



SUD
SUSTAINABLE
ARCHITECTURE
& URBAN DESIGN
PROGRAM

FINE ARTS
PROGRAM

Presented By:
Group 1

**SUSTAIBLE
HOUSING STUDIES
(ARC338)**

Presented To:
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TA.Nourhan Tarek ,
TA.Rawan el sebai



APEX HOUSING COMPLEX

Where you find sustainable home



MEET THE TEAM



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Mariam Ismail



Nouran Ahmed



Mohamed Ahmed



Momen Adel



Youssra Abdellatif

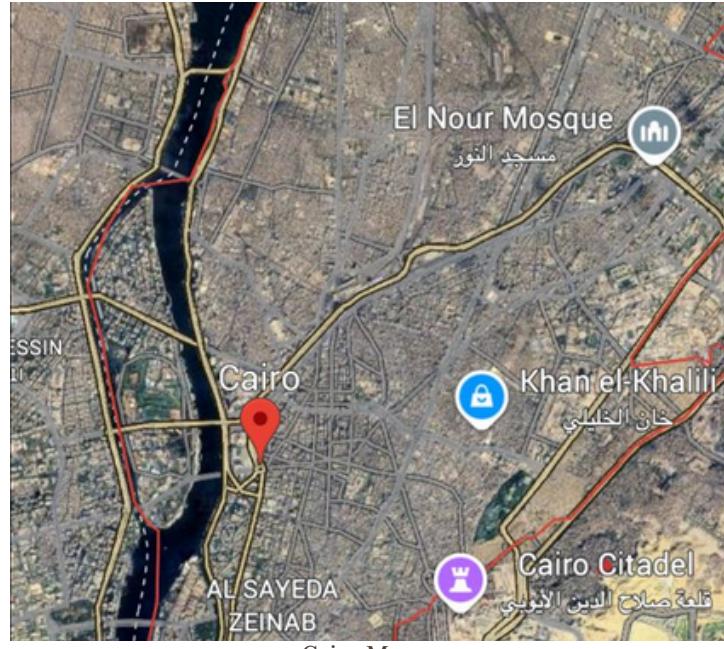
LOCATION

Manshiyat Naser, Mokattam, Cairo, Egypt
(Located in the heart of the Zabbaleen community)

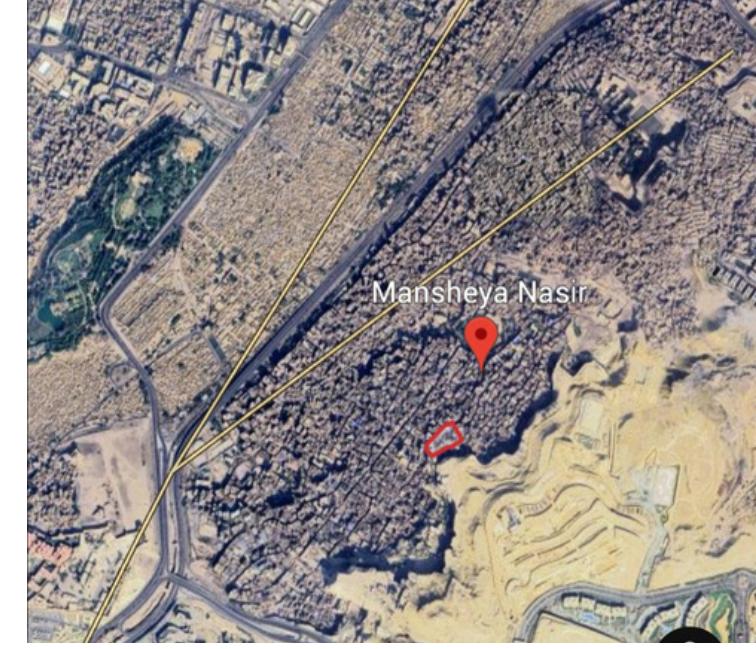
Commonly known as "Garbage City", this area is renowned for its unique urban fabric and its role as the primary hub for Cairo's informal waste collection and recycling industry. The neighborhood is characterized by a complex network of narrow streets, vibrant community life, and a strong social structure centered around waste management practices carried out by the Zabbaleen (garbage collectors) community. Despite the harsh living conditions and infrastructural challenges, Manshiyat Naser is a place of resilience, resourcefulness, and deep cultural identity. Its location at the base of the Mokattam hills also offers a striking contrast between natural rock formations and dense urban growth.



Egypt's Map



Cairo Map



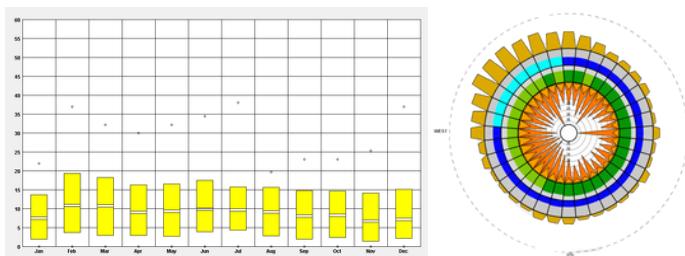
Mansheyat Nasser's Map



Site

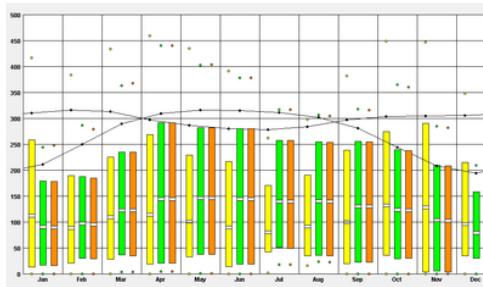
CLIMATIC ANALYSIS

Wind Velocity Range:



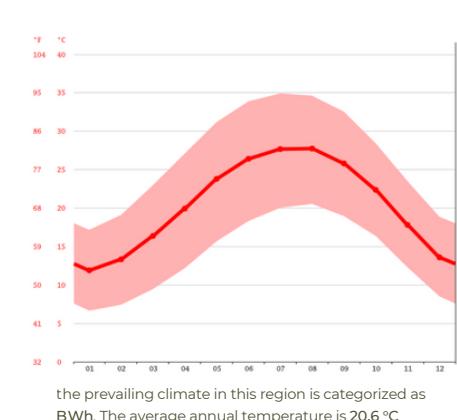
- **Typical Range:** 2-20 km/h (1-12 mph).
- **Seasonal Variation:** Generally higher in winter due to northerly winds; calmer in summer.

Solar Radiation Range:



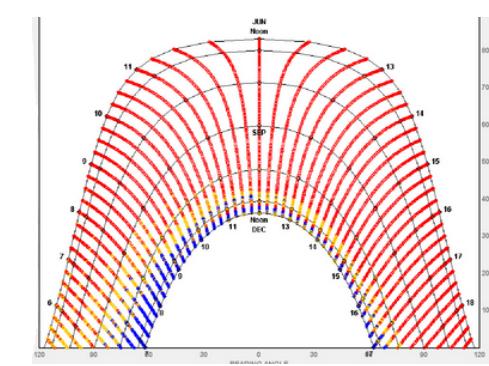
- **Summer:** High daily radiation levels, averaging around 6-7 kWh/m².
- **Winter:** Lower levels, averaging about 4-5 kWh/m².

Average temperature



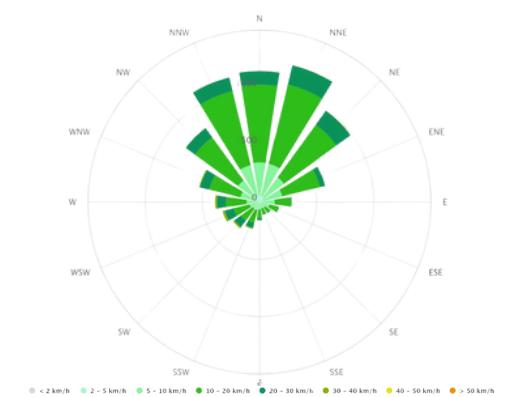
the prevailing climate in this region is categorized as BWh. The average annual temperature is 20.6°C

Solar Diagram

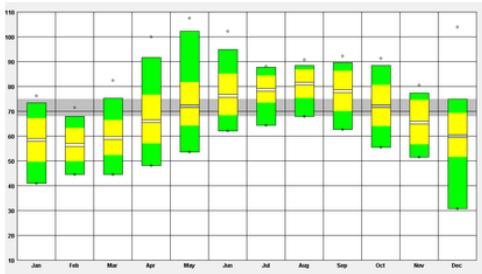


The sun reaches its highest altitude in June and the lowest in December. Most of the year and day falls into Warm/Hot category, indicating a hot climate.

Wind Rose

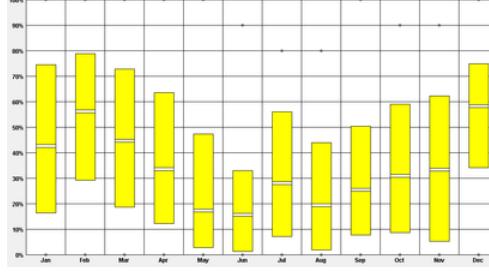


Temperature Range:



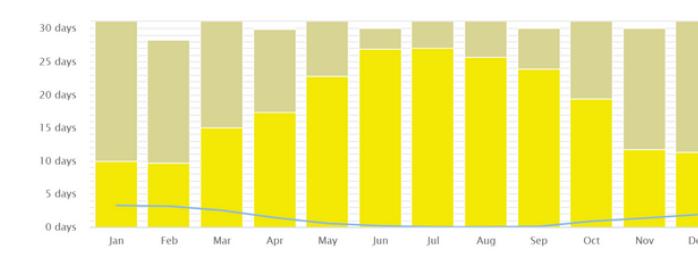
- **Summer (June - August):** Average temperatures range from 25°C to 30°C (77°F to 86°F).
- **Winter (December - February):** Average temperatures range from 10°C to 18°C (50°F to 64°F).

Sky Cover Range:



- **Typical Conditions:**
 - Winter: More overcast days.
 - Summer: Clearer skies, with occasional clouds.
- **Cloud Cover Percentage:** Ranges from 40% in winter to 20% in summer.

Cloudy, sunny, and precipitation days



- The months (June-August) experience the highest number of sunny days, while the months (December-February) have more partly cloudy days.

Humidity



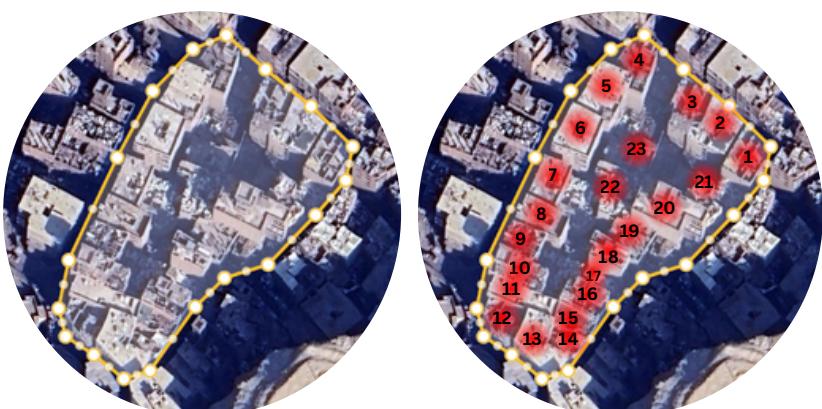
- higher humidity levels in the winter months (January and December) and a decrease during spring (April and May). Humidity begins to rise again in the summer months.

SITE BOUNDARIES

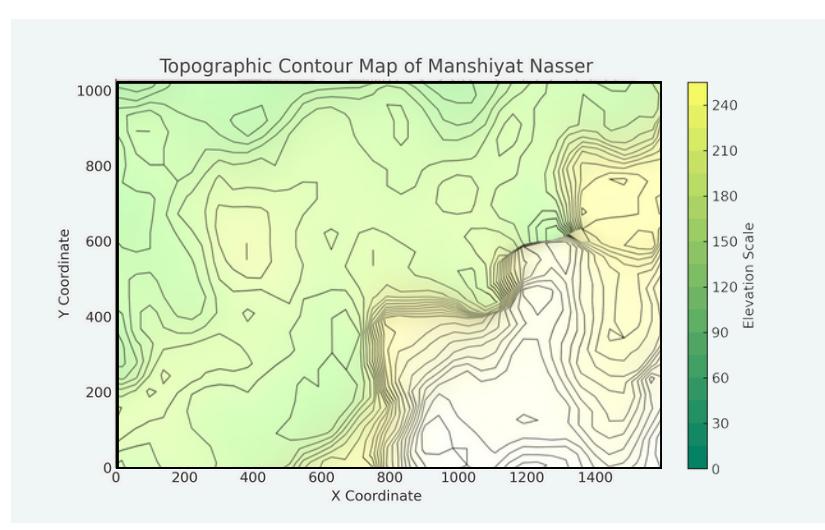
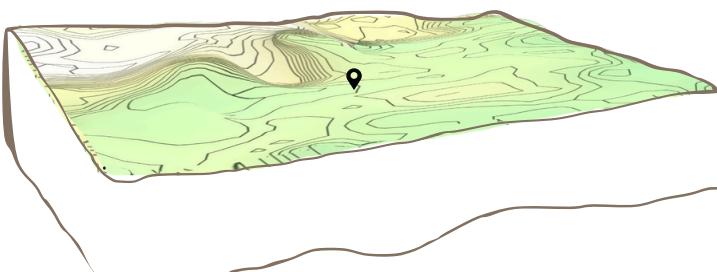


SITE AREA

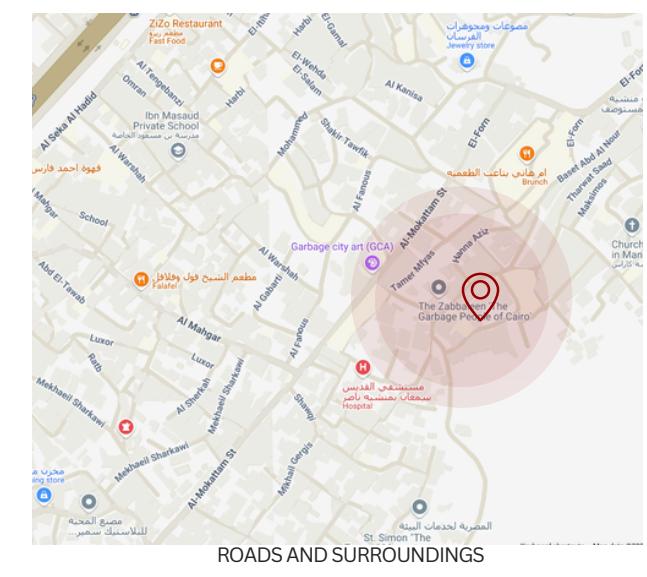
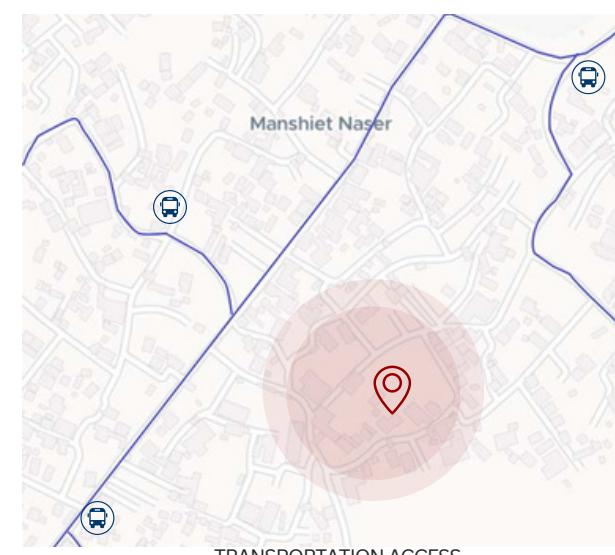
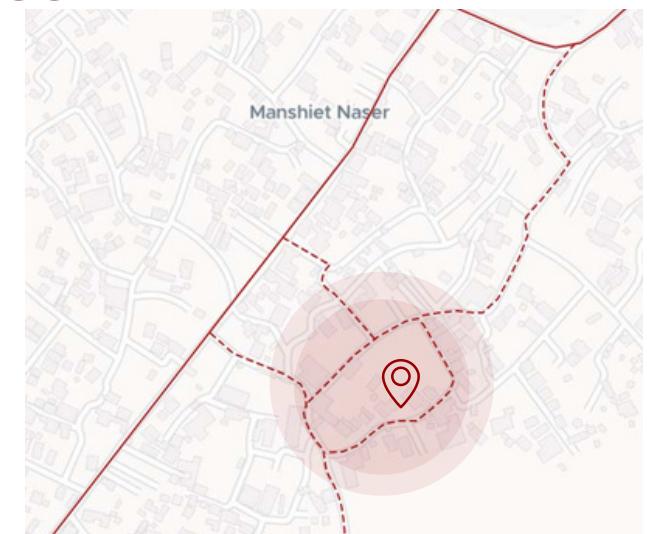
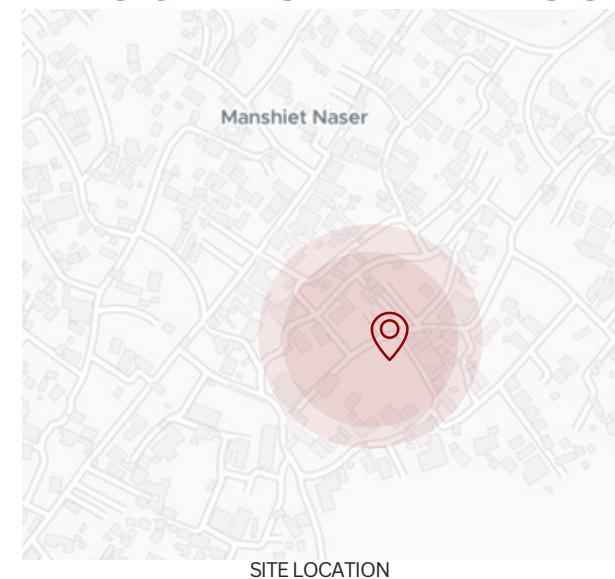
PERIMETER = 0.34KM
AREA = 15,000 M²



TOPOGRAPHY



SITE LOCATION AND ACCESSIBILITY



SITE TIMELINE



2000



2020

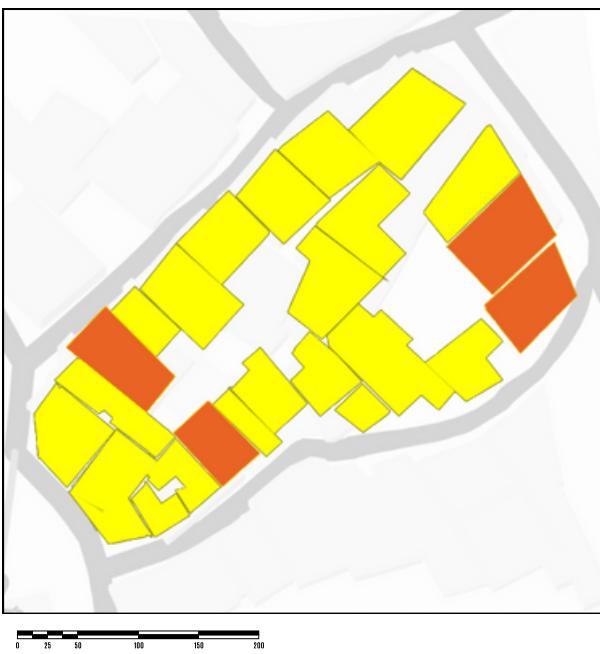


2010

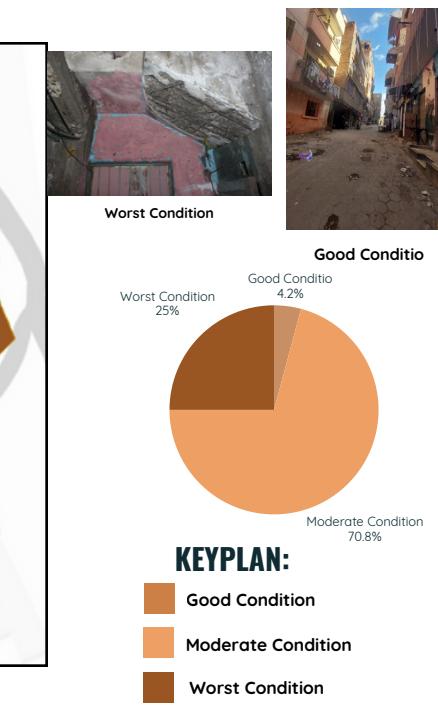


2025

BUILDING USE



BUILDING CASE



STRUCTURAL SYSTEMS



RATIO OF OPEN SPACES VS. BUILT-UP AREA



BUILDING HEIGHTS



KEYPLAN:

- 1:2
- 3:4
- 5:7
- 7:10
- above than 10

ROAD HIERARCHY

MAIN STREETS

Site land is near to main roads which give advantage to the chosen land

1. Moussa Hanna
2. Al sharki
3. Hanna Aziz



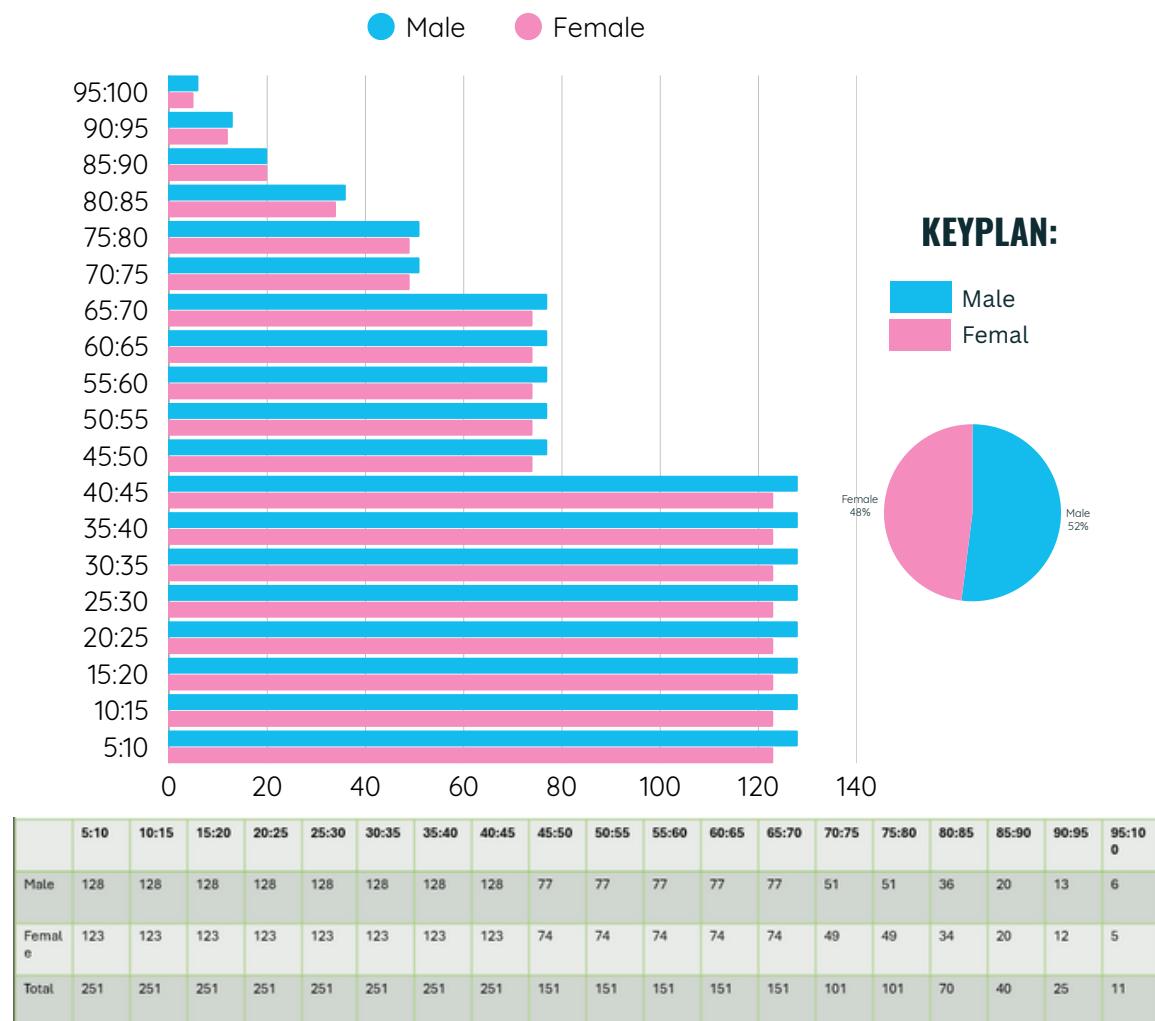
SECONDARY STREETS

Most of land in manshet nasser is small roads and could not exceed 6 meters of width which is not well designed

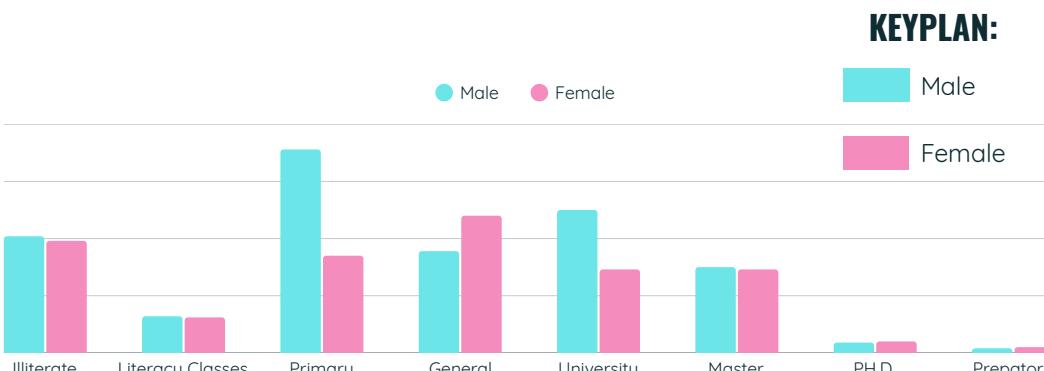
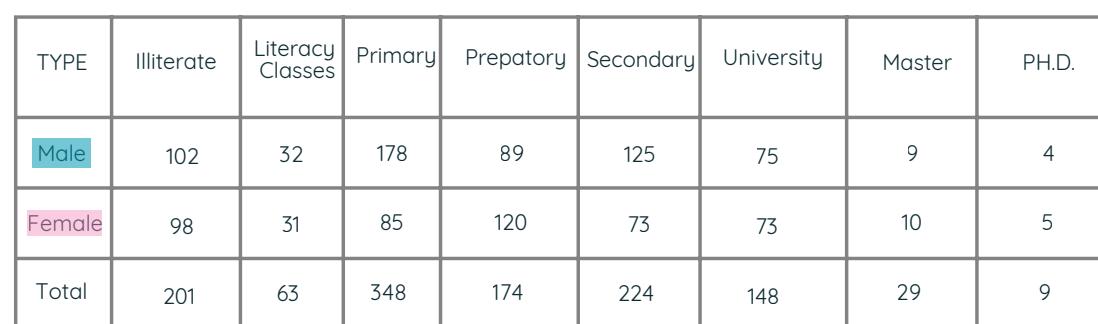
PEDESTRIAN PATHS

The place is not well designed to have pedestrian paths and has a lot of dead ends which give hard experience for walking all over district

NUMBER OF MALES AND FEMALES AT ALL AGE LEVELS

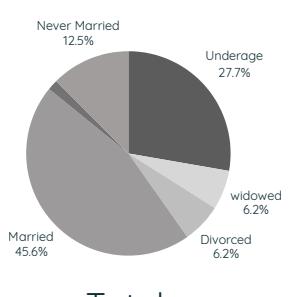
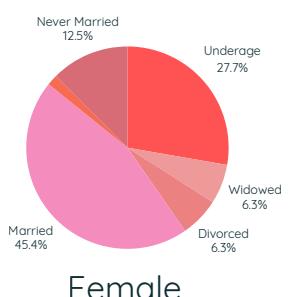
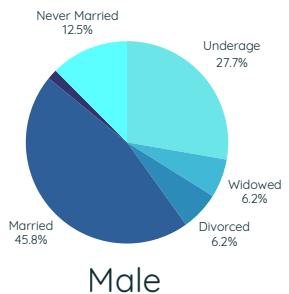


EDUCATIONAL STATUS



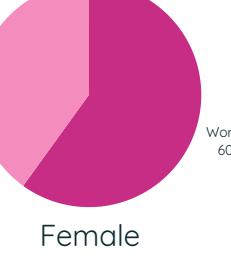
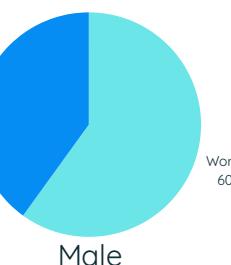
MARITAL STATUS

Type	Underage	Widowed	Divorced	Married	Marriage contract	Never Married
Male	256	57	57	423	15	115
Female	246	56	56	403	15	111
TOTAL	502	113	113	826	30	226

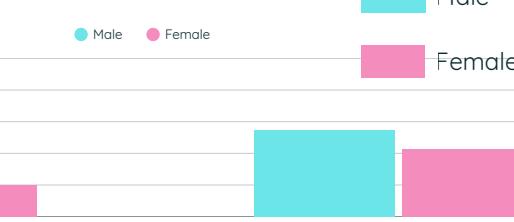


WORK POSITION STATUS

Type	Working	Not Working
Male	614	410
Female	590	394
Total	1205	803



KEYPLANS



SITE PROBLEMS

- High population density
- Lack of service spaces: Such as parking lots and markets.
- Infrastructure: Poor water and sewage services, and weak connectivity between areas, resulting in narrow alleys and streets that undermine security control.
- Abandoned, unpaved, and underutilized areas: Spaces between buildings and under bridges that serve as hotspots for crime.
- Lack of public sanitation services
- High unemployment rates
- Underutilized rooftops
- Poor ventilation and natural lighting: Due to the close proximity of buildings.

CURRENT STATE



VISION:

To design a sustainable residential environment that not only respects the dignity and humanity of its residents, but also actively contributes to improving their daily lives. The project envisions a community where architecture becomes a tool for social well-being, environmental harmony, and long-term resilience. Through the integration of green spaces, healthy social interactions, and sensitivity to the surrounding natural and cultural context, the design aims to foster a sense of belonging, empowerment, and collective growth.

CONCEPT

The architectural concept is inspired by the modular nature of LEGO, allowing for the playful arrangement, addition, and subtraction of volumes to create functionally diverse and environmentally integrated spaces.:.

- Allocation of open landscape areas for social gathering and play
- Creation of green roofs to increase planted surfaces and reduce carbon emissions
- Architectural flexibility to adapt to the surrounding environment and evolving resident needs
- Harmonious integration of design elements with environmental and social factors



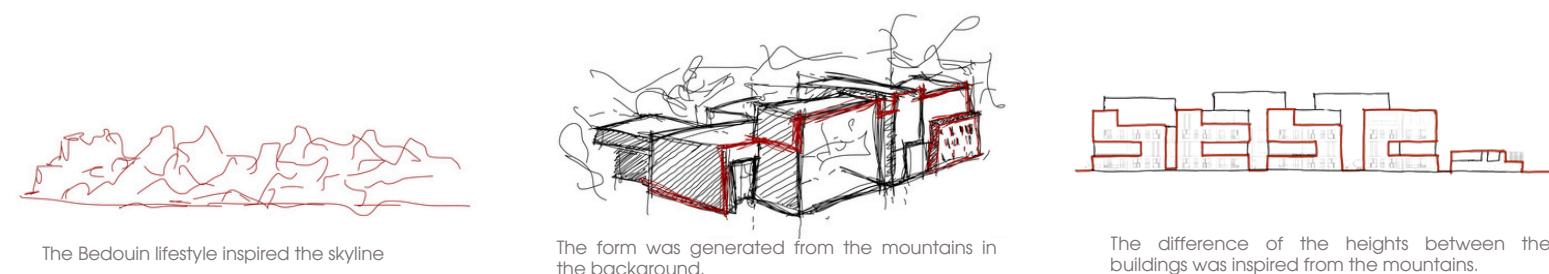
AIM:

To enhance residents' quality of life by providing humane, context-sensitive housing that respects their daily roles, routines, and social identities. The design ensures a thoughtful separation between work and living spaces to promote mental comfort, productivity, and personal balance. It also integrates resilient and sustainable infrastructure that responds to both environmental and community needs, including:

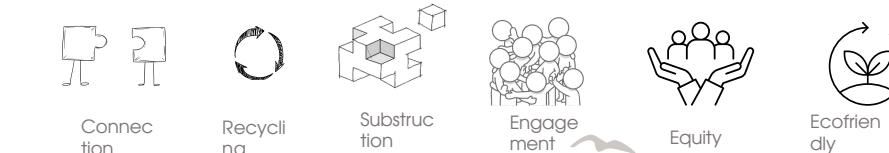


SKYLINE MANUAL ABSTRACT GENERATION

This architectural skyline explores Egypt's evolving identity through varied heights and forms that link past, present, and future. Inspired by Pharaonic, Islamic, and contemporary design, the composition uses addition and subtraction to symbolize memory, transformation, and growth. The result is a dynamic skyline that narrates Egypt's cultural journey through time, blending tradition with forward-looking vision.

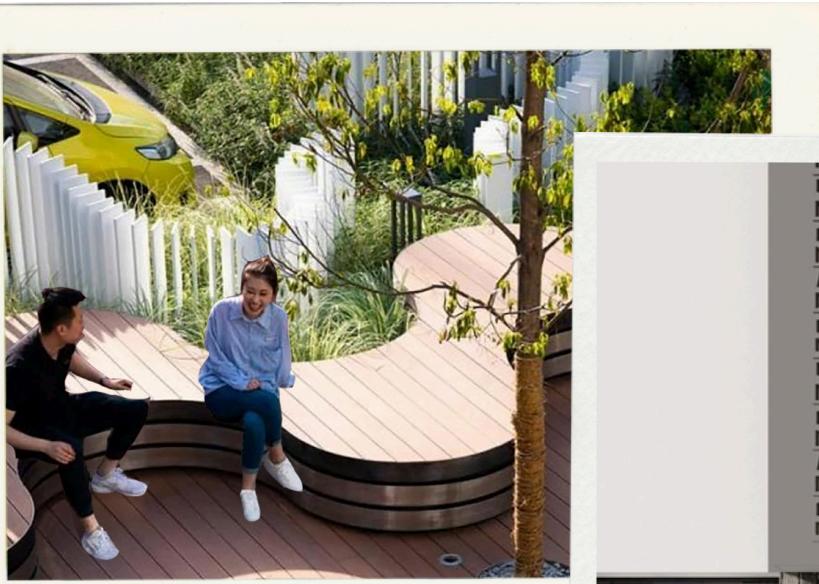


KEYWORDS



Sustainable housing

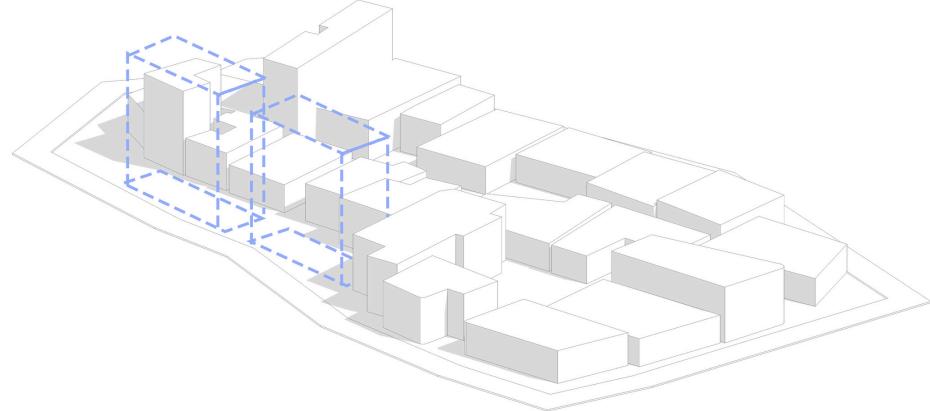
Vision Board



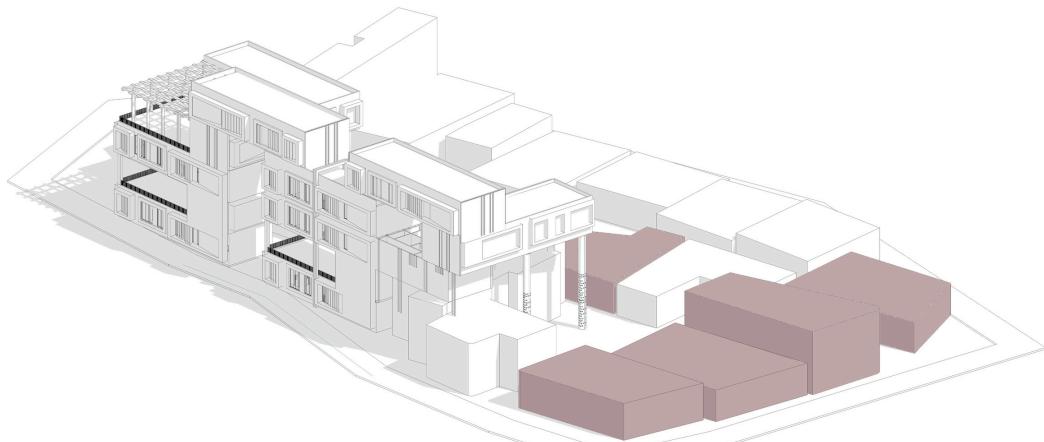
Improved quality of life

Sun fences

Construction Phases



The site currently contains several existing buildings, with a central vacant area. This empty space will be the starting point for the new construction.

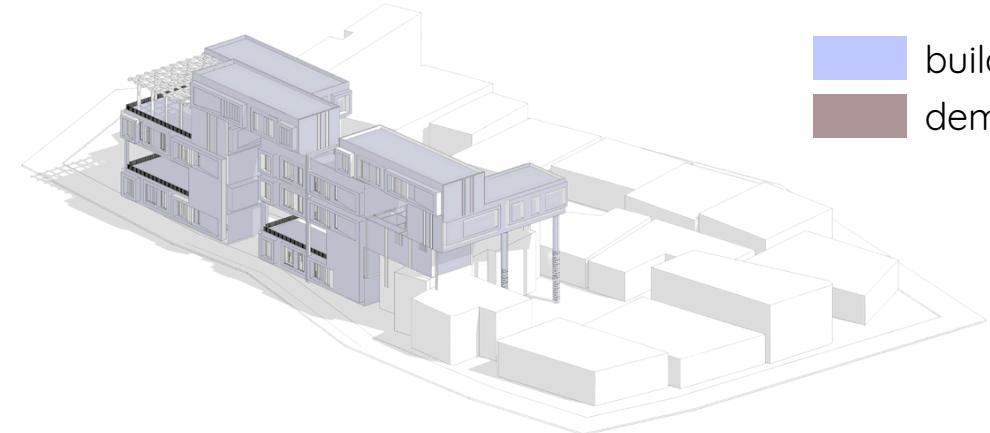


The vacated buildings are now demolished, making room for further development.



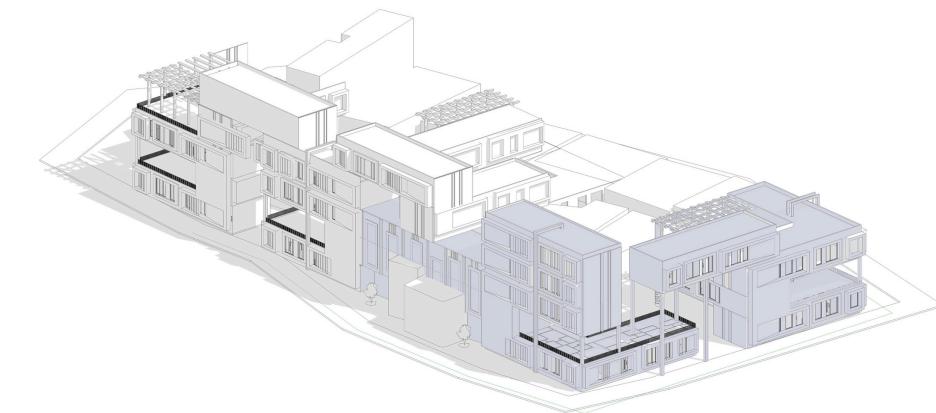
The remaining old buildings are demolished, as all residents have now been relocated to newly constructed units.

Phase 01



New buildings are constructed in the vacant area. Once completed, residents from the buildings planned for demolition are relocated to these newly built units.

Phase 02



New buildings are constructed in the area of the recent demolitions. These will now accommodate residents from the remaining old buildings.

Phase 03

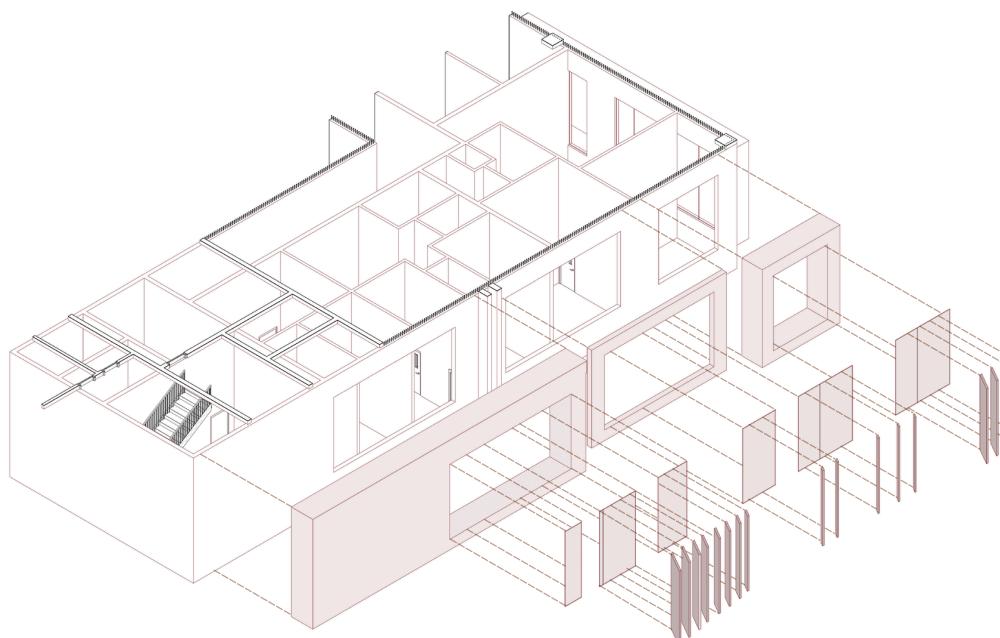


The final phase completes the project by constructing new buildings in the last cleared area. The entire site is now fully redeveloped without needing to displace residents externally during the process.

building
demolition



before



after

ELEVATION AND 3D FOR ONE UNIT

THE LAYOUT WAS DERIVED FROM THE CIRCULATION AXIS AND THE CONCEPT OF COURTS, VENTILATION AND CONNECTIVITY



Materials used:

Green concrete:

A concrete which uses waste material as at least one of its components, or its production process does not lead to environmental destruction, or it has high performance and life cycle sustainability



E-low glass

is glass that has a coating applied to it, making windows and doors substantially more energy efficient. Originally designed to keep in infrared light for colder climates.



Timber wood

is wood that has been processed into beams and planks, a stage in the process of wood production. Lumber is mainly used for construction framing, as well as finishing (floors, wall panels, window frames).



Metalic net

using it to provide shading inside the building and on the exterior walls to avoid heating it and also it doesn't block the view outside.

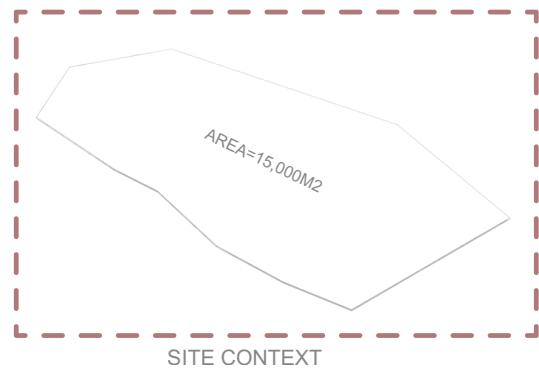


Planting

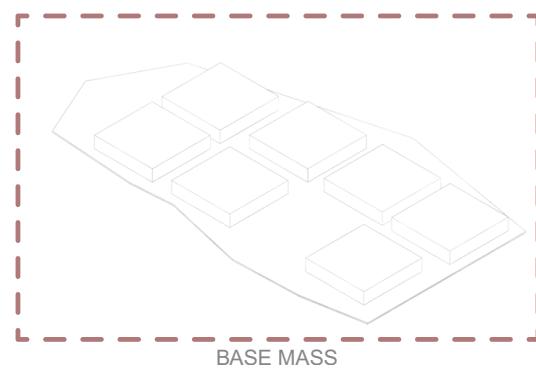
provides shading and natural ventilation, prevents direct sun rays and also absorbs CO₂



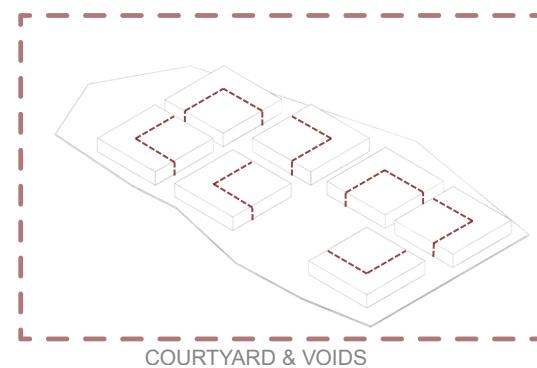
FORM GENERATION



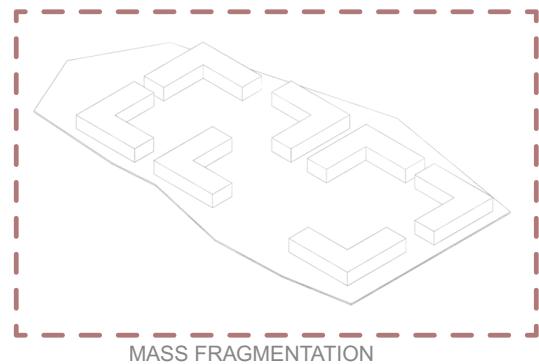
SITE CONTEXT



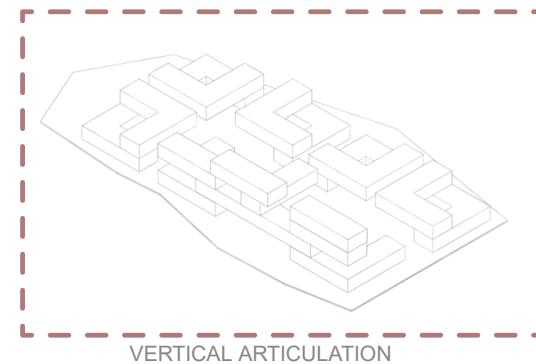
Showing the extrusion of the base volume that fits the site boundary



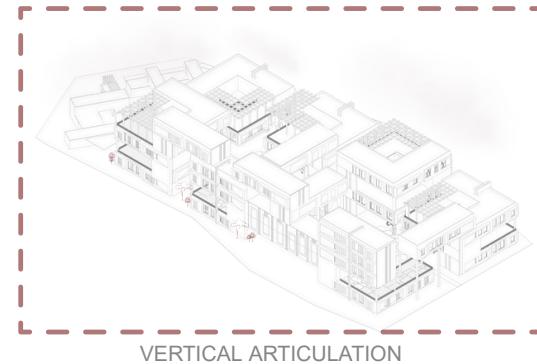
Subtracting inner voids and courtyards to form open spaces.



Breaking the mass into smaller blocks for light, ventilation, and scale.



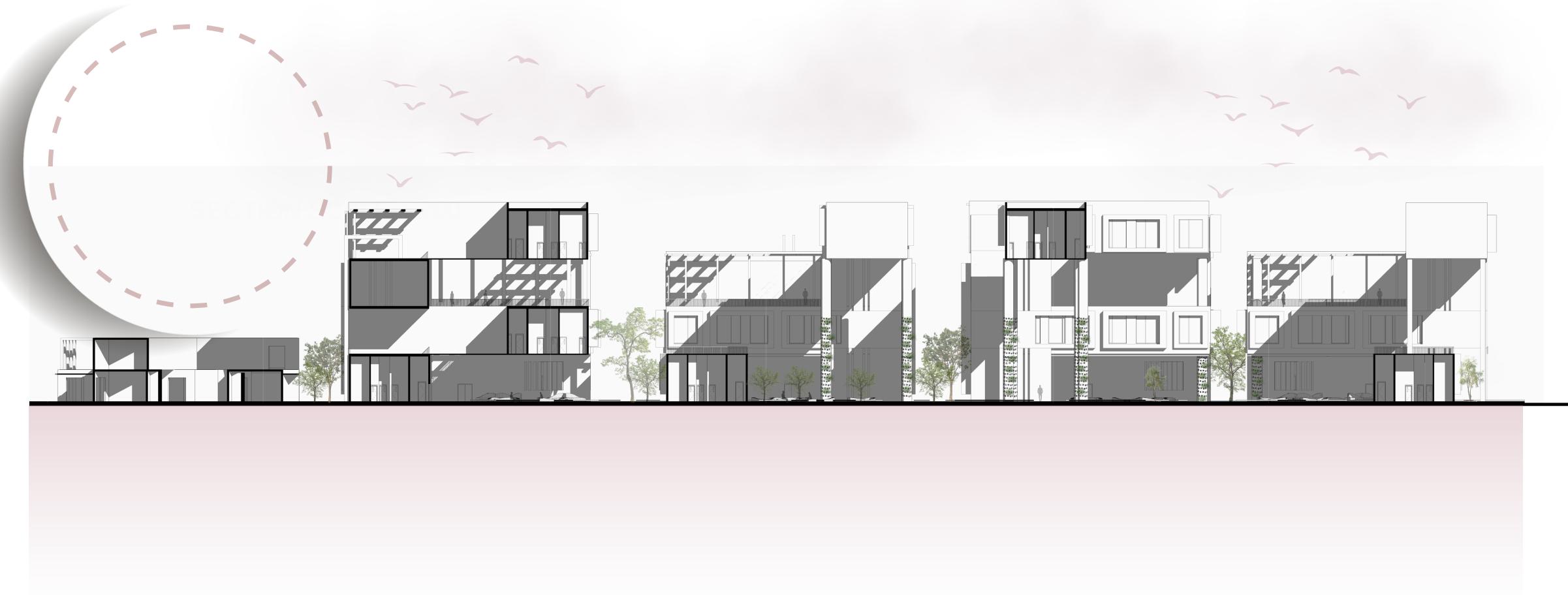
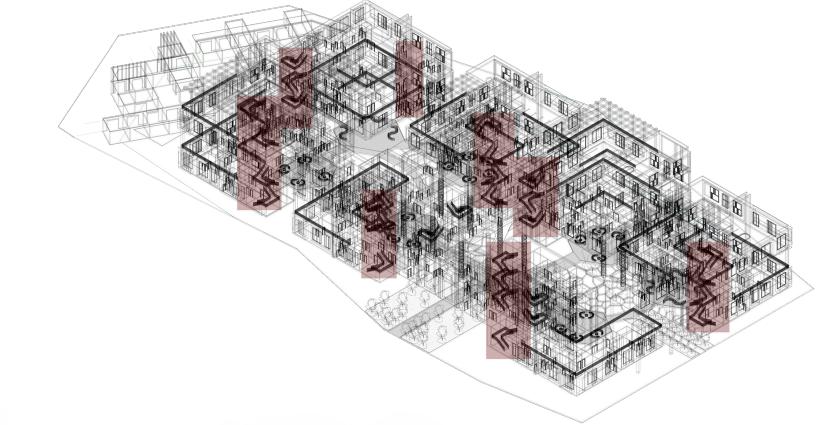
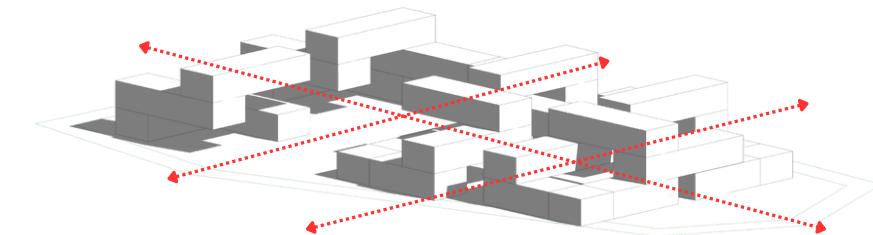
Adding levels (floor-wise extrusion or stacking) with height variation.



Showing the final form , structure and features that supports our concept.

CIRCULATION

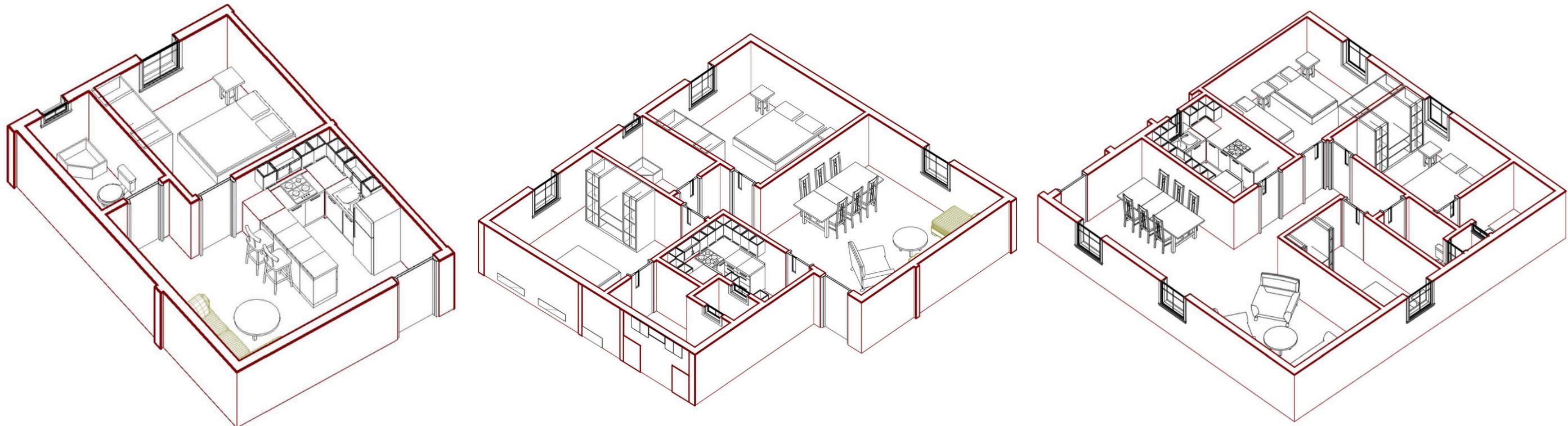
THE LAYOUT WAS DERIVED FROM THE CIRCULATION AXIS AND THE CONCEPT OF COURTS, VENTILATION AND CONNECTIVITY



SECTION SCALE 1 1:200

ISOMETRIC PROTOTYPES

3 PROTOTYPES WERE USED IN THE PLAN TO FIT 3 DIFFERENT TYPES OF FAMILY RESIDENTS



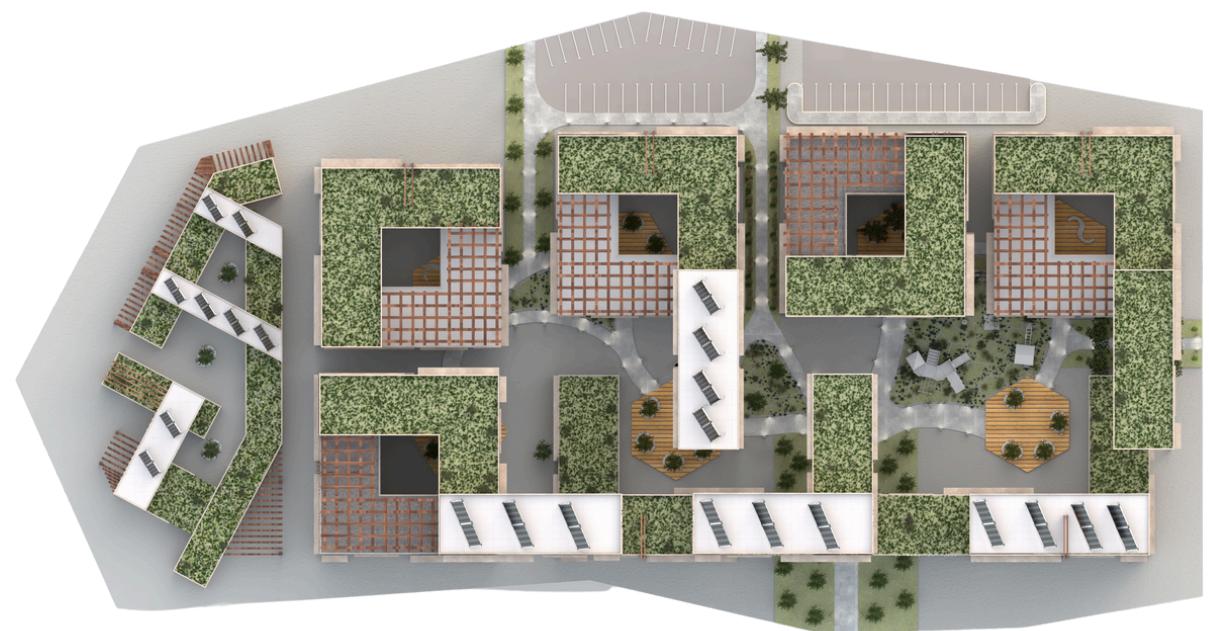
PLAN PROTOTYPE

THE LAYOUT WAS DERIVED FROM THE CIRCULATION AXIS AND THE CONCEPT OF COURTS, VENTILATION AND CONNECTIVITY



SOCIAL PROBLEMS





LAYOUT

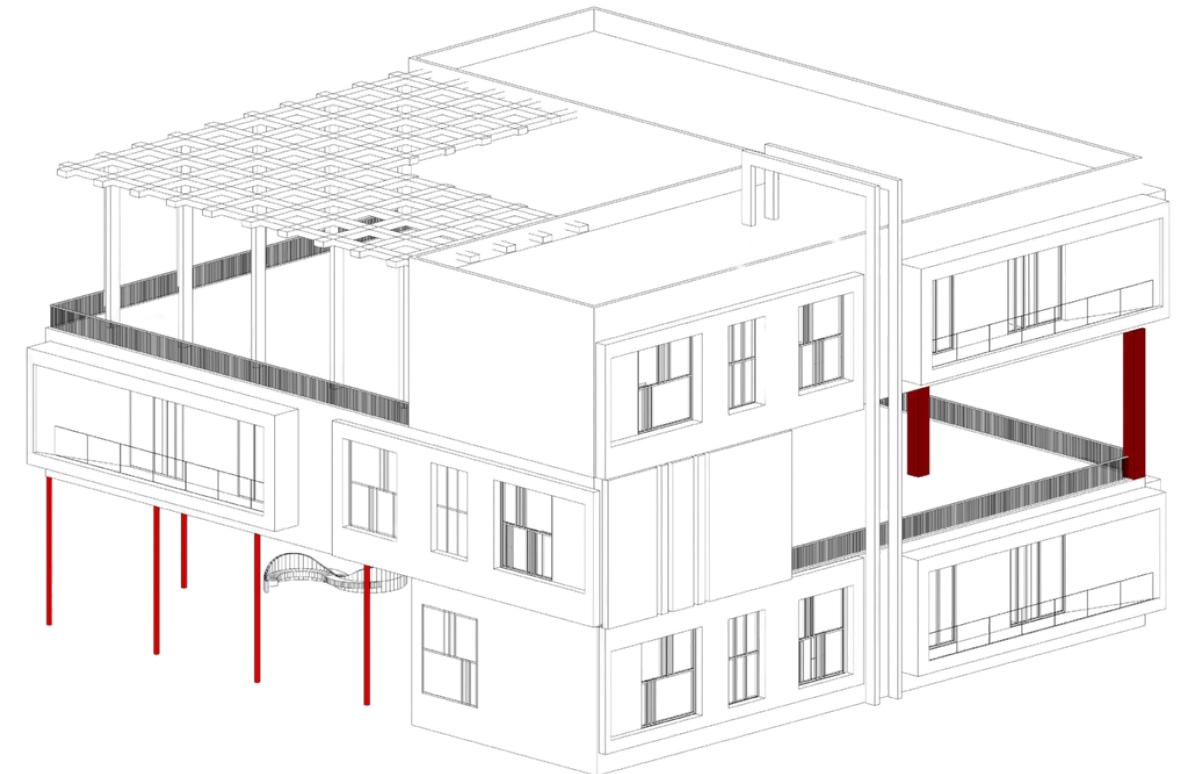
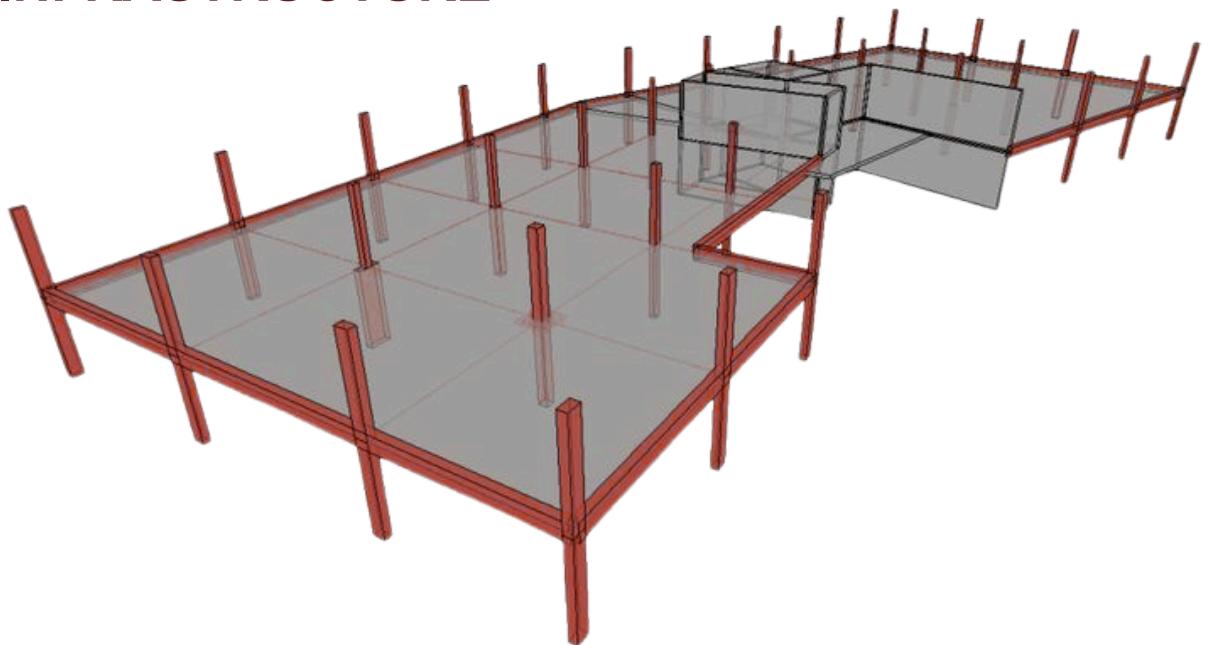


ELV 1

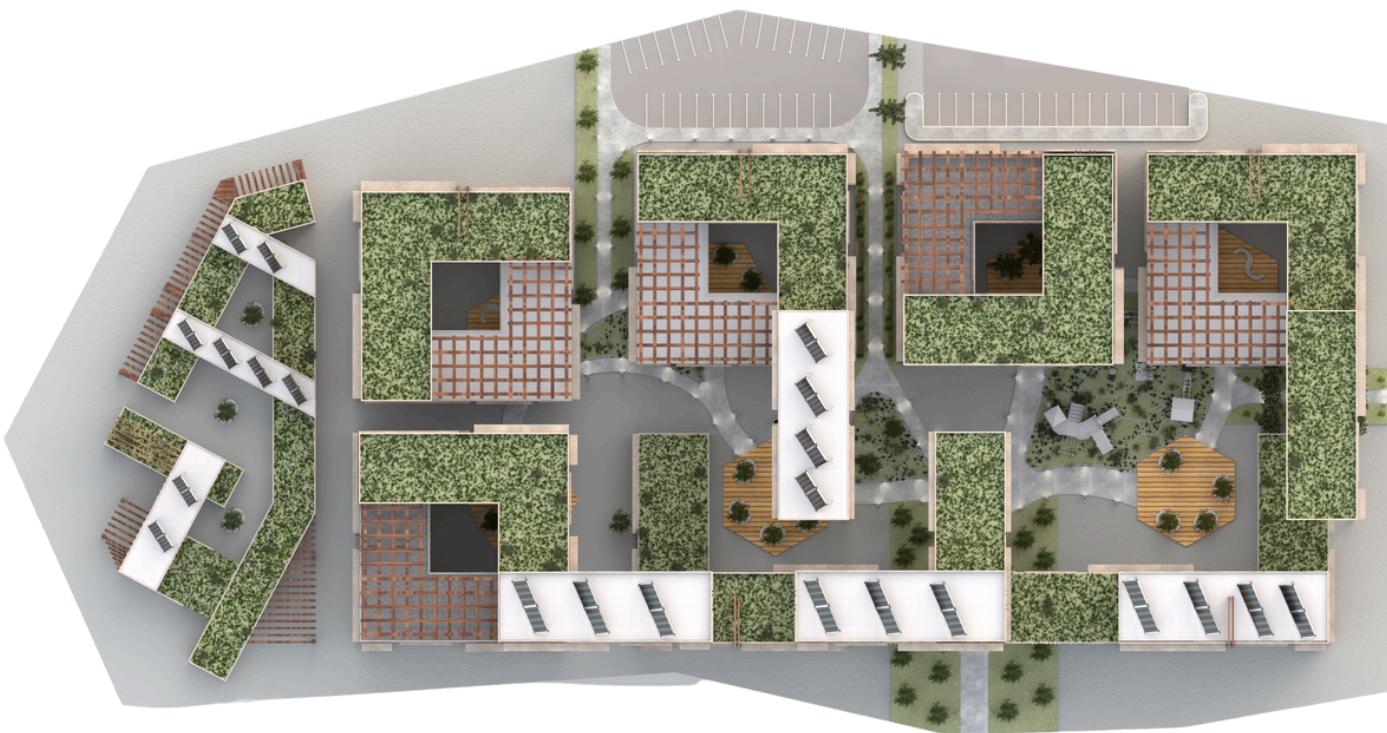


ELV 2

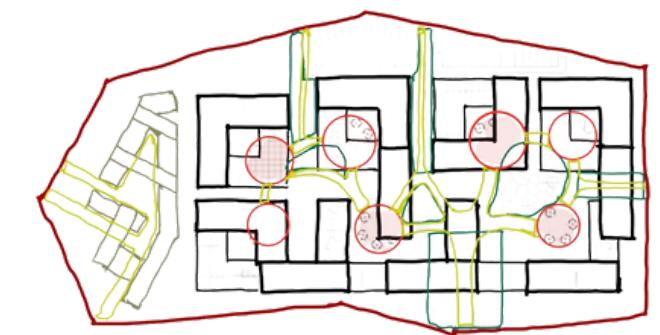
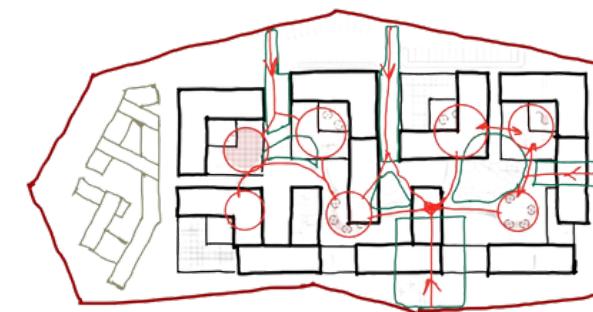
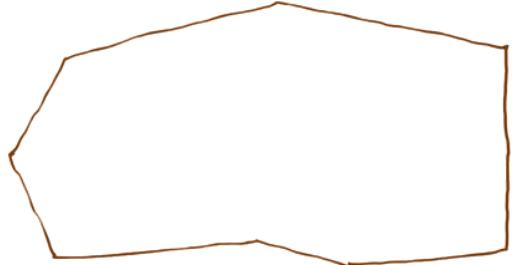
INFRASTRUCTURE



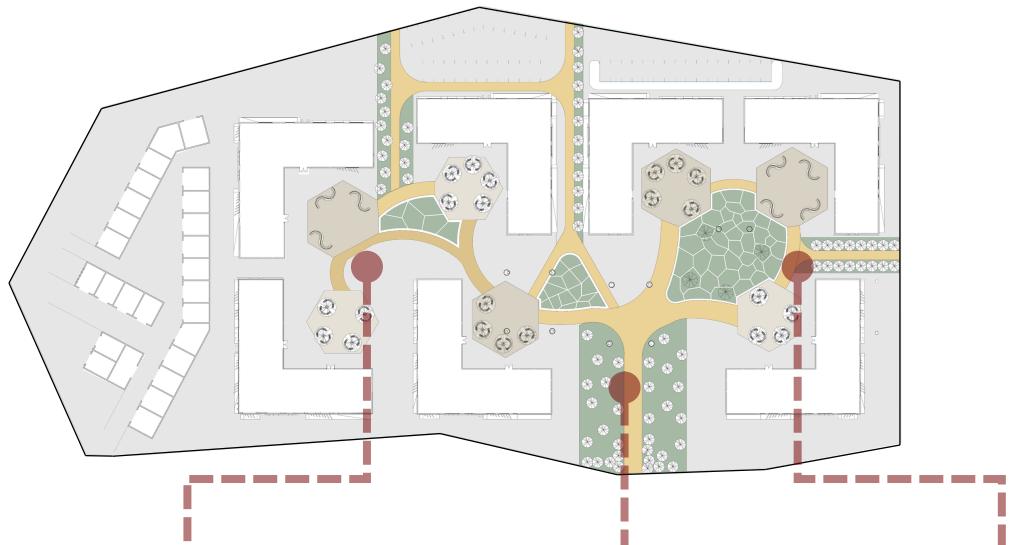
LAYOUT



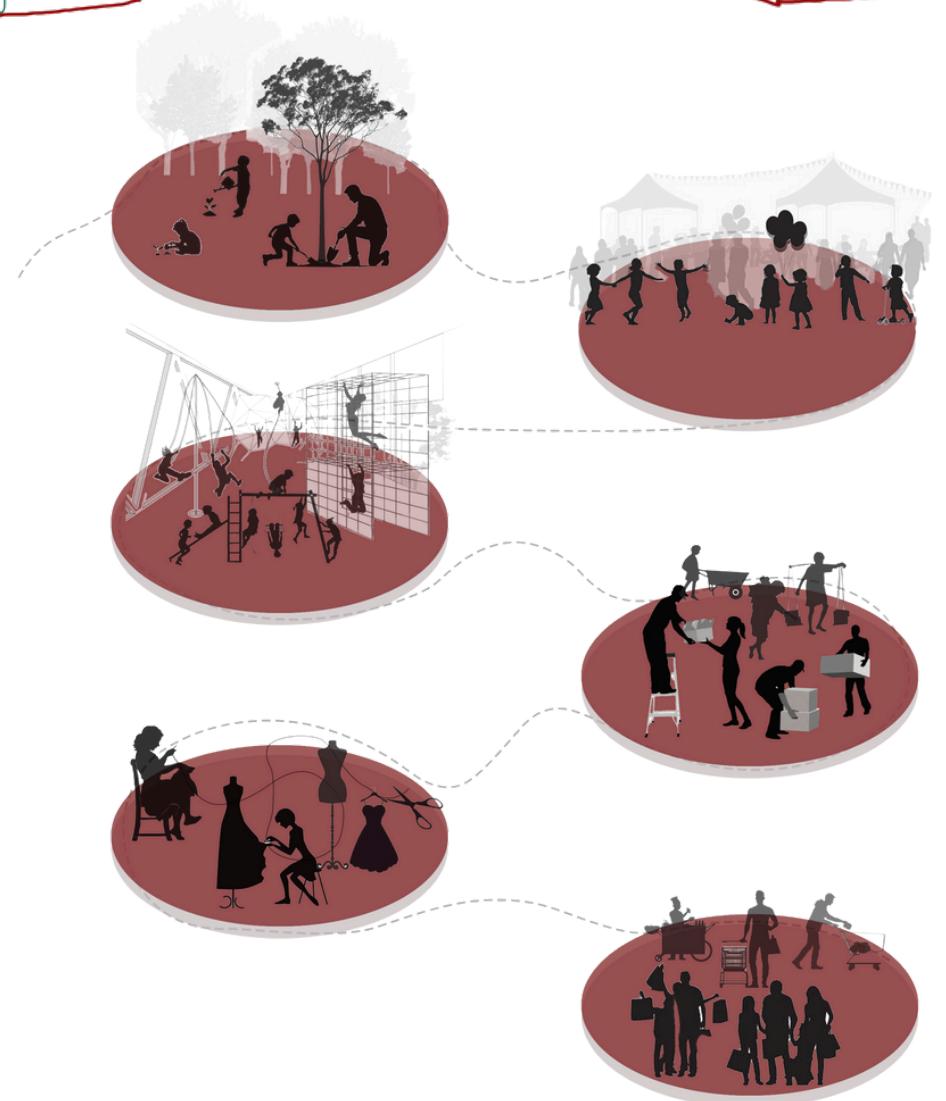
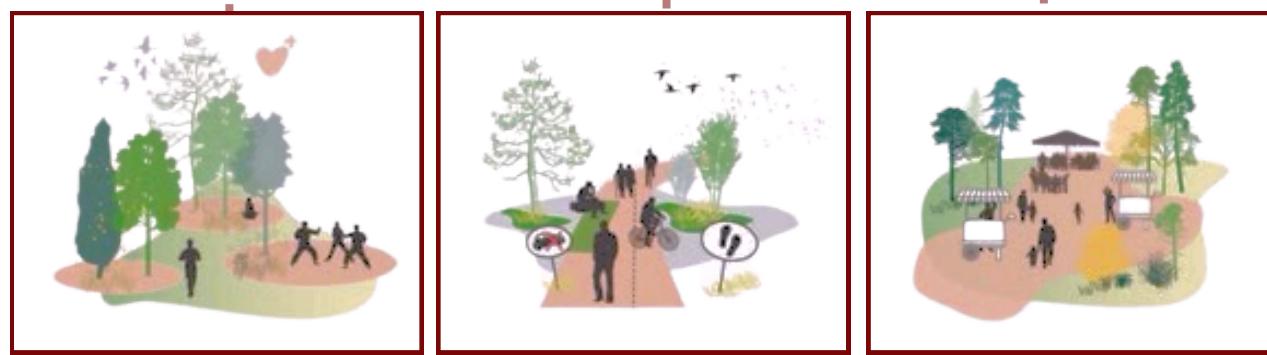
LAYOUT GENERATION



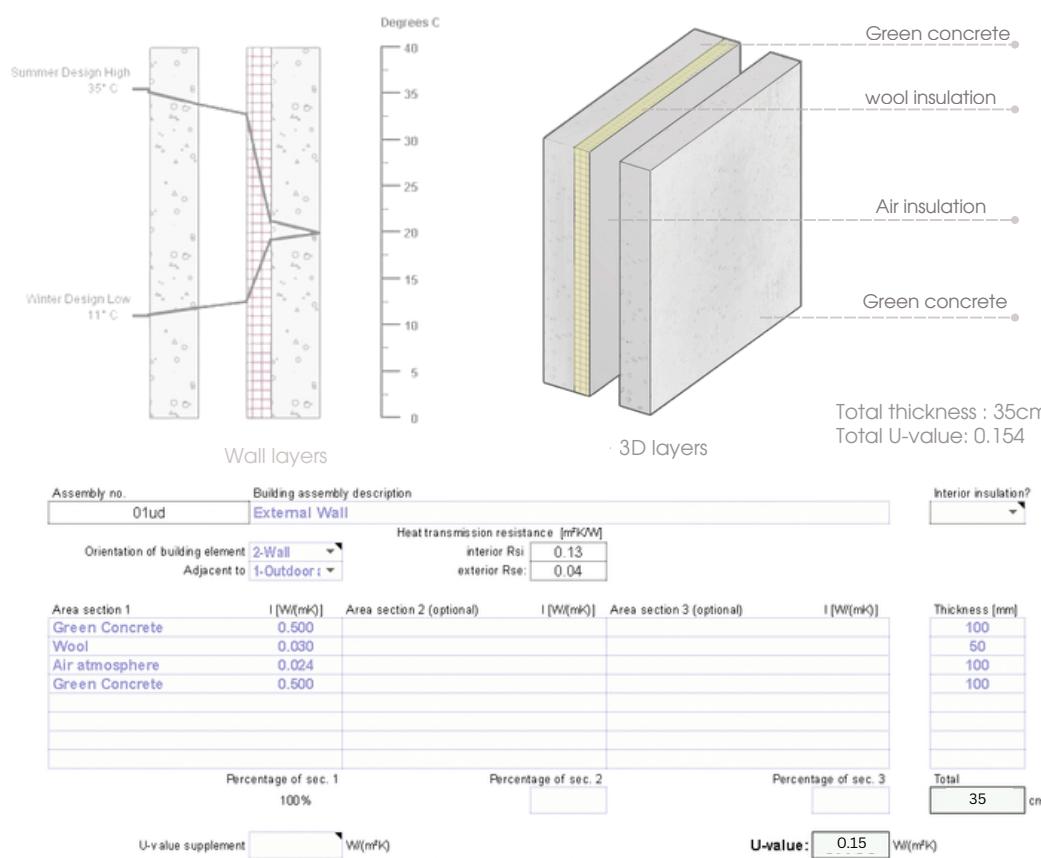
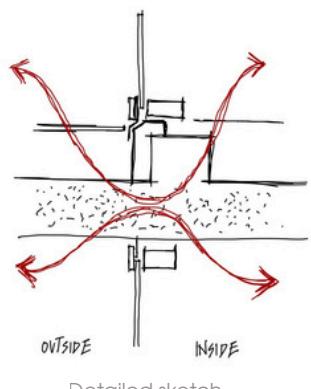
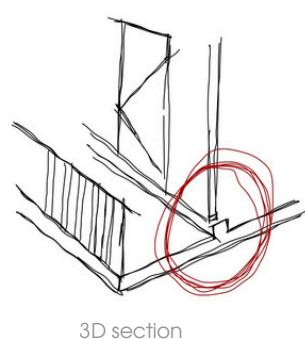
LANDSCAPE



- Main Path
- Greeneries
- Activity Zone
- Pavement



THERMAL BRIDGING



WATER FILTRATION SYSTEMS:

Pre-filtration:

Remove hair, lint, and larger particles at the source (e.g., drain filters) or immediately after collection.

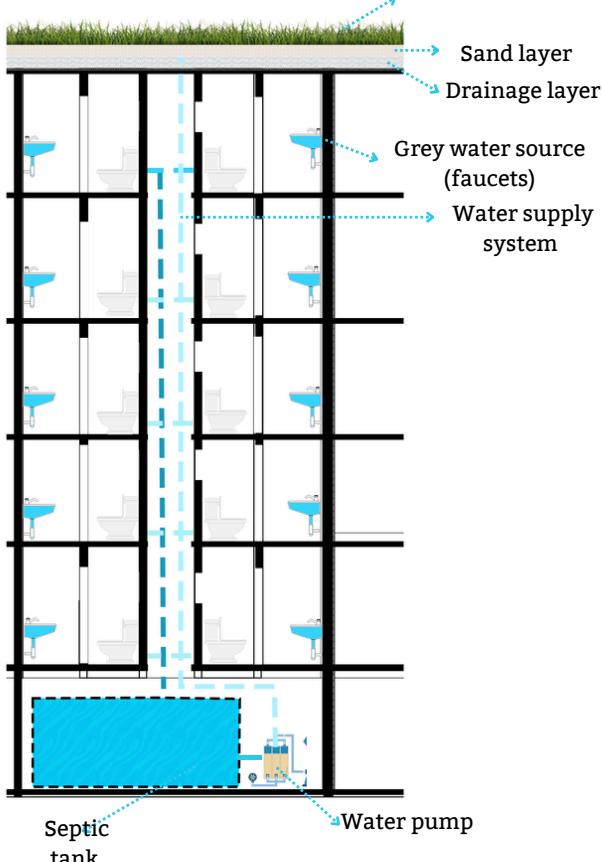
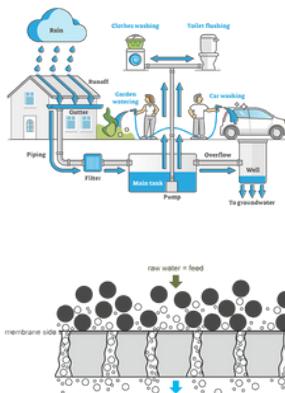
Rainwater Harvesting:

Collection: Design roofs and surfaces to efficiently collect rainwater into storage tanks (underground or above-ground).

First-Flush Diverters: Essential to divert the initial, most contaminated runoff from roofs (containing dust, leaves, bird droppings) before it enters the main storage.

Pre-tank Filters (Leaf Screens/Coarse Filters): Install at the point of entry to the storage tank to remove larger debris like leaves, twigs, and sediment. These can be mesh or grill filters.

Microfiltration (MF) & Ultrafiltration (UF): Use membranes with very small pores to remove suspended solids, bacteria, protozoa, and some viruses. Highly effective and often used in greywater recycling systems.

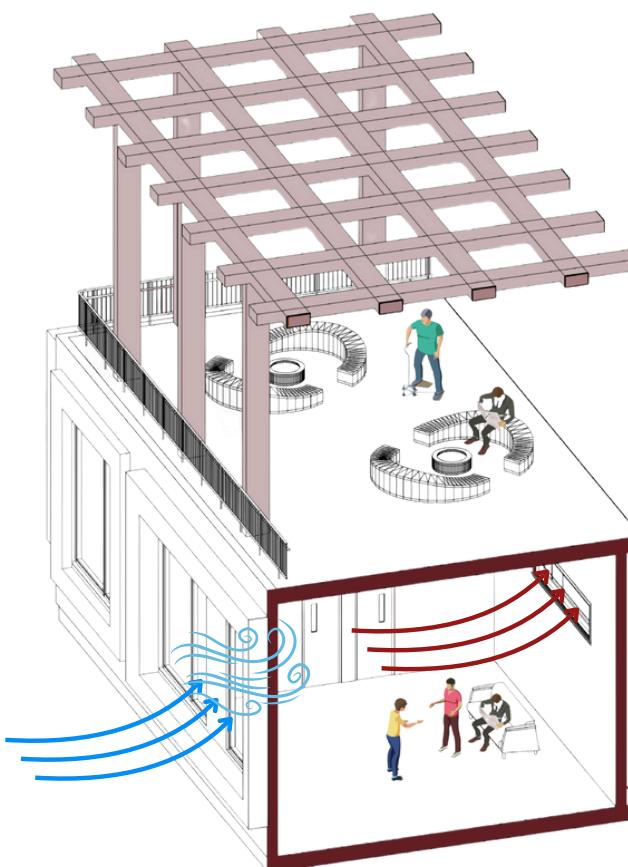
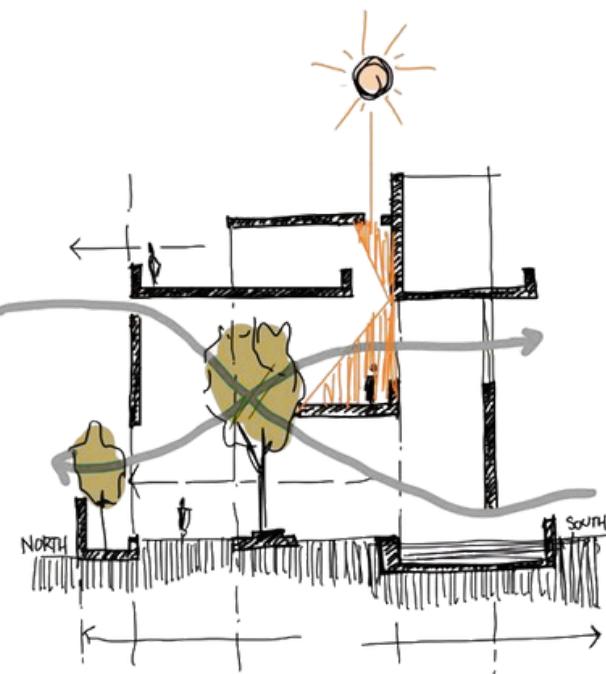


CLIMATE AND SOLUTIONS

Hot Summers

Water Scarcity (Regional):
Geology and Soil

VENTILATION



Grey water

- Underground water tank
- Grasses watered by grey water
- Water flow system



SUSTAINABILITY INNOVATIONS

ENHANCING INDOOR AIR QUALITY

Cleaner indoor air in homes comes from stopping pollution at its origin, like using safer materials. Good airflow from open windows and fans helps. Air purifiers can also clean the air. Well-built and maintained homes prevent pollutants from getting in. Teaching people how to keep their air clean is also key. Research helps us find the best ways to make indoor air healthier.



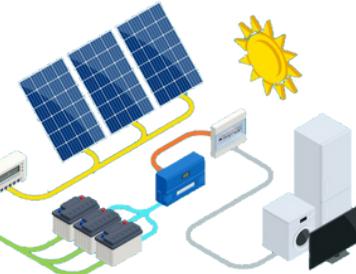
GREEN SPACE, ROOFS

Simply put, green spaces (like parks and gardens) around homes boost residents' happiness and health by providing places to relax and play. They also cool down the area, clean the air, and help with rainwater. Green roofs save energy by keeping homes cooler in summer and warmer in winter, manage rainwater better, and can even create small green areas in cities.



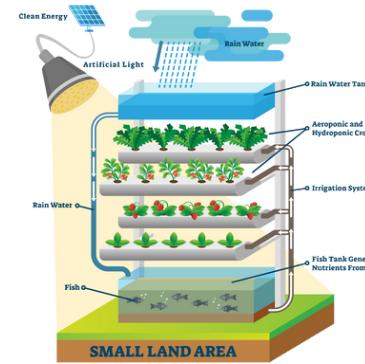
SOLAR ENERGY

Putting solar panels in housing can save money on electricity, potentially increase home value, and are good for the environment. Although they cost money upfront and only work when it's sunny, they're becoming more popular as a way to make homes more sustainable and affordable in the long run.



VERTICAL FARMING ELEVATIONS

Vertical farms in housing let people grow food in their buildings. Studies show this can provide fresh food, help the environment, and connect neighbors. Researchers are figuring out the costs and best ways to set these up in homes. It's about making living spaces greener and giving people easier access to healthy food.



3 GOOD HEALTH AND WELL-BEING



7 AFFORDABLE AND CLEAN ENERGY

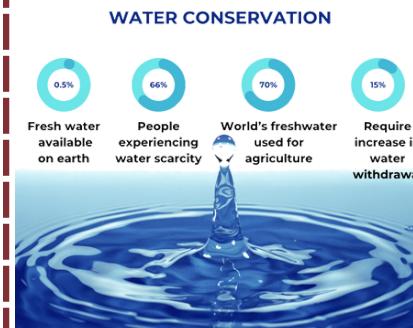


9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



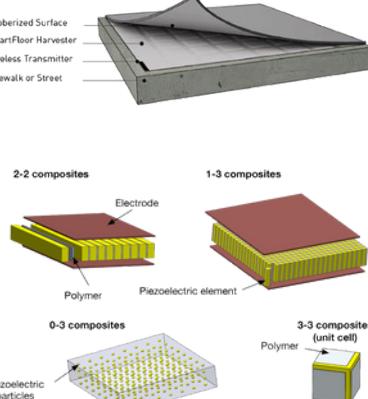
WATER CONSERVATION AND MANAGEMENT

Innovation in water-efficient fixtures, rainwater harvesting systems, greywater recycling, and sustainable landscaping are key areas of study. Researchers aim to minimize water usage and manage stormwater runoff effectively within housing complexes



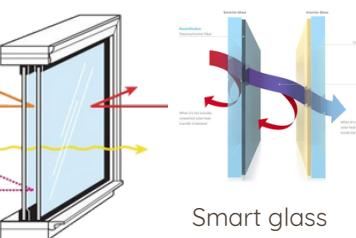
PIEZOELECTRIC CERAMICS

Piezoelectric ceramics are a class of polycrystalline ceramic materials that exhibit the piezoelectric effect. This means they can generate an electrical charge in response to applied mechanical stress or, conversely, undergo mechanical deformation in response to an applied electric field



SUSTAINABLE GLASS

Low-Emissivity (Low-E) Glass: This is a fundamental type, featuring coatings that minimize heat transfer. It keeps interiors cooler by reflecting solar heat outwards and warmer by retaining indoor heat. **Dynamic Glazing (Smart Glass):** This advanced type can change its transparency in response to light, heat, or electrical signals.



Low-Emissivity (Low-E) Glass:

POLICY AND REGULATORY FRAMEWORKS:

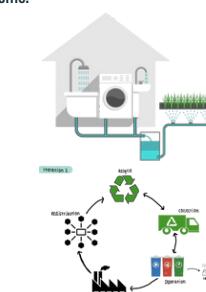
Studies may also examine the role of government policies, building codes, and certifications (like LEED) in promoting and accelerating the adoption of sustainable innovations in housing complex design.



SUSTAINABLE APPROACHES

WASTE AND WATER MANAGEMENT

- Advanced waste separation and recycling systems.
- Greywater recycling and sustainable drainage systems.



COMMUNITY ENGAGEMENT AND CO-HOUSING

- Strong resident participation in urban planning.
- Baugruppen (building groups): Collaborative housing initiatives that reduce costs and promote sustainable living.



GREEN SPACES AND BIODIVERSITY

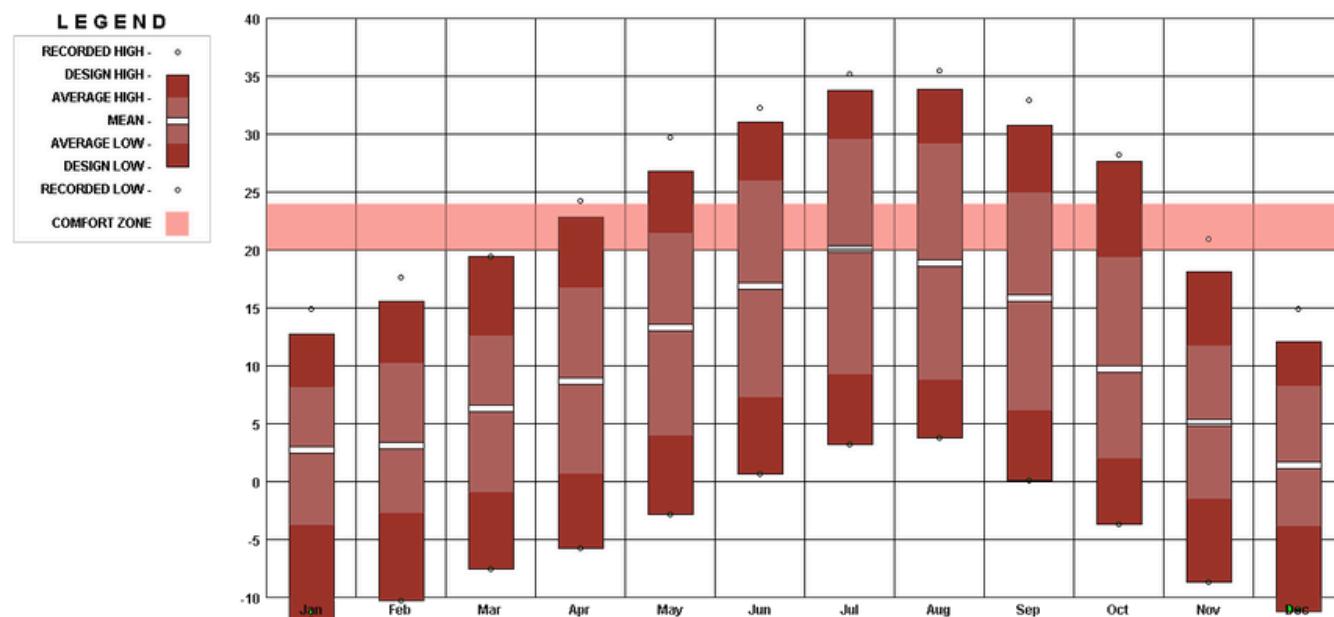
- Integration of green roofs, urban gardens, and natural landscapes.
- Preservation of biodiversity through green corridors and tree planting.
- Sustainable water management (rainwater harvesting and permeable surfaces).



CLIMATIC STRATEGIES

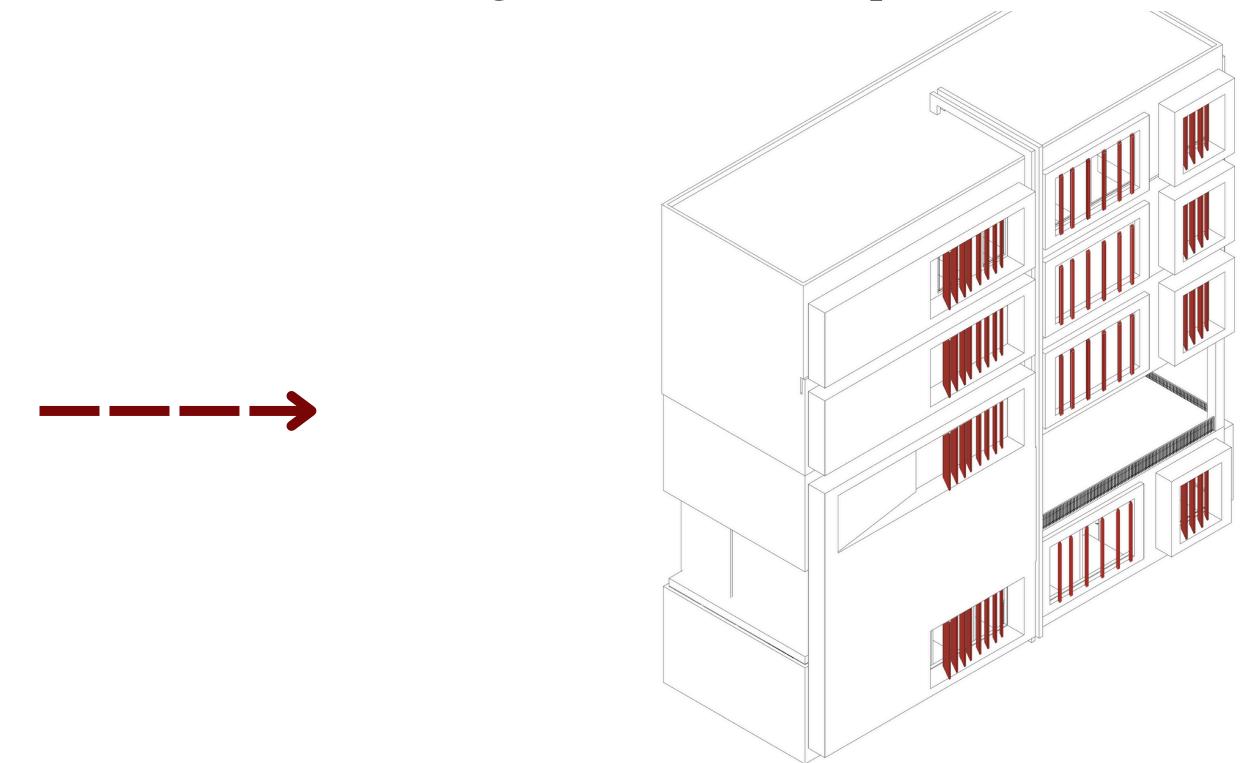
Climate Problem (Sunny weather)

This pie chart shows the high sunlight power during all day that can have bad effect on building throw time



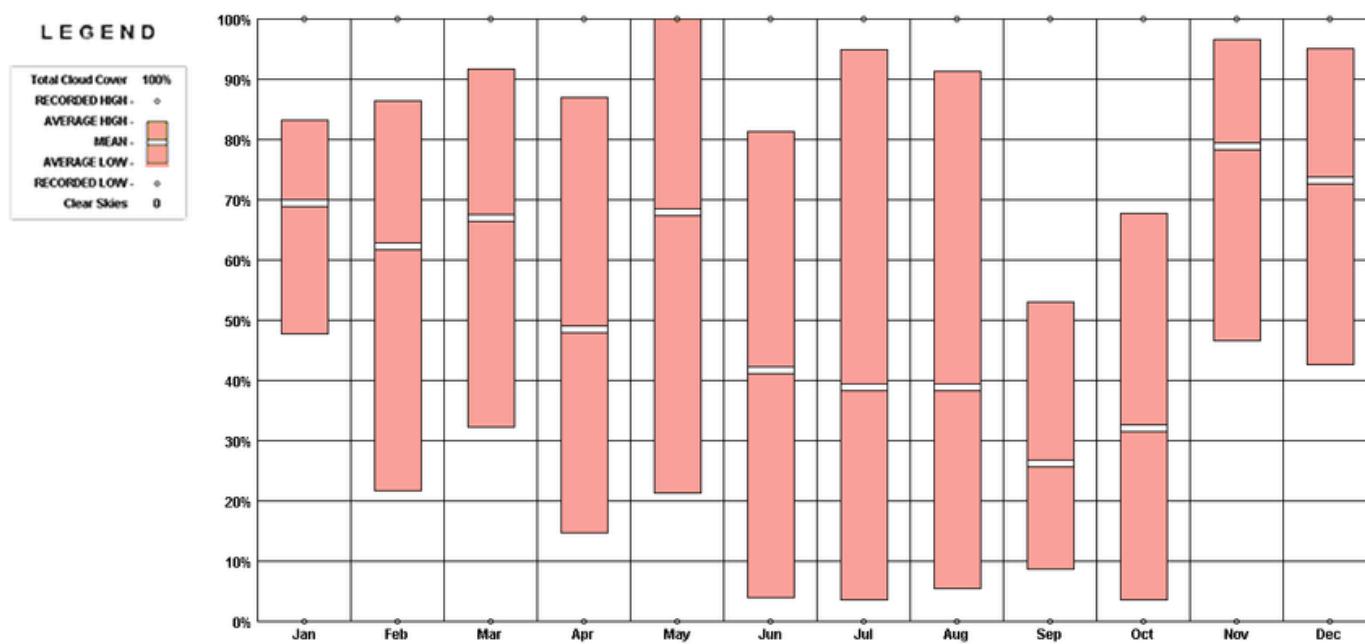
Climate solution (Sun fenses)

Light fences which helps in shade and shadow



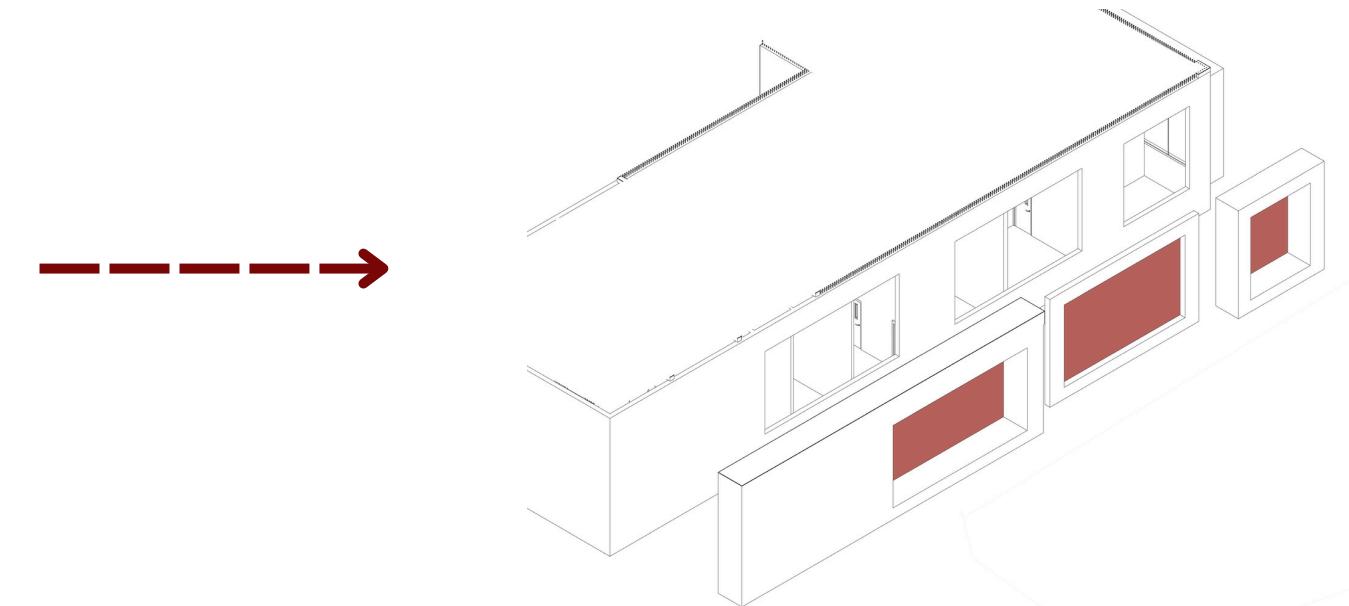
Climate problem (Hot weather)

This pie chart shows the high temperature during all day that can have bad effect on people health

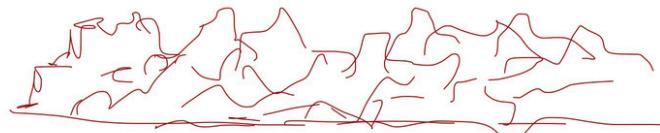


Climate solution (Double smart insulated glass)

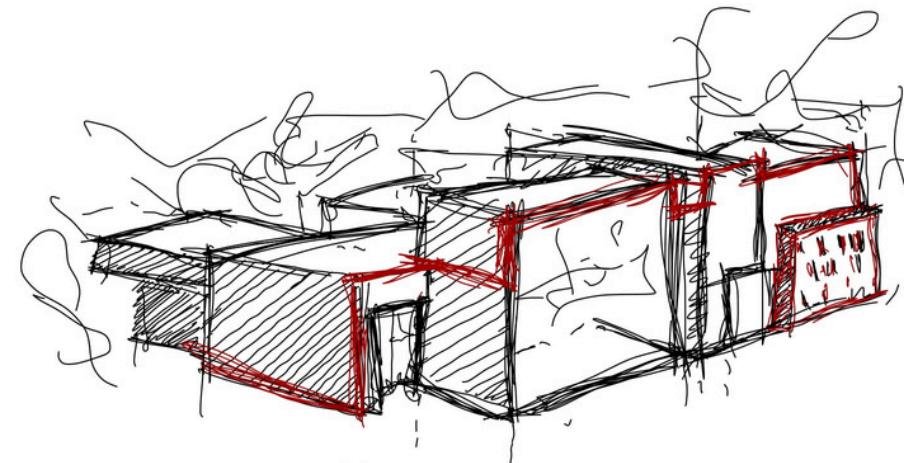
Putting this glass in windows will help to store energy and prevent from high temperature



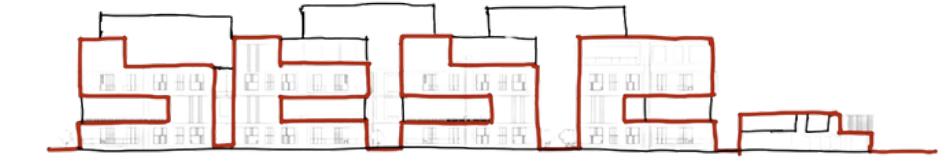
SKYLINE MANUAL ABSTRACT GENERATION



The Bedouin lifestyle inspired the skyline



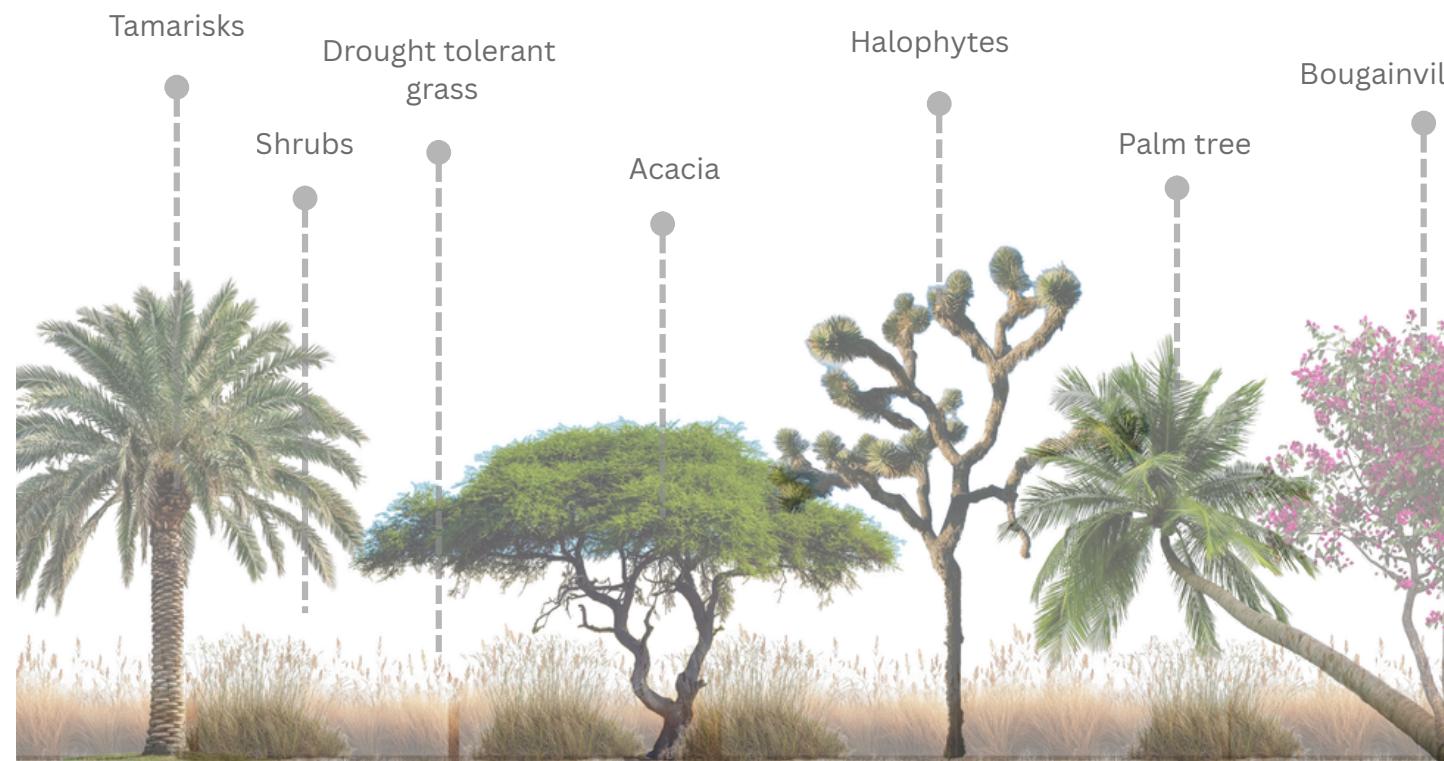
The form was generated from the mountains in the background.



The difference of the heights between the buildings was inspired from the mountains.



Final elevation sketch



HARDSCAPE MATERIALS

