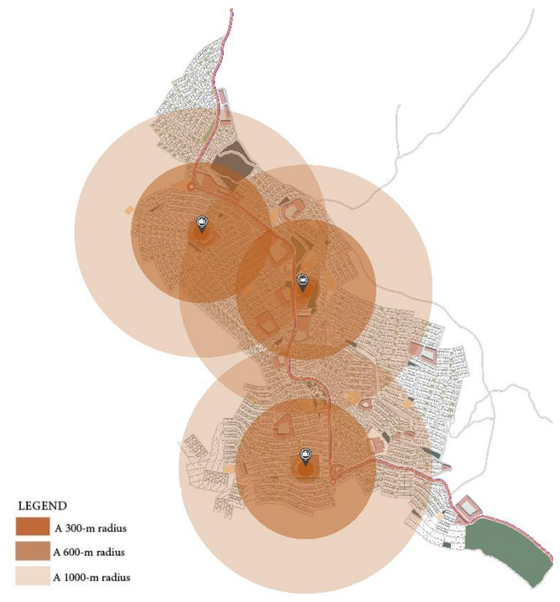


Figure 3.59 : APC Offices (2 municipal annexes, Author

Post Offices (1 buildings)

Postal services are distributed for **north–south coverage**:

- Surface: **500–700 m²**
- Capacity: **~300–400 users/day**
- Location: near **mixed-use corridors** (commercial + residential)
- Positioned within a **1 000–1 200 m buffer** per sector

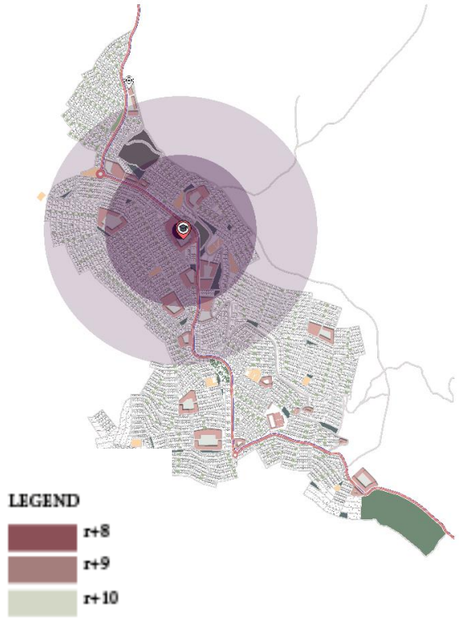


Figure 3.60 : Post Offices, Author

Playgrounds (8 units)

One **play area per neighbourhood**, inserted within each residential îlot:

- Surface: **100–200 m²**
- Age target: **2–10 years old**
- Distance: within **50–70 m radius**, placed in **shaded, flat, communal cores**
- These spaces promote spontaneous socialisation and safe outdoor activity for young children

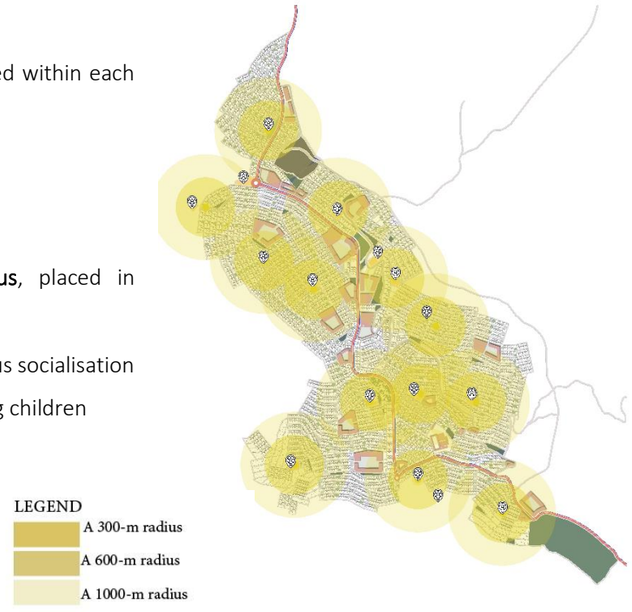


Figure 3.61 : Playgrounds (8 units) , Author

8. Implementation Strategies

8.1.Phased Development

Developing an urban project in a semi-mountainous and evolving context like Sidi Serhane requires a phased implementation strategy that aligns with spatial, economic, and social dynamics over time (UN-Habitat, 2020). Rather than imposing a complete and rigid urban fabric from the outset, this approach prioritizes gradual growth, flexibility, and resilience (Fraker, 2013). The proposed phasing begins with essential infrastructure, including primary circulation routes, water management, and foundational housing units, and then expands progressively toward complete neighborhoods with integrated public services and green spaces (Dempsey, Brown, & Bramley, 2011). Each phase is carefully calibrated to respond to population growth, land capacity, and service demands, reducing pressure on infrastructure and avoiding the socio-spatial disruptions often caused by large-scale developments (Gehl, 2010). This strategy also enables constant adaptation to unforeseen challenges—economic fluctuations, climate risks, or institutional delays—thus ensuring a more sustainable and community-responsive development model (UN-Habitat, 2020). By integrating the needs and feedback of local actors into each stage, the plan supports active participation and long-term place attachment (Talen, 2012). Moreover, the phasing process takes into account topographic complexity and slope orientation, allowing each built segment to integrate organically with the landscape (Fraker, 2013). Facilities such as schools and health centers are introduced according to their radius of influence and demographic capacity, ensuring that accessibility and efficiency are maintained as new units are constructed (Dempsey et al., 2011).

STEP 1:

Neighbourhood Structuring

The city is subdivided into **8 urban neighbourhoods** based on access points, natural barriers, and topographic flow. Each neighbourhood is conceived as a **self-contained unit** with local identity and functional autonomy. These units are defined to optimise **land management**, access to public services, and ease of phased implementation (figure 3.61) .

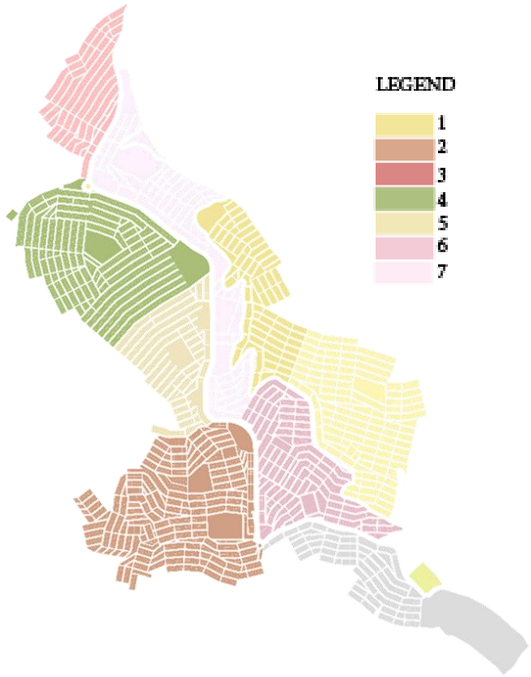


Figure 3.61: Neighbourhood Structuring Author

STEP 2:

MASSING STRATEGY AND TOPOGRAPHIC ORIENTATION

The global massing responds to the **slope gradient**, avoiding excessive earthworks and following **contour lines**.

Buildings are oriented to maximise **solar gain, cross ventilation**, and **panoramic views**.

Height and density gradients are adjusted progressively from **lower (north)** to **higher (south)** elevations (figure 3.62).

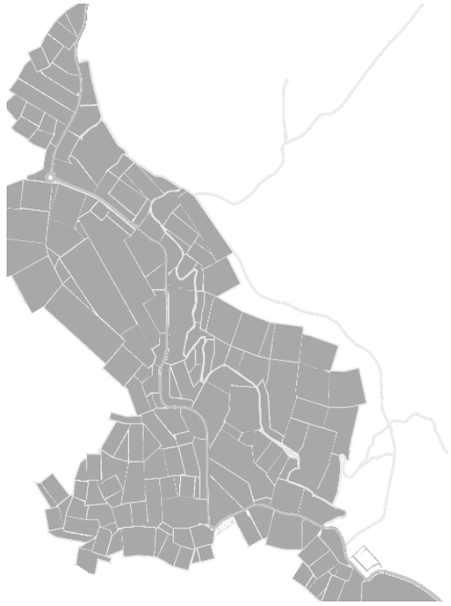


Figure 3.62 : MASSING STRATEGY AND TOPOGRAPHIC ORIENTATION Author

STEP 3:

BLOCK SUBDIVISION

Each neighbourhood is divided into standardised **urban blocks (îlots)**, each containing **24 dwelling units**.

The block layout integrates a **central stairway**, adapting the housing pattern to the site's slope (figure 3. 64) .

Typological repetition ensures **coherence** while enabling diversity through functional variation (residential, garage, mixed-use).

Figure 3.64 : BLOCK SUBDIVISION Author

STEP 4:

PLOT DIVISION AND TYPOLOGY ALLOCATION

Each block is further subdivided into **individual parcels**, assigned according to the **6 housing typologies**:

- ✓ 70 m², 80 m², 100 m², and 120 m² units
- ✓ With or without integrated garage
- ✓ Mixed-use types with commercial ground floors

The **main commercial spine** receives exclusively mixed-use plots, ensuring a **linear urban frontage**.

STEP 5:

Facility Mapping and Public Infrastructure Deployment

Each neighbourhood integrates:

- ✓ 1 primary school
- ✓ 1 sports field
- ✓ 1 children's playground

City-wide distribution includes:

- ✓ 3 mosques
- ✓ 3 middle schools (CEM)
- ✓ 1 secondary school (lycée)
- ✓ 2 health clinics
- ✓ 2 post offices
- ✓ 2 local APC administrative units

Facilities are placed strategically based on **catchment radii** and **walkability criteria**.

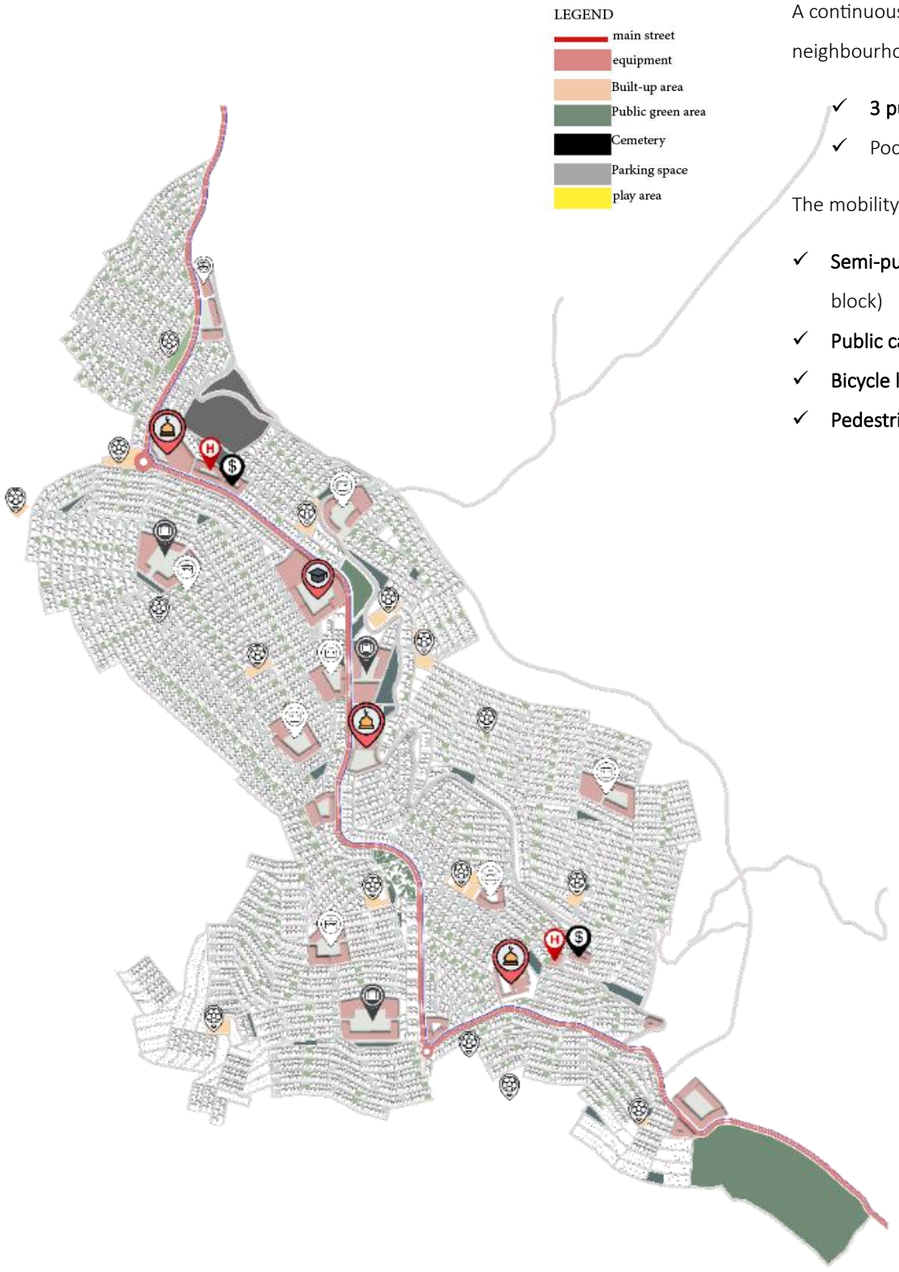


Figure 3.65 : Facility Mapping and Public Infrastructure Deploymen; Author

STEP 6:

PUBLIC REALM AND MOBILITY SYSTEMS

A continuous **green infrastructure network** connects neighbourhoods via:

- ✓ **3 public parks**
- ✓ Pocket parks and ecological corridors

The mobility system includes:

- ✓ **Semi-public parking lots** at the block level (2 per block)
- ✓ **Public car parks** near commercial and civic hubs
- ✓ **Bicycle lanes** linking all neighbourhoods and facilities
- ✓ **Pedestrian priority streets and shared spaces**

Figure 3.66 : Facility Mapping and Public Infrastructure Deployment Author

8.2.Mobility & Green Infrastructure

The proposed circulation network for Sidi Serhane is designed to ensure **fluid movement**, **multi-modal accessibility**, and a balanced coexistence between **motorised traffic**, **pedestrians**, and **cyclists**, all while respecting the site's **complex topography** (figure 3.67).

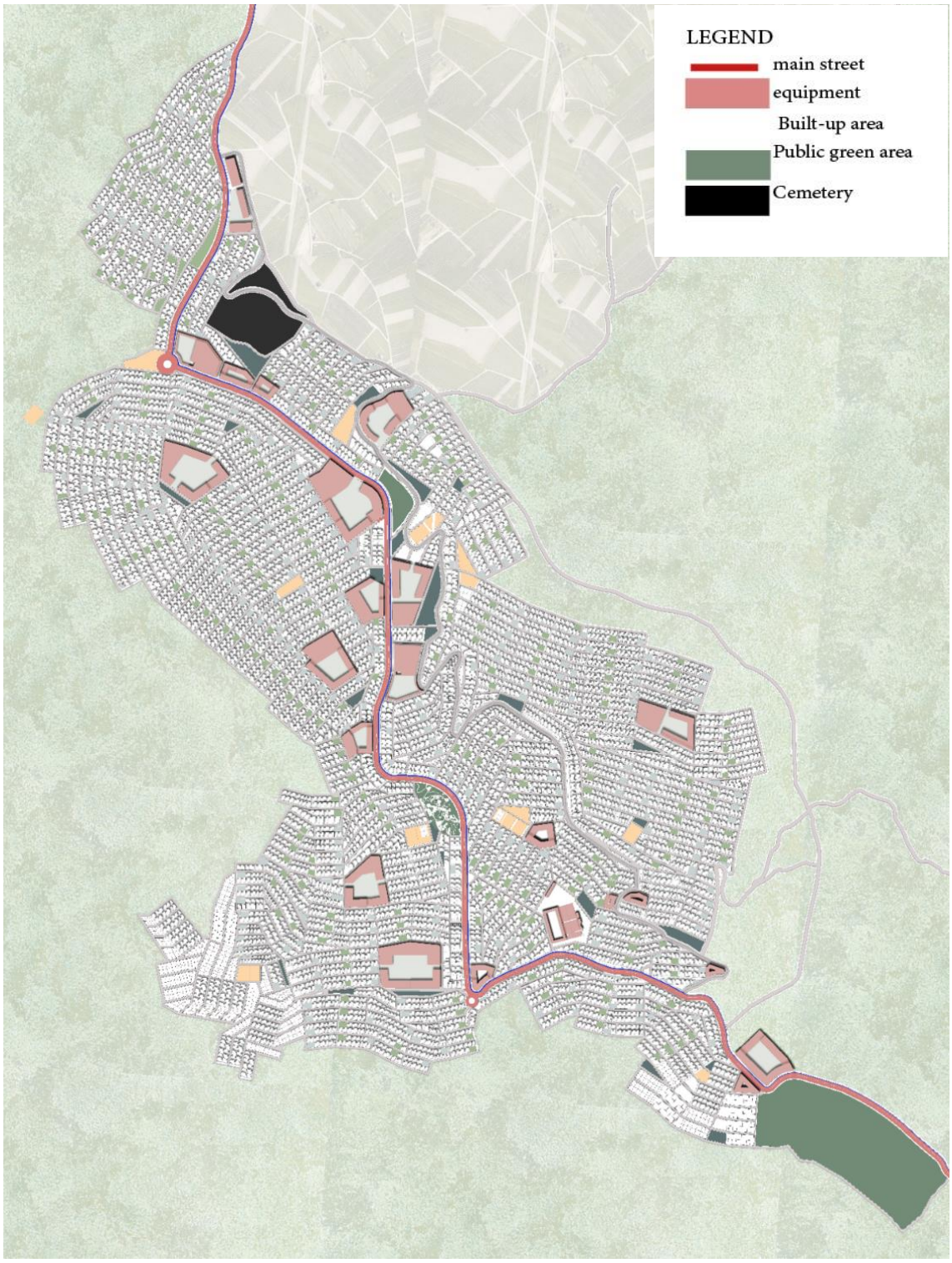


Figure 3.67: Urban Circulation Strategy – Sidi Serhane, Authors2025

8.2.1. Access and Primary Road Network

The city is served by **three main access points**:

- ⇨ **North**: from Bouinan town centre, via the existing RN29.
- ⇨ **South**: from the traditional village core of Sidi Serhane.
- ⇨ **East**: via the road linking to the industrial zone.

These entries converge into a **primary loop road** that:

- ⇨ Forms the **structural backbone** of the urban layout.
- ⇨ Connects all eight neighbourhoods.
- ⇨ Integrates **public transport stops**, commercial fronts, and civic hubs.
- ⇨ The primary road is designed to accommodate **mixed traffic** (vehicles, buses, service vehicles) with **traffic calming zones** at key junctions.

8.2.2. Secondary and Tertiary Roads

Secondary roads branch off the primary loop, providing access to housing clusters (îlots), public facilities, and parks.

These roads are designed for **low-speed traffic**, with shared surfaces in selected residential areas (figure 3.68).

Tertiary lanes and alleys serve as service and fire access roads within blocks, ensuring maximum permeability while maintaining a **quiet neighbourhood environment**.

8.2.3. Pedestrian Network

A continuous **pedestrian-first network** ensures that all residents are within **5–7 minutes walking distance** of local amenities.

Pedestrian-only streets are introduced in areas around schools, mosques, and playgrounds to ensure safety and comfort.

Staircases and sloped ramps are integrated along the natural terrain to preserve walkability in sloped areas.

8.2.4. Cycling Infrastructure

A dedicated **cycle lane network** is proposed along:

- ⇨ The **main north–south urban axis**.
- ⇨ The **green corridors** connecting parks, schools, and facilities.
- ⇨ Selected neighbourhood streets where slope permits safe riding.

The cycling network ensures **continuous, secure, and shaded routes** across the entire city, promoting **active and sustainable mobility**.

8.2.5. .Parking Strategy

Semi-public parking lots (2 per residential block) ensure sufficient car space without dominating the streetscape.

Public car parks are provided near:

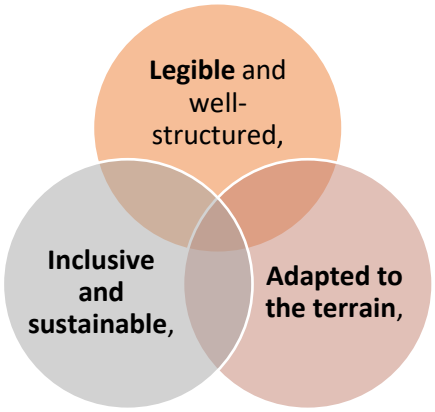
- ⇨ Commercial areas (along the main spine),
- ⇨ Civic facilities (clinics, post offices, mosques),
- ⇨ School complexes (drop-off and short-term parking zones).

Wherever possible, **peripheral parking** and **shared parking areas** are used to minimise impermeable surfaces and reduce car intrusion in residential environments.

8.2.6. Hierarchical and Resilient Layout

The circulation strategy follows a **clearly hierarchical structure**:

- ⇨ **Primary road** = circulation and service spine.
- ⇨ **Secondary streets** = local distribution and parking access.
- ⇨ **Tertiary streets and alleys** = pedestrian access, deliveries, and safety lanes.



All road profiles are designed with **integrated stormwater management**, **tree-lined footpaths**, and **universal accessibility standards (table 17).**

Key Principles Ensured:

- ✓ **Balanced land use distribution**, combining density and quality of life.
- ✓ **Priority to pedestrians and cyclists**, with strong green integration.
- ✓ **Accessibility to all facilities within walking distance** (5–15 min).

Figure 3.68 : devloppement plan of sidi serhan Authors2025

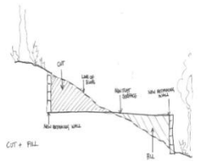
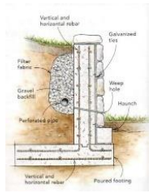
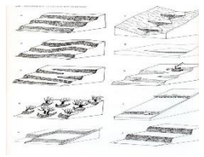
8.3.Slope Adaptation Techniques

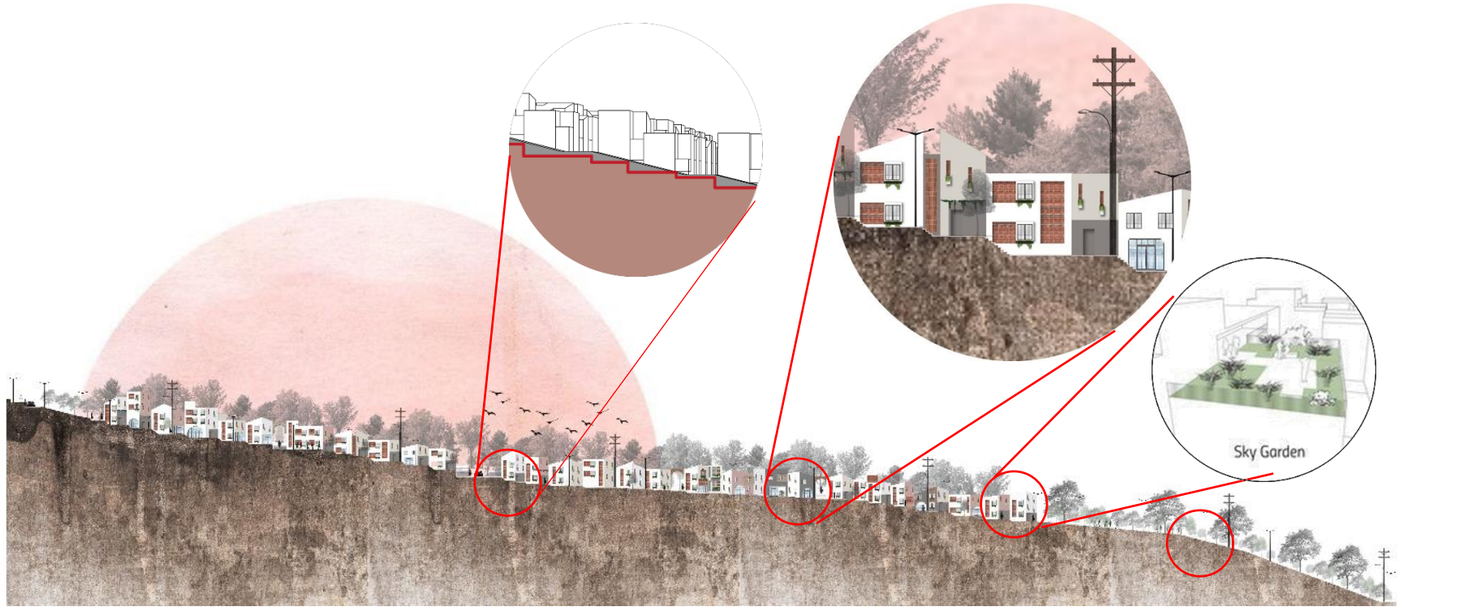
The proposed masterplan for the new city of Sidi Serhane is conceived as a topography-driven, low-rise high-density urban model, fully adapted to the mountainous terrain of the site. The city is divided into eight neighbourhoods, each functioning as a self-sufficient urban unit composed of repeating 24-unit blocks (îlots), organised along the natural slope. These îlots are structured by a central urban stairway or stepped pedestrian alley that adapts precisely to the site's contours, allowing for a gradual descent or ascent within each micro-fragment of the urban fabric. The placement of buildings follows the **natural contour lines**, significantly reducing earthworks and maintaining the natural hydrological flow of the site.

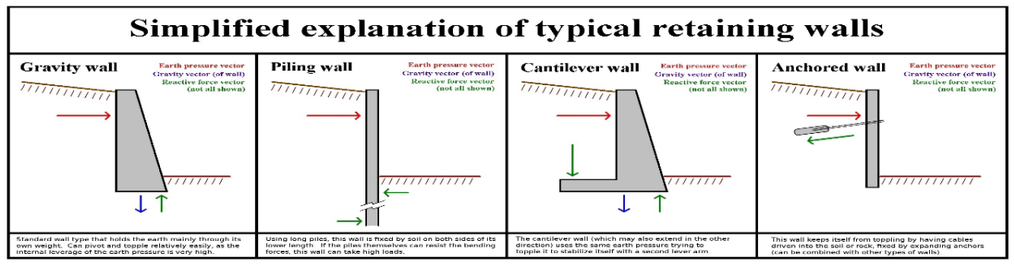
To ensure optimal slope adaptation, housing units are deployed in **terraced arrangements** or in **split-level typologies**, allowing built forms to "step" down the hillside without altering the terrain excessively. Retaining walls are minimised by integrating **garden platforms** or **semi-basement garages** on steeper lots. Public facilities such as schools and mosques are positioned on naturally flatter terraces or intermediary plateaus, ensuring accessibility and construction efficiency. Roads are aligned parallel to contours wherever possible, while staircases and pedestrian ramps are used to connect different elevation levels, preserving a **walkable and inclusive vertical city**.

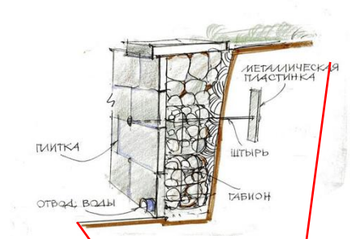
Each block subtracts two units for semi-public parking and two for playgrounds, contributing to permeability and air circulation. Six housing typologies, ranging from 70 m² to 120 m², respond to both family size and terrain constraints: compact single-family units for steep plots, and wider duplex or mixed-use units for flat segments or frontage lots. Along the north–south main axis, the city's commercial and civic functions are concentrated, where terrain conditions allow broader plots and higher activity flow.

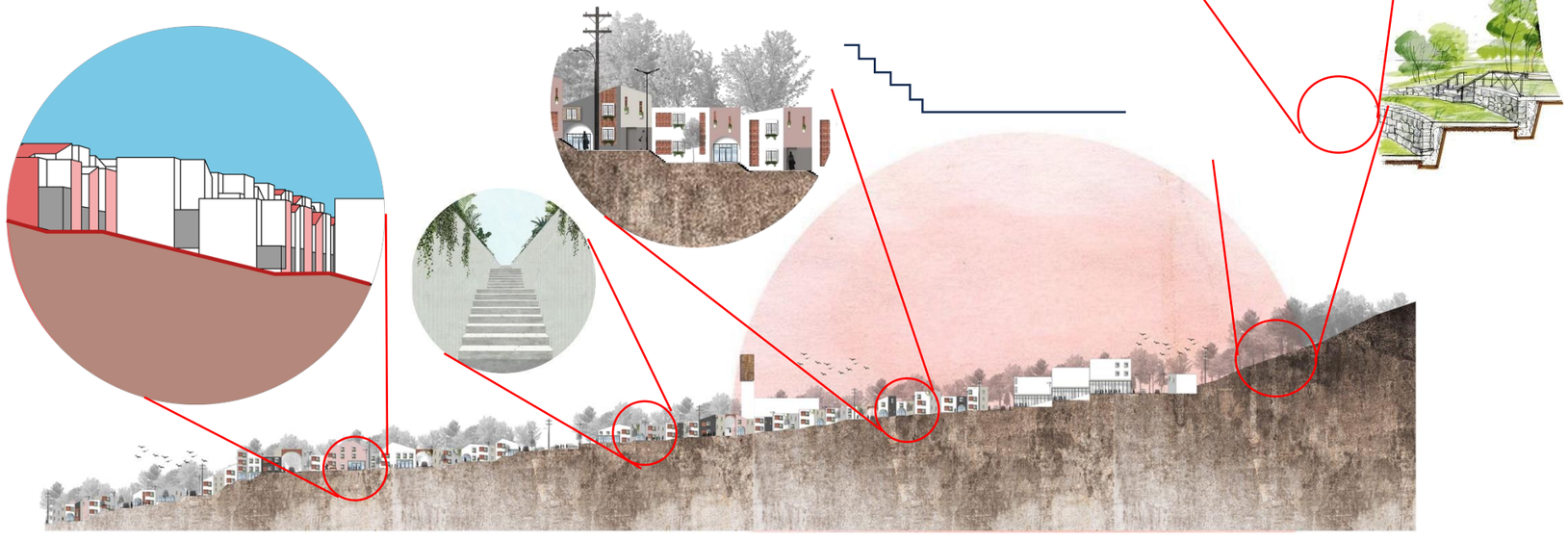
The circulation system follows a clear hierarchy: a main loop road connects the north (Bouinan), south (Sidi Serhane village), and east (industrial zone), supported by secondary streets and shared alleys. Pedestrian paths and bike lanes run through a green network that also serves as an ecological buffer and drainage system. The masterplan allocates 35% to housing, 20% to green space, 15% to circulation, 8% to public facilities, and the rest to commerce, parking, and soft mobility. Architecture and public spaces reflect local identity through natural materials, earth tones, and courtyards, while applying bioclimatic strategies adapted to sun, wind, and slope (figure 3.69).

Aspect	Strategy Description	Purpose / Effect	
Urban Terracing and Platforms	Development follows natural contours using stepped platforms. Each terrace accommodates a housing row with minimal earth modification (1.0–1.5 m elevation difference).	Reduces excavation, maintains slope stability, and preserves natural water drainage.	
Urban Staircases as Connectors	Staircases connect different platform levels and îlots. Built in concrete or stone, they include landings, rails, and planted areas.	Serve both as vertical circulation and social micro-spaces, enhancing walkability and visual flow.	
Retaining Walls and Stabilisation	In steeper areas (>15% gradient), stone or masonry-clad concrete walls support structures and pathways. Often integrated with planters or seating.	Ensure ground stability, define urban edges, and contribute to the visual character of public spaces.	
Ramps and Accessibility	Ramps (5–8% slope) accompany stairs and public access points. Made with textured, anti-slip finishes for safety.	Ensure universal access, especially for children, elderly, and people with reduced mobility.	
Public Facilities on Flat Terraces	Schools, mosques, clinics, etc., are placed on wide, flat areas with courtyard configurations and direct entries.	Simplifies construction, improves accessibility, and emphasizes civic presence at neighbourhood scale.	
Slope Integration in Aesthetics	Building heights, rooftop steps, and visual openings follow terrain. Staircases and housing align with views and natural gradients.	Creates a unique, layered skyline with strong landscape integration and visual identity.	







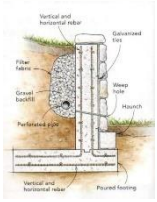


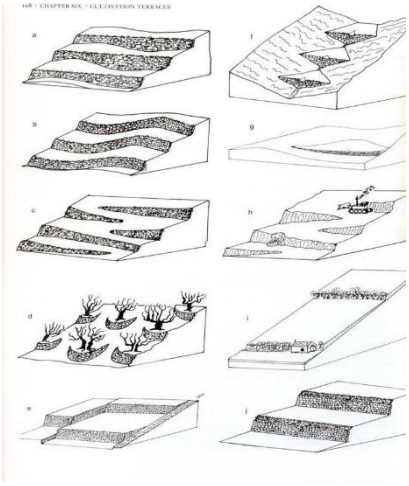
Fegure 3.69 : detail of urban facade /Authors2025

“Building with the Slope — Not Against It”

The slope is not a problem — it’s a design ally.

Stepped Housing (Gradins bâtis)	Terraced levels follow contour lines Each house = light, view, ventilation	“Architecture steps with the land.”
Retaining Walls (Murs de soutènement)	Light, modular, greenable structures Stabilise soil without cutting the hill	“The wall holds the earth — gently.”
Urban Stairs (Escaliers urbains)	Link levels & homes Become meeting places, not barriers	“We walk the city — not climb it.”





What it creates?

- Harmony with the mountain
- Zero back façade: all homes face the view
- Slow paths = stronger social links
- Land preserved, not destroyed

We don’t erase the slope — we inhabit it

Step by step, home by home, the city grows with the mountain.”

9. Capstone project: Les Rosiers Neighbourhood

The neighbourhood of Les Rosiers constitutes a model sector within the proposed masterplan of Sidi Serhane, integrating all urban functions—residential, civic, educational, religious, health and public services—within a compact, topographically responsive framework. Situated on a mid-slope terrace with moderate gradients (Figure 9-1), Les Rosiers benefits from direct connection to the main circulation loop, offering both centrality and permeability (3.70) .

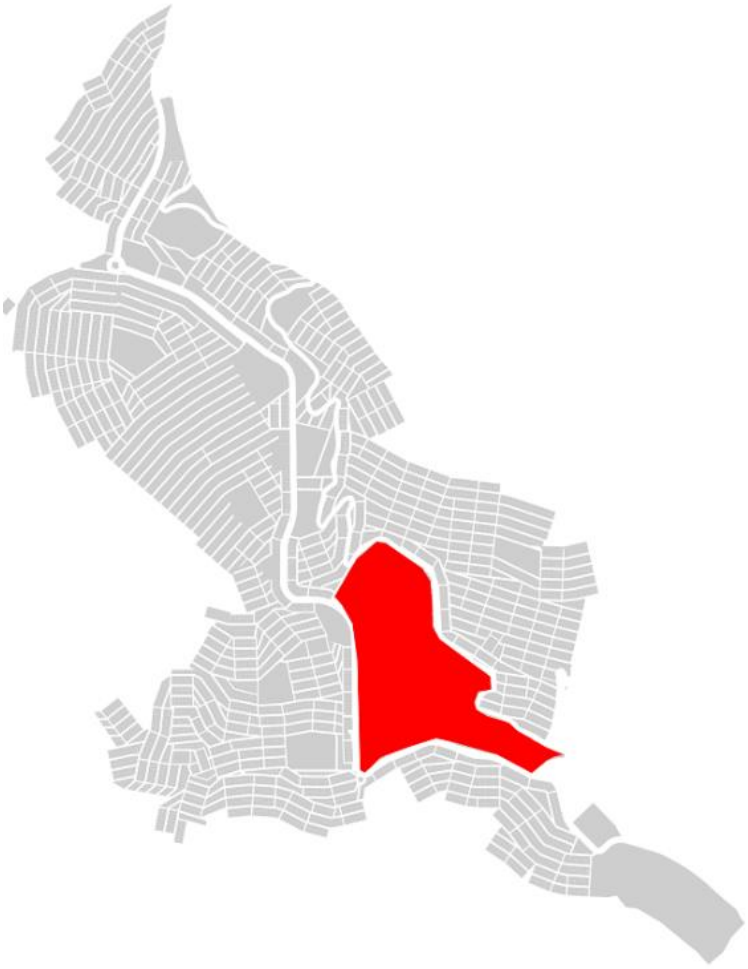


Figure 3.70 : urban situation of neighbouhood " les rosier" source : authoe, 2025.

9.1.Urban Composition

The neighbourhood is organised around a **central green axis**, from which a grid of **residential îlots** extends. Each îlot follows the standard typology of **24 units**, with two dwellings transformed into a **shared children's playground** and two into **semi-public parking**. The blocks are staggered along the contour lines to form **stepped rows**, preserving slope integrity and optimising solar orientation.

The housing typologies implemented include:

Row houses and duplexes (80–120 m²), some with private garages.

Mixed-use units with ground-floor shops facing the neighbourhood edge.

A limited number of **courtyard houses (patio-type dwellings)**, placed at slope breaks or interior corners to create spatial variety and micro-collective spaces (figure 3.71) .

Fegure 3.71 : Urban Composition MAP/Authors2025

9.1.1. Key Facilities within Les Rosiers

a- The Mosque

Located at a slight elevation in the northern part of the neighbourhood to ensure visual prominence and accessibility.

Includes a **prayer hall**, **ablution rooms**, a **small teaching room (madrassa)**, and shaded outdoor space. See annexe 4

b- Primary School

Centrally placed to be accessible to all residents within **5 minutes' walk**.

Includes **12 classrooms**, a **library**, a **multi-purpose hall**, sanitary blocks, and a **sports yard**.

Clinic (Basic Healthcare Unit)

Located near the main loop road, ensuring vehicular access.

Includes consultation rooms, vaccination rooms, waiting areas and a small pharmacy (See annexe 3).

c- APC Local Office

Provides civil registration services, administrative support and a community meeting room. Positioned near the neighbourhood entrance, paired with the clinic for civic clustering (figure 3.72) .

Figure 3. 72 : Public Spaces and Green Infrastructure, Author

9.1.2. Public Spaces and Green Infrastructure

A **central neighbourhood park** (approx. 4,000 m²) forms the green heart of Les Rosiers, containing seating areas, gardens, walking paths and shaded pavilions. **Linear green corridors** branch out from the central park, integrating stormwater management and biodiversity zones.

Tree-lined pedestrian routes connect all major facilities, while **cycle lanes** run along the neighbourhood edges, ensuring smooth linkages with the city's green network

9.1.3. Circulation and Access

A **secondary road loop** distributes local traffic within the neighbourhood, linking to the city's main ring road. **Tertiary shared streets** provide vehicular access to each îlot, designed as woonerfs (shared spaces with limited traffic speed).

Pedestrian stairways and ramps traverse the slope, ensuring vertical continuity and universal access (figure 3.73) .

LEGEND

Parking space

Bus stop

A public garden

Figure 3 . 73 : Circulation and Access Author

9.1.4. Master Layout Plan – "Les Rosiers" Neighbourhood (Black & White Format)

The master plan of Les Rosiers strongly reflects the principle of compactness, where built form dominates over void. Rendered in solid black, buildings occupy approximately 65% of the surface area, clearly asserting their visual and spatial presence. This figure-ground relationship emphasizes a dense, cohesive urban fabric composed of repetitive îlots, each accommodating 24 dwellings along stepped pathways. The urban composition prioritizes spatial efficiency and proximity between residential and public functions—such as the mosque, school, and clinic—without dispersion. Open spaces, shown in white, are carefully inserted but remain secondary in scale and impact, reinforcing the logic of low-rise, high-density planning. Internal patios, playgrounds, and parks are tightly framed by surrounding buildings, ensuring enclosure and integration. The result is a legible and grounded urban form where compactness supports walkability, social interaction, and functional diversity, while the dominance of built mass over void ensures architectural coherence and a strong spatial identity(figure 3.74) .

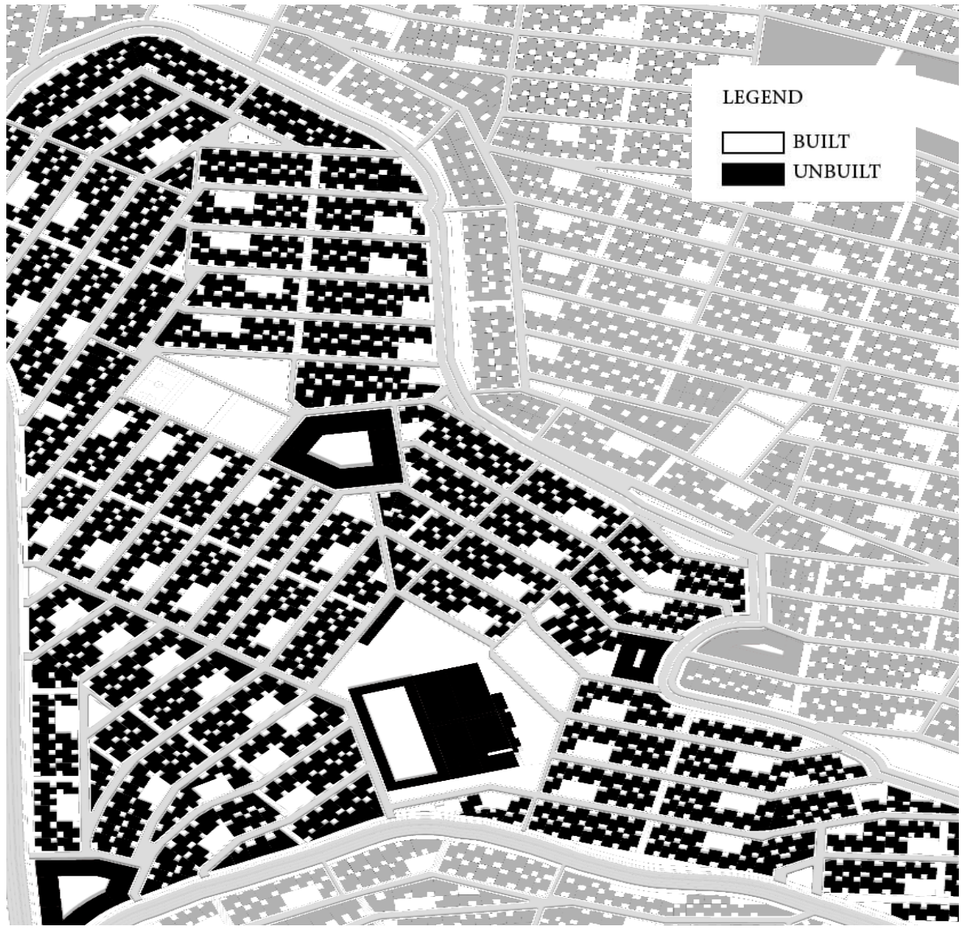
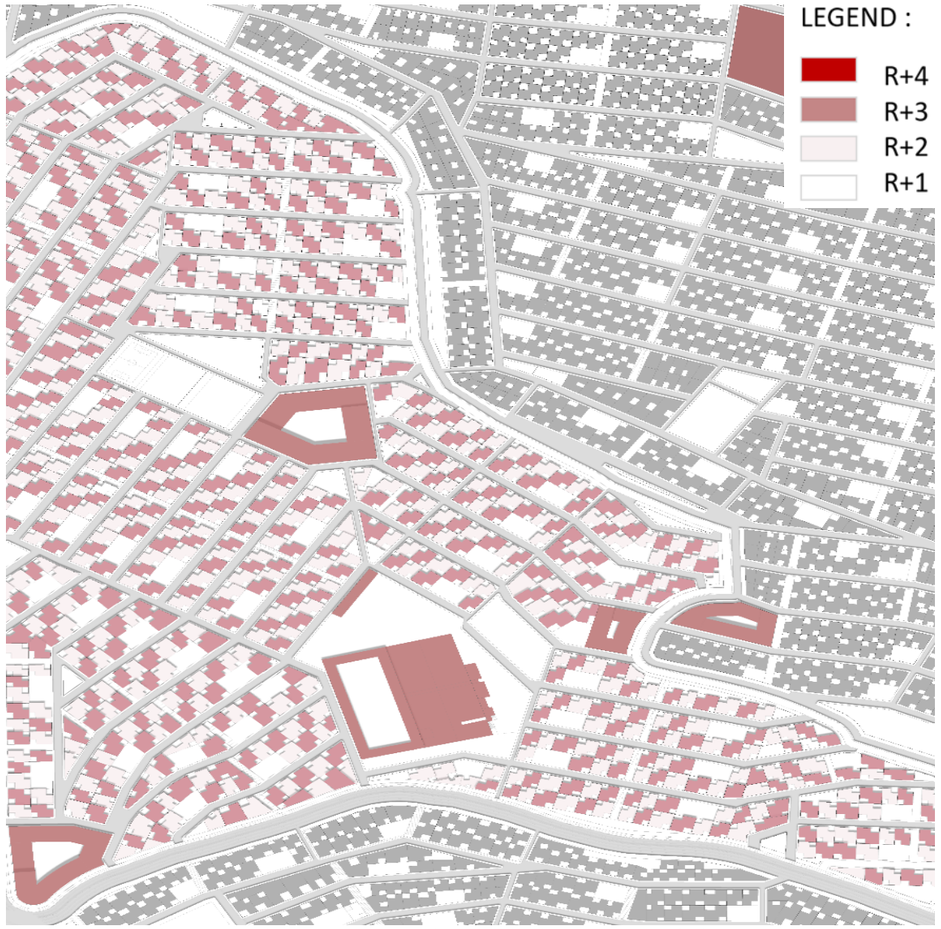


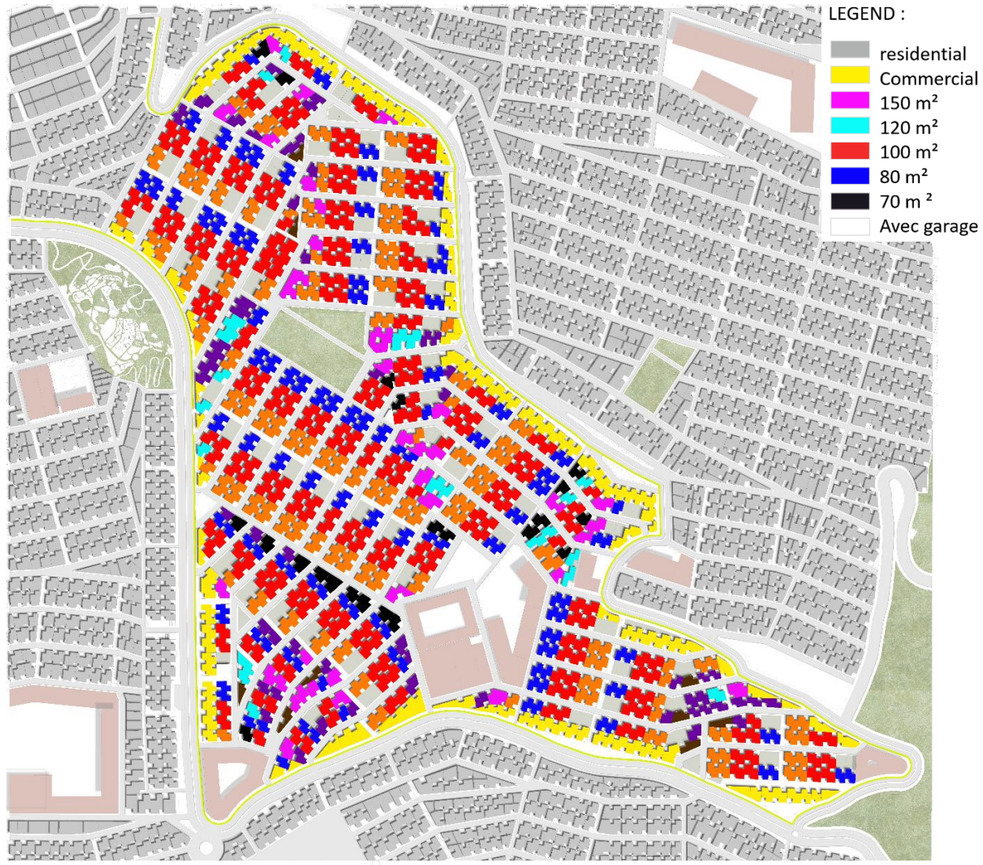
Figure 3.74 : "Les Rosiers" Neighbourhood (Black & White Format. Authors

Built Form Height Strategy – Gabarit Map of Les Rosiers :



The gabarit map of Les Rosiers illustrates the vertical structure of the urban fabric, emphasizing the neighbourhood's approach to low-rise, high-density development. It reveals a built environment primarily composed of G+1 and G+2 buildings, with occasional G+0 units dedicated to community or mixed-use functions. This controlled height variation allows the project to adapt naturally to the site's topography while preserving visual continuity and a human scale. Height zoning is carefully planned according to street width, platform elevation, and proximity to public facilities. Taller volumes are positioned along main roads and commercial spines to mark key activity zones, while lower heights are used in interior residential areas and steeper terrain. This strategic modulation enhances urban legibility, improves access to views and natural light, and maintains a harmonious roofline. The gabarit map ultimately supports a balanced and context-sensitive urban form, integrating density while respecting the landscape and ensuring architectural coherence.

Housing Typologies – Les Rosiers Neighbourhood



Fegure 3. 75 : Les Rosiers Neighbourhood map. Authors

The housing typologies in the Les Rosiers neighbourhood are designed to meet diverse household needs while adapting to the site's topography and promoting a compact, walkable urban fabric. Six low-rise types (G+1 to G+2), ranging from 70 to 120 m², include standard dwellings, units with garages, and mixed-use buildings with ground-floor shops. Arranged in rows, these buildings follow the slope using stepped or split-level layouts. Corner plots feature patio houses inspired by traditional "haouch," enhancing privacy, daylight, and ventilation. Mixed-use typologies are limited to the main commercial spine to encourage retail activity, while the interior blocks are occupied by residential and garage-equipped units. Though standardised for construction efficiency, the typologies are varied based on street width, orientation, and platform level, offering visual diversity and contextual integration. This flexible, resilient approach combines traditional urban forms with modern functionality, resulting in an urban fabric that is well adapted to the terrain, climate, and communal living (figure 3.74) .

Final Layout Plan – Urban Composition Map of "Les Rosiers"

The layout adopts a compact urban form that follows the site's natural contours. Terraced residential blocks align with the slope, while key public amenities are placed on flat areas for easy access. Open spaces are woven between buildings to support social life and pedestrian movement. A clear hierarchy of streets ensures smooth circulation. The plan balances density, function, and environmental sensitivity(figure 3.76).

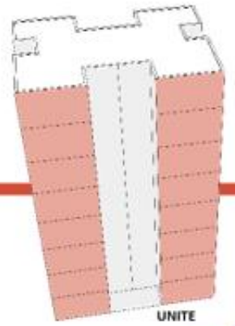
Fegure 3.76 : Urban Composition Map of "Les Rosiers"map. Authors

9.2. Architectural concept

The architectural concept of the Sidi Serhane counter-project is deeply rooted in a contextual and identity-based approach that reinterprets traditional Algerian spatial logics through the lens of contemporary sustainability. Rather than imposing generic or vertical solutions, the project promotes low-rise, high-density (LRHD) typologies organized into compact, human-scaled clusters that prioritize privacy, community interaction, and environmental integration. Inspired by vernacular architectures of the Blidean Atlas, the Casbah of Algiers, and the M'zab Valley, the design reintroduces core elements such as courtyards, patios, covered passages, arcades, and terraced roofs. These spatial devices are not only cultural references—they are functional tools that enhance natural ventilation, regulate thermal comfort, and foster shaded semi-public zones for everyday life. Houses are arranged around shared alleys and green pockets, creating a gradient of intimacy from public to private space.
Three main housing typologies are proposed, each with a compact footprint and a maximum height of R+1. All include dual patios, one open and one shaded, providing cross-ventilation, filtered daylight, and personal outdoor areas. These homes are adaptable, enabling incremental growth or modular transformation over time, especially for multi-generational households. The units are also designed to be accessible, with integrated ramps and gentle internal slopes, making them inclusive to all users regardless of age or mobility.
The material palette is derived from local resources: earth-based renders, stone cladding, terracotta tiles, wooden shading systems, and lime-based plasters. Colors are kept in harmony with the mountainous landscape—soft ochres, dusty whites, warm browns—evoking a sense of continuity between built and natural environments. Construction methods prioritize low-carbon and low-cost solutions, allowing for potential community participation or assisted self-building.
The design of Les Rosiers reflects a thoughtful integration of architecture and landscape, aiming for a livable, inclusive, and topography-adapted neighbourhood.

9.2.1. Architectural Form Development

Architectural form is shaped by local identity, natural topography, climate conditions, cultural memory, and spatial adaptation to context. . See annexe 2



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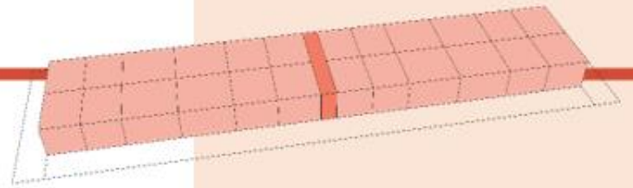

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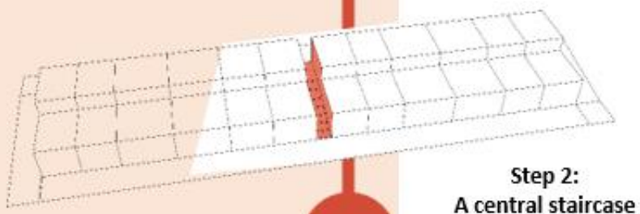

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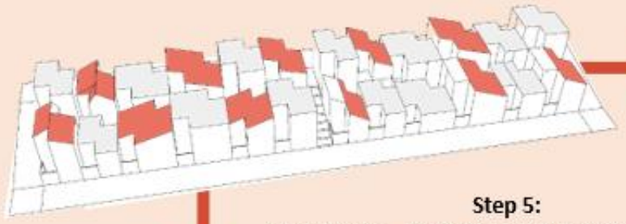

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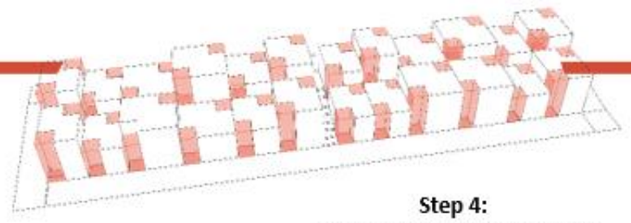

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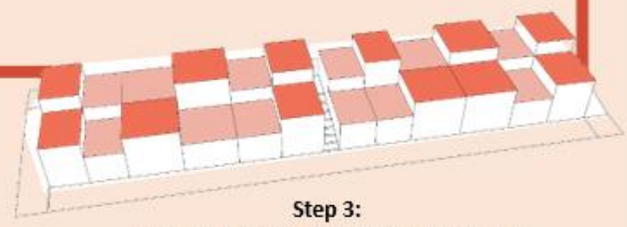
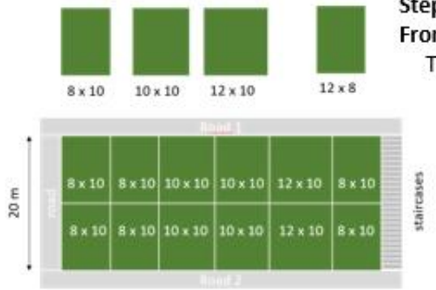


06

07

08

Step 1:
From a Single Building to 12 Housing Units
The initial building mass was divided into 12 individual housing units, creating a more human-scale living environment.



Step 2:
A central staircase connects and adapts circulation to slope.

Step 3:
Volumetric Play – Heights and Surfaces
The block was reshaped with a variation of volumes (3-storey and 2-storey units) and a diversity of surfaces (100 m² / 80 m² / 70 m²), supporting social diversity.

Step 4:
Mixed-use housing combines living, garages, and small commercial spaces.

Step 5:
Subtraction – Dual Patios for Ventilation & Light
Due to the compact nature of the massing, two internal patios of 9 m² were subtracted from the block. These serve for natural ventilation, thermal comfort, and align with the daily lifestyle in Algerian culture.

Step 6:
Terraces and sloped roofs enhance privacy and landscape views.

Step 7:
Green Buffer and Intimacy
A 2-meter-wide garden strip surrounds the units, acting as a vegetated buffer that enhances intimacy, microclimate, and ecological integration.

Step 8:
Two units removed to create parking and shared playground.

9.2.2. Urban Façade Design – Local and Mountain Architecture Reinterpreted

The design of Les Rosiers reinterprets North African vernacular architecture and Mediterranean hillside settlements. It integrates traditional spatial principles—like privacy, compactness, and climate response—with modern needs. The use of stepped forms, local materials, and terraced roofs reflects both cultural identity and topographic adaptation. This approach creates an architecture that is rooted in place, environmentally responsive, and socially cohesive.

Materials and Surface Treatment
• Façades coated with lime-based plaster in natural earth tones.
• Lower sections protected with stone cladding for durability and grounding.
• Public buildings include decorative elements (mosaics, carvings) inspired by regional craft.

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• Lower sections protected with stone cladding for durability and grounding.
• Public buildings include decorative elements (mosaics, carvings) inspired by regional craft.

Arches and Openings
- Use of segmental and horseshoe arches.
- Shading through screens, shutters, lattice panels.
- Asymmetric window placement follows internal

Overall Concept

- Reflects a contemporary reinterpretation of local and mountain-edge architecture.
- Integrates environmental, cultural, and material responses.
- Aims to create a strong architectural identity rooted in place

. *Vernacular reinterpretation, climate-sensitive, place-based identity*

Roof Strategies
- Flat roofs on upper units for views and outdoor living.
- Pitched roofs on exposed/public buildings for rain control.
- Material choice based on program and

DESIGN ELEMENTS

"These are not styles — they are stories built in stone."

Openings

Small, deep-set, rhythmical

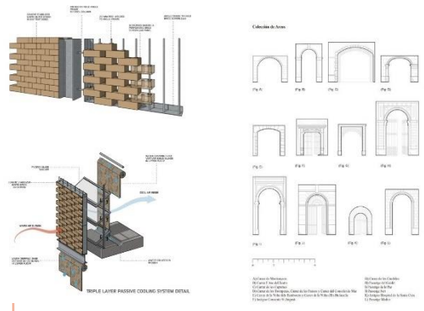
Material

Earth plaster, natural stone, brick , beton

Form

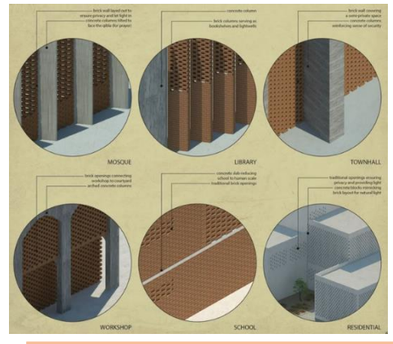
Cubic volumes, sloped or flat roofs

Details

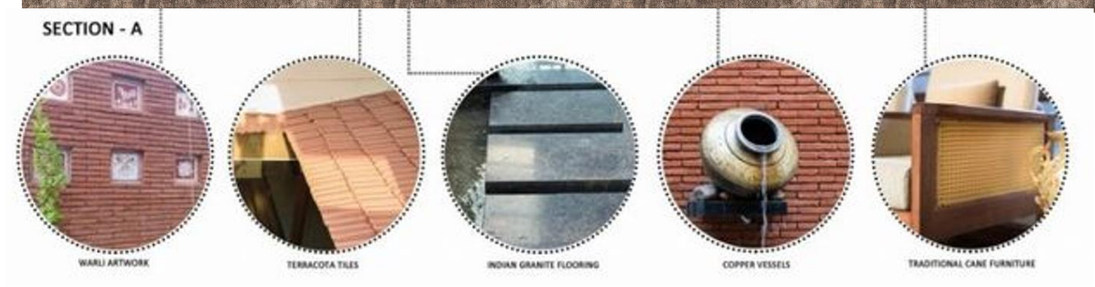


Arches, mashrabiya, carved wood & metal

Climate logic

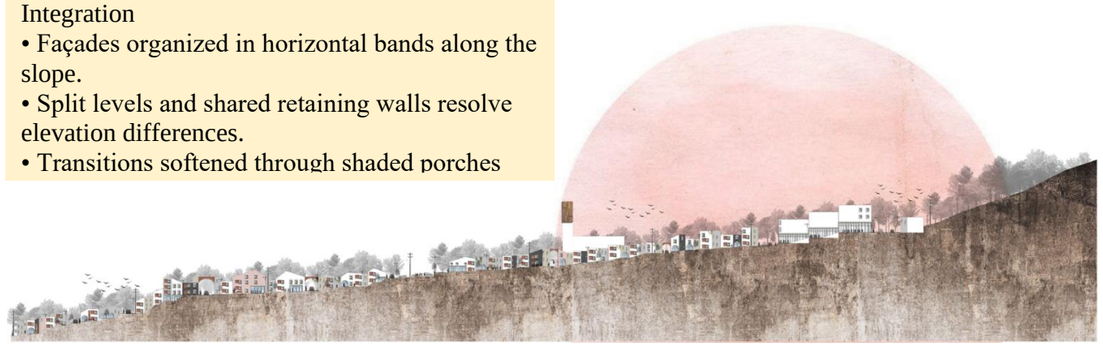


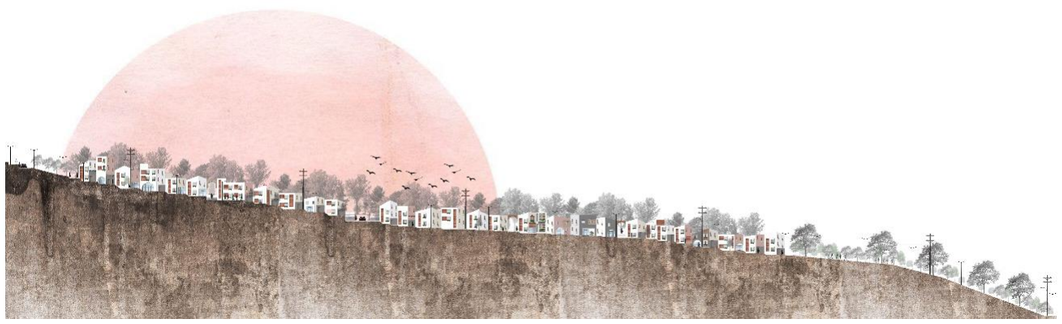
Shading, ventilation, thermal mass



Collective Identity and Aesthetic Unity
• Repetition of façade language ensures visual cohesion.
• Subtle variations avoid monotony and

Façade Composition and Topographic Integration
• Façades organized in horizontal bands along the slope.
• Split levels and shared retaining walls resolve elevation differences.
• Transitions softened through shaded porches

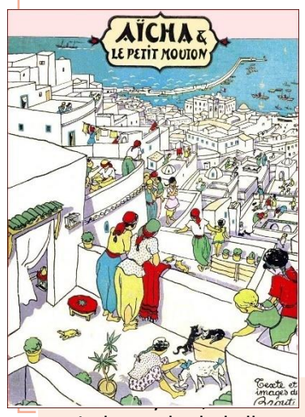




INSPIRATION SOURCES

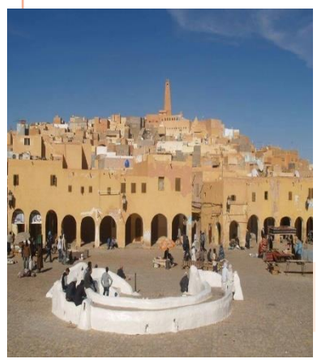
Façades that Breathe Memory

Casbah (Algiers)

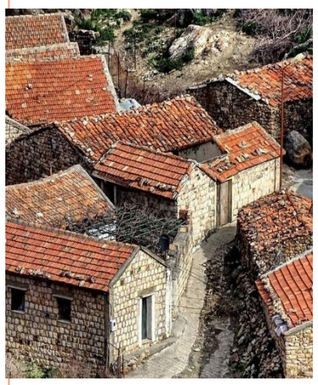


windows, shaded alleys

Mzab (Ghardaïa)



Berber Mountain Villages



Stone + white lime, roofs as terraces, thick walls

Ottoman Influence

URBAN VALUES IT CREATES

Continuity	Calmness	Intimacy	Character
→ A visual link across the site	→ No aggressive contrast or noise	→ Facades protect, frame and invite	→ Strong identity, timeless atmosphere

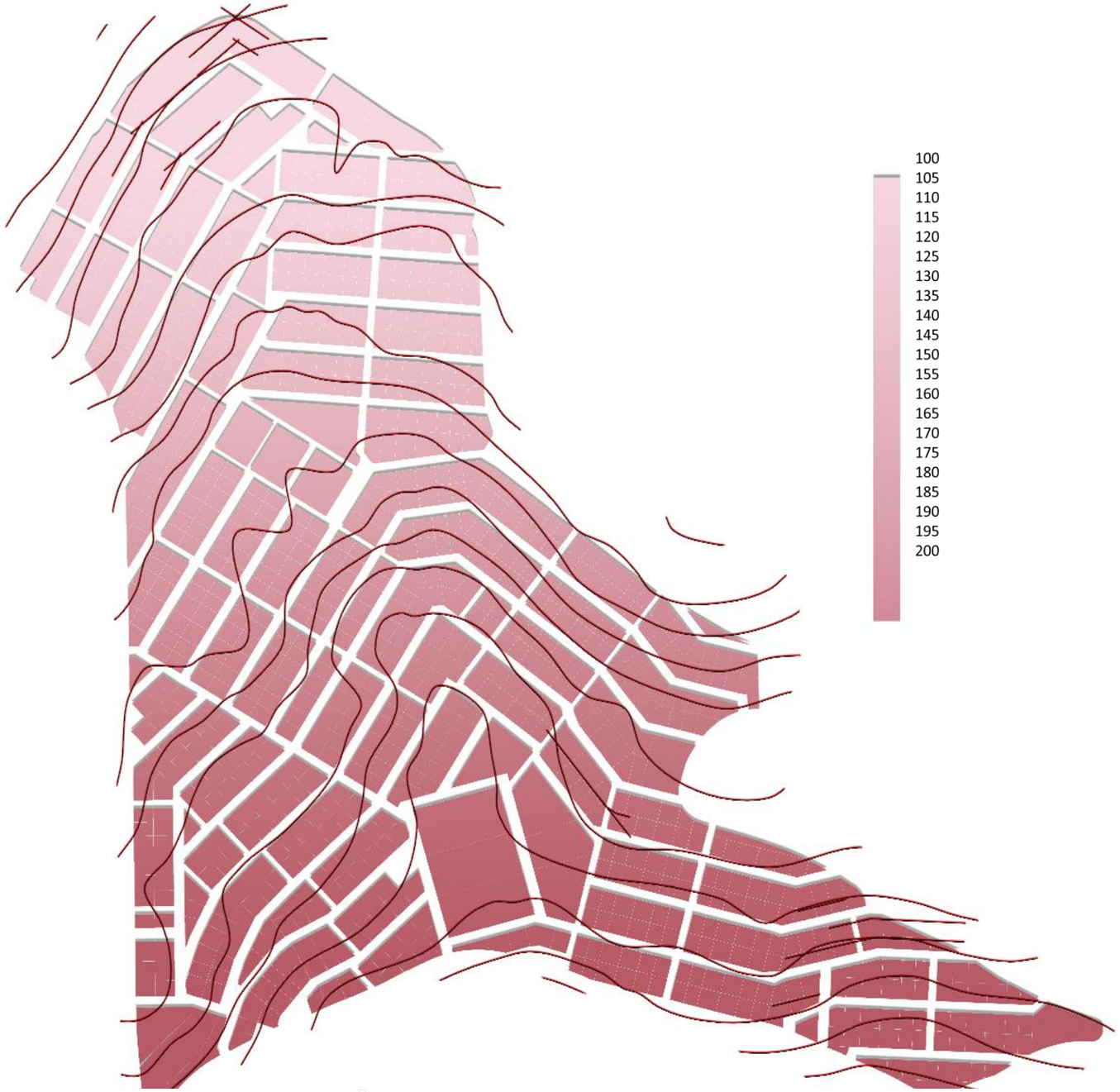
9.3. Technical Execution

9.3.1. Earthwork and Platform Plan :

The earthwork strategy for the Les Rosiers neighbourhood is based on a platform approach that respects the site's natural topography. Instead of using extensive excavation or leveling, the design introduces a series of terraced platforms that follow existing contour lines. Each îlot or group of buildings is placed on a specific level, forming stepped development bands with vertical intervals of about 1.00 to 1.50 metres, depending on slope intensity. Minimal retaining structures are used and are architecturally integrated as stair bases, planters, or seating edges. Residential blocks are staggered along the slope, creating a dynamic streetscape. Roads follow natural contours to limit cut-and-fill work, while ramps and stairs ensure access across levels. Public facilities like schools, mosques, and clinics are strategically located on flatter zones to reduce earthwork and enhance accessibility (table 18) . This platform-based strategy allows the project to integrate with the landscape, preserving water flow, supporting stormwater management, and creating a layered, resilient urban form adapted to its mountainous setting (figure 3.77) .

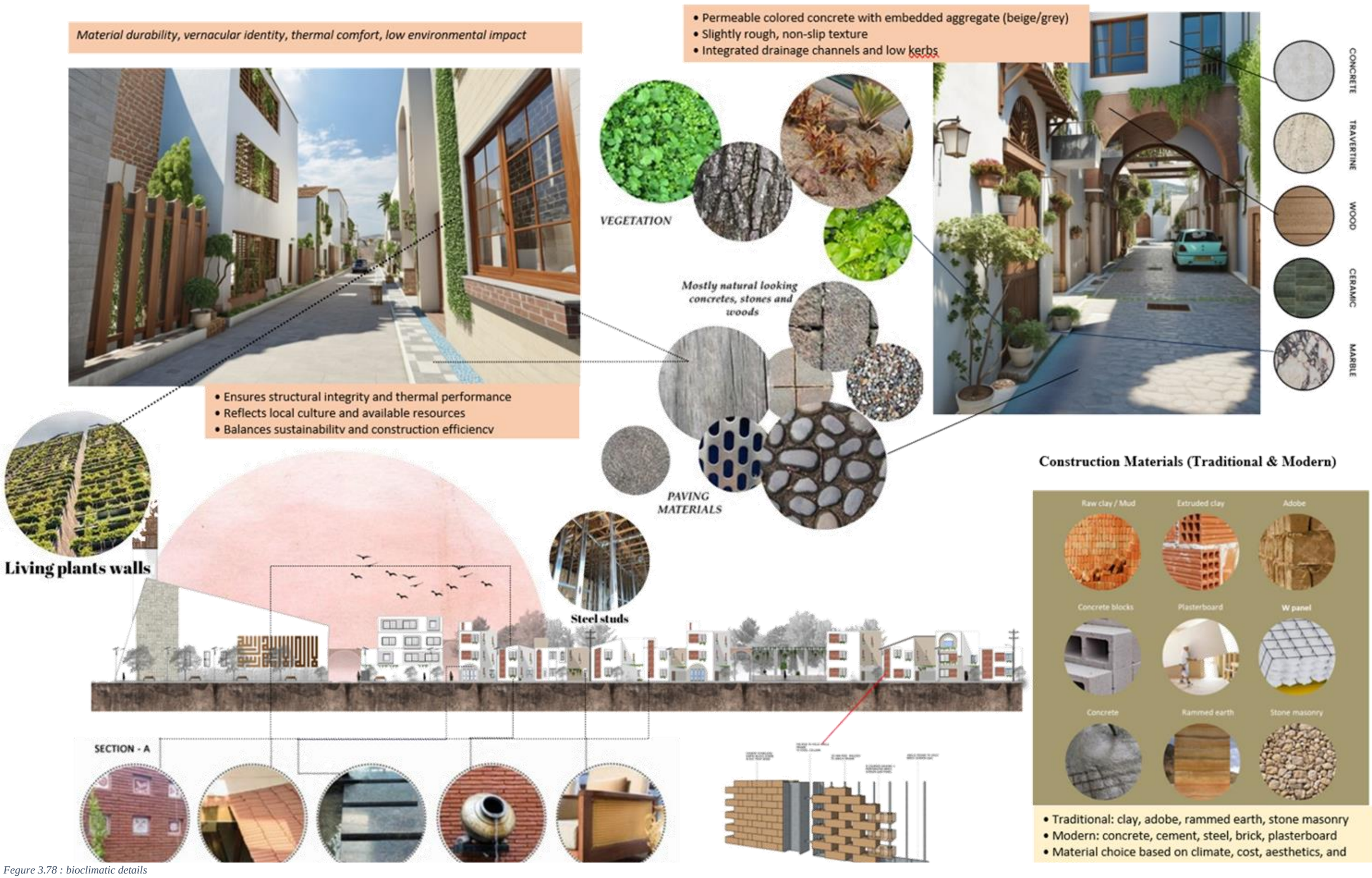
Tableau 18 : Earthwork and Platform Plan

Aspect	Key Strategy
Design Approach	Terraced platforms following natural slope
Level Differences	Steps of 1.00–1.50 m per band
Excavation	Minimal cut-and-fill
Building Layout	Staggered blocks on dedicated levels
Retaining Walls	Few; integrated as stairs, planters, seating
Roads	Aligned with contour lines
Access	Via ramps and stairs
Facilities Location	Placed on flat areas for ease and accessibility
Environmental Role	Supports drainage, water flow, and topographic integration
Urban Form	Layered, adaptive, and landscape-responsive



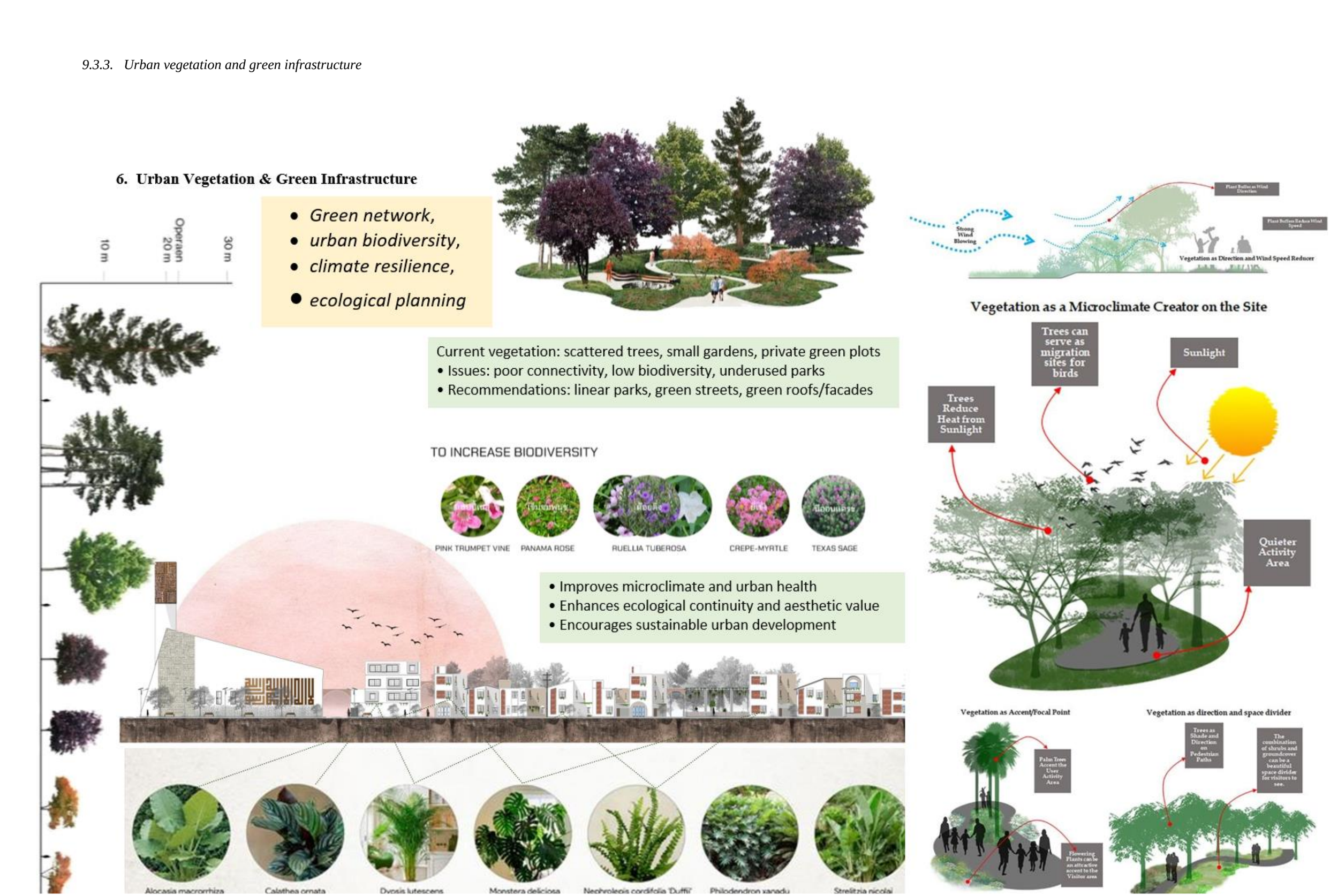
Fegure 3.77 : Earthwork and Platform MAP. Authors

9.3.2. bioclimatic details



Fegure 3.78 : bioclimatic details

9.3.3. Urban vegetation and green infrastructure



Fegure 3.79 : Urban vegetation and green infrastructure

10. The Economic Challenge: Can We Build Differently Without Exceeding the AADL Budget?

In the framework of the urban project proposed for Sidi Serhan, the challenge of cost is fundamental. The national AADL programme represents a dominant model for public housing in Algeria, with a vertical logic that prioritises quantity and standardisation. Our alternative—low-rise, high-density, identity-driven housing—must not only meet qualitative urban aspirations but also prove financially viable (UN-Habitat, 2020).

Figure 3.80 : Technical Sheet of the AADL Project – Sidi Serhane Source: BET'S – Salhi, n.d.

The government has allocated a specific investment of **14,620,375,000 DZD** to build approximately 7,500 housing units. This section evaluates whether a horizontal model can be adapted to meet that budgetary constraint without compromising on quality, sustainability, or community value.

10.1. Detailed Cost Breakdown of the Horizontal Model Before Optimisation

Before applying cost-reduction strategies, a full-scale implementation of the horizontal model in Sidi Serhan reveals the following expenditure profile per housing unit:

Table 12 Detailed Cost Breakdown of the Horizontal Model Before Optimisation

Cost Category	Unit Cost Estimate (DZD)	Description
Site infrastructure (roads, water, sewage, electricity)	2,000,000	Includes full layout of networks, road surfacing, water tanks, etc.
Structural construction	3,500,000	Concrete frame or masonry with foundations and roofing
Building materials	1,800,000	Blocks, cement, reinforcements, tiles, finishes
Labour (contracted)	1,200,000	Skilled and unskilled site labour
Finishing and fittings	1,200,000	Doors, windows, tiling, sanitary,

		painting
Shared amenities (public spaces, schools, mosques)	1,000,000	Pro-rata cost per unit
Technical studies and supervision	300,000	BET, topography, architectural services
Total Cost per Unit	11,000,000	
Total for 7,500 units	82,500,000,000 DZD	Far above available budget

This table confirms the need for a deep cost rationalisation plan to bring the project closer to the state ceiling of **14.62 billion DZD**. The gap is significant, and overcoming it demands a comprehensive and multi-scalar strategy (Aravena, 2016). (*Source: Adapted from regional cost norms, BET estimates, and prior case studies (UN-Habitat, 2020; Aravena, 2016).)*

10.2. Seven Integrated Strategies to Reduce Costs

10.2.1. Phased Urban Development (3 to 5 Phases)

The construction process is divided into progressive stages of 1,500 to 2,500 units. Instead of mobilising full resources for the entire city at once, infrastructure and housing are developed only where necessary, matching real demographic and economic demand. This enables a dynamic city that grows over time and reduces initial pressure on public budgets (UN-Habitat, 2020).

By sequencing investments and concentrating early development on priority sectors, this strategy helps control costs while maintaining adaptability. It allows ongoing community feedback and spatial corrections without major financial risks.

10.2.2. . Incremental Housing Model

Each house is conceived as a growing structure. In the first phase, a "core unit" is delivered, including wet rooms, structural supports, and a basic living area. Future extensions—either vertical or horizontal—are enabled by design and carried out by families over time (Aravena, 2016).

This model allows cost-sharing between state and resident. The state provides the foundations, roof, and service connections, while the household can add bedrooms, storage, or terraces when ready. Inspired by Latin American experiments, this model reduces per-unit cost without compromising quality or spatial dignity.

3.2.3. Use of Local and Low-Carbon Materials

Standard construction methods using reinforced concrete and industrial finishing materials significantly increase costs and environmental impact. The proposed model replaces them with Compressed Earth Blocks (BTC), lime-based plasters, and metal roofing—materials

that are affordable, durable, and regionally available (UN-Habitat, 2020).

These choices minimise transport, promote local labour and artisanal skills, and reduce long-term maintenance needs. They also improve thermal inertia, making homes more comfortable and reducing energy use. The simplicity of these systems supports the self-build and cooperative models described next.

10.2.4. Supervised Self-Build and Housing Cooperatives

Labour costs represent a large share of construction expenses. By involving future residents in the building process, guided by local professionals, the project reduces expenses while reinforcing ownership and empowerment (GSD Harvard, 2021).

Supervised self-build involves training residents through workshops on masonry, waterproofing, and safe construction practices. BETs and municipal teams provide monitoring and assistance, ensuring quality and safety. Construction kits (foundations, BTC walls, steel roofing modules) are standardised to simplify the process.

Cooperatives of 5 to 10 households co-manage their parcels, coordinate bulk purchases, and share services (solar power, sanitation, water tanks). These legal and social entities are responsible for maintaining shared infrastructure and are eligible for special subsidies or microcredits. They reduce land consumption, cut infrastructure duplication, and strengthen social bonds (GSD Harvard, 2021).

10.2.5. .Cluster Housing with Shared Infrastructure

Instead of scattered individual units, the project introduces clusters of 3 to 6 homes around shared spaces—courtyards, gardens, or common patios. This spatial strategy allows for shared networks (wastewater, electricity, internet) and collective open space management (UN-Habitat, 2020).

Infrastructure becomes more efficient and compact: shorter roads, fewer pipes, fewer utility boxes. The clustering also fosters sociability and neighbourhood governance, echoing traditional Algerian settlements (ksour, medinas, Mzabite structures).

10.2.6. Mixed Financing: Public–Private–Waqf

Relying solely on government investment is risky and unsustainable. A hybrid financing model distributes responsibility among public actors, private developers, and religious foundations (waqf) (UN-Habitat, 2020).

Private firms are contracted to build according to standardised low-cost prototypes. Waqf-based institutions (shops, schools, gardens) provide recurring income to finance common goods. Cooperatives and residents may access microfinance to fund incremental upgrades or

shared utilities.

This system spreads financial load and creates a circular economy, where part of the generated value returns to the community.

10.2.7. Densified Parcels Without Losing Identity

To reduce land cost and improve urban efficiency, individual plot sizes are optimised to 90–120 m², compared to the conventional 150 m². Built forms—such as duplexes, row houses, and patio homes—respect privacy while allowing greater density (GSD Harvard, 2021).

This morphological densification improves walkability, reduces servicing distances, and increases the number of families per hectare. It maintains Algerian architectural identity through arches, flat and inclined roofs, courtyards, and earth-toned materials, ensuring density without loss of human scale.

10.3. Final Budget Comparison: AADL versus Optimised Horizontal Model

To determine the financial feasibility of the horizontal model after applying cost-saving strategies, the following comparison outlines total expenditure against the AADL state budget.

Model	Cost per Unit (DZD)	Total Units	Total Cost (DZD)	Fits in 14.62B Budget?
AADL (vertical, R+5 to R+10)	6,800,000	7,500	51,000,000,000	❌ No
Horizontal (before optimisation)	11,000,000	7,500	82,500,000,000	❌ No
Horizontal (after optimisation)	3,400,000 (average)	4,300	**14,620,000,000**	✅ Yes

- ⇨ **AADL model exceeds the limit** but delivers full units using vertical typology with reduced land use.
- ⇨ **Horizontal model, before optimisation, is entirely unviable** at scale.
- ⇨ **Optimised horizontal model becomes feasible by limiting first-phase delivery to 4,300 units** within the allocated state budget.
- ⇨ **Future phases** can be financed progressively through waqf, PPP, and cooperative contributions.

This comparison confirms that the horizontal strategy, although land-intensive, becomes economically sustainable and aligned with the state vision when applied with realistic phasing, incremental housing logic, and local resources.

10.4. Final Synthesis: A Budget-Compatible Vision of Urban Quality

By combining these seven strategies, the horizontal model becomes:

- ✓ Financially viable (aligned with 14.62B DZD)
- ✓ Technically achievable
- ✓ Culturally and climatically responsive (UN-Habitat, 2020)

This isn't just about saving money. It is about building better cities for less. With low-rise, high-density, and high-dignity principles, Sidi Serhan becomes a model for Algerian urban transformation

GENERAL CONCLUSION

As Algeria undergoes one of the most dynamic urban transitions in the Maghreb, the nature of its housing and urbanisation strategies has come under intense scrutiny. The current model — based largely on vertical densification and state-led programmes like AADL — has proven to be efficient in terms of numbers, but insufficient when it comes to creating meaningful, livable, and identity-rooted urban environments. This thesis challenged this dominant paradigm by proposing an alternative approach: horizontal densification anchored in context, culture, and ecological balance.

The broader research inquiry did not simply question whether building upwards or outwards was preferable. Instead, it interrogated the **fundamental values** that urban planning should reflect: human dignity, environmental responsibility, cultural continuity, and collective memory. In this regard, the case of Sidi Serhane — a semi-mountainous peri-urban locality in Blida — offered a compelling terrain to test a counter-project rooted in **Low-Rise, High-Density** (LRHD) urbanism. The vertical model — although efficient in land use and infrastructural compactness — frequently ignores topography, local heritage, and spatial identity. It reduces cities to mathematical grids rather than social organisms. The result, visible across Algeria's new urban extensions, is a monotony of housing blocks that lack civic life, architectural expression, or integration with the natural landscape. Moreover, these models often replicate colonial-era spatial logics: segmentation, surveillance, detachment from the street, and minimal human-scale design — all legacies incompatible with Algeria's cultural DNA.

In contrast, horizontal densification — when intelligently conceived — offers more than a technical fix; it is a **philosophy of urban being**. It re-centres the human body within the urban space. It acknowledges slope, climate, and tradition. It revives the collective ethos of Algerian medinas, the terraced villages of Kabylie, the M'zab Valley settlements, and the adaptable compactness of Ottoman and Berber architectures. These traditions are not relics; they are resources. They constitute an **urban memory** waiting to be reinterpreted.

Our research has shown that horizontal densification is not the mere opposite of verticality; it is a **third way** — a synthesis of density and humility, of collectivity and intimacy. It does not require monumental towers to assert modernity, but rather, **meaningful forms** that echo the past while serving the present. Our thesis therefore joins a wider international discourse that argues for the **re-humanisation of urbanism**. Cities should not only be engines of economic efficiency but also vessels of memory and identity (Norberg-

Schulz, 1980; Gehl, 2011). The identity of a place is not a nostalgic concern — it is a practical framework for **urban resilience**. Cities that ignore their context will struggle with alienation, environmental breakdown, and social fragmentation. In the case study of Sidi Serhane, the prevailing AADL model was found to be **structurally misaligned** with the site's geography and socio-cultural character. The analysis highlighted several critical mismatches:

- ⇨ A rigid, orthogonal road grid that ignores slope and contours.
- ⇨ Monofunctional zoning that isolates housing from commerce, recreation, and civic life.
- ⇨ Vertical apartment blocks unrelated to the human scale or vernacular forms.
- ⇨ Minimal use of terraces, courtyards, or shared spaces despite their deep roots in Algerian domestic architecture.
- ⇨ Public spaces as residual voids rather than intentional, meaningful gathering points.

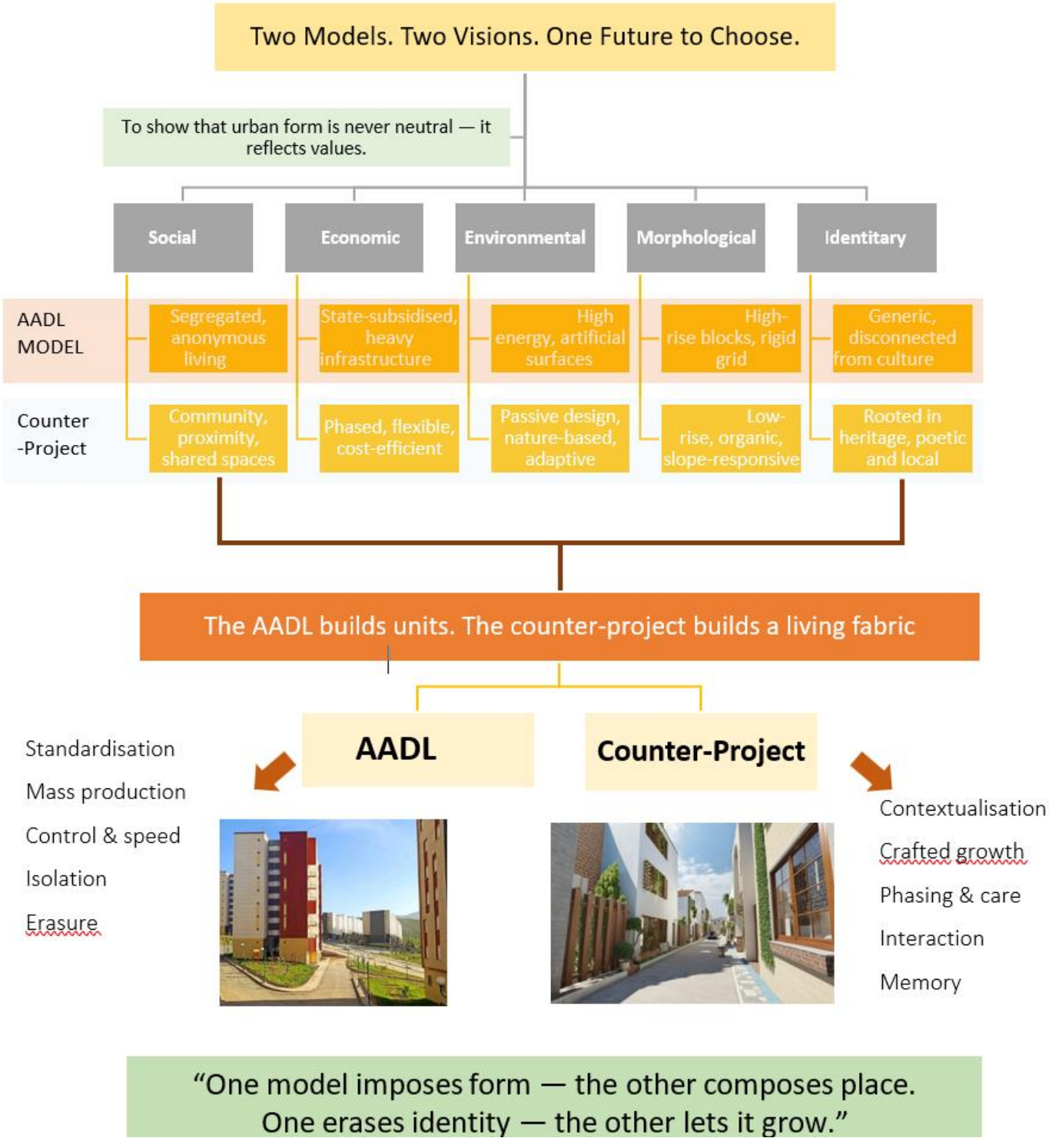
In opposition to this model, the counter-project proposed in this research re-imagines Sidi Serhane as a place where **identity, topography, and community are integrated** into a new urban morphology. The design principles were guided by three imperatives:

1. **Topographical logic**: Buildings follow the slope through terraced platforms, not flattened plots. Staircases and ramps become urban connections rather than constraints.
2. **Architectural continuity**: Materials, colours, roof forms, and façade language draw from local traditions — including whitewashed surfaces, arcades, earthen tones, and rooftop terraces offering panoramic views.
3. **Social activation**: Streets are not just for cars, but also for children, traders, pedestrians, and elders. The public realm is diversified through souks, shaded alleys, collective gardens, and prayer spaces.

Importantly, the **notion of identity** was treated not as a stylistic reference, but as a **generative force** in urban and architectural design. Identity here includes not only visible features but also **intangible dimensions**: habits of movement, spatial rituals, climate responsiveness, and neighbourly dynamics. Thus, Sidi Serhane counter-project becomes more than a prototype — it is a manifesto for re-grounding Algerian urbanism in **its own soil**, culturally and literally. As a conclusion to this academic and architectural journey, we

affirm that **horizontal densification**, when designed with care, identity, and adaptability, can become **an Algerian model of urban resilience**. It reconnects us with our environment, reactivates forgotten traditions, and empowers communities to co-create their futures. This is not a return to the past, but a way forward — a form of **rooted modernity**. By designing cities that reflect who we are — geologically, historically, spiritually — we affirm that

urbanism is not just about space. It is about **belonging**.



Strategic Recommendations

Based on the research findings, spatial analyses, and project testing, the following recommendations are suggested:

a- Urban Planning Recommendations

- Adopt a Contextual Master Planning Framework

1. National housing strategies should move from "one-model-fits-all" to **regionally differentiated** urban guidelines.
2. Semi-mountainous areas like Sidi Serhane require **slope-aware**, terrace-based urban forms rather than standardised vertical grids.

- Legalise and Promote Horizontal Densification Typologies

  - ✓ Update zoning laws to explicitly support **Dense Individual Housing (HID)** and **Mixed Housing (HM)** models.
  - ✓ Introduce incentives for developers to adopt **low-rise, compact layouts** integrated with public space networks.

- Re-integrate Landscape and Hydrology

  - ✓ Use natural slope, water flow and vegetation as **form-givers** in urban design.
  - ✓ Protect green corridors and introduce **eco-terraces** to manage runoff, enhance cooling, and create leisure space.

- Enforce Human-Scale Design Guidelines

  - ✓ Limit building heights in sensitive areas to **R+2 or R+3** where applicable.
  - ✓ Mandate **minimum percentages of courtyards, semi-private patios**, and **walkable paths** in new developments.

b- Architectural and Cultural Identity Recommendations

- Establish a National Vernacular Architecture Reference Code

- ✓ Compile a guideline of architectural vocabulary (roofs, colours, arches, materials) derived from **local heritage**: Berber, Ottoman, Moorish, and rural Algerian typologies.

- Design for Climate and Culture

- ✓ Promote **passive cooling**, use of traditional shading devices (mashrabiyyas, porticoes), and **openable terraces**.
- ✓ Encourage spatial sequences typical of traditional housing: **entrance thresholds**, layered privacy, inner courts.

➢ Revalorise Public Space through Ritual and Memory

- ✓ Integrate **symbolic elements** such as communal fountains, prayer niches, and arcaded walkways.
- ✓ Create **"urban mnemonics"** — spatial patterns or landmarks that embed collective memory.

Socioeconomic and Policy Recommendations

a- Promote Participatory Planning

- ✓ Require that all housing master plans include a **community consultation phase**.
- ✓ Use **co-design workshops** to involve local craftspeople, residents, and youth in shaping the built environment.

a- Subsidise Local Materials and Techniques

Provide incentives for builders to use **earth bricks, local stone, and lime-based renders**.

Support training in traditional building techniques to create jobs and strengthen identity.

Develop Flexible Land Policies

- ✓ Create **phased land allocation frameworks** that allow for incremental horizontal growth without sprawl.
- ✓ Encourage **cooperative ownership models** that promote solidarity and prevent speculative verticalisation.

Future perspectives

The broader implication of this thesis is the urgent need for **a new planning ethos** in Algeria — one that treats urbanism not merely as a quantitative response to population growth, but as a **cultural and ecological project**.

We must reclaim **the right to inhabit space meaningfully**, not just to occupy it. We must build for **continuity, not rupture**. We must rediscover the **poetics of place** — where

hills become urban terraces, where a narrow street frames the sky, where architecture listens to the land.

This is not a romantic vision; it is a **strategic necessity**. In a time of climate emergency, social alienation, and economic fragility, Algerian cities can no longer afford imported models that flatten identity and ignore geography. What we need is a **context-based urbanism**, rooted in place, memory, and people.

The story of Sidi Serhane is not isolated. Similar sites — from Tizi Ouzou to Boussaâda, from Béjaïa to Ghardaïa — face the same tension: between imposed verticality and organic horizontality. The counter-project presented in this thesis offers a **method, a vocabulary, and a vision** for building differently.

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Annexes

1. Urban Framework in Bouinan

Table 13 Urban Framework in Bouinan

Urban Framework in Bouinan

Bouinan features three street structures:

(1) orthogonal grid (north-south/east-west),

(2) radioconcentric spreading from a central hub, and (3) organic patterns adapting to terrain morphology. These patterns influence accessibility, orientation, and land use efficiency, supporting diverse functions across the urban landscape (figure 3.26.27.28) .

Application to Sidi Serhane

In Sidi Serhane, a **hybrid approach** is recommended: maintain **organic integration** with the natural slopes and heritage pathways while introducing **small-scale radial hubs** to organize neighborhood life around central plazas. This helps preserve the rural identity and promote legibility.

Figure 1.26 : orthogonal grid street Source: BET'S – Salhi, n.d.

Figure 1.27 : organic patterns streetSource: BET'S – Salhi, n.d.

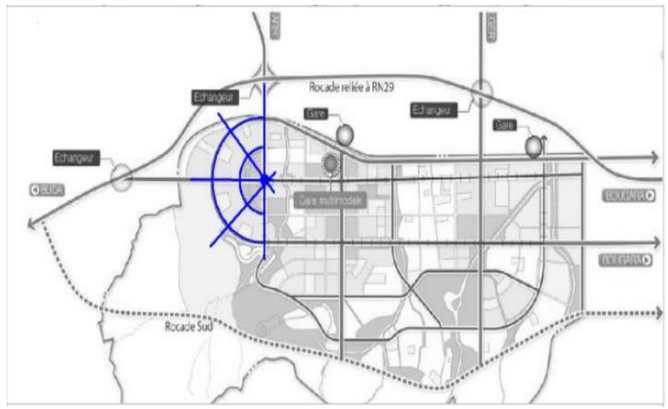

Figure 1.28 radioconcentric street Source: BET'S – Salhi, n.d.

Morphology of Buildings

The city reveals **three main morphologies**: 1) **Punctual** structures scattered in agricultural plots, 2) **Linear** alignments following main axes, and 3) **Compact** clusters forming dense neighborhoods. The north has more linear patterns, while the south is organically compact. Sidi Serhane can benefit from a compact urban form promoting horizontal density with shared open courtyards and cluster housing. Linear segments can be added for main village arteries. This allows efficient land use while integrating communal spaces(figure 3.29) .

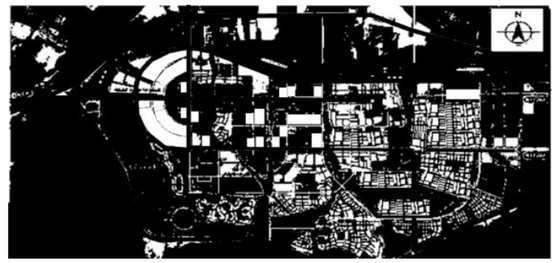

Figure 1-29 : Morphology of Buildings map bouinan source : author , 2025.

Ecological and Public Space Integration

Built and Non-Built Environment	Parks and Green Spaces	Hubs and Community Nodes

Bouinan's landscape consists of 75% built surfaces and 25% green spaces, which include agricultural lands, vacant lots, and ecological parks. These non-built areas play roles in climate regulation, recreation, and biodiversity.

In Sidi Serhane, aim to **increase non-built areas**, using **green infrastructure**, **productive gardens**, and **public parks** along existing wadis or slopes. This supports **microclimate cooling** and **communal interaction** (figure 3.30) .

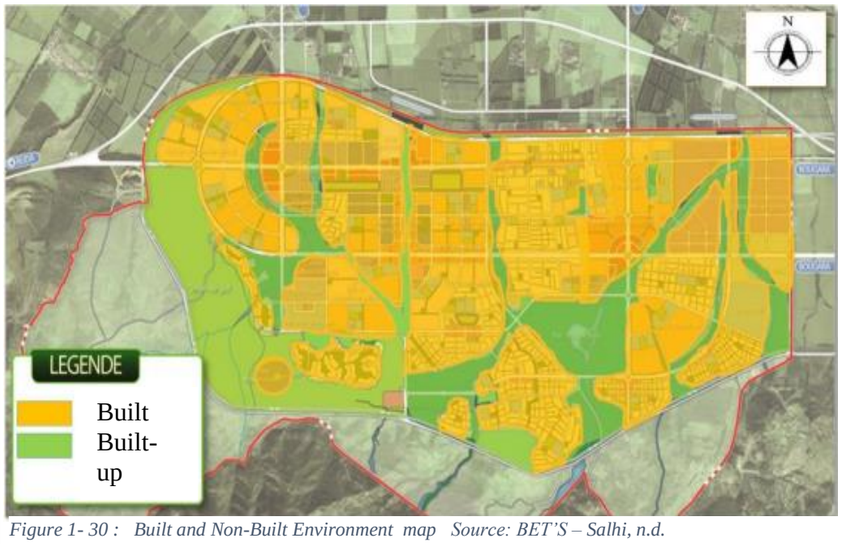

Figure 1- 30 : Built and Non-Built Environment map Source: BET'S – Salhi, n.d.

Green spaces in Bouinan are often designed with **cultural and ecological significance**, contributing to local identity and ecological continuity. Public parks act as social condensers and ecological buffers (figure 3.31) .

In Sidi Serhane, designing **green corridors**, **heritage gardens**, and **permaculture zones** can tie the **natural landscape to communal values**, supporting **eco-tourism** and **local agriculture**.

Figure 1.31 : Parks and Green Spaces map Source: BET'S – Salhi, n.d.

Urban hubs are defined by **low-to-medium-rise public structures**, surrounded by mixed-use plots and community facilities (schools, markets). Their formation follows land ownership and accessibility(figure 3.32) .

Sidi Serhane can develop **low-rise, multifunctional hubs** combining **educational, religious, and market spaces** in one node. This aligns with **rural spatial culture** while improving services.

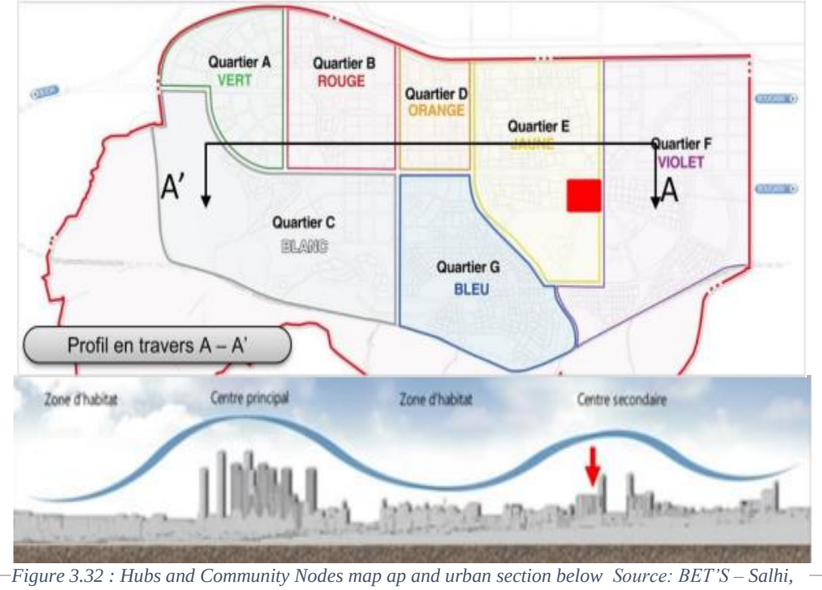

Figure 3.32 : Hubs and Community Nodes map ap and urban section below Source: BET'S – Salhi, n.d.

Urban Framework in Bouinan

Functional Zoning

Bouinan hosts a **multifunctional urban system**: administrative centers, biotech parks, sports zones, and commerce. This heterogeneity supports economic resilience and diverse services (figure 3.17) .

Application to Sidi Serhane

In Sidi Serhane, **small-scale mixed-use zoning** can support **agri-businesses**, **local crafts**, and **home-based workspaces**, boosting the economy while preserving its rural character.

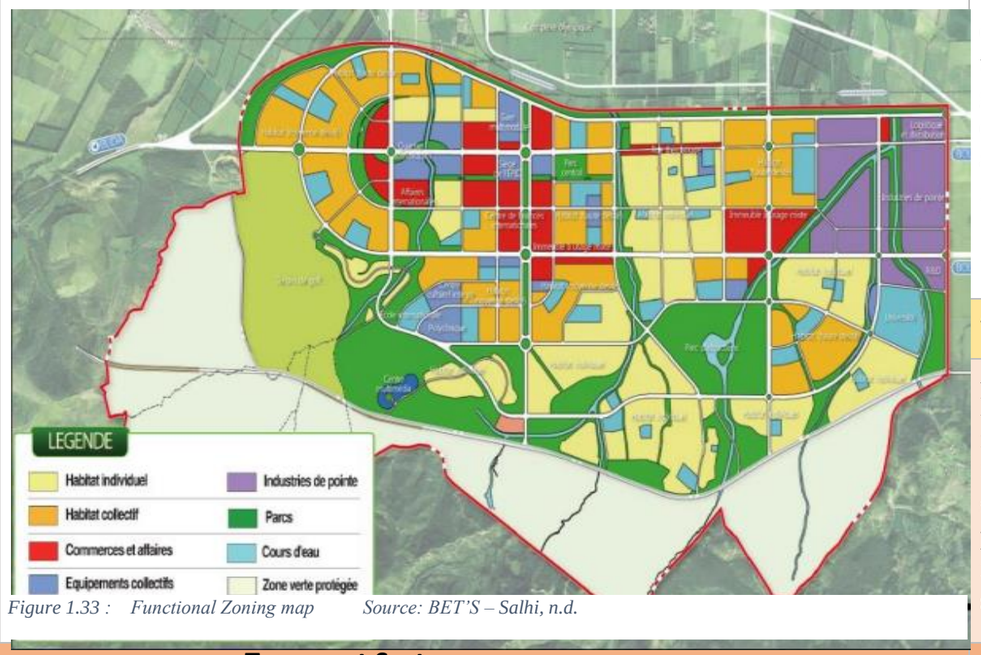

Figure 1.33 : Functional Zoning map Source: BET'S – Salhi, n.d.

Implementation of Road Network

The **radial and looped design** accommodates terrain and social geography, ensuring cohesion and legibility across districts (figure 3.17) .

Application to Sidi Serhane

Adopt a **looped street layout** respecting the **natural slope** of Sidi Serhane, integrating **public spaces**, **markets**, and **pedestrian crossings** to form a coherent village structure.

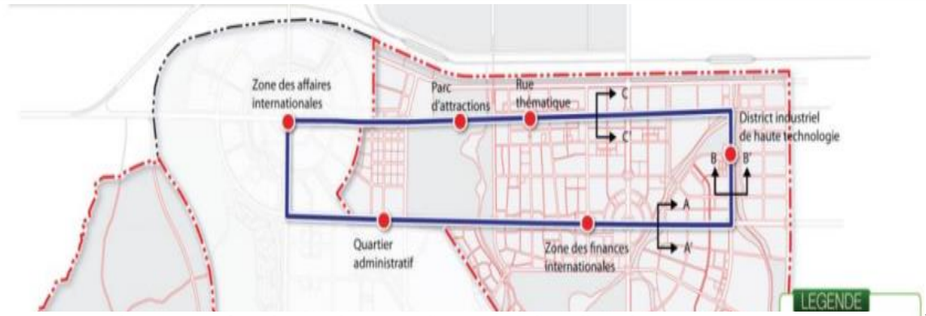

Figure 1.34 : Implementation of Road Network map Source: BET'S – Salhi, n.d.

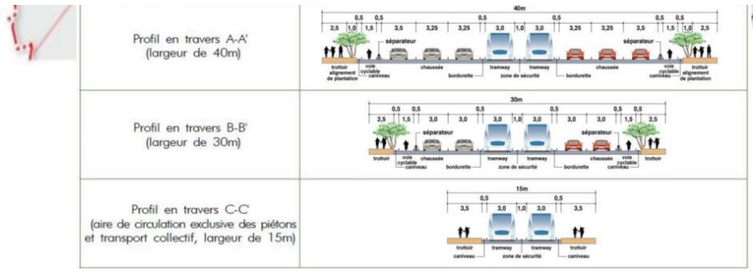

Figure 1.35 : street section Source: BET'S – Salhi, n.d.

Transport System

Bouinan's hierarchical system (main, secondary, tertiary roads) supports urban zoning and traffic flow. The **tramway system** is a major sustainable mobility axis (figure 3.17) .

Application to Sidi Serhane

In Sidi Serhane, introduce a **looped pedestrian-first hierarchy**, integrating **service roads**, **public shuttles**, and **soft mobility paths**, preserving traditional alleyways.

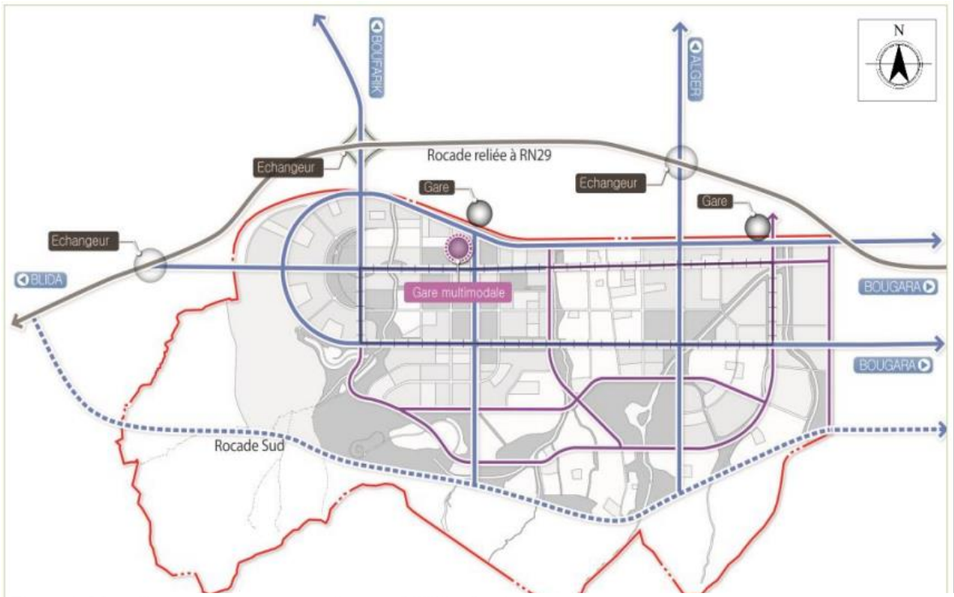

Figure 1. 36 : Transport System map Source: BET'S – Salhi, n.d.

Sensory Landscape

Bouinan exhibits clear **nodes**, **edges**, and **landmarks**—distinguishing old quarters from modern sectors. Spatial identity is strengthened by visual cues(figure 3.17) .

Application to Sidi Serhane

In Sidi Serhane, use **landmarks** such as **historical structures, mosques, and landscape features** (olive groves, rock formations) to structure **navigation and memory** in the village.

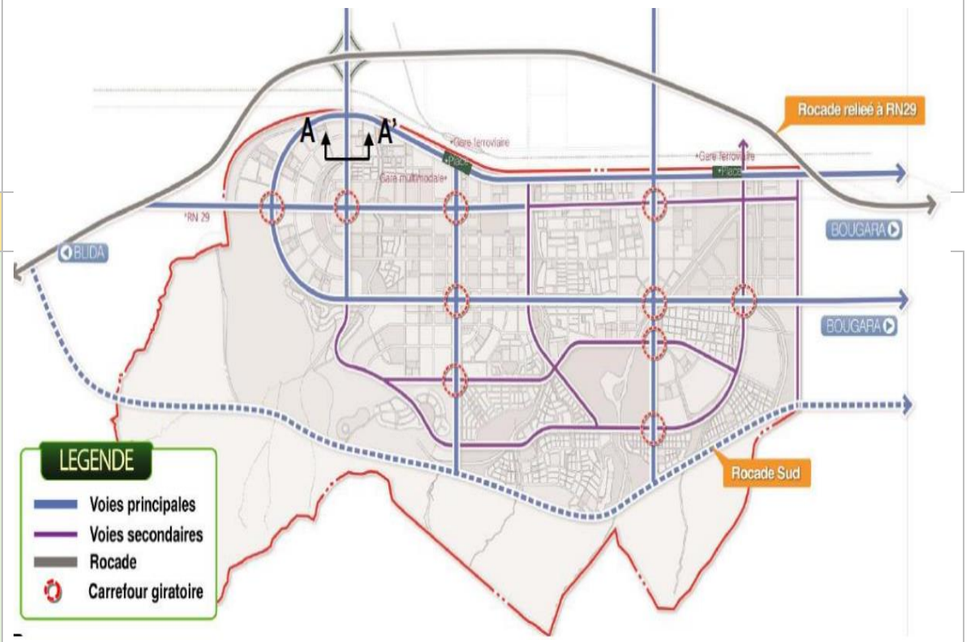

Figure 1.37 : Sensory Landscape Source: BET'S – Salhi, n.d.

2. Prototype of AADL Apartment Unit and Typical Floor Configuration

a- Typical Floor Plan of an AADL Residential Block

PLAN DU 3éme,4ème ,5éme ETAGE

b- **Standard Housing Unit Plan – AADL Dwelling Cell**

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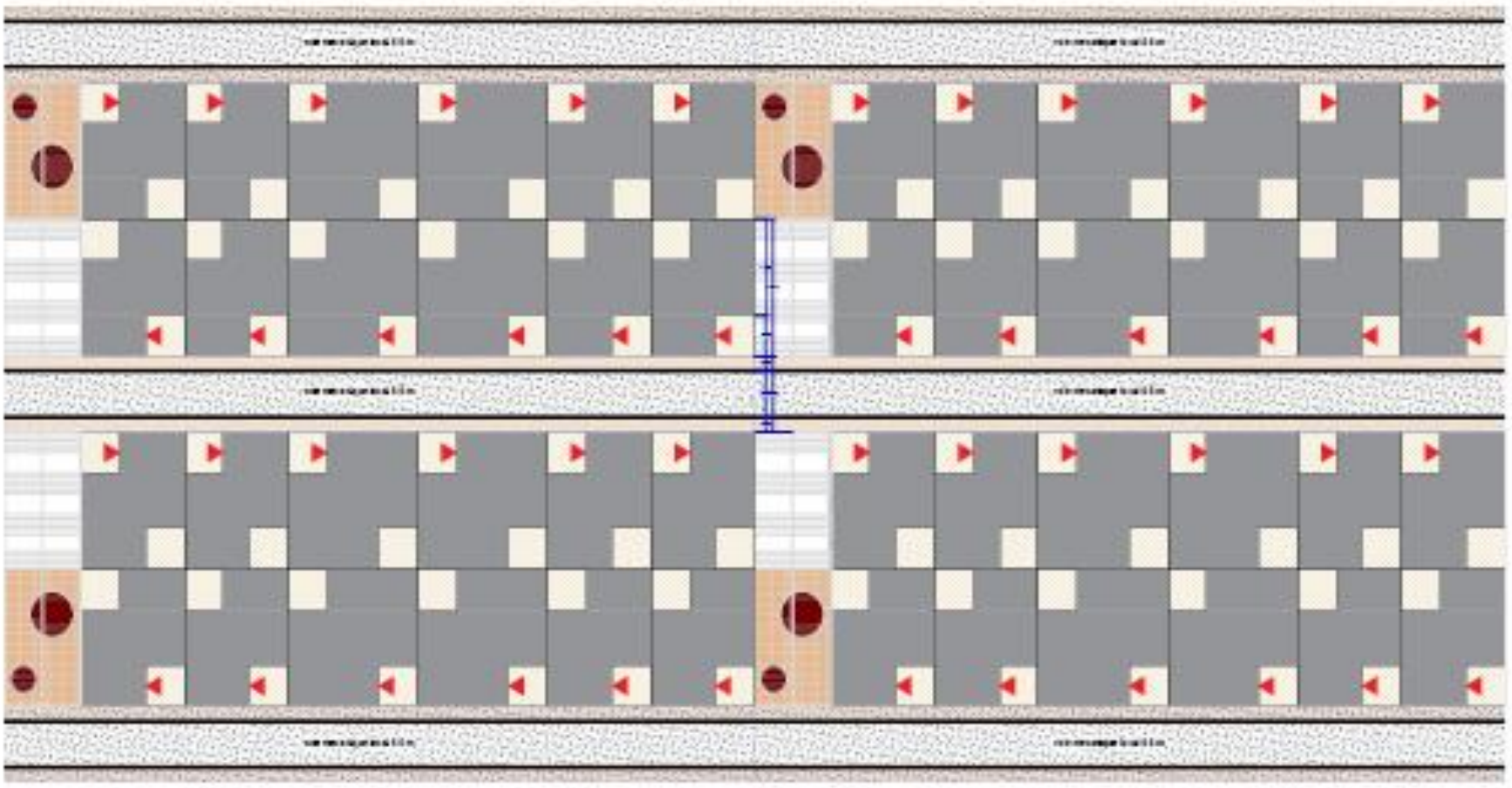
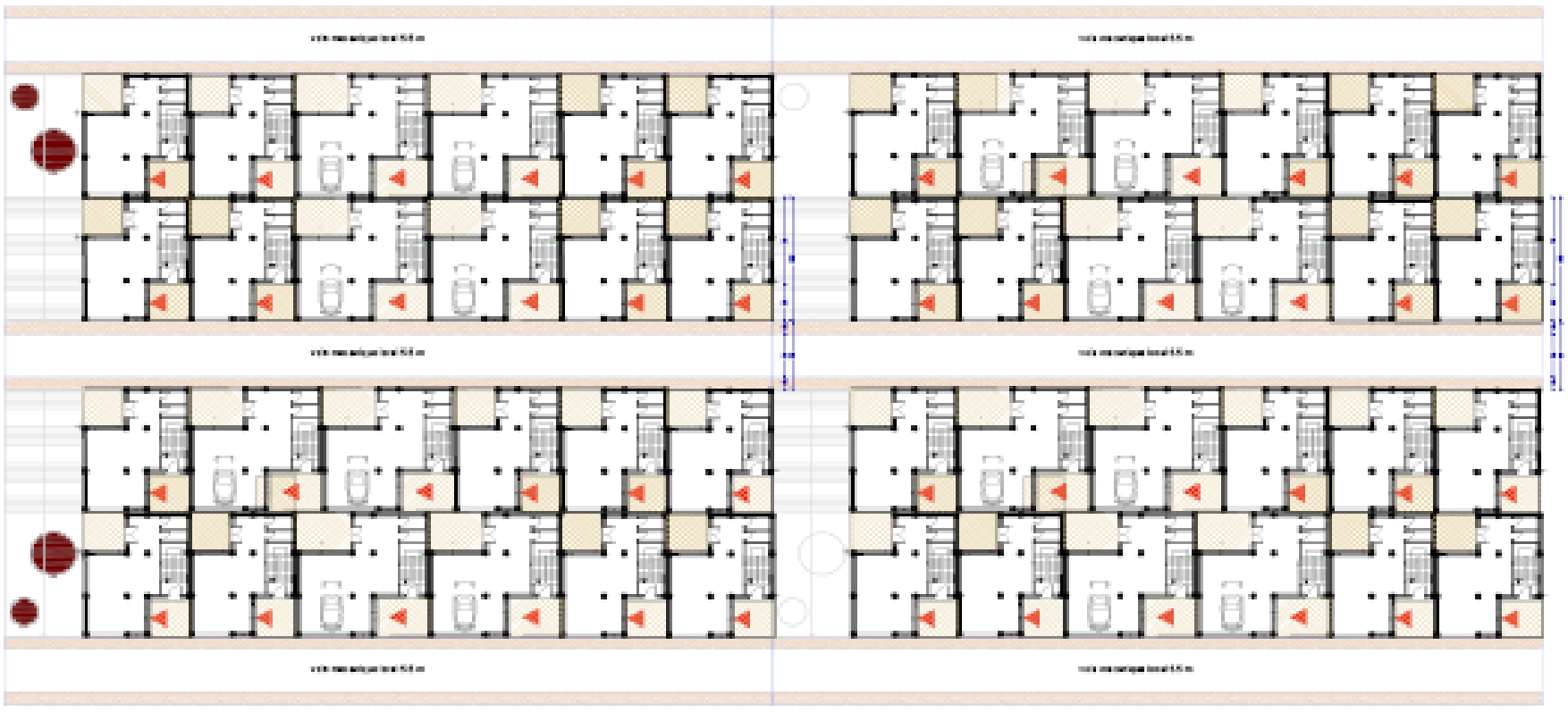
2.1. Architectural Unit Plans : AADL Standard Housing Model

Roof Plan:

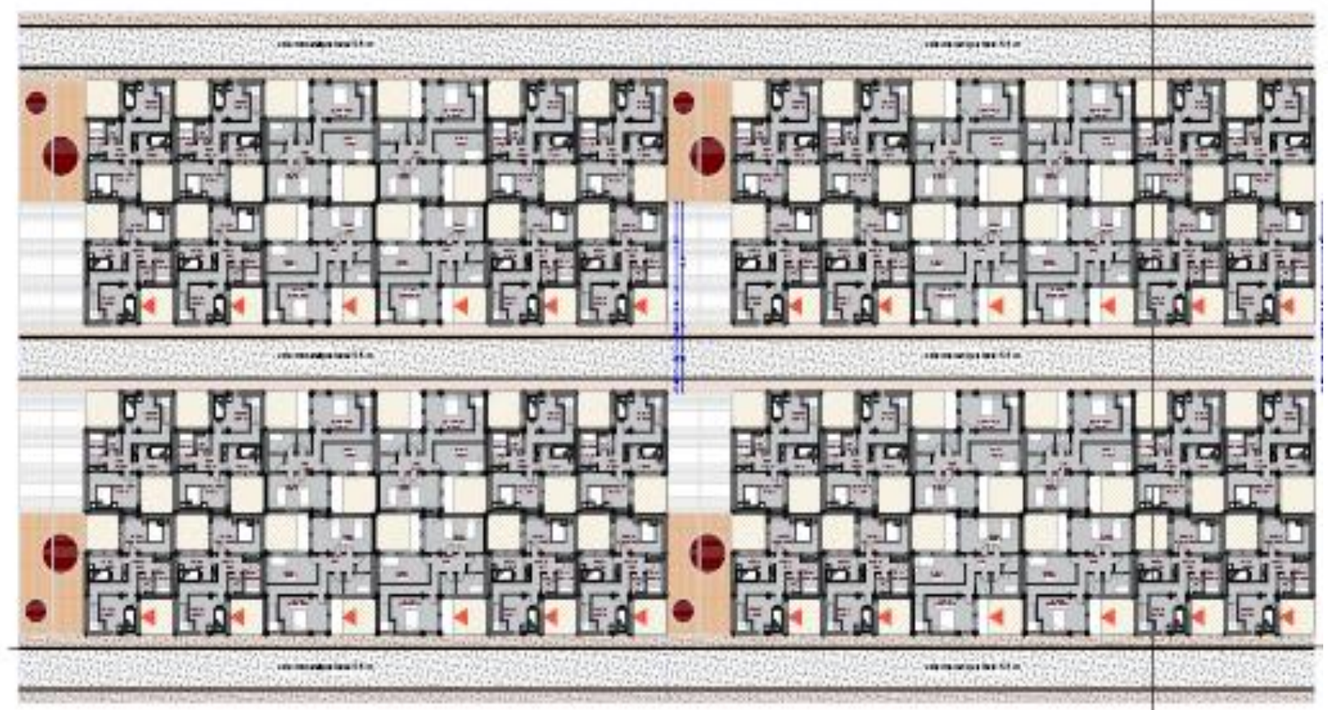


Ground Floor Plan:

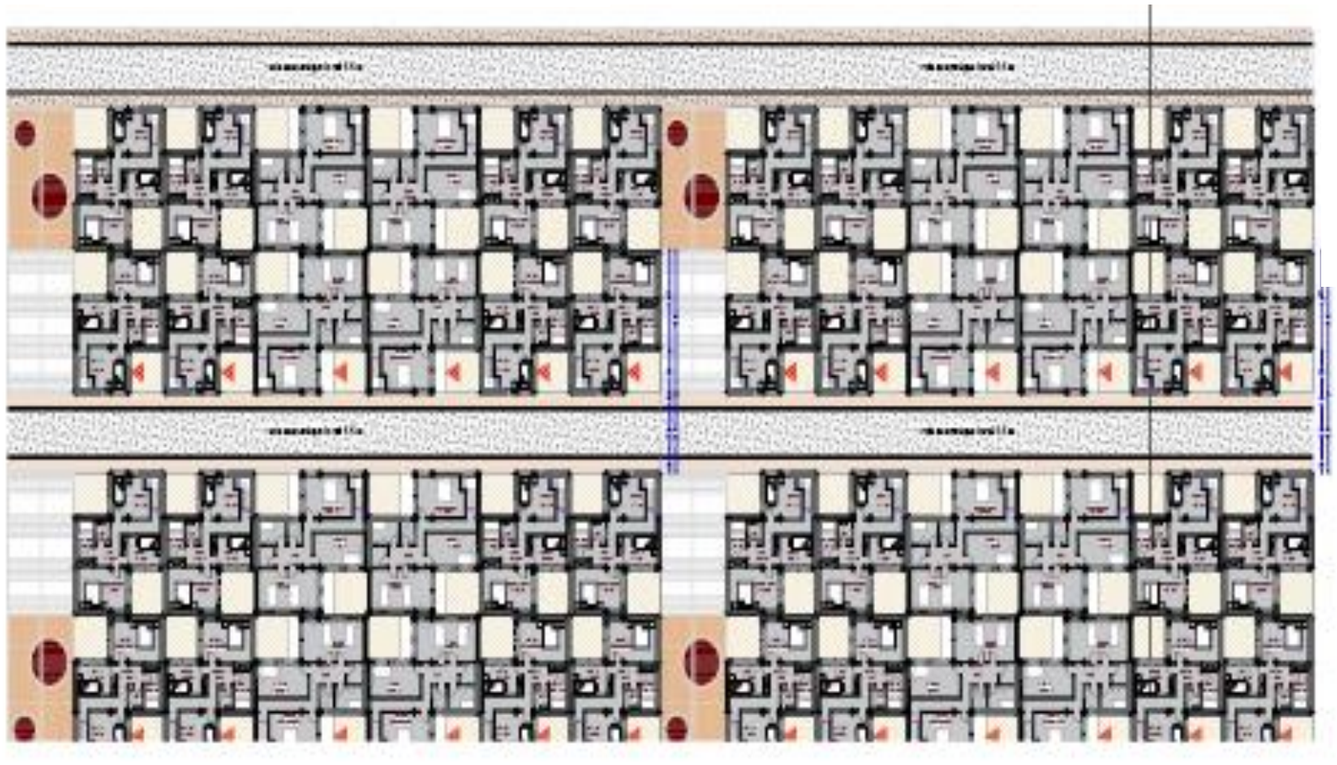


First Floor Plan:

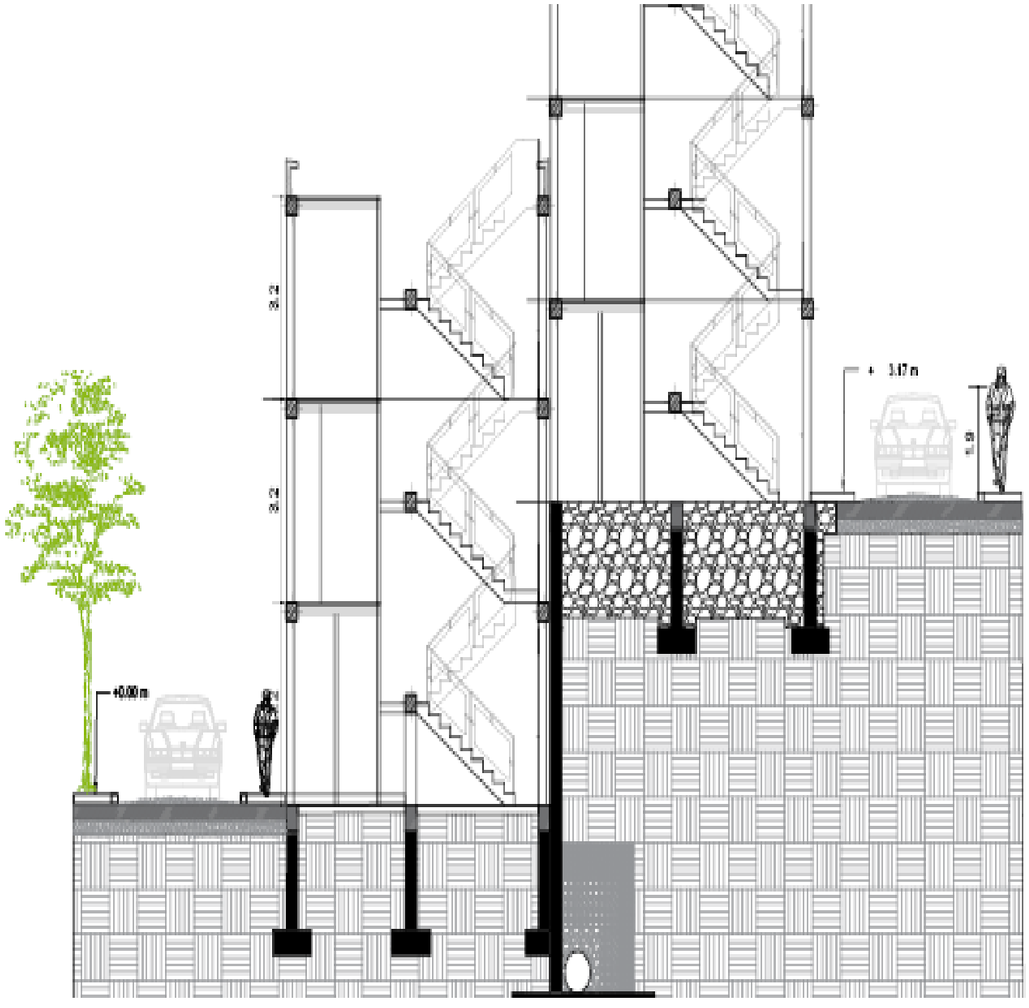
✓ Ground Floor Plan:



✓ First Floor Plan:



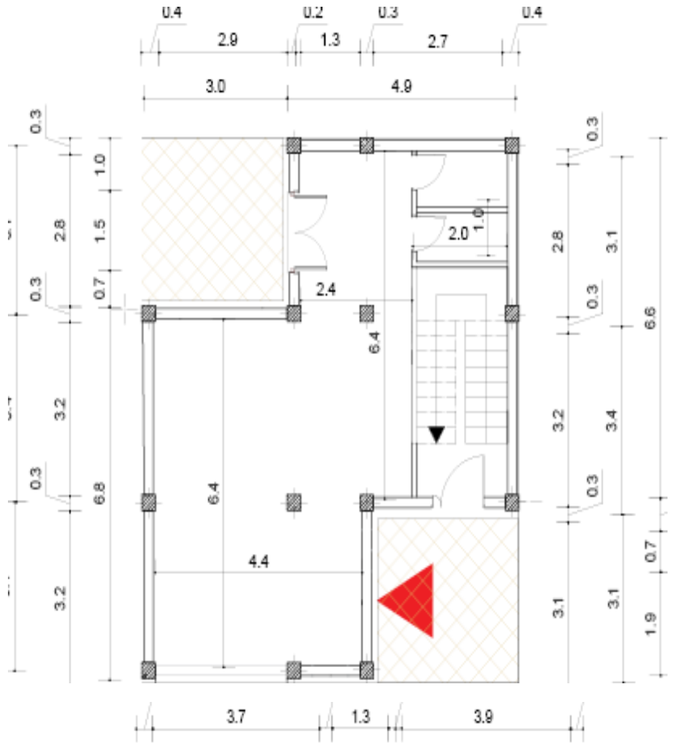
✓ Section AA:

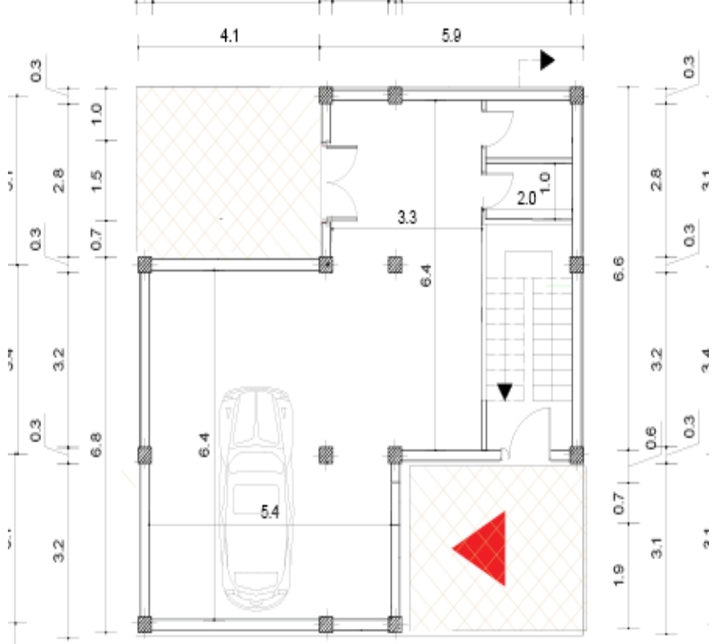


✓ ELEVATION VIEW:

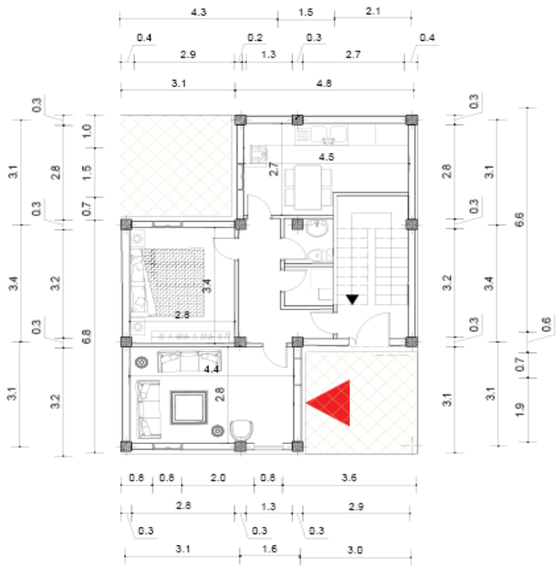
UNIT OF HOUSING

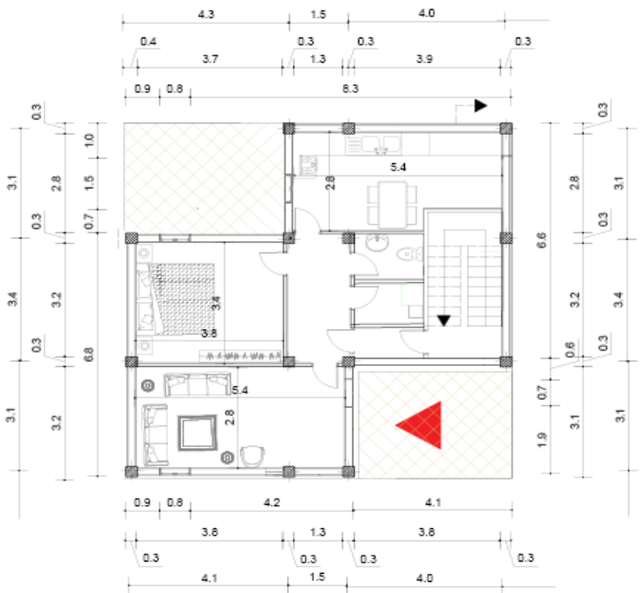
TYPE 1





TYPE 2





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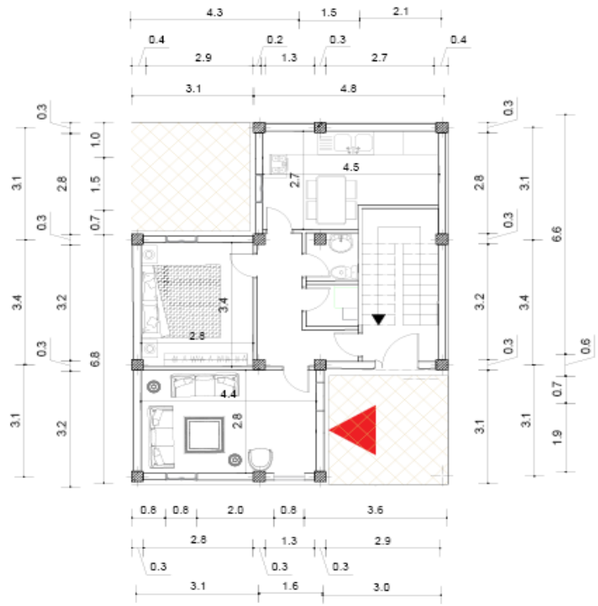
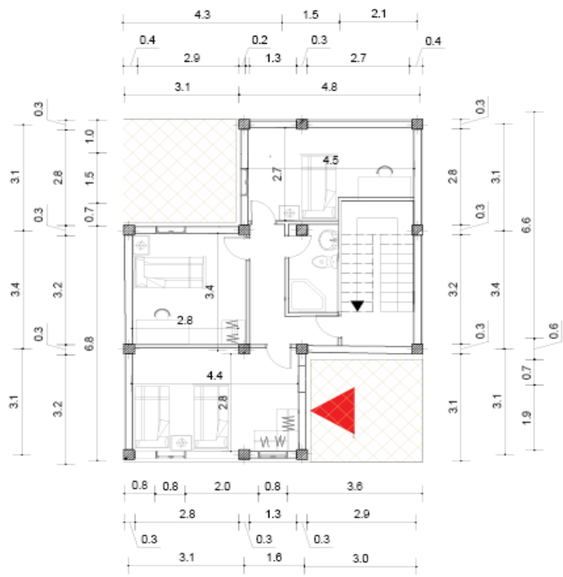
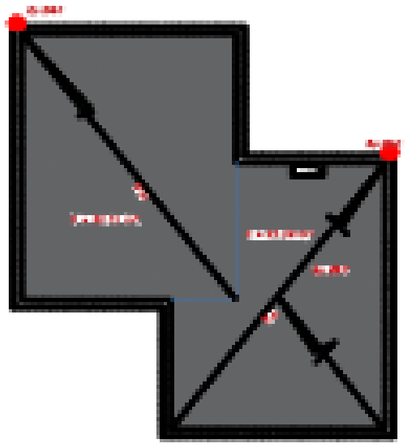
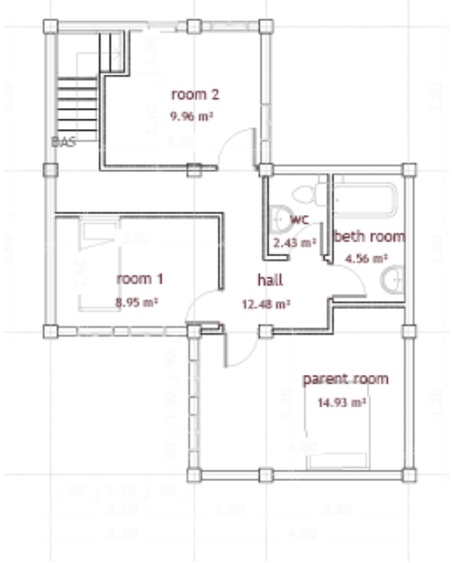


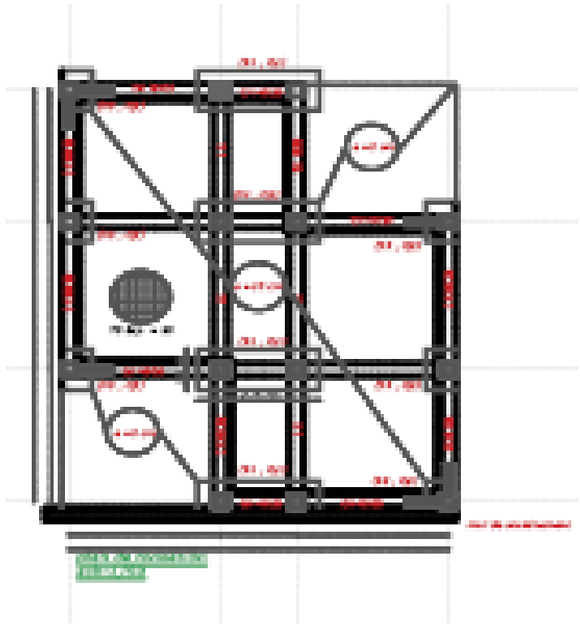


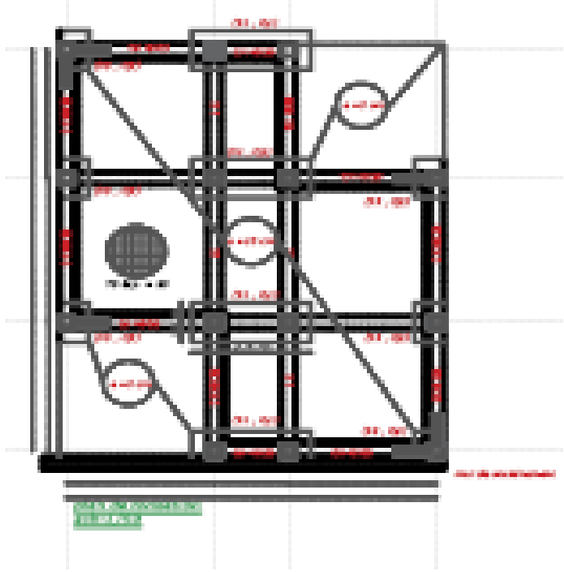
ROOF





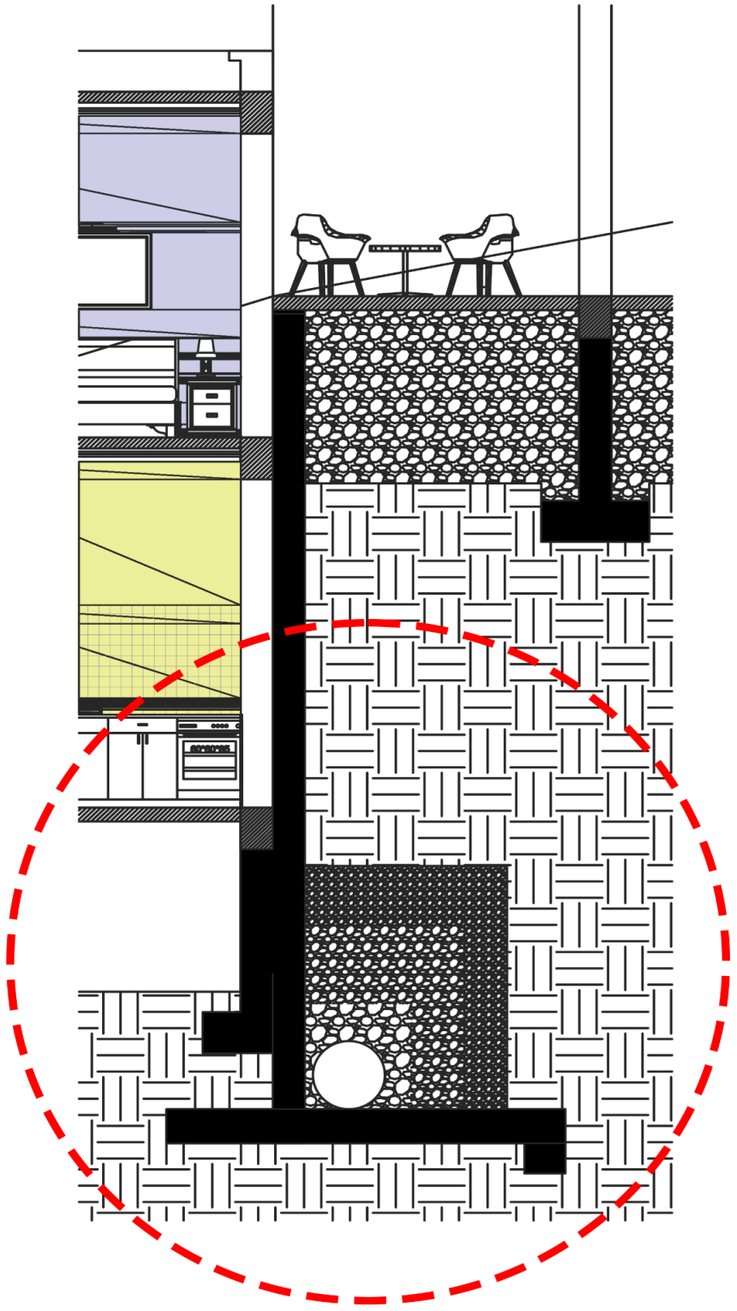
FORMWORK

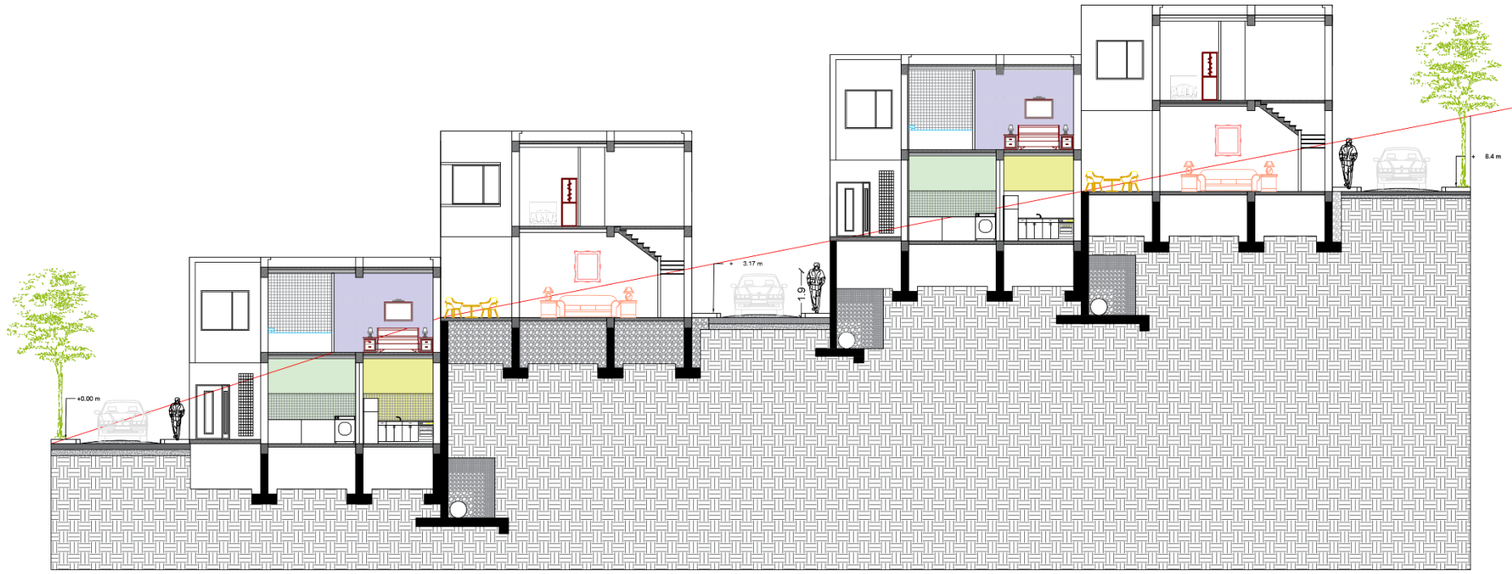


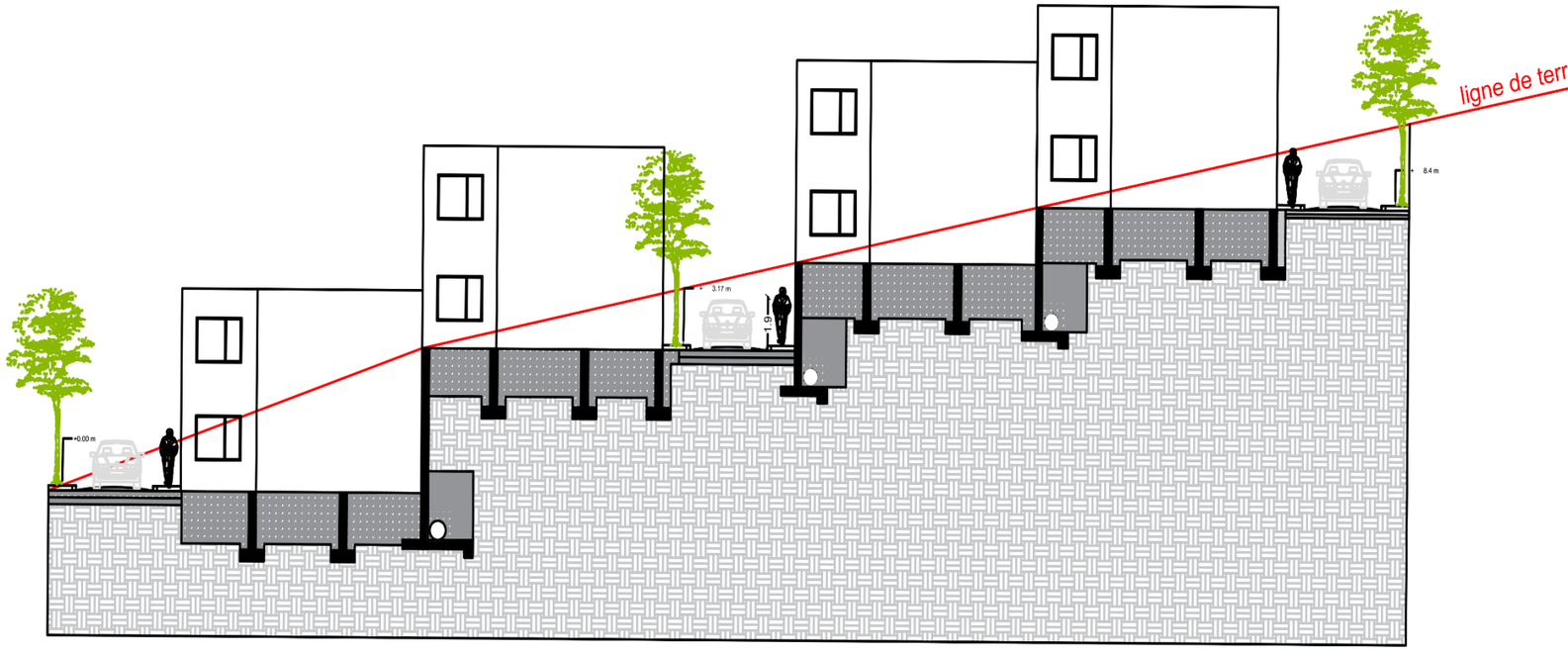


STRUCTURAL

DETAIL OF SECTION

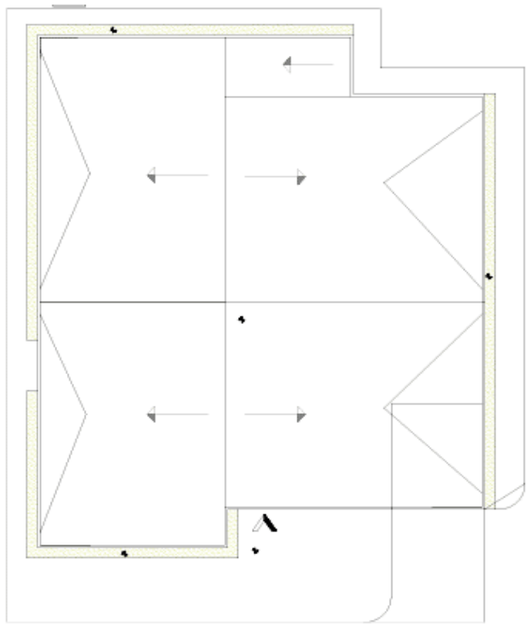


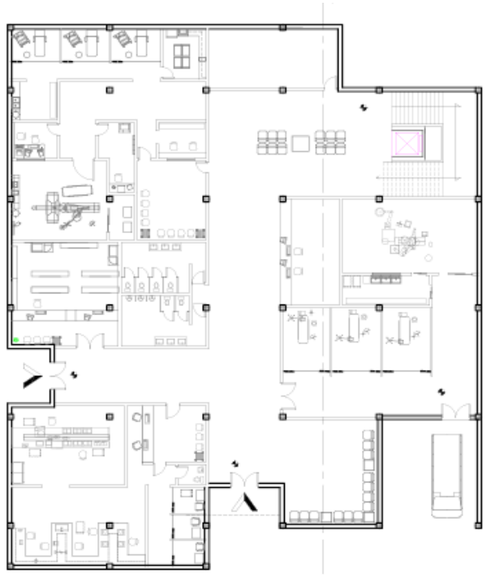


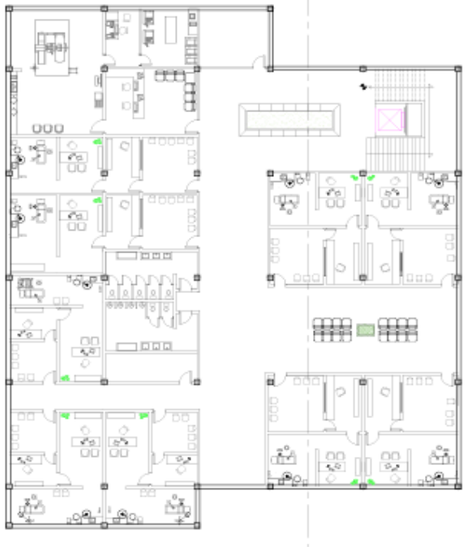


2.2. Graphical File – Outpatient Clinic Architectural Proposal

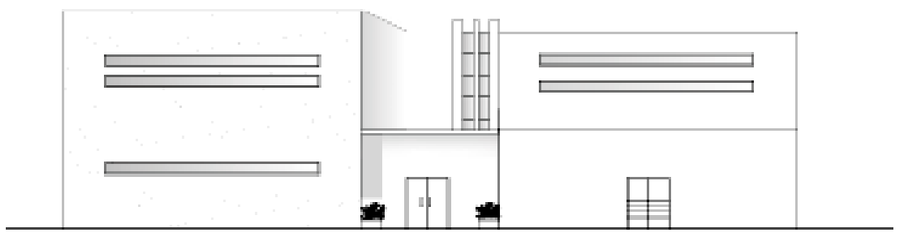
Floor Plans:

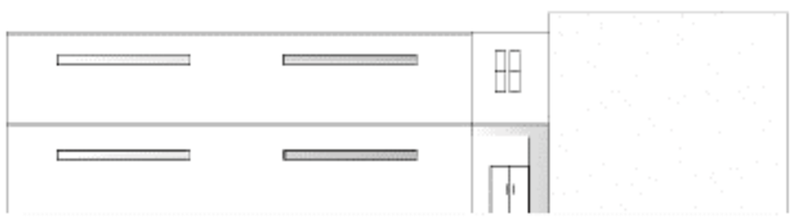




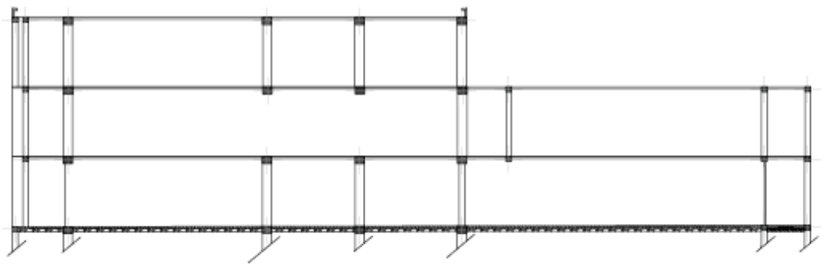


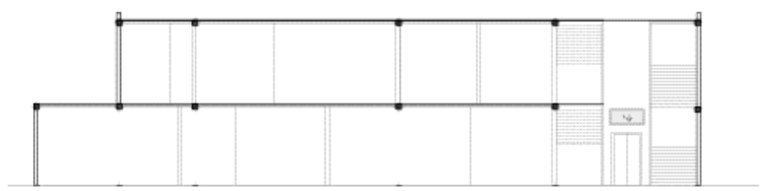
Elevation :





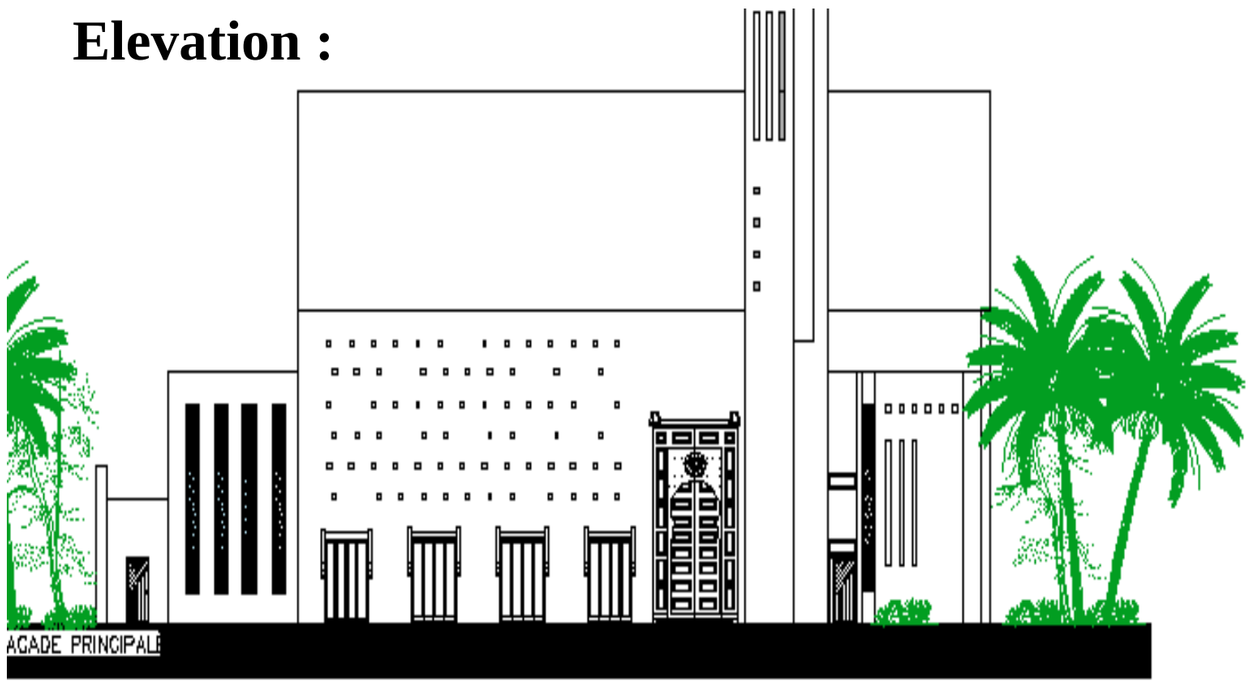
Section :



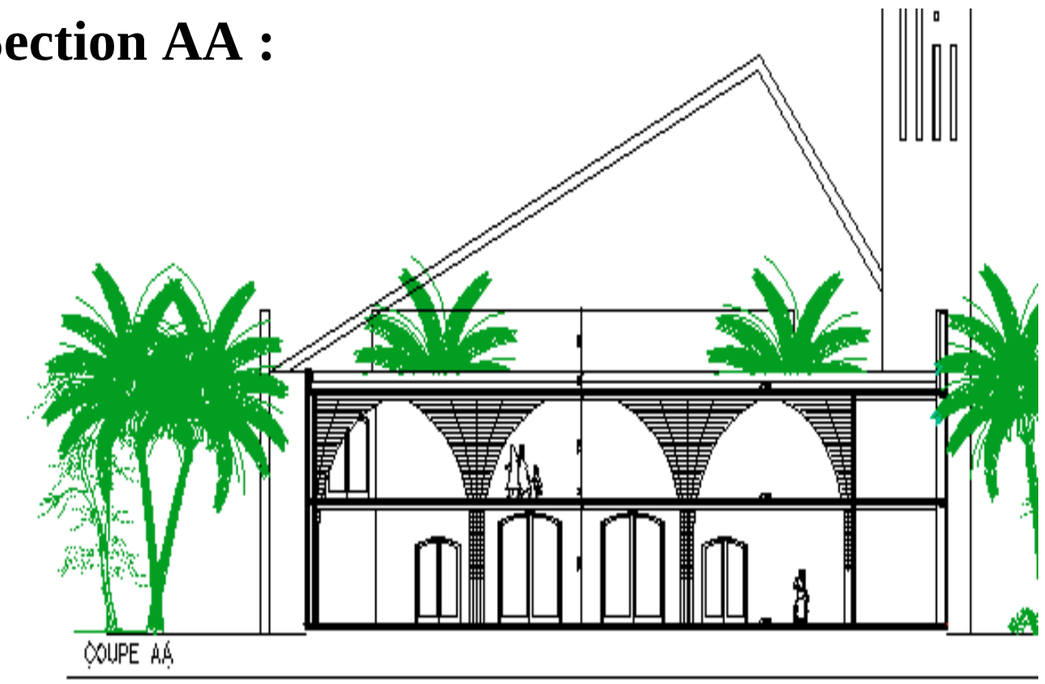


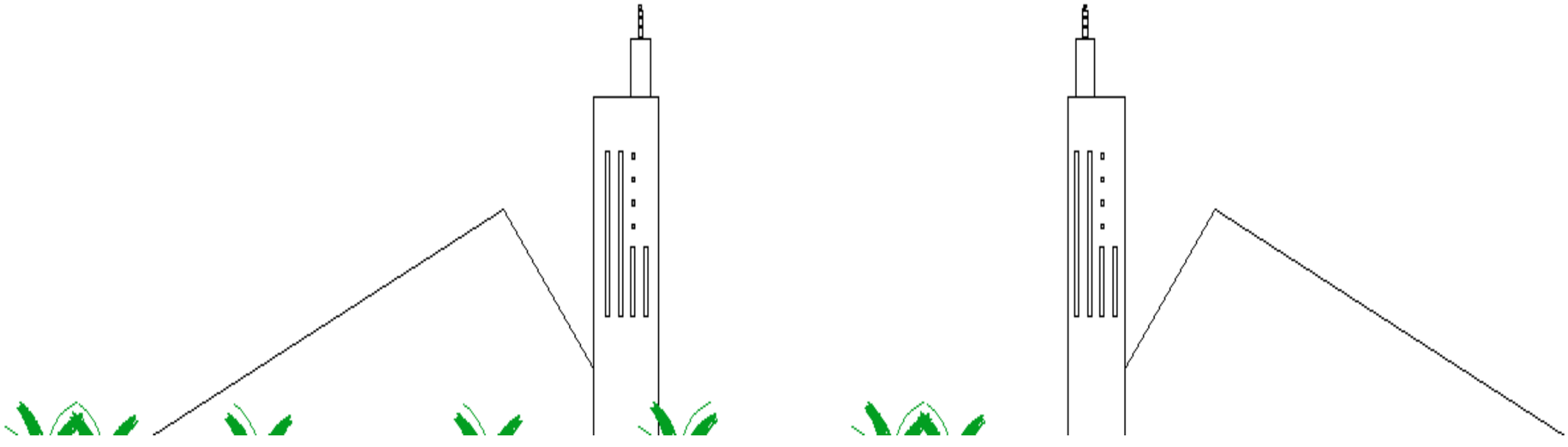
2.3. Graphical File – Mosque Project: Plans, Sections, and Facades

Elevation :



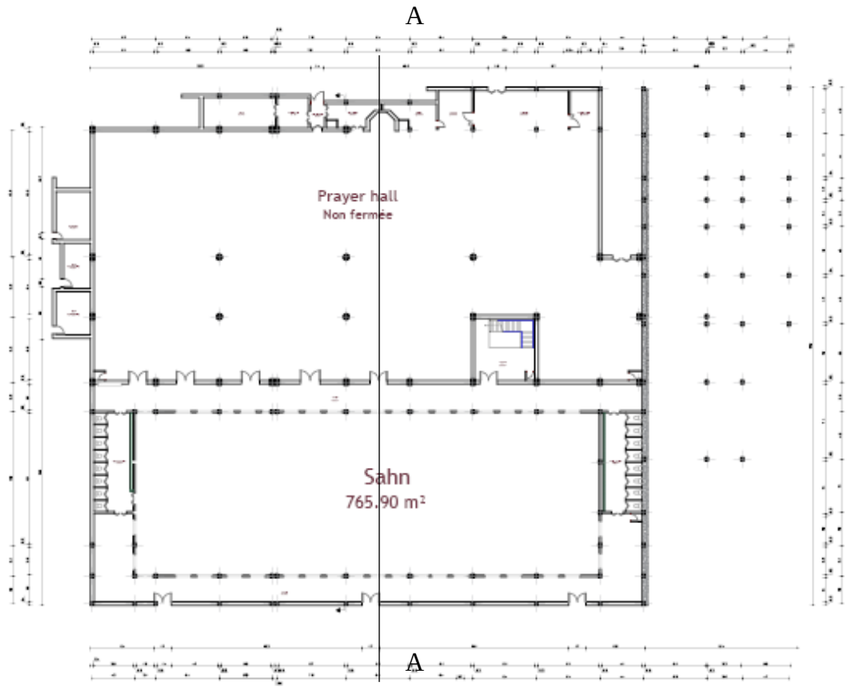
Section AA :



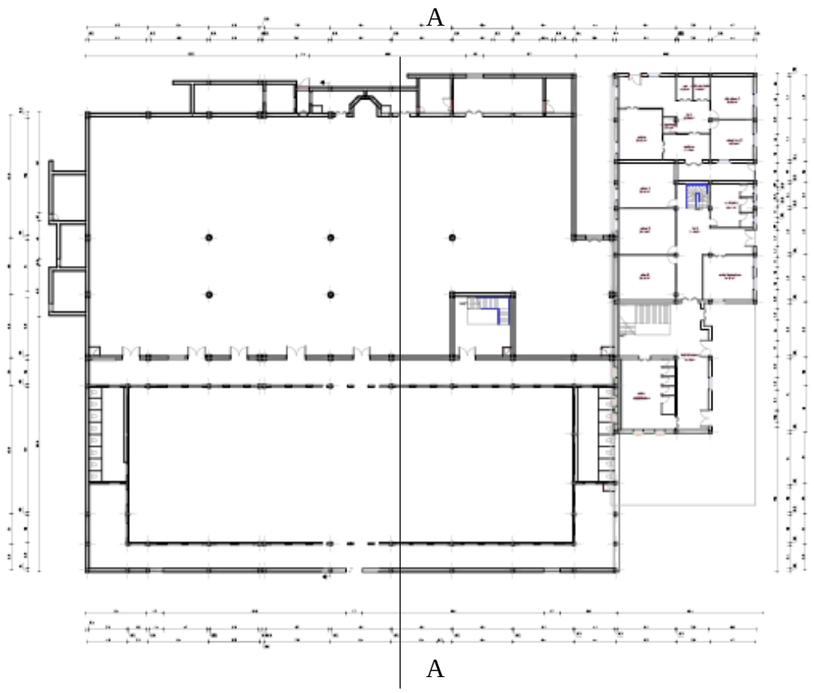


Floor plan :

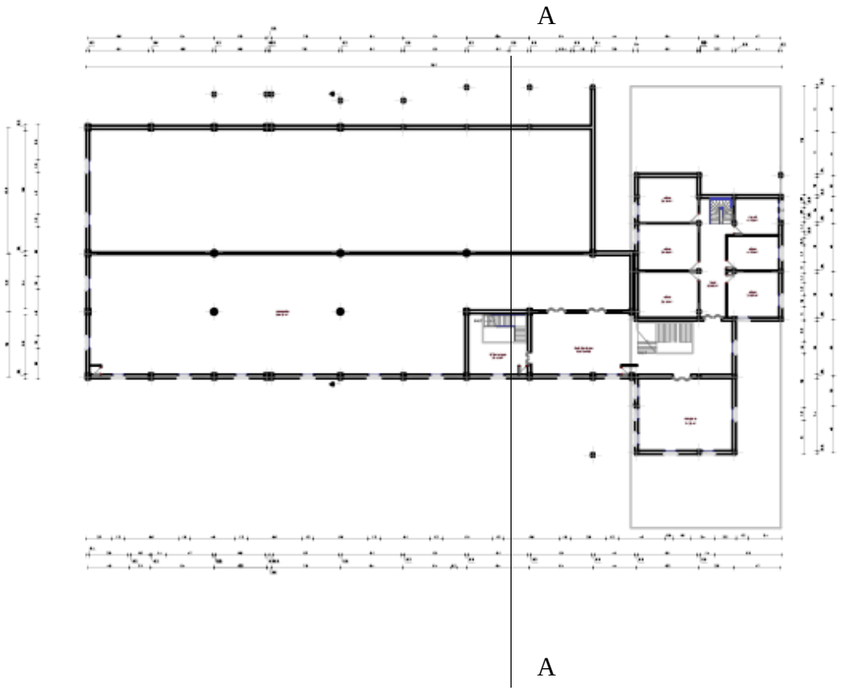
Ground Floor plan :



First Floor plan :

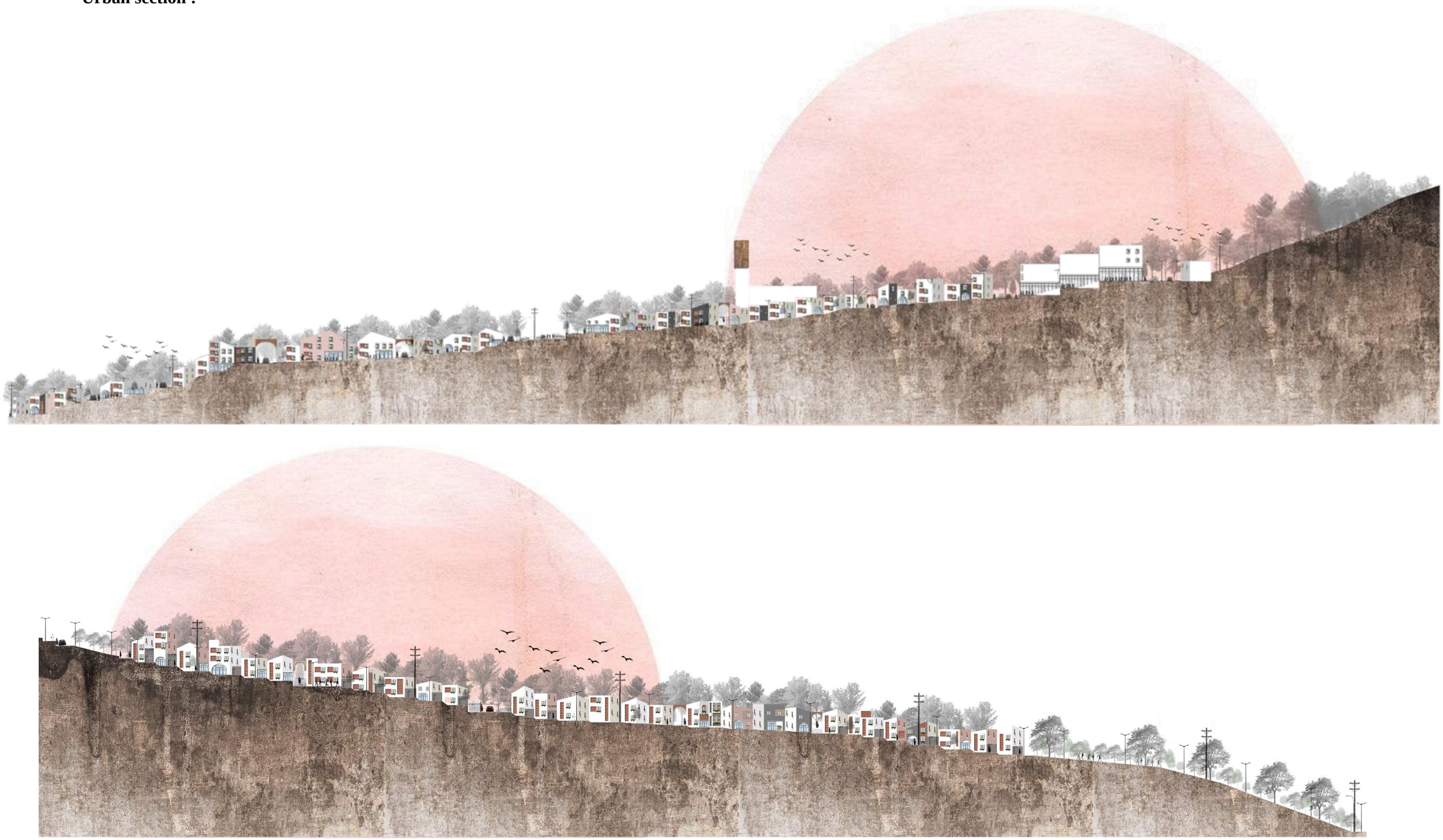


Second Floor plan :

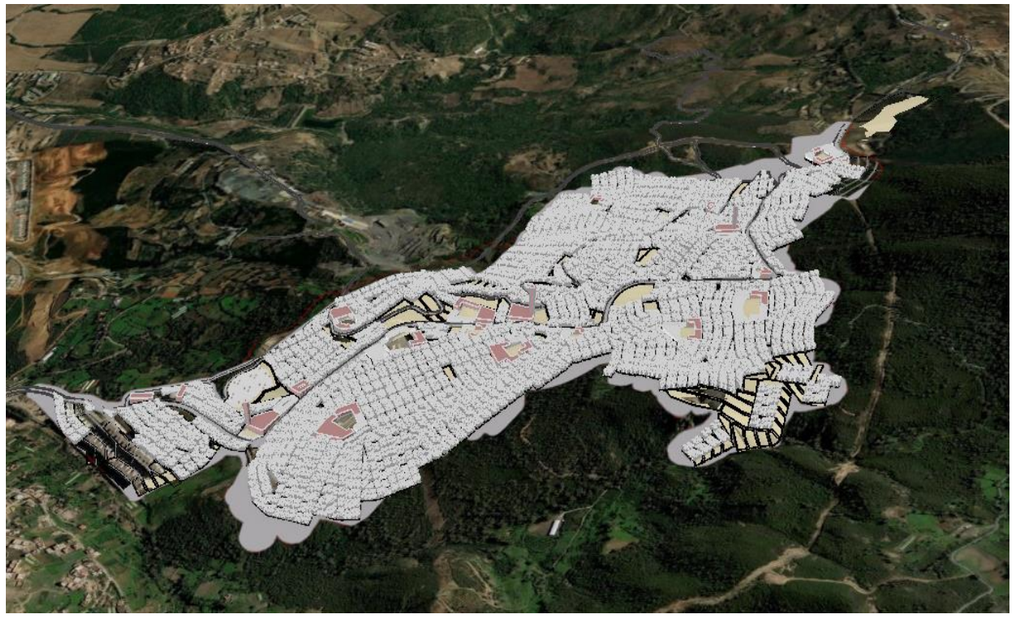


3.Urban elevation :

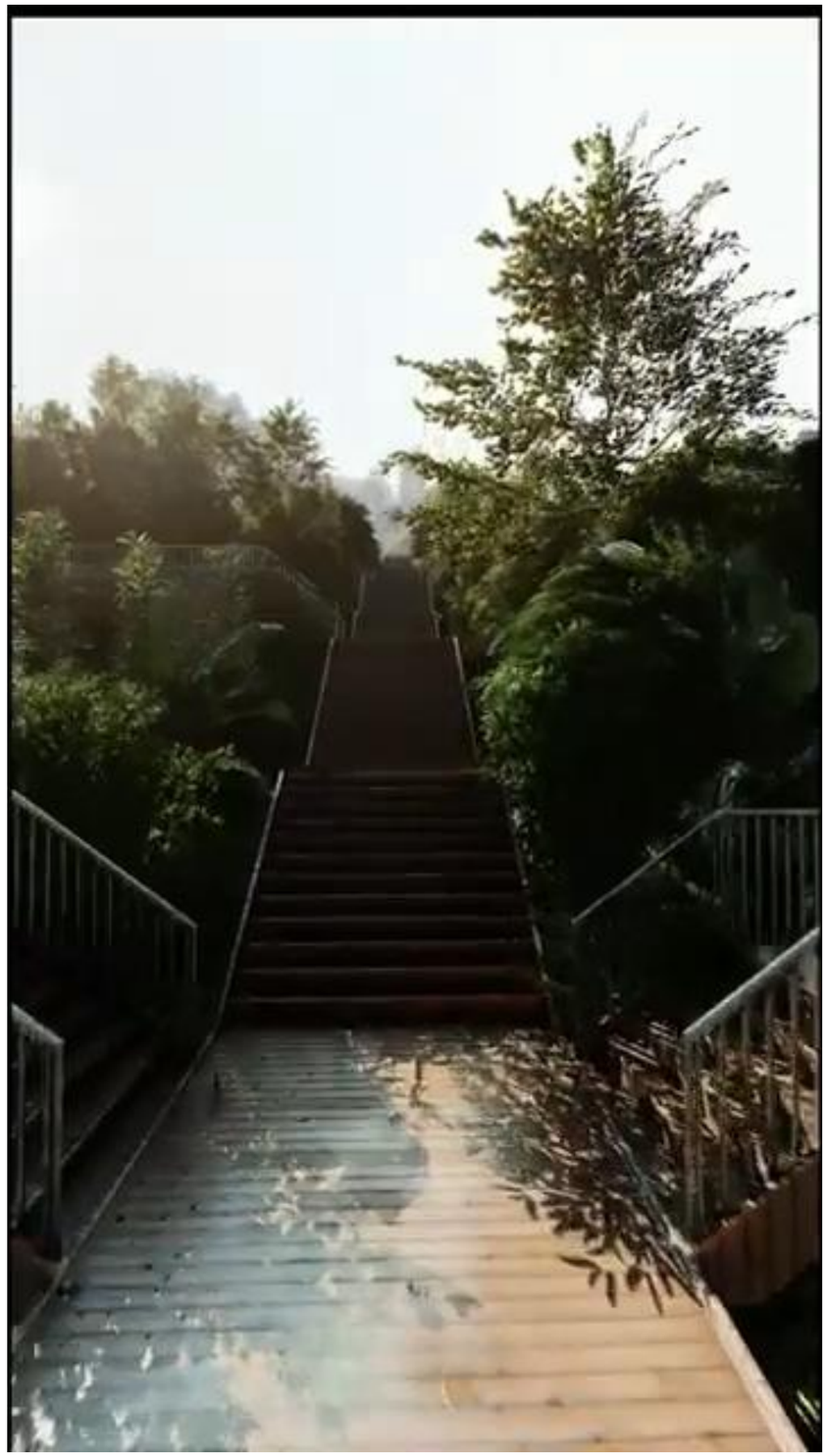
Urban section :



✓ **Perspective Views – Proposed Architectural Project (Lumion Renderings)**



CLINIC :



Mosque :