

# Fontys Architecture Beyond Cement

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## Story of (Chekka - Lebanon) Quarry

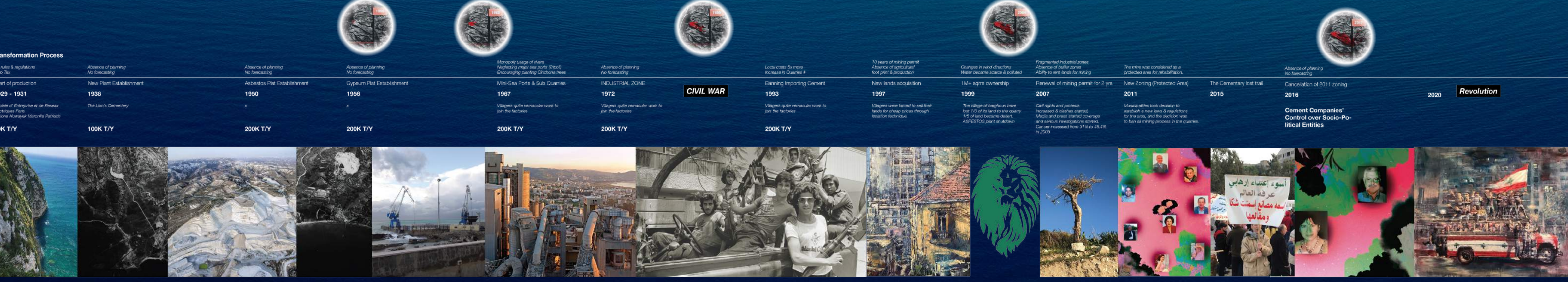
34°19'56" N 35°45'09" E

Transformation plan from cement  
production to timber production.

Al Sabea" National Cement Factory  
Sorting & grinding plant - site  
Quarry - site

## Time-line:

This linear diagram represents a visual time-line of the site's phases in many events. It shows the cement production over time and its effects on natural & spatial qualities, as well as its effects on the social/economical levels. The start of 2020 was the ignite of a social/political revolution in Lebanon, the awareness on environmental issues has increased, and part of their demands was to shut down all illegal quarries in the Lebanese Territories and especially the mega cement quarries in Al-Koura district in north Lebanon. Those quarries were part of the corrupted system. On the economical level, the price of production and process is extremely high in comparison to neighboring production in Turkey or Egypt were 100 USD per Ton while a maximum of 30 USD of imported cement, this have also risen the real-estate development price per sqm which in return became unaffordable for middle-class citizens to buy a decent home in comparison to similar countries.



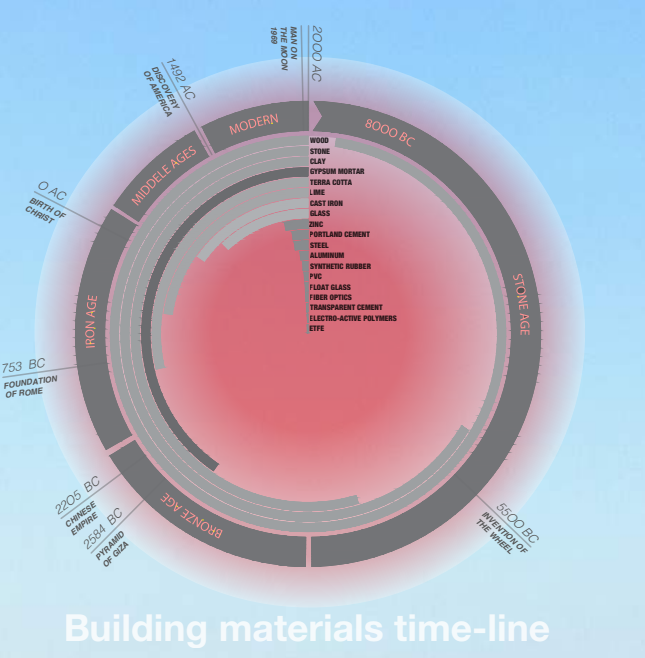
## Global Trends

The current global cycle regarding building material usage and production is suffering from a downward loop. Starting from mining and exploiting natural resources ending up with the social/economical deteriorations on various dimensions, causing an unbalanced model for architects who have a sense of social responsibilities within their disciplines.

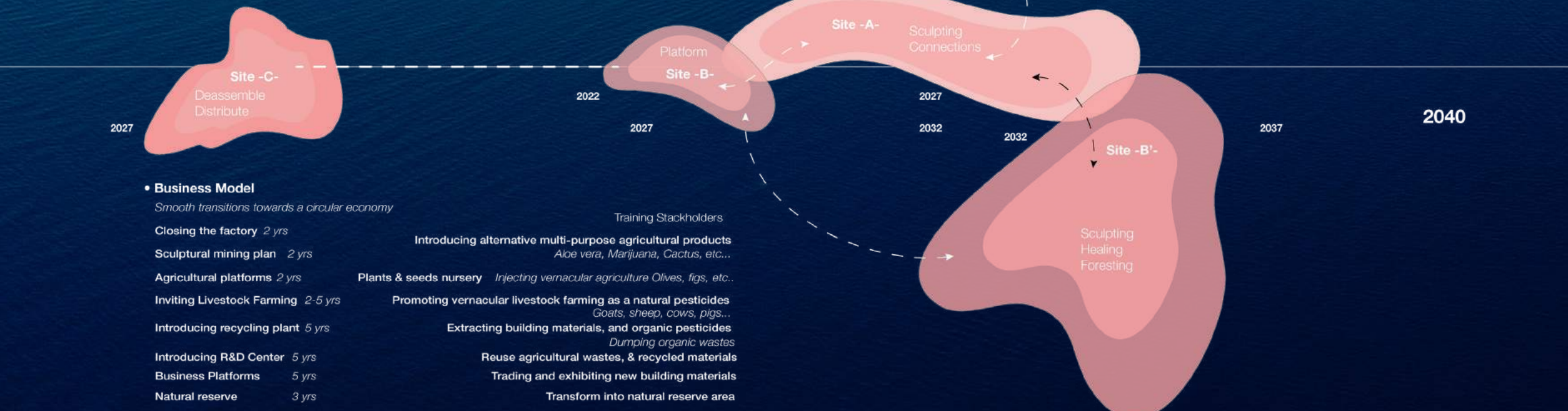


Natural resources are currently being consumed at twice the rate they are produced. By 2050, this could be three times. OECD, An Emerging Middle Class

Urbanized regions are aggregations of materials and nutrients, accounting for 75% of natural resource consumption, 50% of global waste production, and 60-80% of greenhouse gas emissions. UNEP, Resource Efficiency as Key Issue in the New Urban Agenda



## Site Analysis:



## Illegal Mines//

This chart represents the legal administrative model regarding illegal mines in Chekka. There was no economical or environmental strategies regarding the withdrawals of the quarries. The model is a cartel between economies of scale and a corrupted political system in Lebanon.



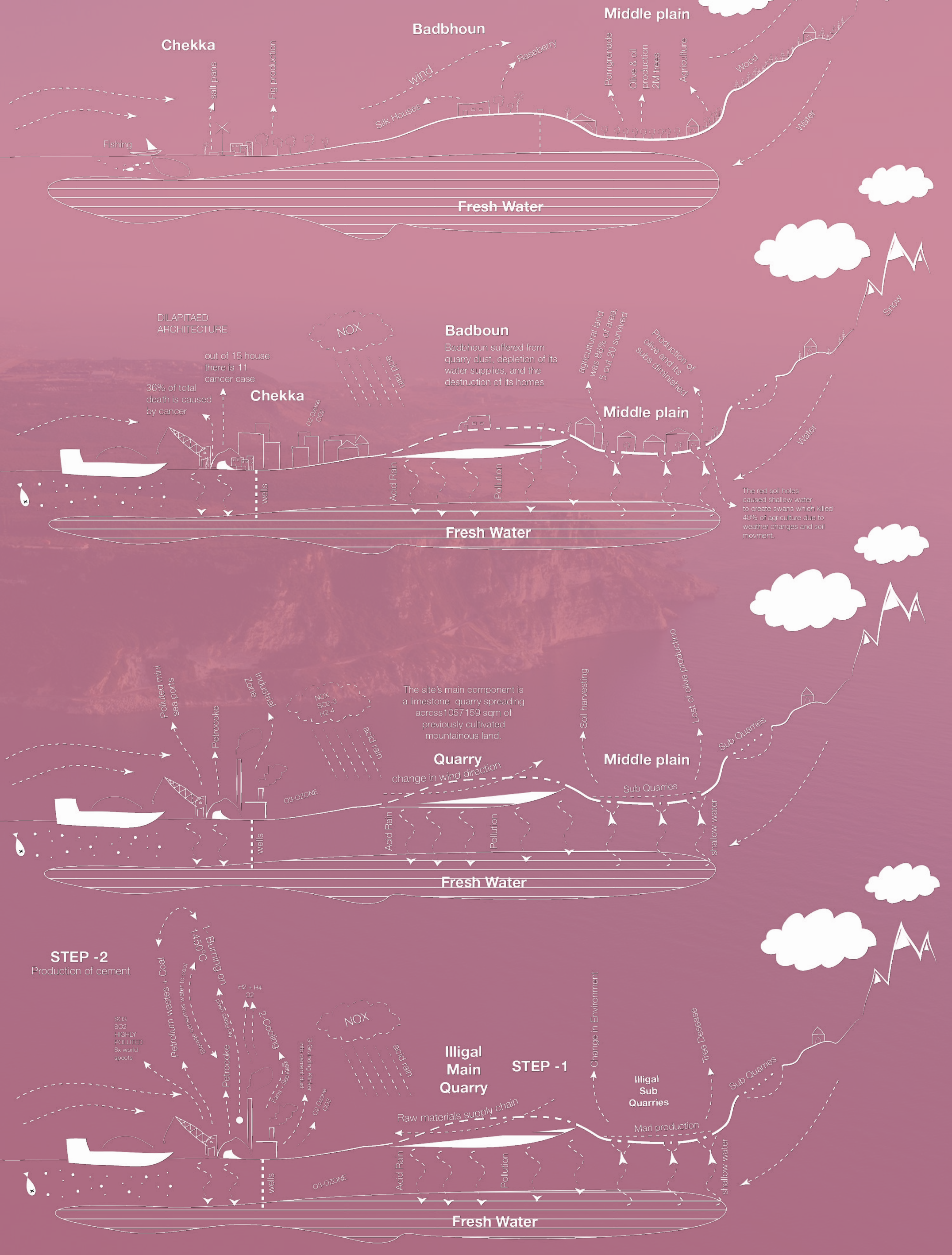
## POLITICS & LAW REINFORCEMENT//

The diagrams shows how the zoning have been manipulated with for the benefit of the quarry and NCF, as well as the legislative approach from the government.



## Micro Climates//

Diagrams shows the variation of micro climates in the area before and after on both levels environmental and economical



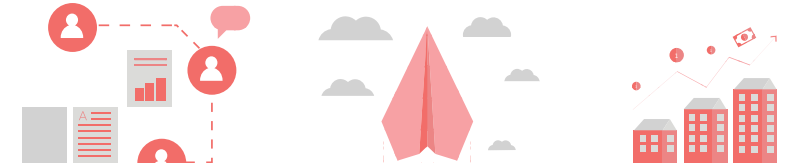


# STRATEGY//

## Accelerating circular growth//

Vision and business plan is based and inspired by the Danish vision and planning for creating circular cities. This holistic model will have major positive impacts on many layers in the region.

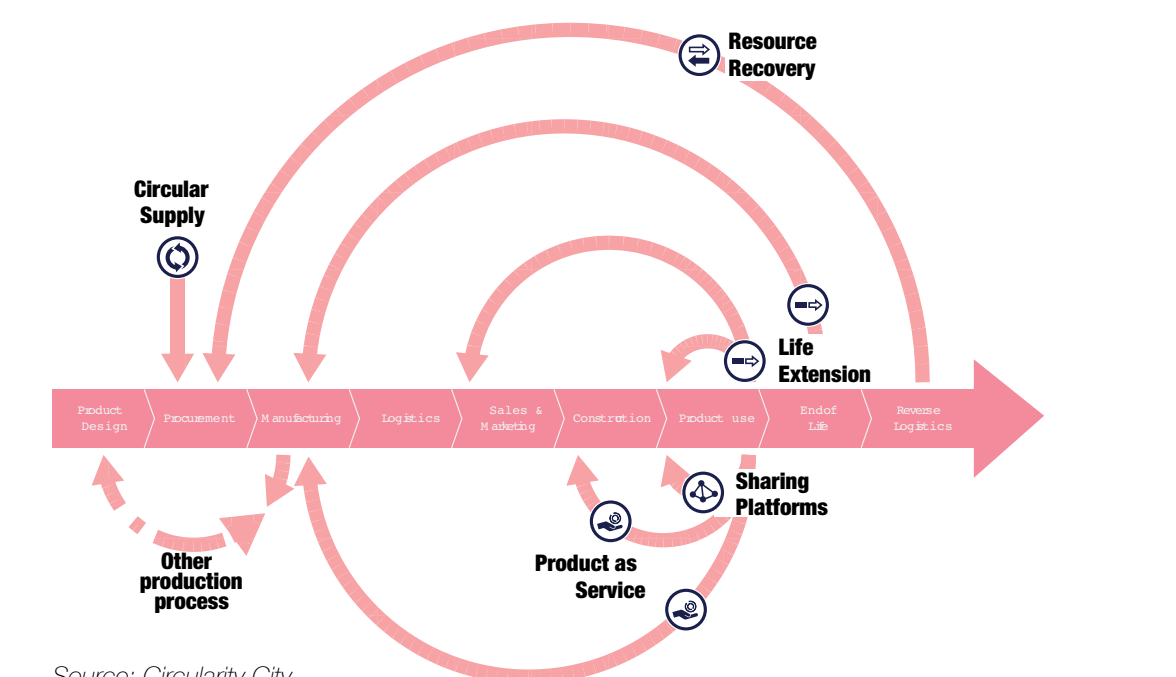
### Three Steps to Realizing the Vision



- 1. Assemble**  
To assemble the construction sector around circular building and urban development projects. To identify barriers and opportunities that must be addressed to accelerate circular construction. To integrate companies through collaboration and thus create new opportunities for growth.
- 2. Innovate**  
To help businesses and builders develop and integrate circular processes. To establish value chain collaborations to deliver circular building solutions. To develop new circular business models for the construction sector. To offer introductory courses to businesses willing to transition to circular construction.
- 3. Initiate and Scale**  
To propose circular solutions for construction projects in the Region. To match circular solutions with building and urban development projects throughout the region.

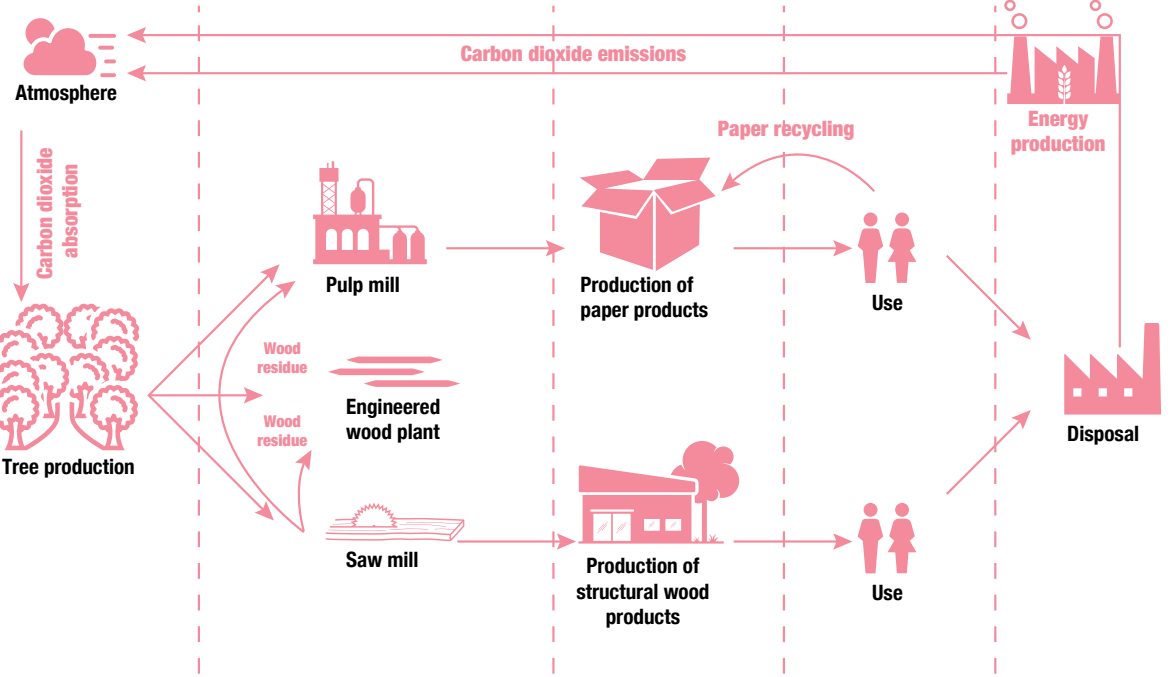
### 5 Business Models are recommended to be introduced in the site:

- 1. Circular Supply**  
Reduce virgin raw materials with materials that are renewable or biodegradable.
- 2. Resource Recovery**  
Recover discarded products or by products to recycle or upcycle the materials.
- 3. Life Extension**  
Extend the life cycle of a product, or parts of a product, while preserving the original function.
- 4. Sharing Platforms**  
Increase the use of a product through new models for sharing, accessibility, and ownership.
- 5. Product as Service**  
Optimize productivity of a resource or product while maintaining ownership of the product.



Source: Circularity City

### Why CLT (Cross Laminated Timber)?

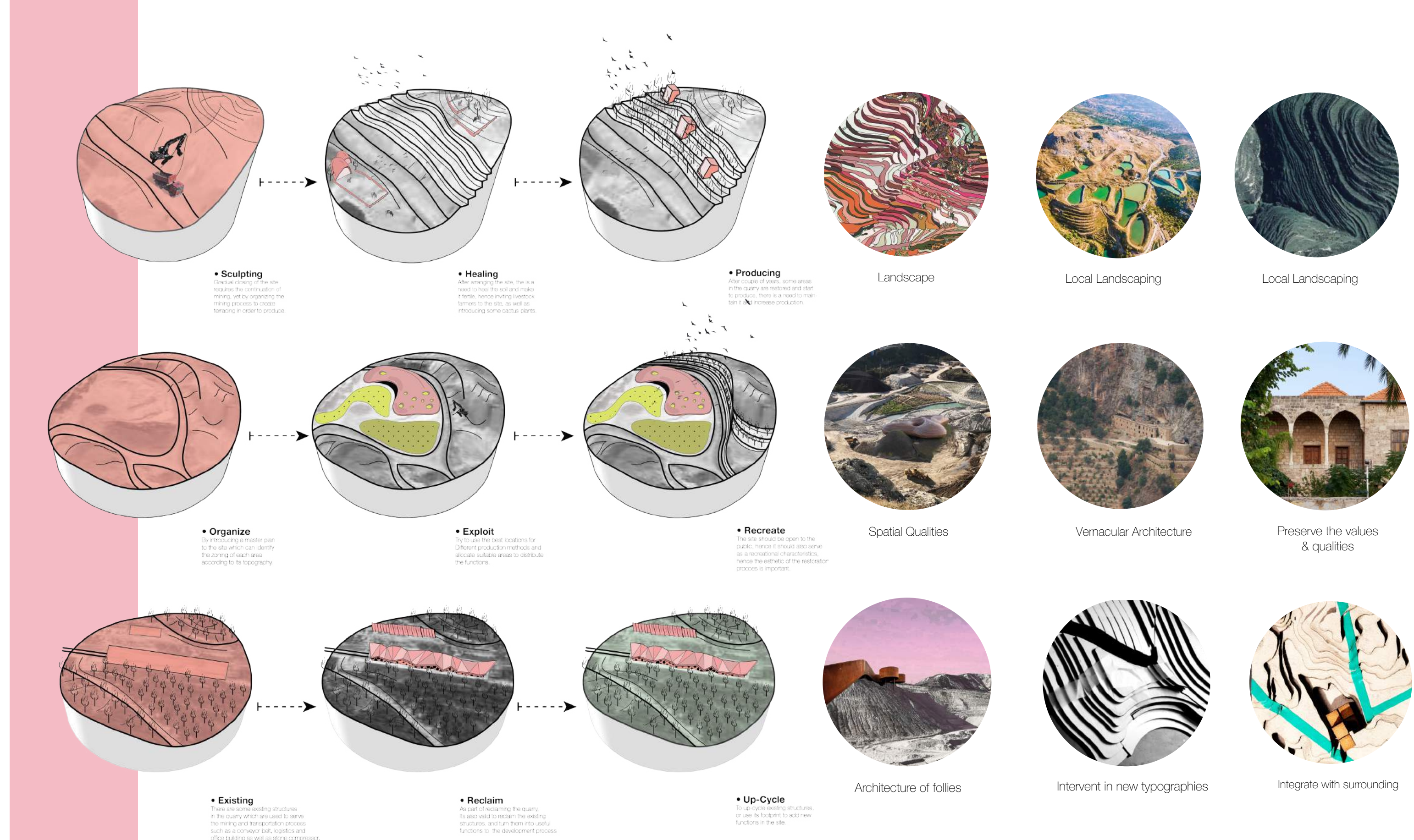


Generic Supply Chain and Related Environmental & Social Impacts

# PLANNING//

## Implementing time-frame & guidelines//

Since the scale of the site is large, there is a need to create an urban vision with guidance prototypes or a manual which could be implemented on phases in the site based on forestation processes and rejuvenation of the quarry. The guides are based on vernacular and local expertise in terrain correction, and addresses all the features regarding the quarry's gradual closing in time/space phases reaching to a new circular micro-climates that are based on resilient building material production.



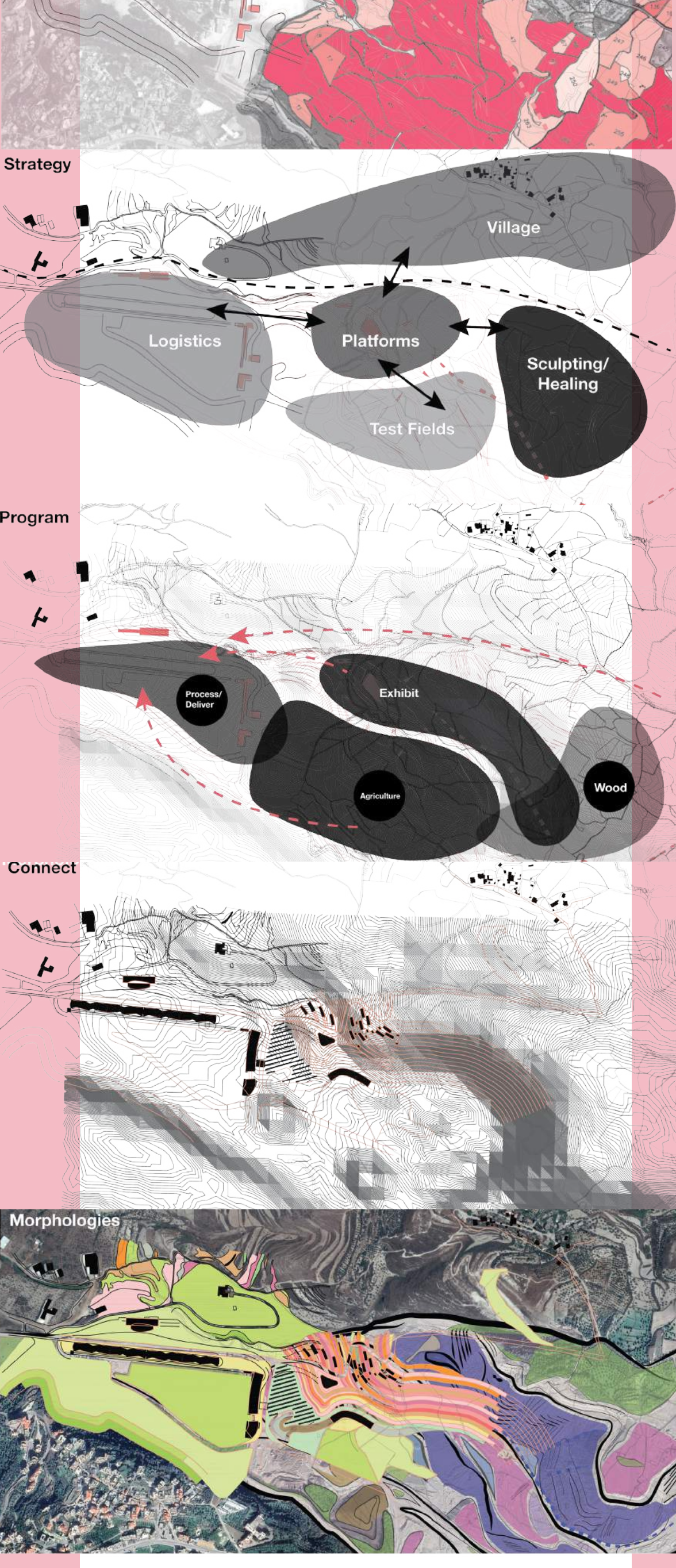
Strategy Prototypes	Phase I 2 years Smooth Transition	Phase II 2 years Shift	Phase III 2 years Circular	Phase IV 2 years Flourish	Phase V 2 years Sustain
Scenario I Reconnecting Balbun	Introducing Alternative Agriculture	Enhancing Estate Quality	Host/Nesting	Model	Sustain
Scenario II Revitalizing Vernacular Agriculture	Terrain Correction	Inviting Livestock Farming	Agricultural Interventions	Production	Sustain
Scenario III Reversing Building Materials	Agricultural Centre	Trees Nursery	Platforms	Convention Center	Convention Center/ R&D
Scenario IV Restoring Seafont	Factory Disassembly	Distribution Center	Collection Center	Reduce footprint	Re-use
Scenario V Reclaiming Land	Positive mining	Soil Healing	Forestation	Restoring Eco-systems	Multiply
	<b>FUNCTIONS</b>	<b>FUNCTIONS</b>	<b>FUNCTIONS</b>	<b>FUNCTIONS</b>	<b>FUNCTIONS</b>

### Planning//

The design was derived from quantitative and qualitative research on the quarry and its surrounding, and the negative impact it had produced. The urgency to close an illegal fully-function quarry and cement factory that has been polluting for around 60 years. A strategy is superimposed to gradually close the factory and the mine during time/space intervals. This procedure will ensure to absorb the shock which will affect the mining business industry and its parasites to reach a healed environment and revitalize old abandoned agriculture and at the same time introduce wood as a new building material which would be part of a national plan to close all building industry-related mines and substitute it by forests. The phases start within two years during the closing process of the mine, while maintaining the production

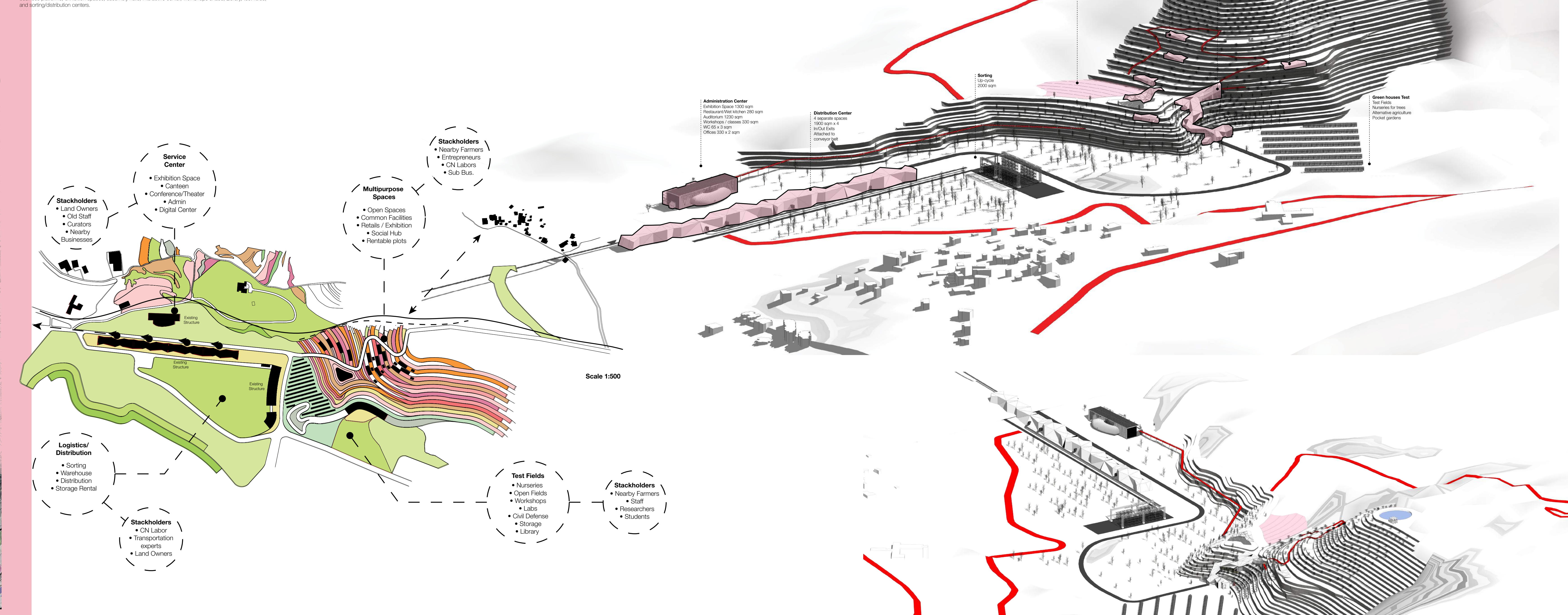
# Master plan//

The master plan is based on multi-layered data and findings. The urban context of the site is unique in terms of its difficult morphologies, urban fabric, micro-climates in the quarry and its surroundings, the urban corridors and the connections, as well as the topographical landscaping qualities that could be exploited and invested. The build-up area in the site should not exceed 10% of the total superficial area, while the structures are multifunctional and are spread to serve each other creating an economical/social cycle. The architecture is designed to be transformed over time and space providing democratic & sharing model. The functions proposed are derived from a research on forestation and building material production, providing business platforms, exhibition spaces, assembly halls, interactive center, workshops & labs, Library, test fields, and sorting/distribution centers.



# Master plan//

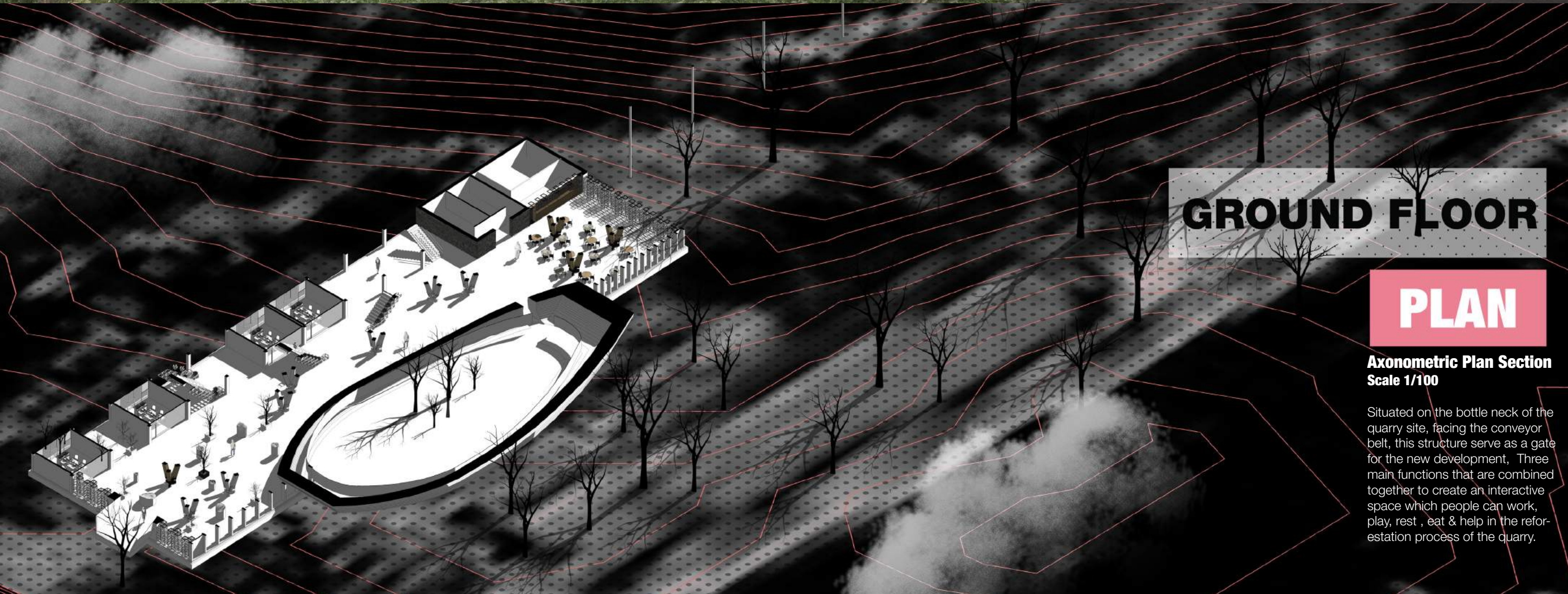
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## GATE



### GROUND FLOOR

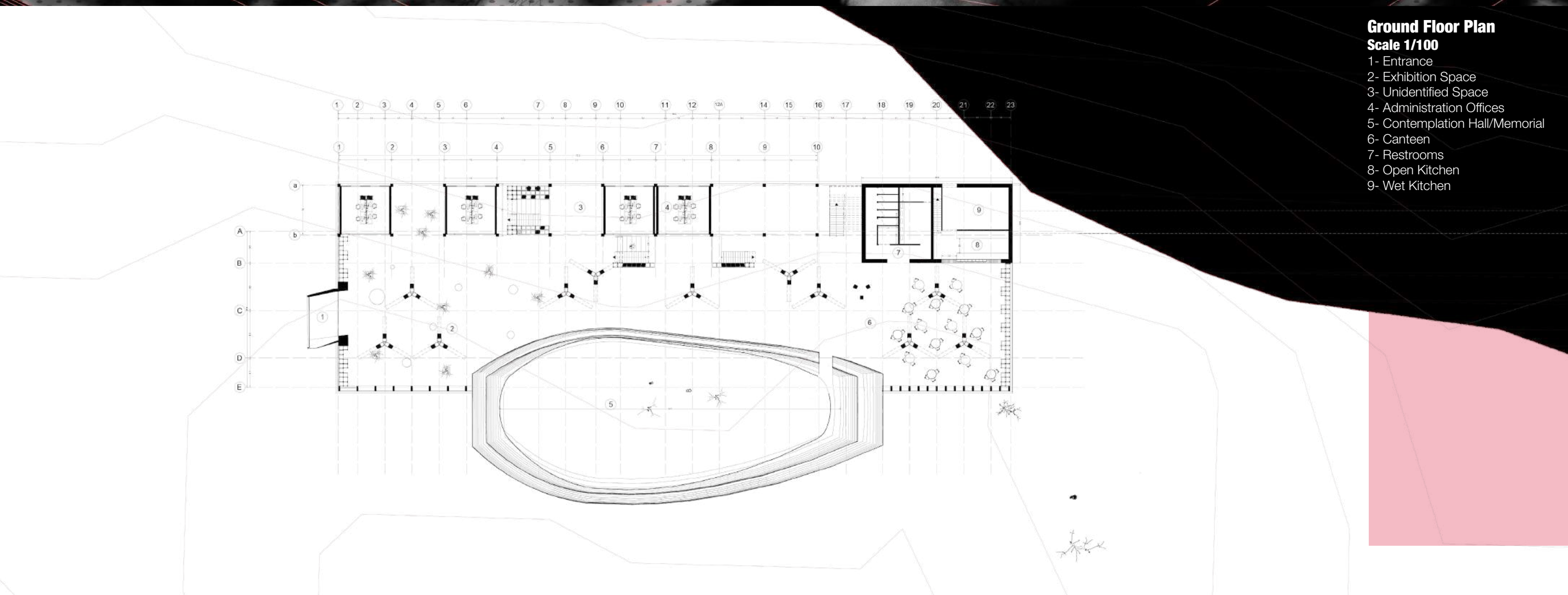
#### PLAN

Axonometric Plan Section  
Scale 1/100

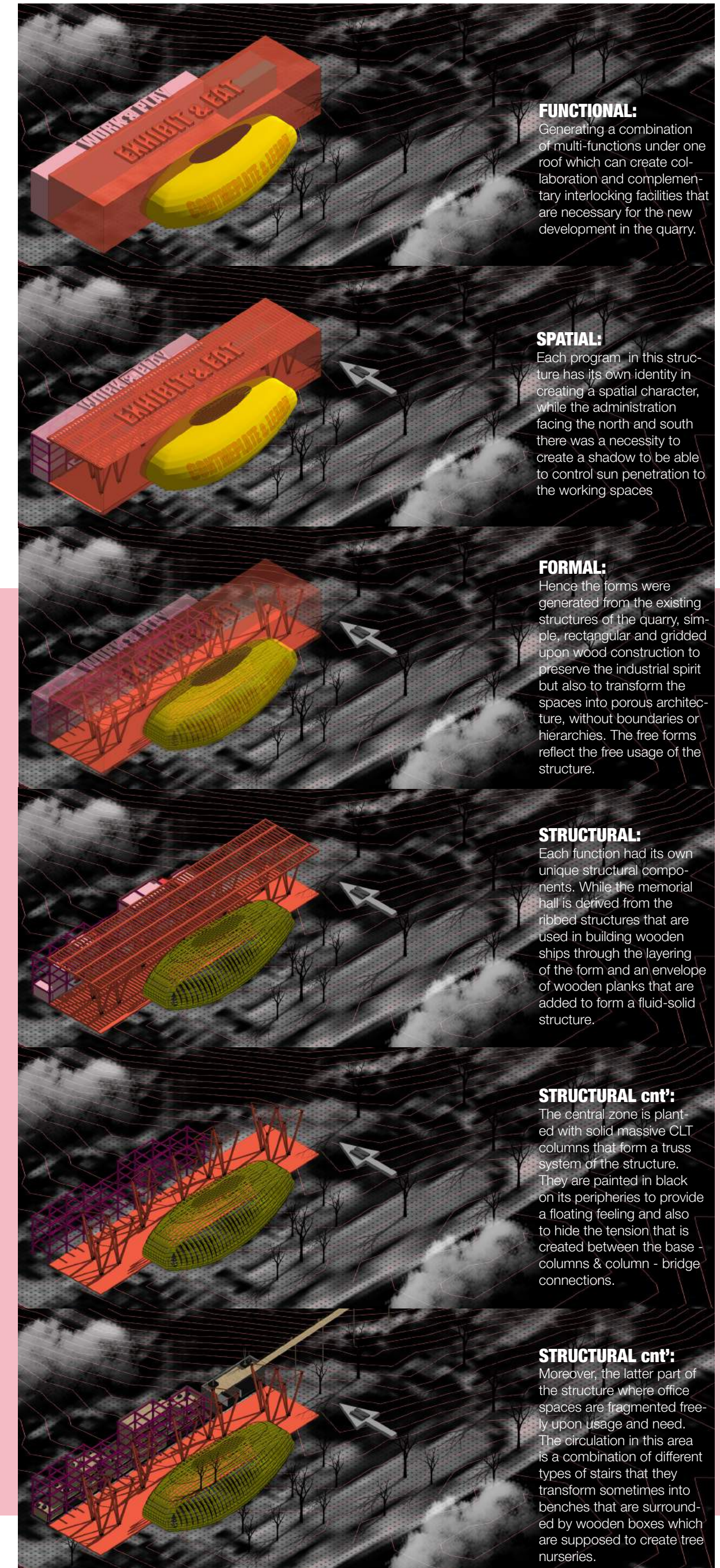
Situated on the bottle neck of the quarry site, this structure serves as a gate for the new development. These main functions that are combined together to create an interactive space which people can work, play, rest, eat & help in the reforestation process of the quarry.

Ground Floor Plan  
Scale 1/100

- 1- Entrance
- 2- Exhibition Space
- 3- Undeveloped Space
- 4- Administration Offices
- 5- Contemplation Hall/Memorial
- 6- Canteen
- 7- Restrooms
- 8- Open Kitchen
- 9- Wet Kitchen



## FUNCTIONAL & SPATIAL DISTRIBUTION



#### FUNCTIONAL:

Generating a combination of multi-functions under one roof which can create collaboration and complementary interlocking facilities that are necessary for the new development in the quarry.

#### SPATIAL:

Each program in this structure has its own identity in its spatial character. While the administration facing the north and south, there was a necessity to create a shadow to be able to control sun penetration to the working spaces.

#### FORMAL:

Hence the forms were generated from the existing structures of the quarry, simple rectangular and gridded upon wood construction to preserve the industrial spirit but also to transform the spaces into porous architecture, without boundaries or hierarchies. The free forms reflect the free usage of the structure.

#### STRUCTURAL:

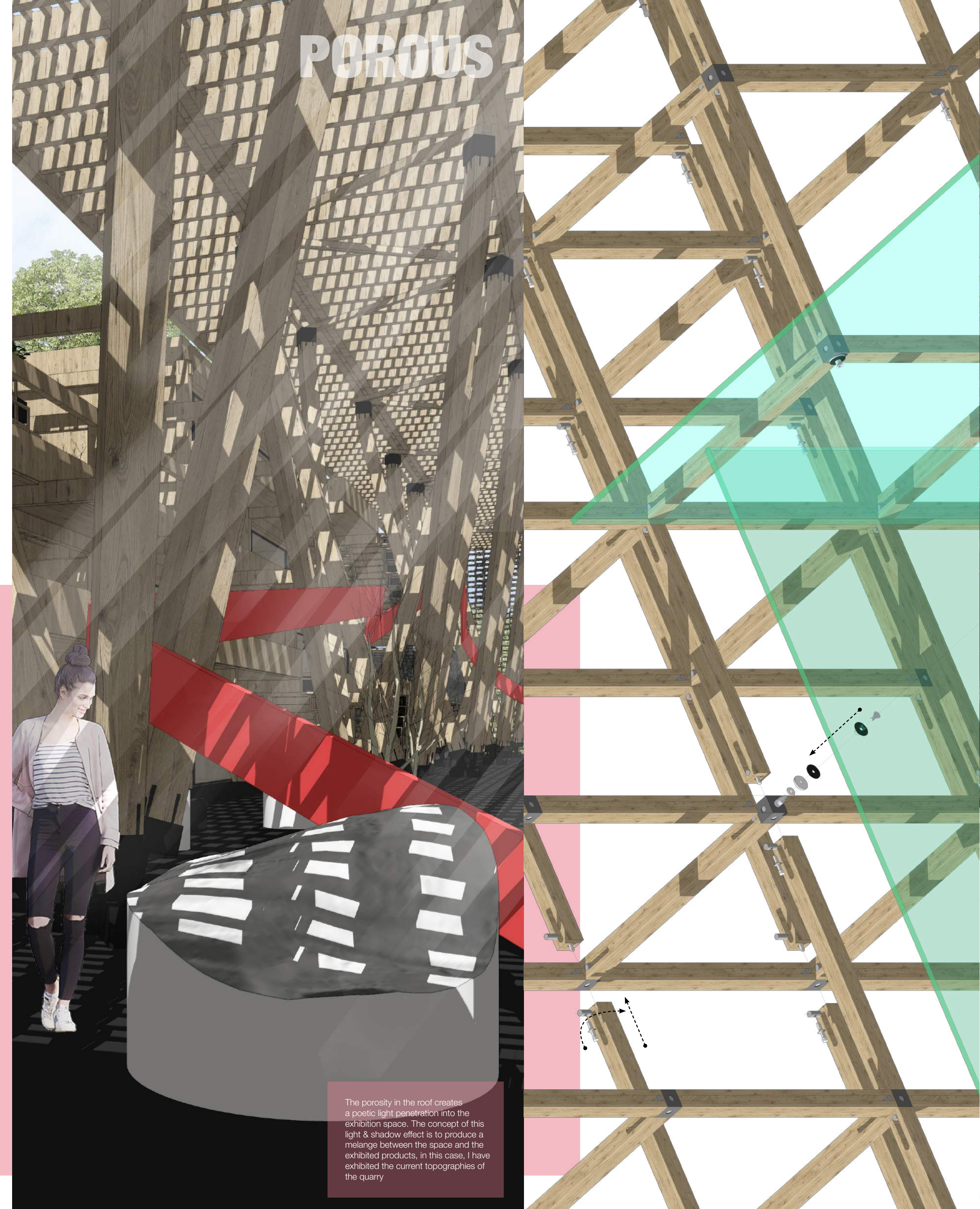
Each function had its own unique structural components. While the memorial hall is derived from the timber structures that are used in building wooden ships through the layering of the form and an envelope of wooden planks that are added to form a fluid-solid structure.

#### STRUCTURAL ent:

The stairs zone is planted with solid massive CLT columns to form a mass wooden frame structure. They are planted in black at its periphery to provide a floating feeling and also to hide the tension that is created between the base, columns & column - bridge connections.

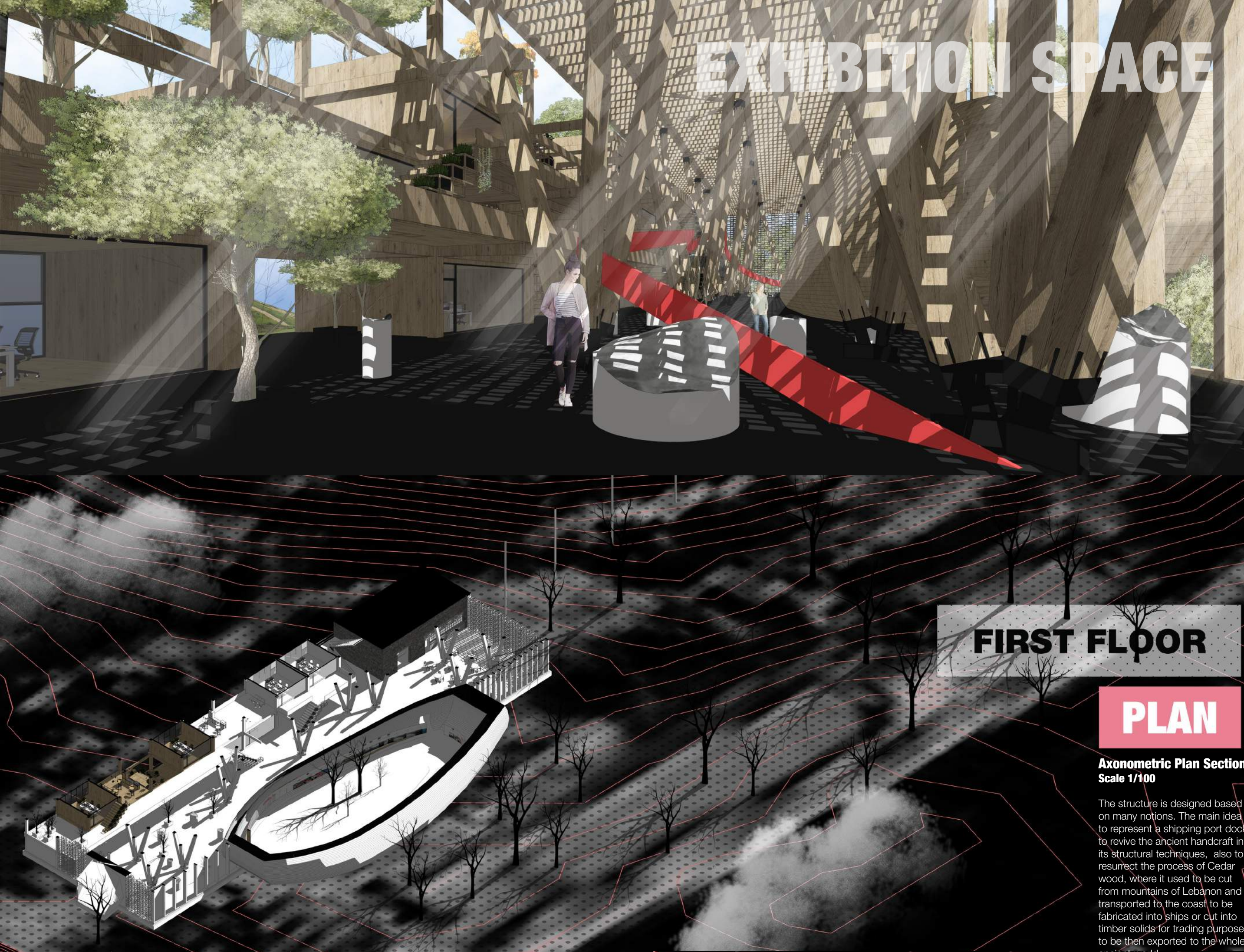
#### STRUCTURAL ent:

Massive perimeter part of this structure where the spaces are fragmented free usage and need. The circulation in this area is a combination of different types of stairs that they transform sometimes into benches that are surrounded by wooden boxes which are supposed to create tree nurseries.

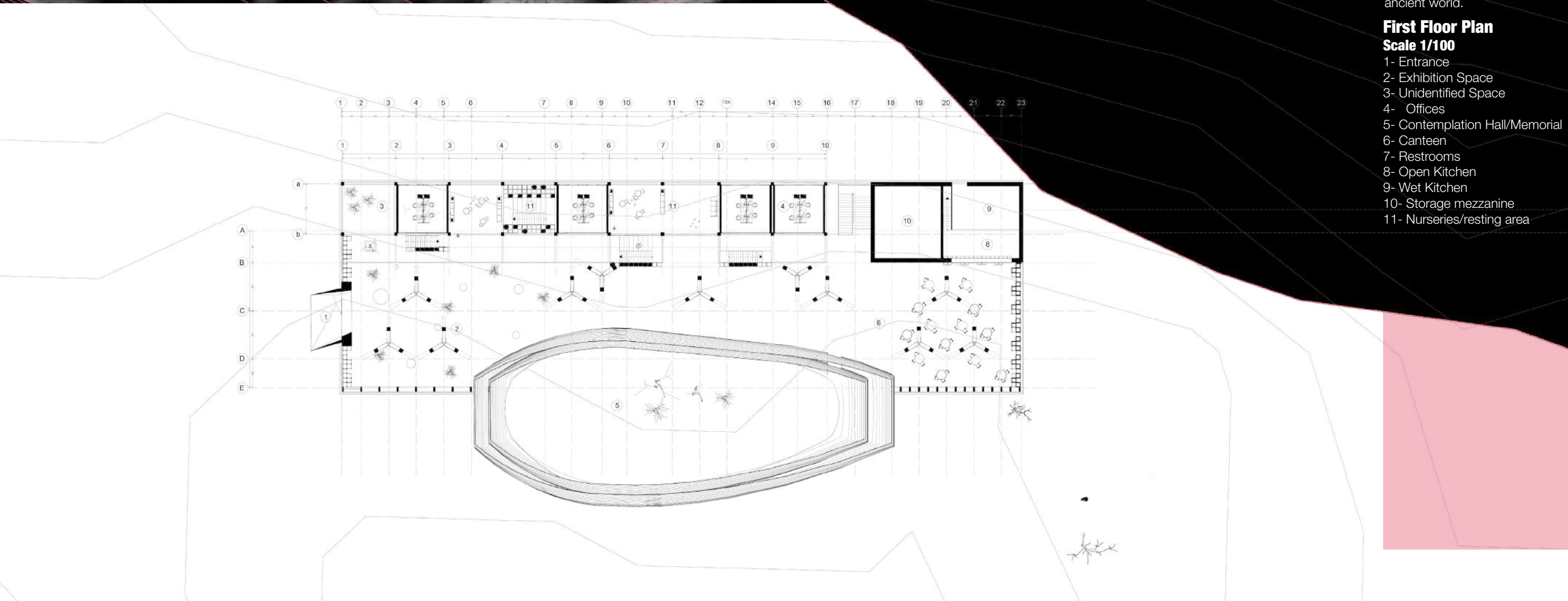


## POROUS

The porosity in the roof creates a poetic light penetration into the exhibition space. The concept of this light & shadow effect is to produce a midrange between the space and the exhibited products. In this case, I have exhibited the current topographies of the quarry.



## EXHIBITION SPACE



### FIRST FLOOR

#### PLAN

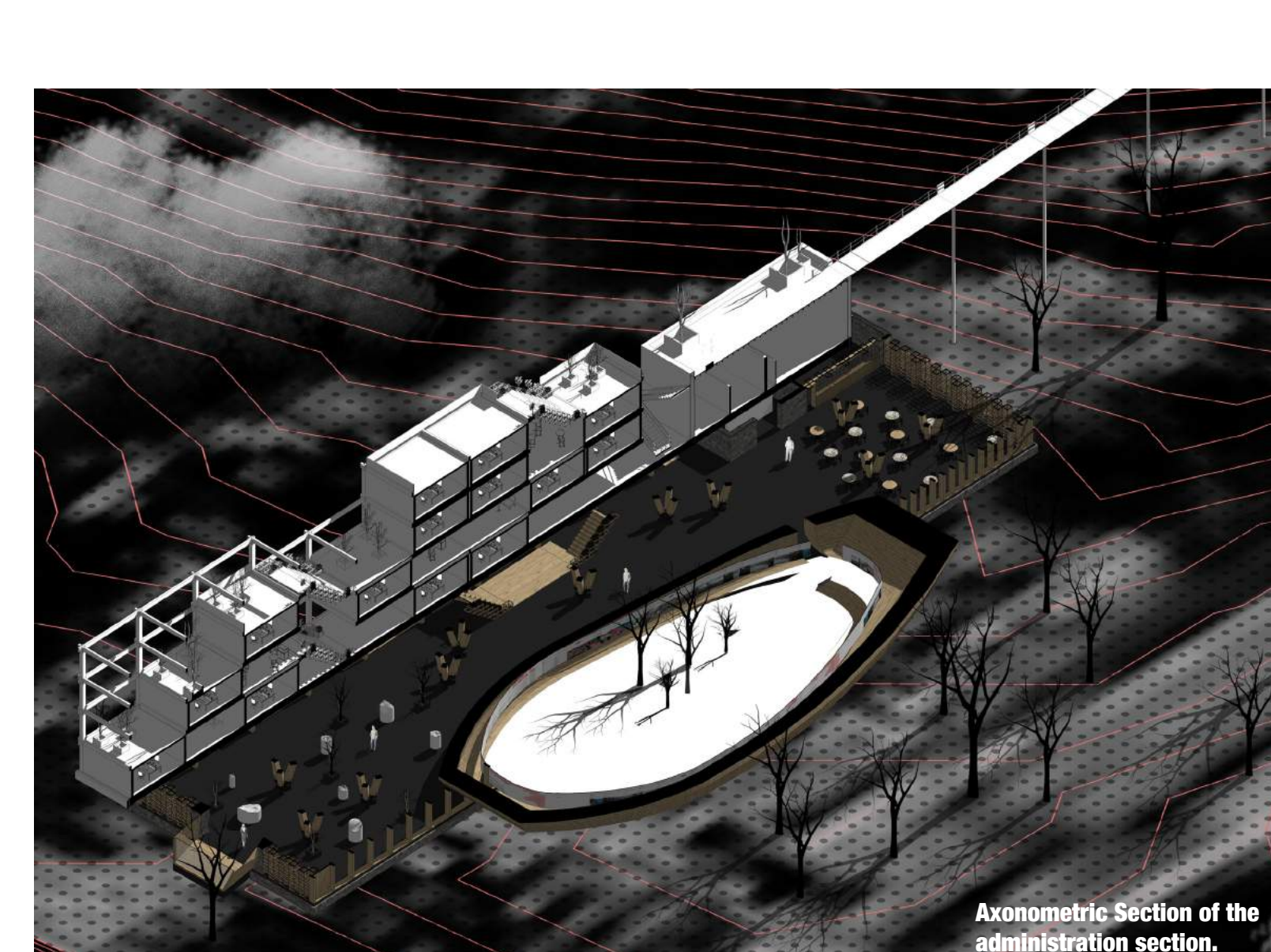
Axonometric Plan Section  
Scale 1/100

The structure is designed based on many notions. The main idea is to represent a shipping port dock to revive the ancient handicraft in its structural techniques, also to resume the process of Cedar wood, where it used to be cut from mountains of Lebanon and transported to the coast to be fabricated into ships or cut into timber solids for trading purposes to be then exported to the whole ancient world.

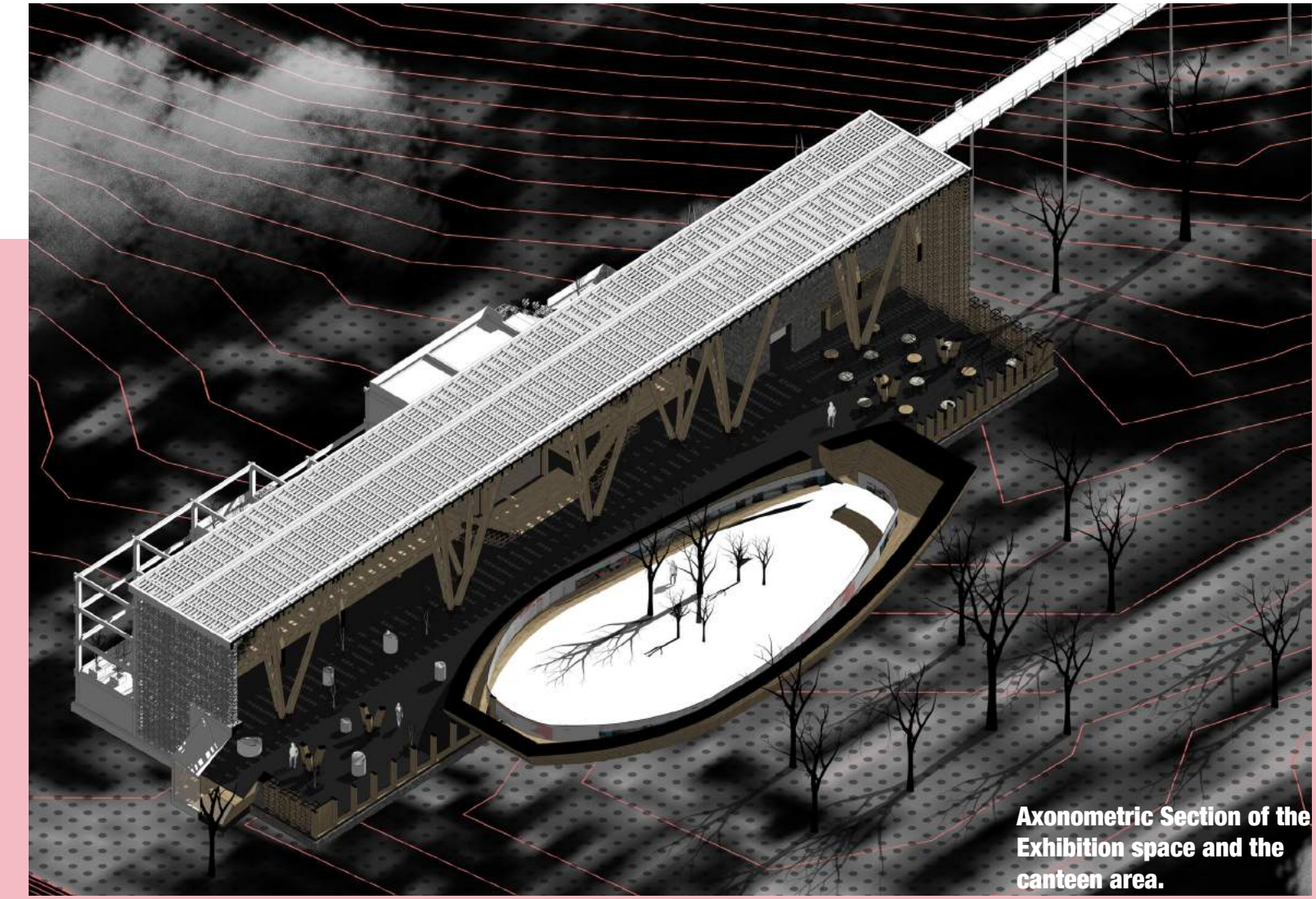
First Floor Plan  
Scale 1/100

- 1- Entrance
- 2- Exhibition Space
- 3- Undeveloped Space
- 4- Offices
- 5- Contemplation Hall/Memorial
- 6- Canteen
- 7- Restrooms
- 8- Open Kitchen
- 9- Wet Kitchen
- 10- Storage mezzanine
- 11- Nurseries/seedling area

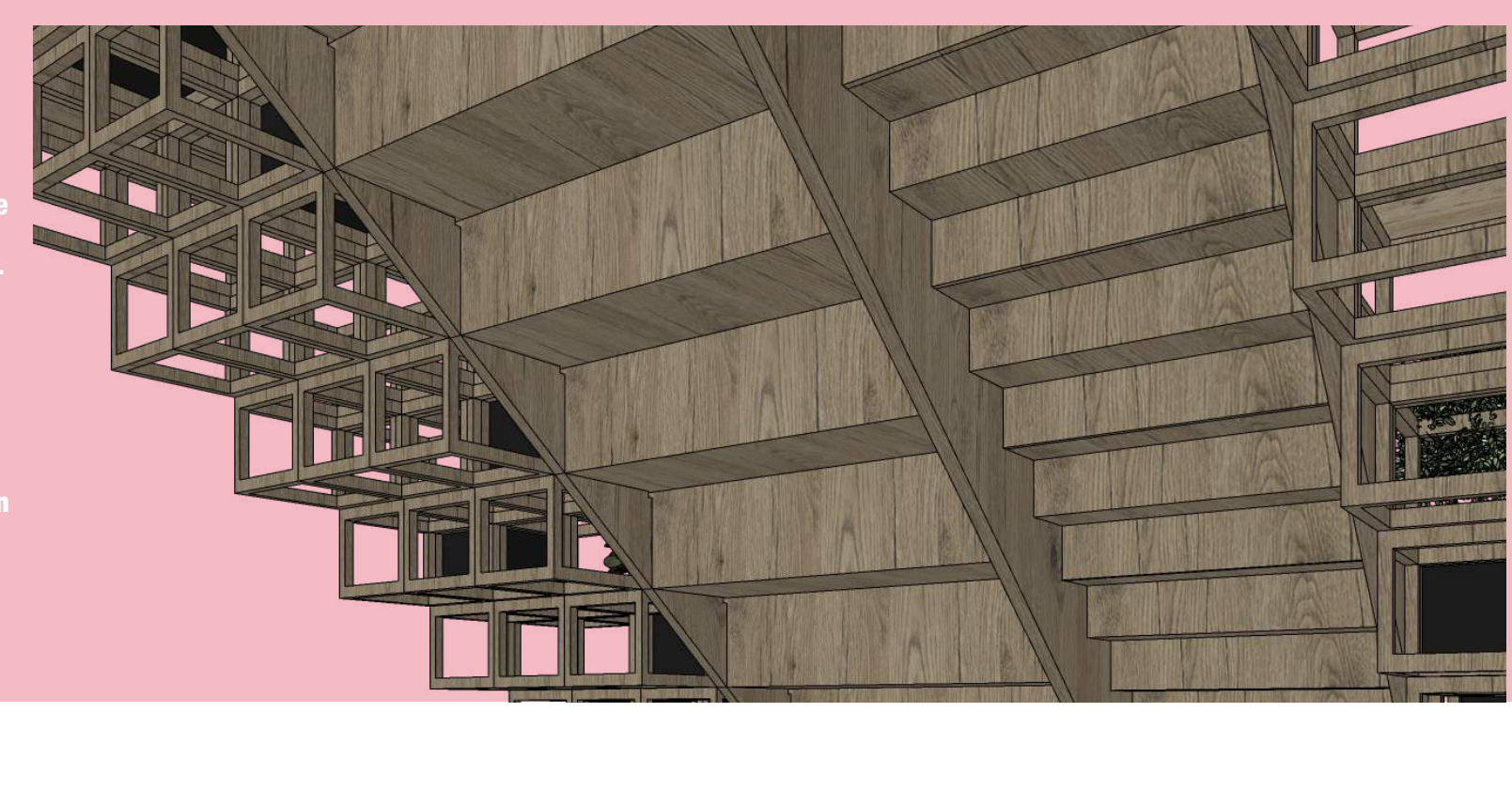
The structure of the stairs cases & benches is a simple wood joinery fabrication where wooden planks are fixed on the stair profiles, surrounded by boxes to form one solid structure that can be disassembled easily and transformed easily into a different location or swive different components.



Axonometric Section of the administration section.



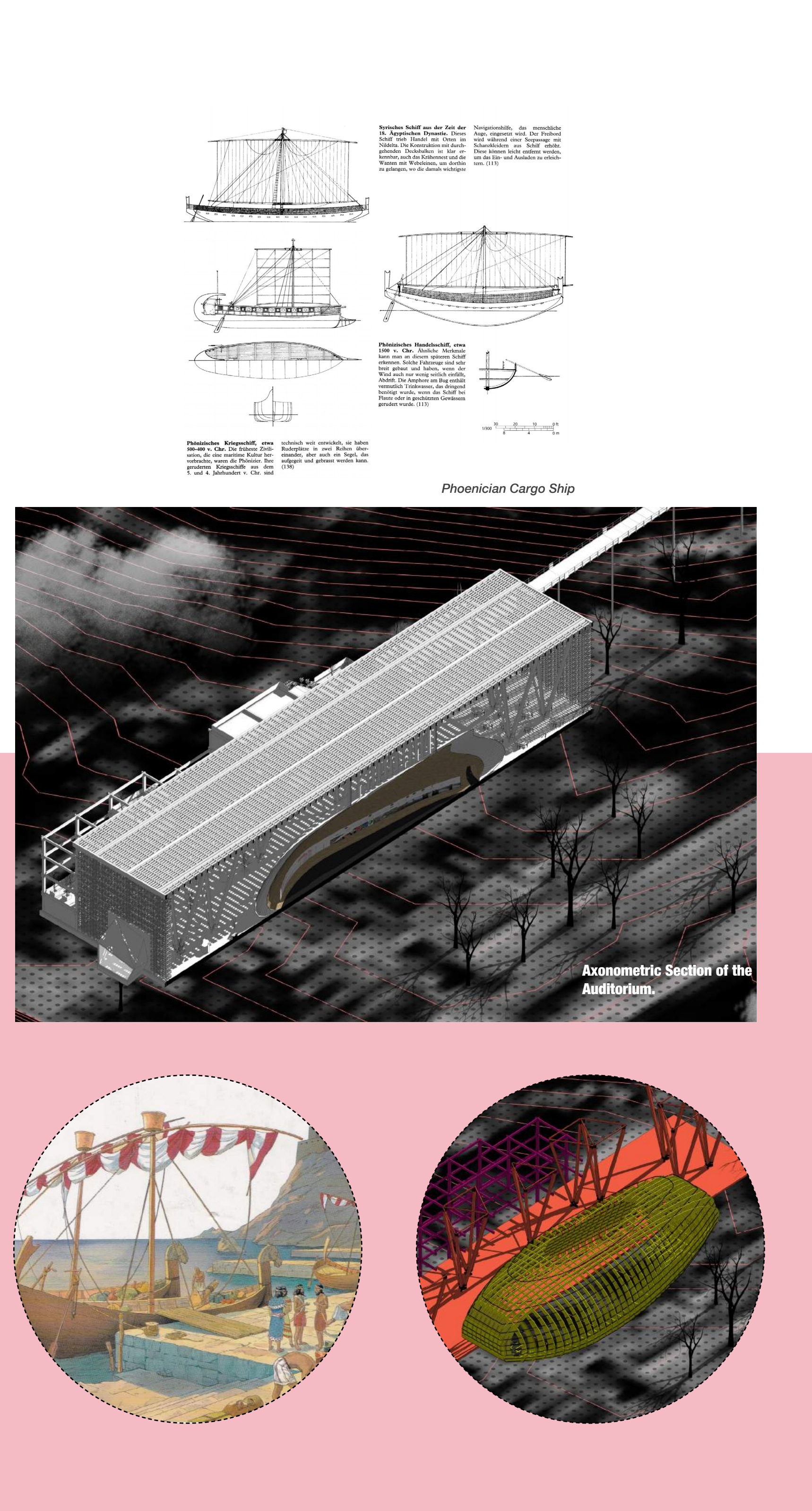
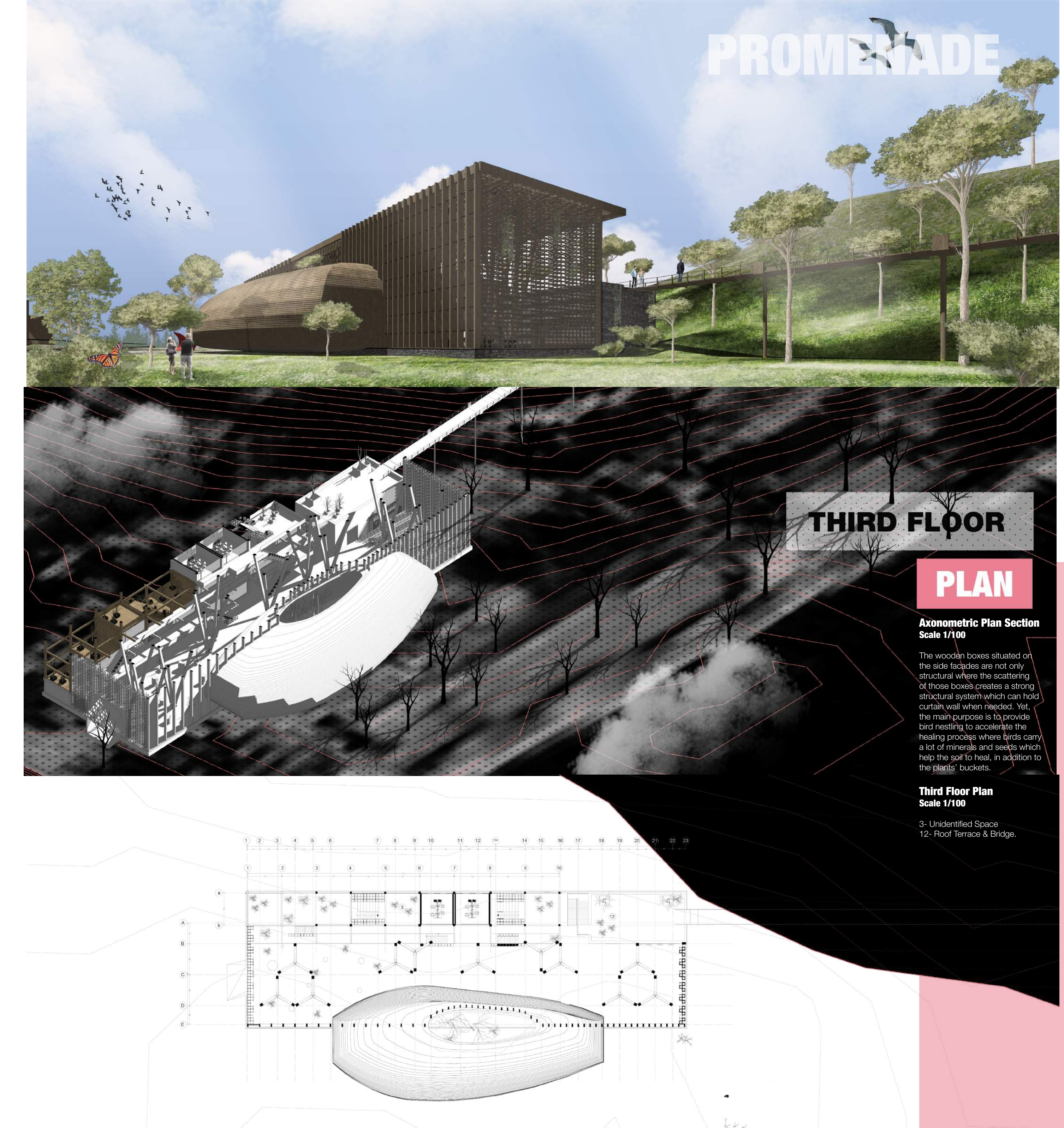
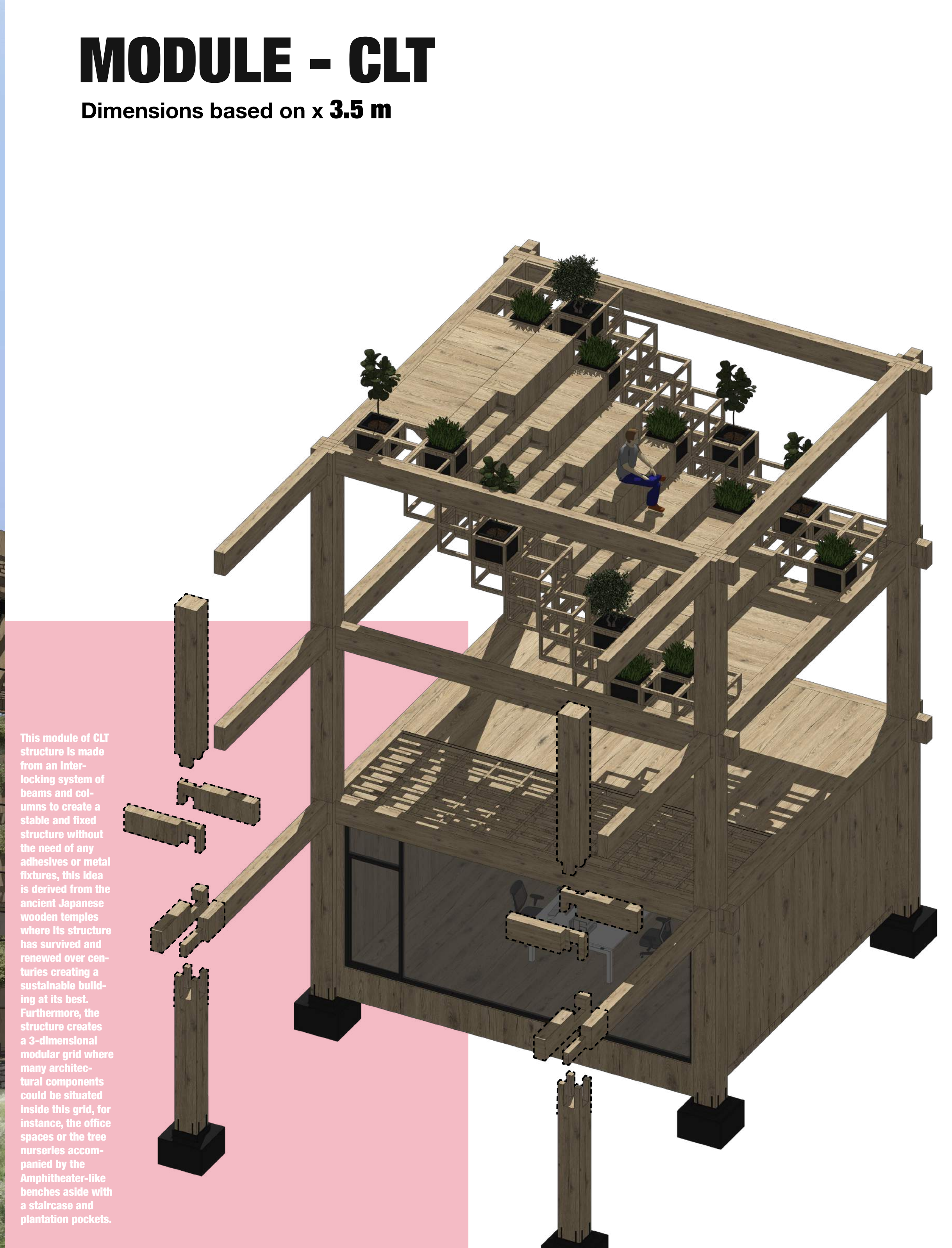
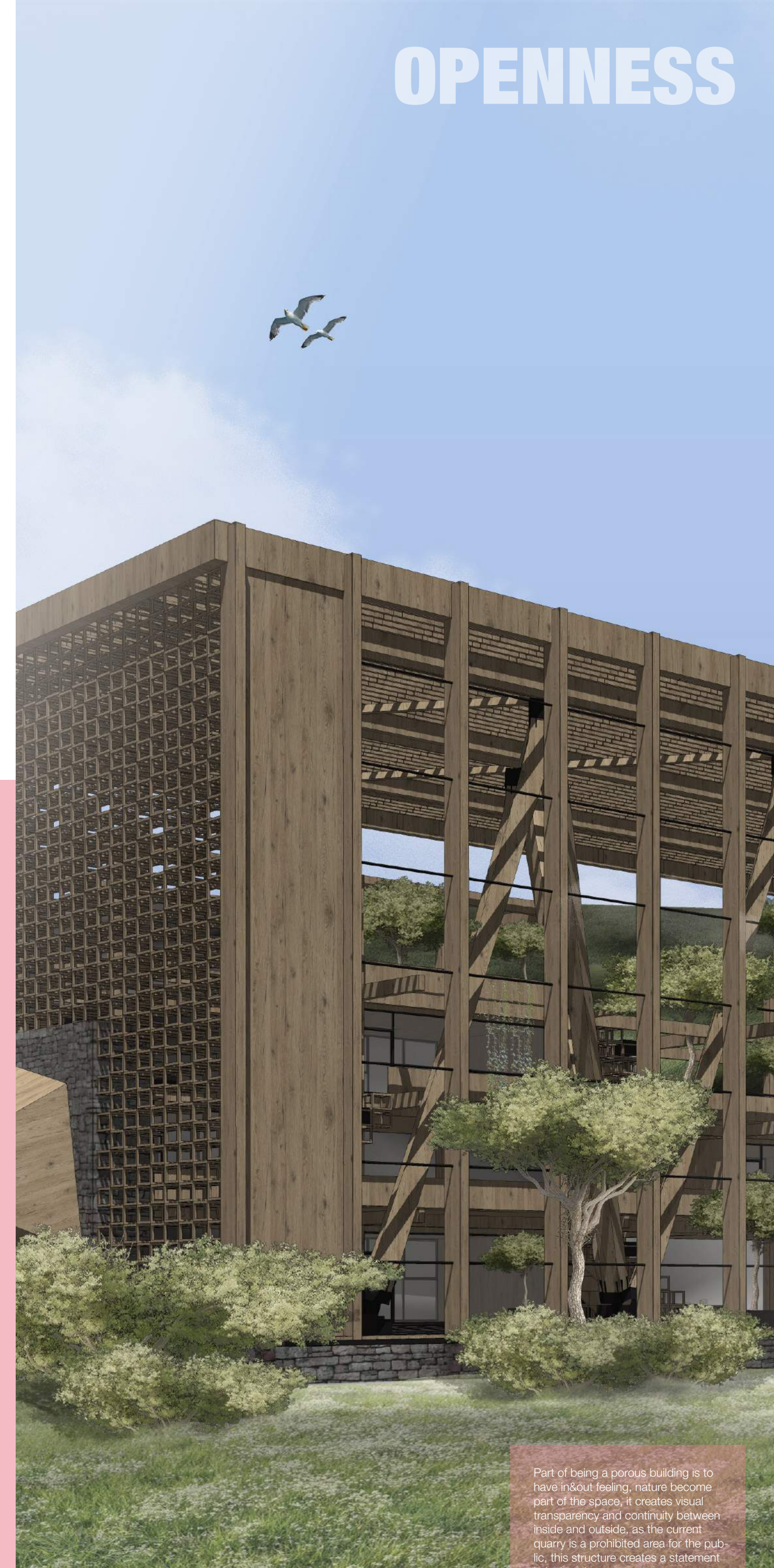
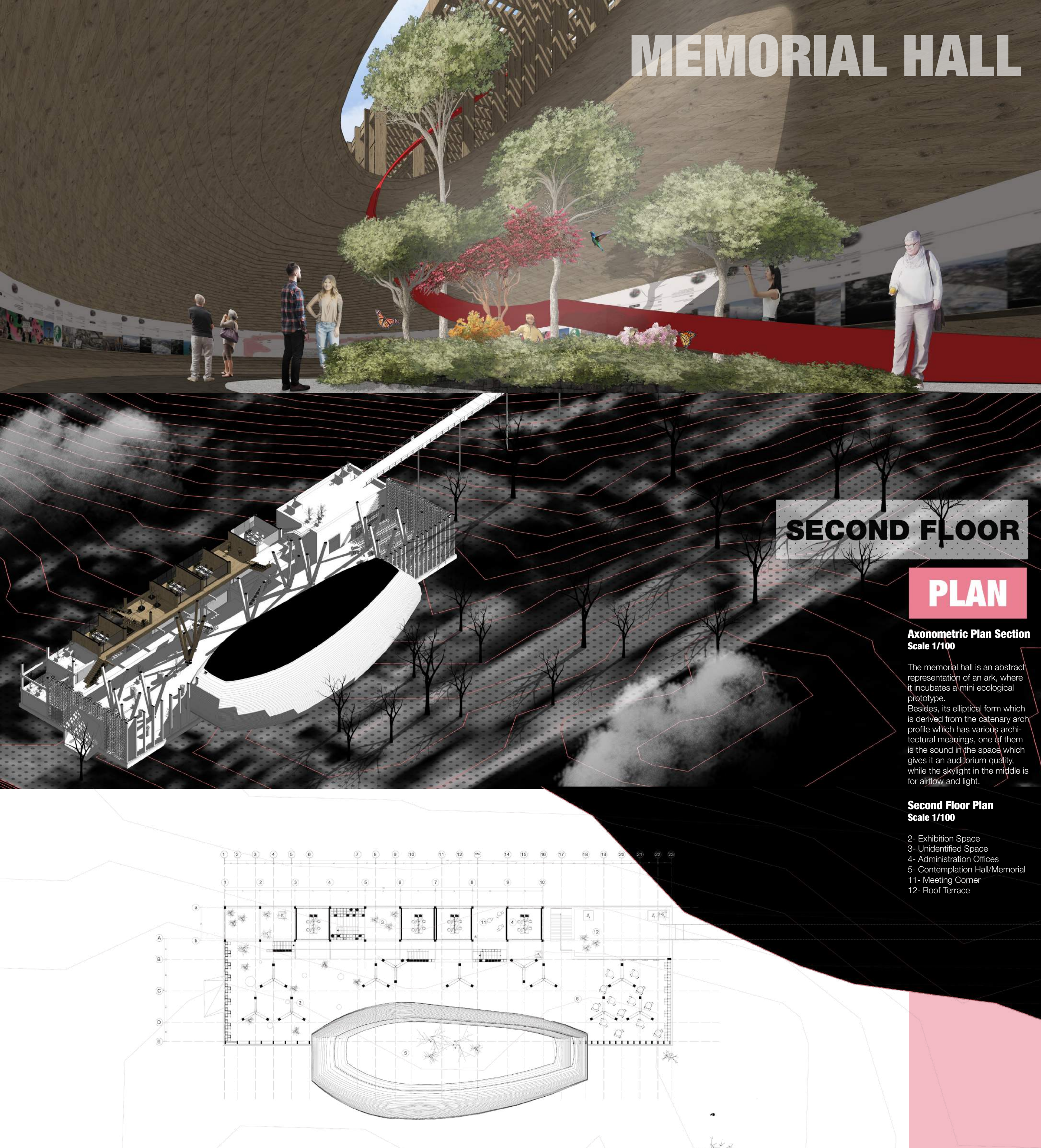
Axonometric Section of the exhibition space and the canteen area.



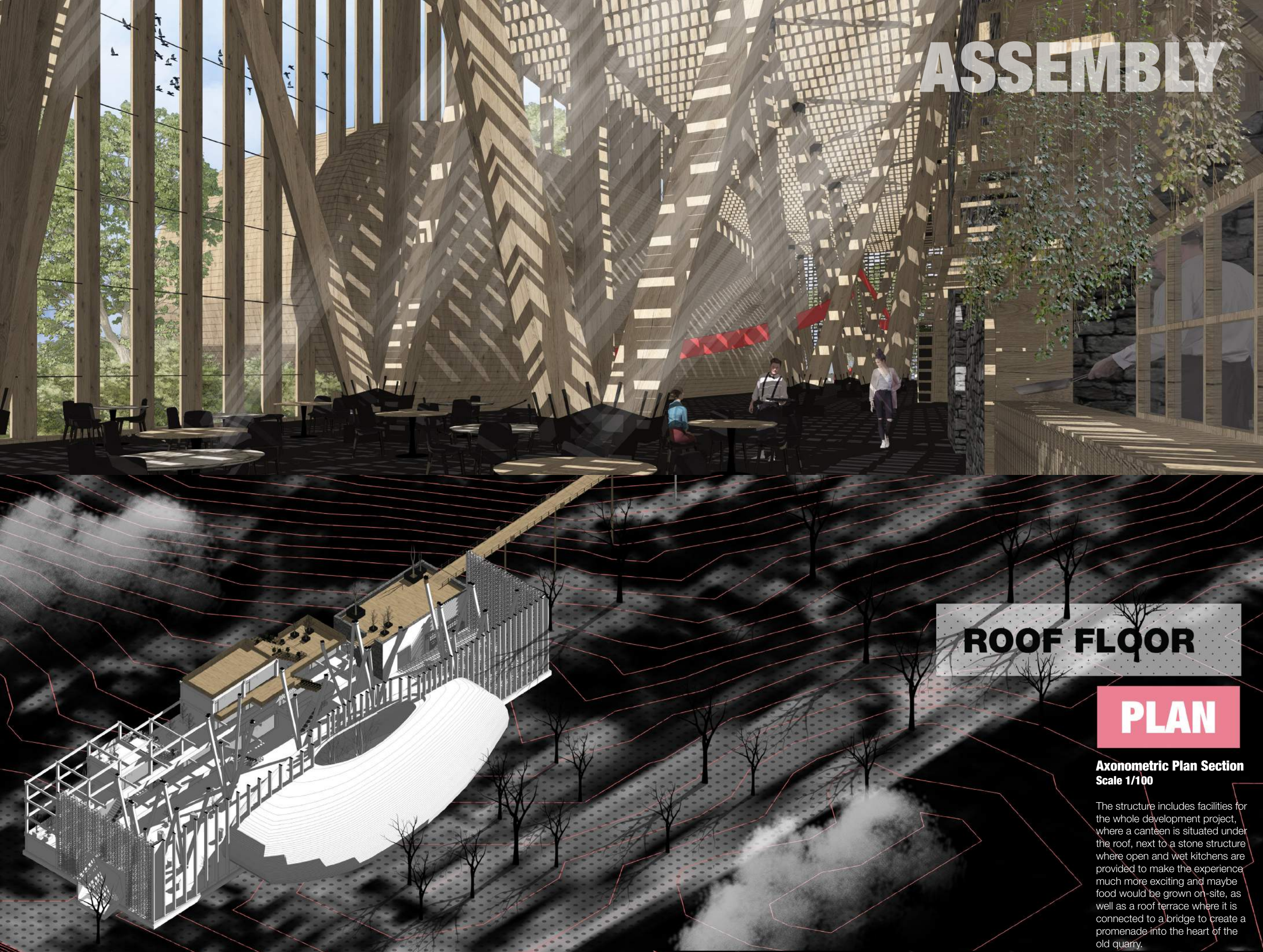
## INDOORS MICRO CLIMATES

The quarry has created massive destruction to the local micro-climate in the region. One of the most important features of organic climates is biodiversity where birds and insects play the biggest role in regulating nature.









# ASSEMBLY

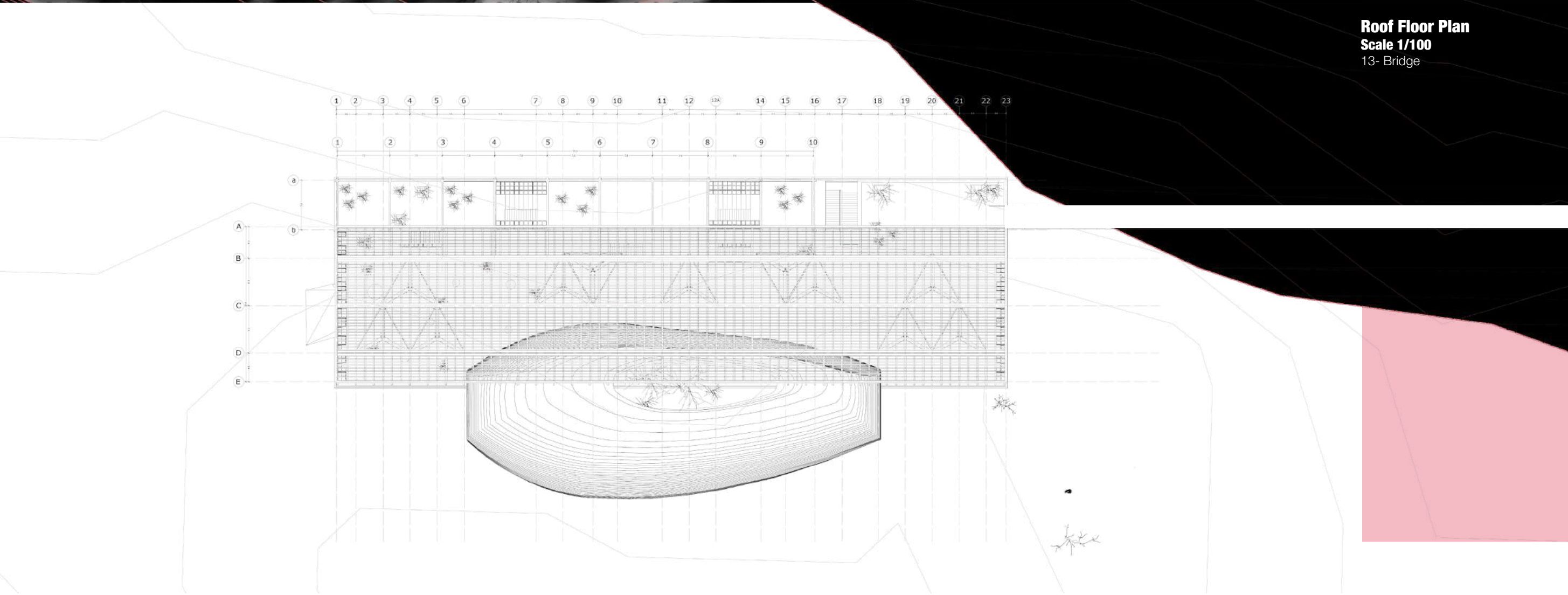
## ROOF FLOOR

### PLAN

Axonometric Plan Section  
Scale 1/100

The structure includes facilities for the whole development project, where a common is situated under the roof, next to a stone structure where open and wet kitchens are provided to make the experience much more exciting and make food would be grown on-site, as well as a roof terrace where it is connected to a bridge to create a promenade into the heart of the old quarry.

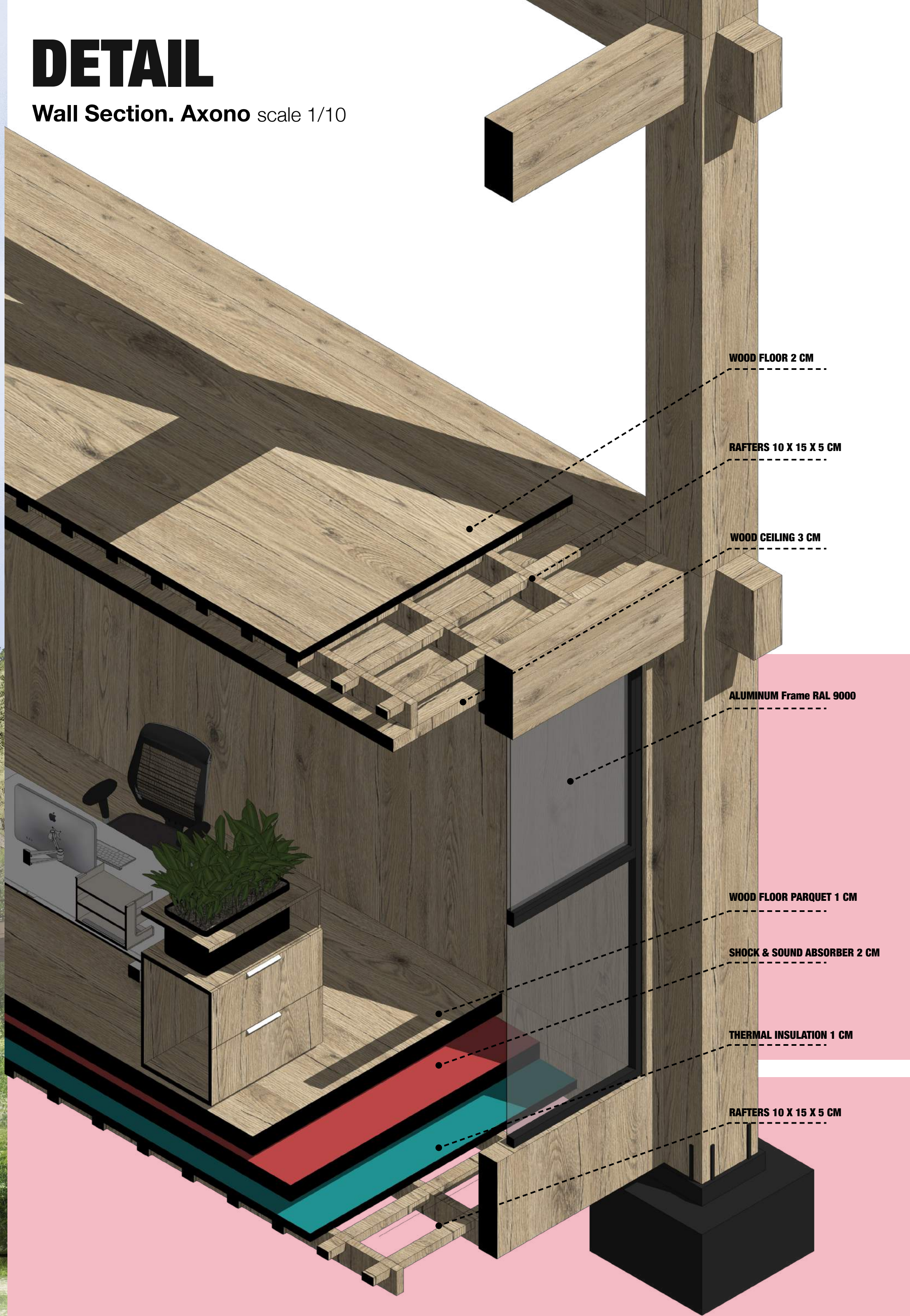
Roof Floor Plan  
Scale 1/100  
13- Bridge



# SERENITY

## DETAIL

Wall Section. Axono scale 1/10



WOOD FLOOR 2 CM

RAFTERS 10 X 15 X 5 CM

WOOD CEILING 3 CM

ALUMINUM Frame RAL 9000

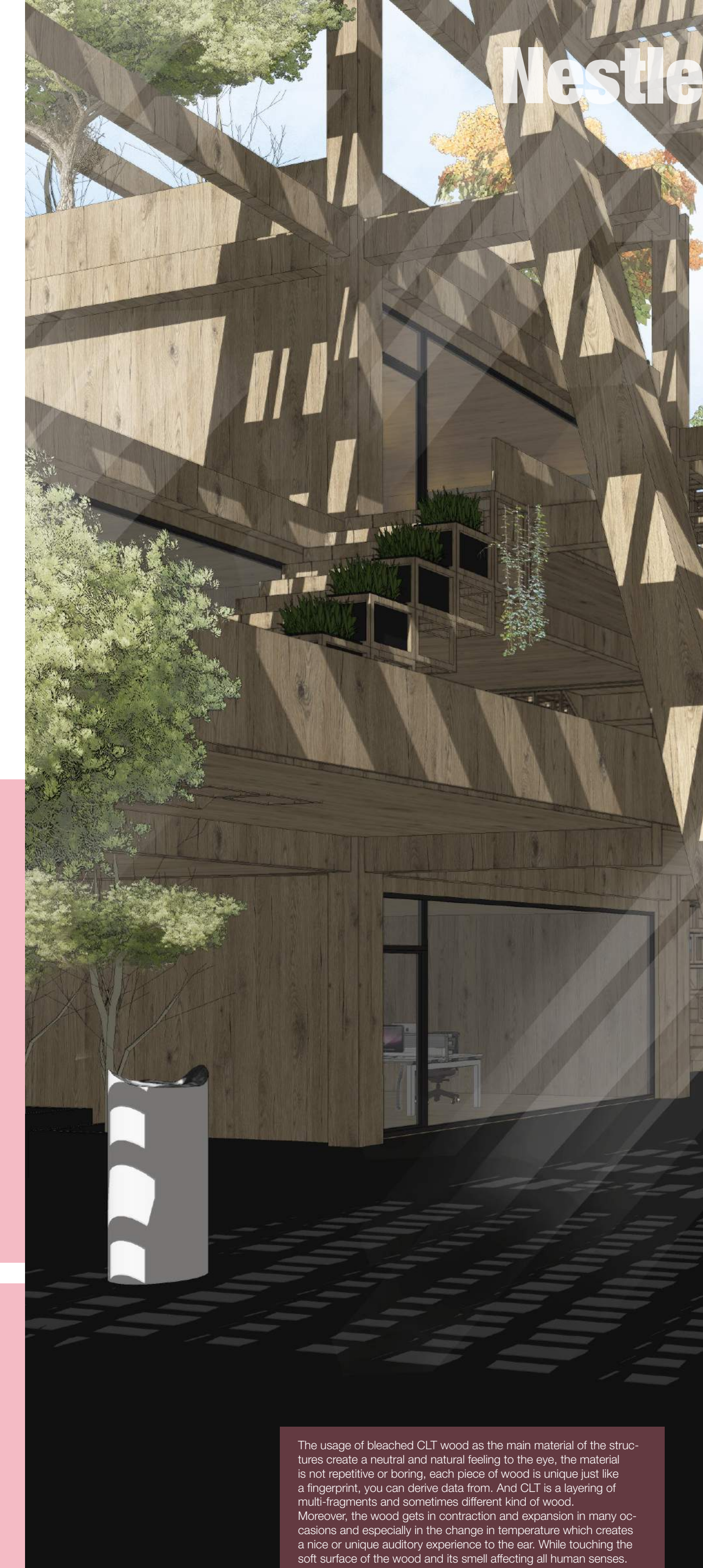
WOOD FLOOR PARQUET 1 CM

SHOCK & SOUND ABSORBER 2 CM

THERMAL INSULATION 1 CM

RAFTERS 10 X 15 X 5 CM

Part of the structure is a bridge connecting it with the hill as a promenade in the site which is gradually leveling up with terraces till it reached one of the platforms in the site where one constructs the journey in the site via the Forest Generator and a regular board walk which connects the platforms and supply them with water and electricity.



# Nestle

The usage of bleached CLT wood as the main material of the structures create a neutral and natural feeling to the eye, the material is not repetitive or boring, each piece of wood is unique just like a fingerprint, you can derive data from. And CLT is a layering of multi-fragments and sometimes different kind of wood. Moreover, the wood gets in contraction and expansion in many occasions and especially in the change in temperature, which creates a nice or unique auditory experience to the ear. While touching the soft surface of the wood and its smell affecting all human senses.



# INNOVATE & PRODUCE

## PLATFORMS

The symbolic meaning of 3 arches MANDALOUN is a cultural heritage that is derived from ancient history in the area. Working with odd and prime numbers in the architectural language is something significant in the vernacular architecture in the Region, as well as the idea of differentiating spaces in a structure, that is creating private spaces (Night Area) as privacy really matters in this culture, as well as a semi-private (Day Area) where guests are welcomed and the public area or a terrace to enjoy nature. Therefore, I wanted to transform these notions into embedded structures in the mountains just like the old monks used to escape to the caves in the height mountains and valleys. The "platforms" are democratic spaces which the entrepreneurs could exploit in the site space which provides a good start of a business that is going to be shared with many other people during a time frame. The 3 Venetian arches are common in Lebanese houses, hence a cross vault could carry lots of abstraction and be able to transform into parametric architectural components, as a result, I have derived the roof of the platforms from connecting main structural anchors in the cross vault, as well as dividing the plan into three different spaces that will provide the people various usage of the spaces. N.B. The platforms are the second phase of the development.



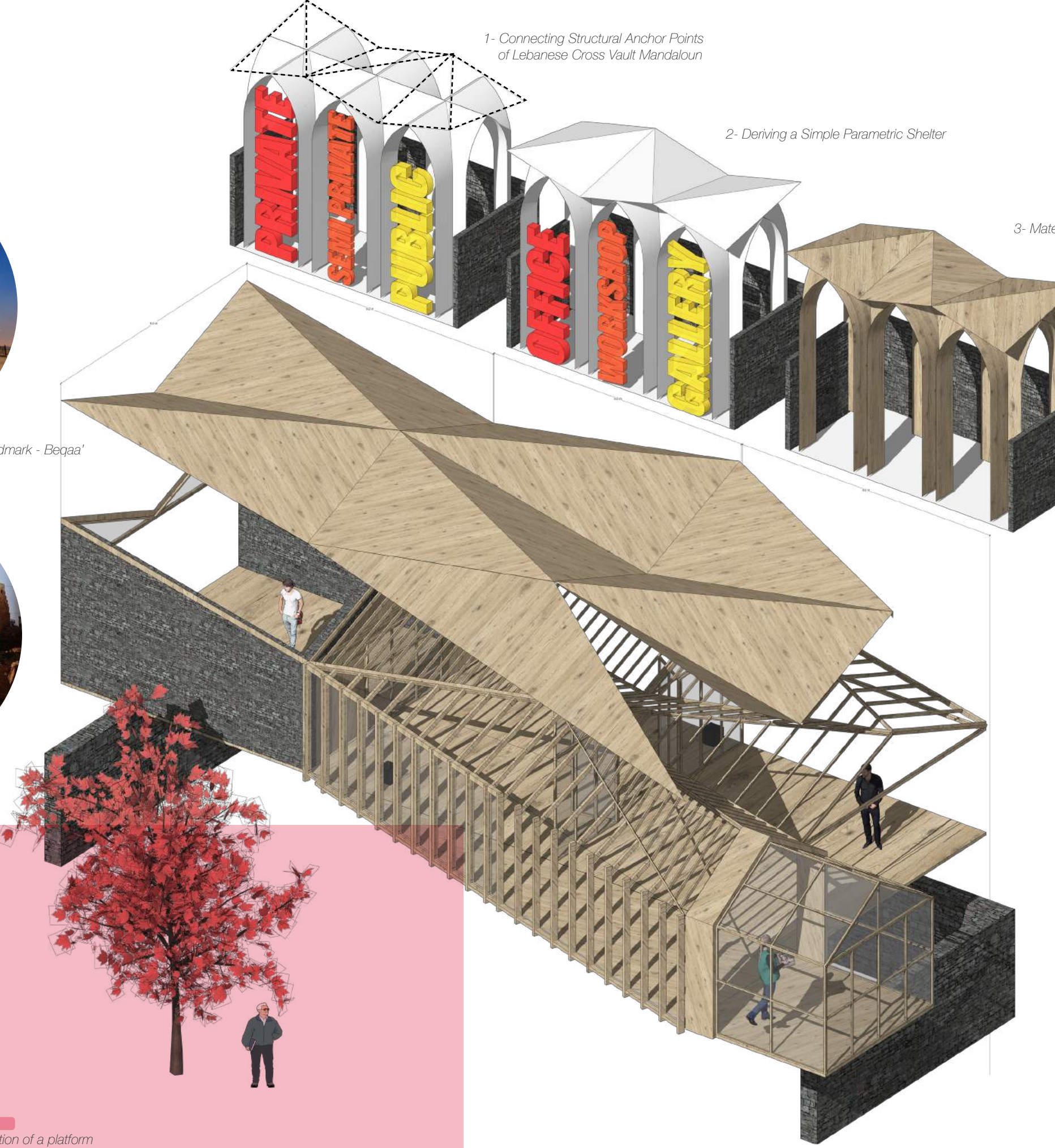
Roman treasury Landmark - Baalbek



Artifact - Baalbek



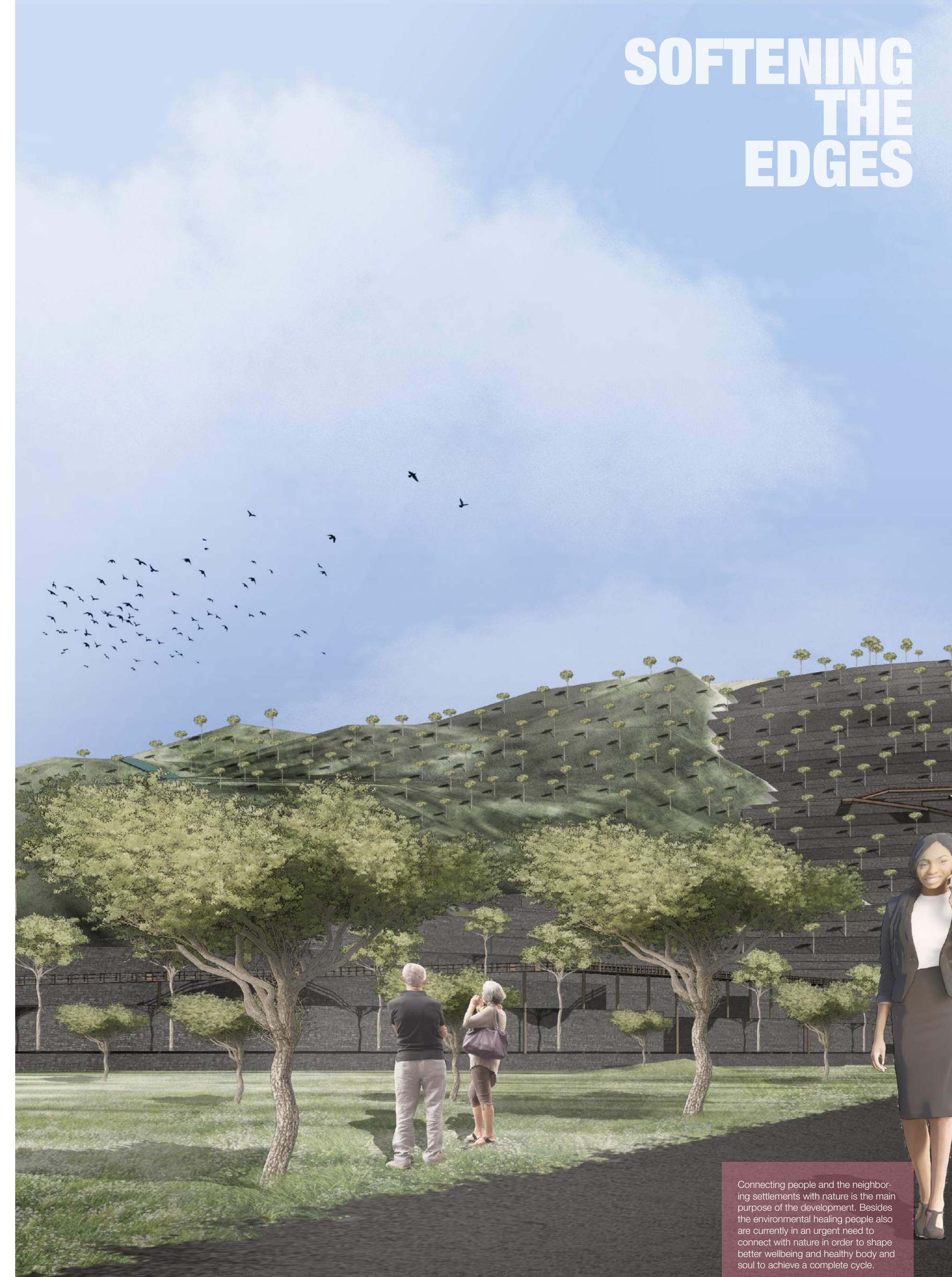
Symbolic representation of a platform



1- Connecting Structural Anchor Points of Lebanese Cross Vault Mandaloun

2- Deriving a Simple Parametric Shelter

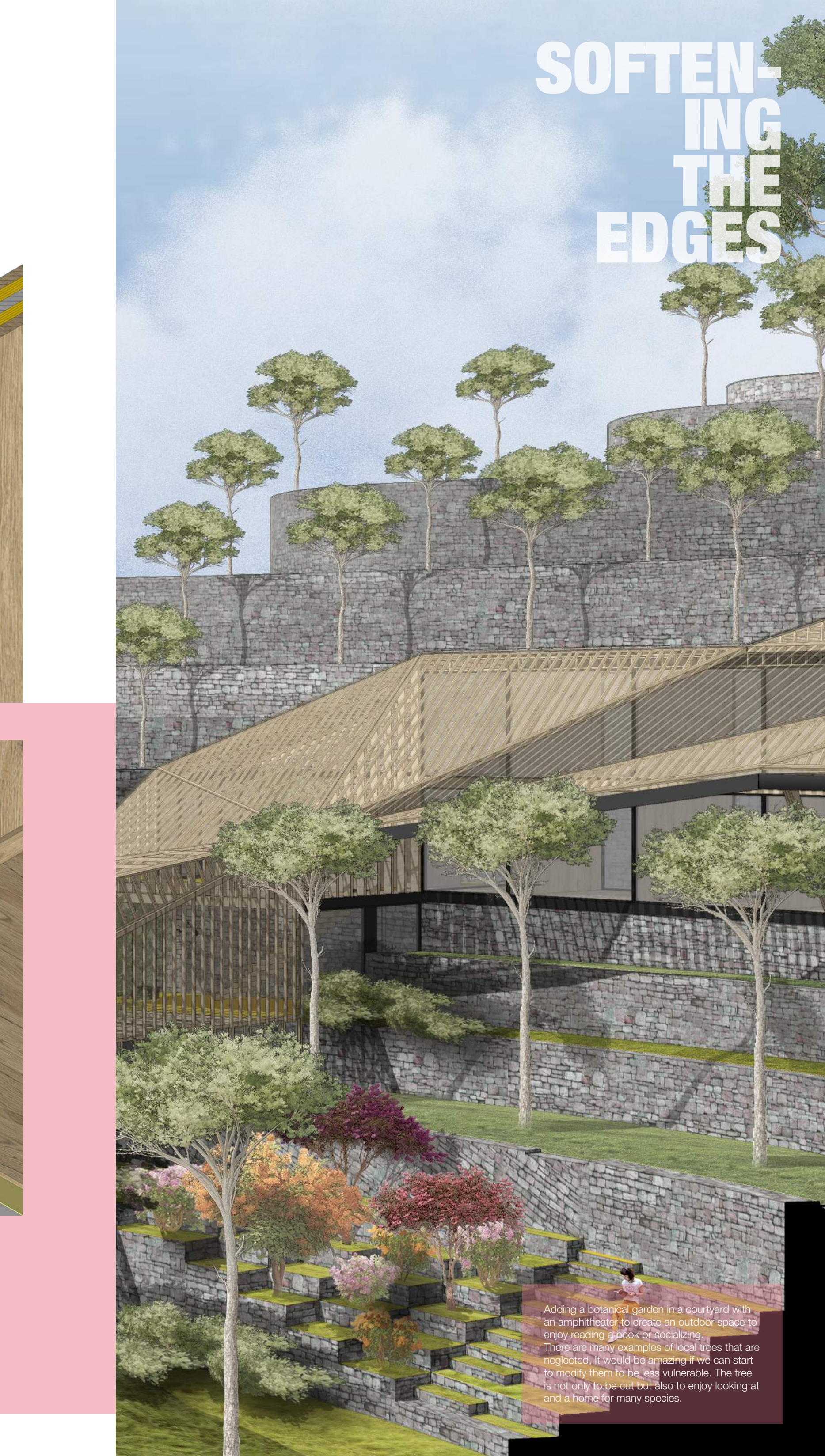
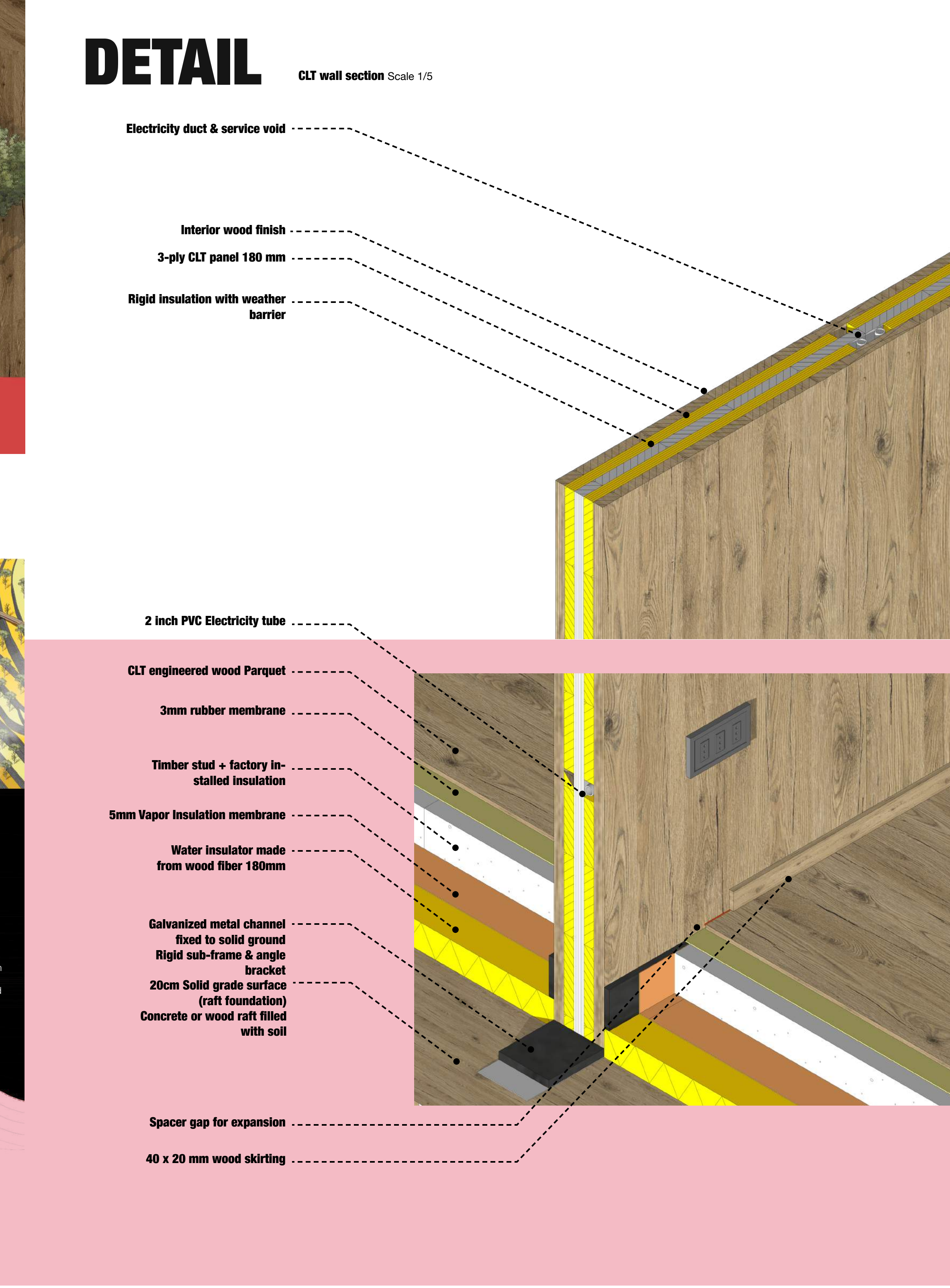
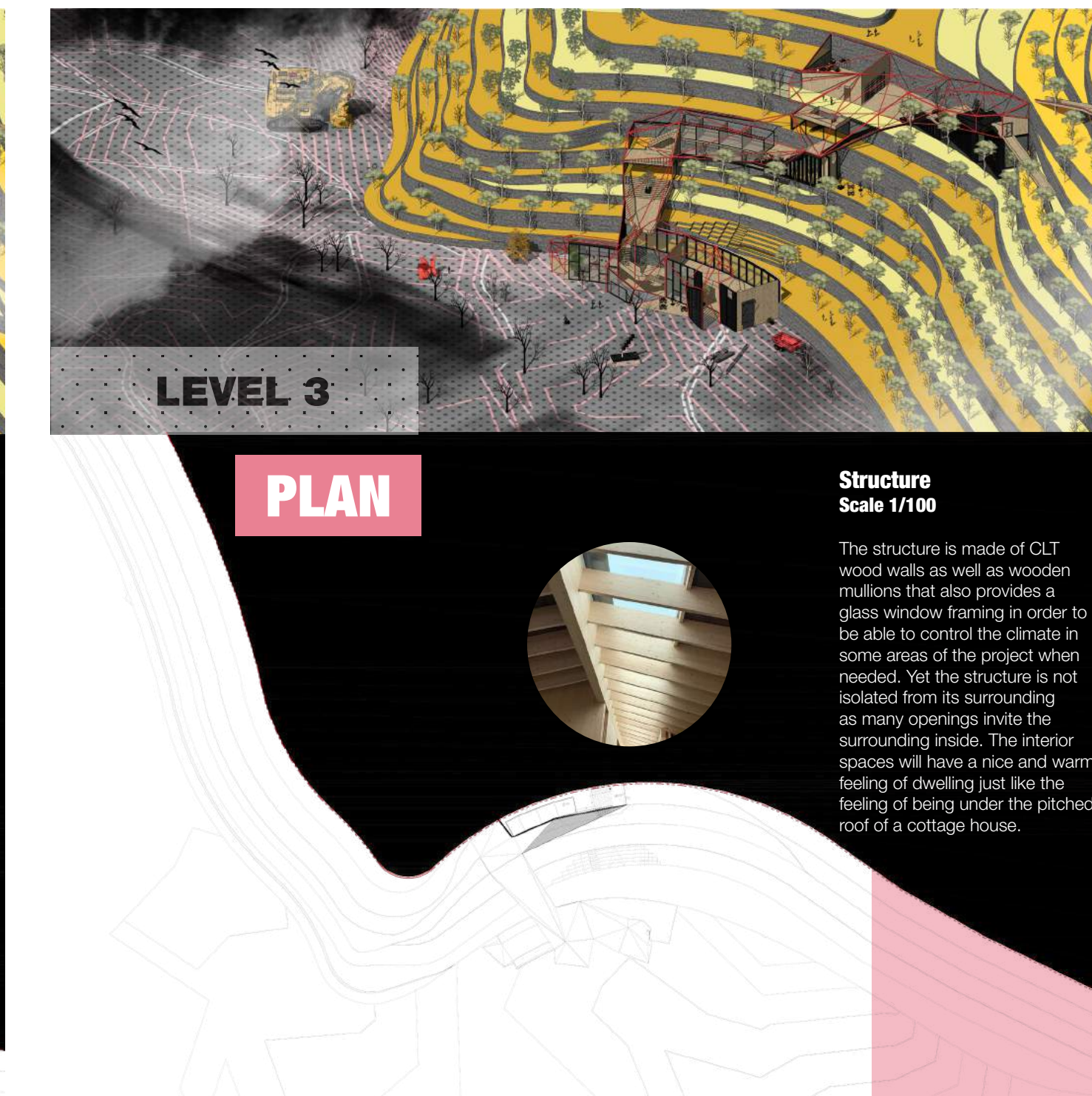
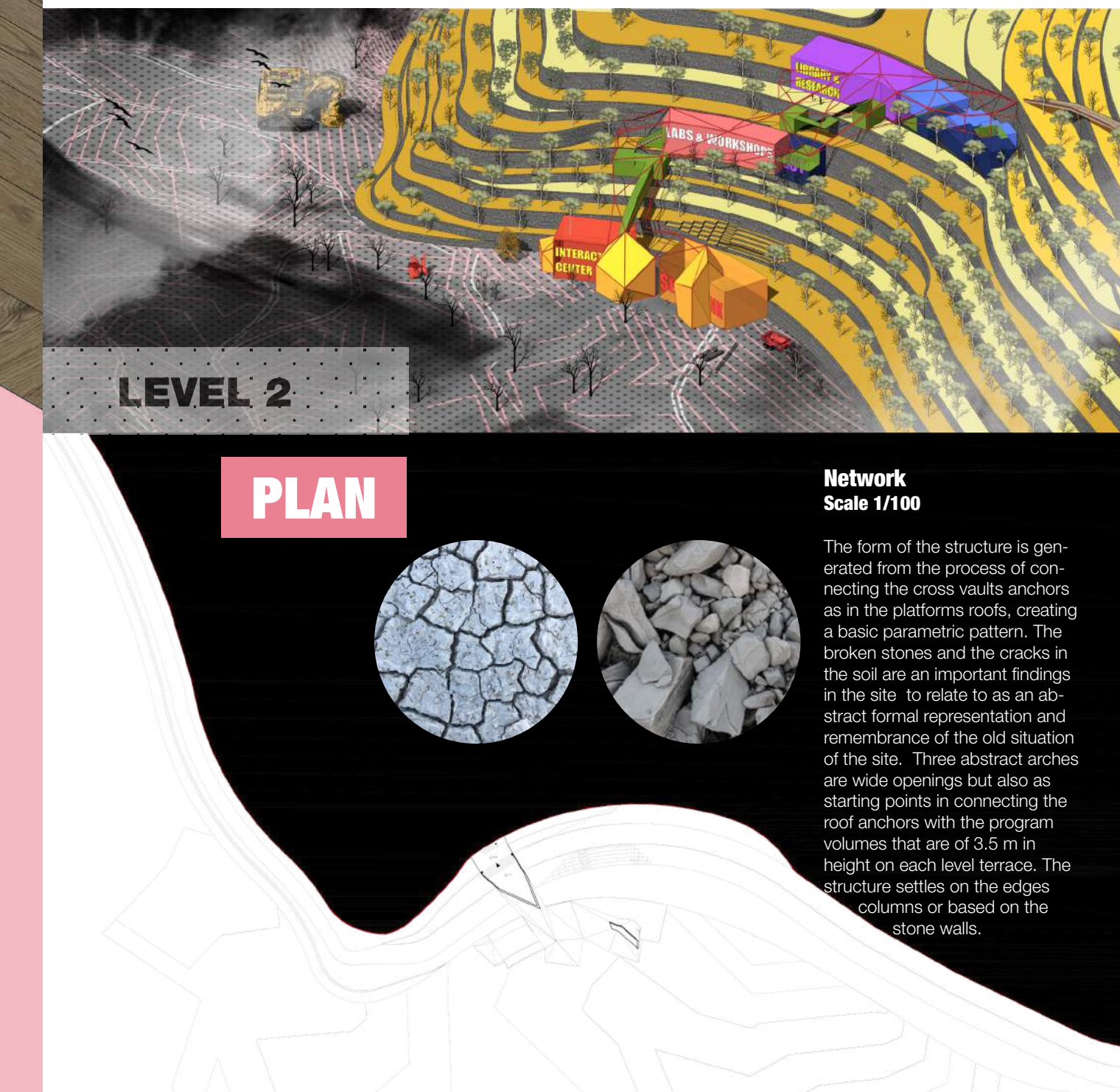
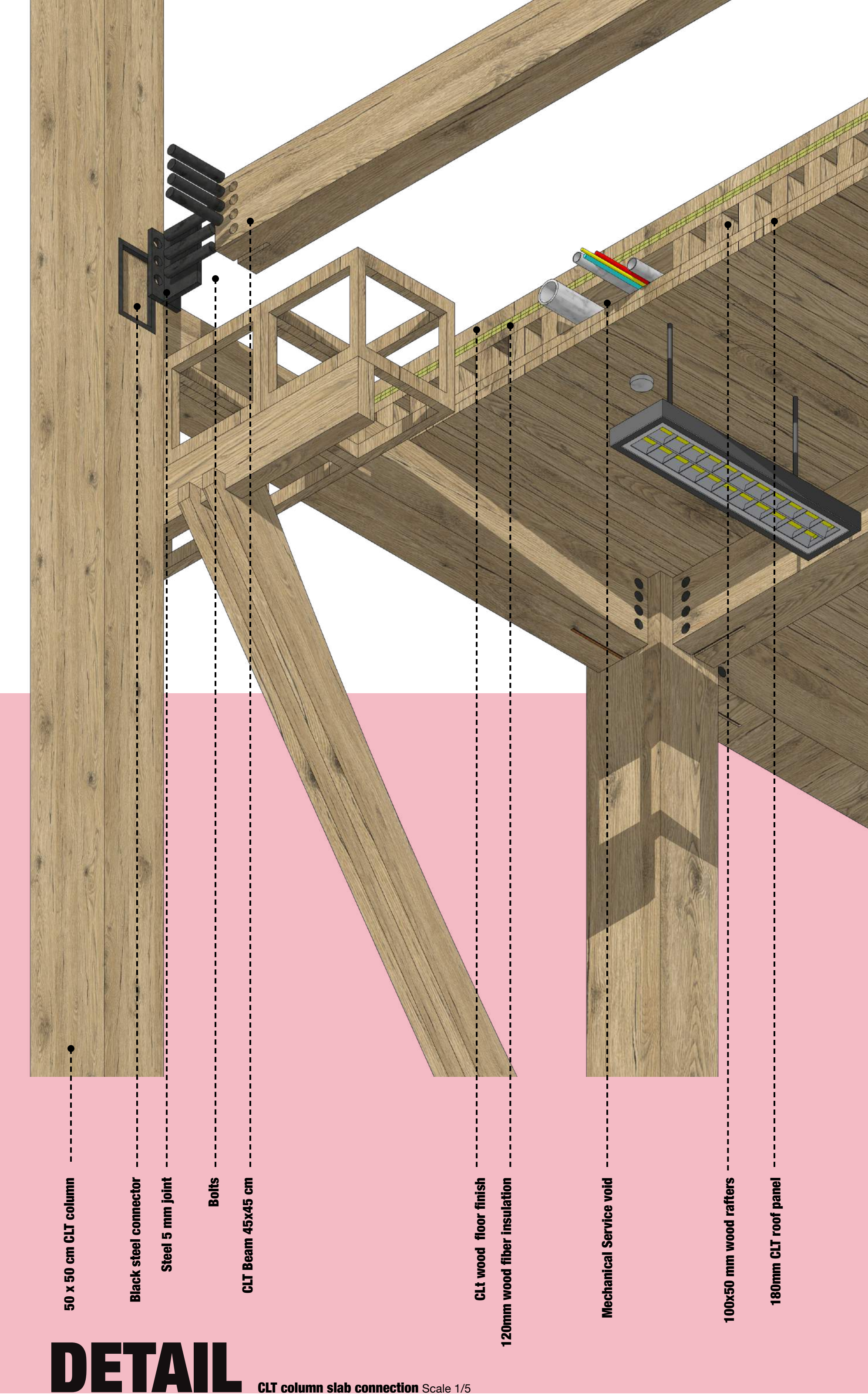
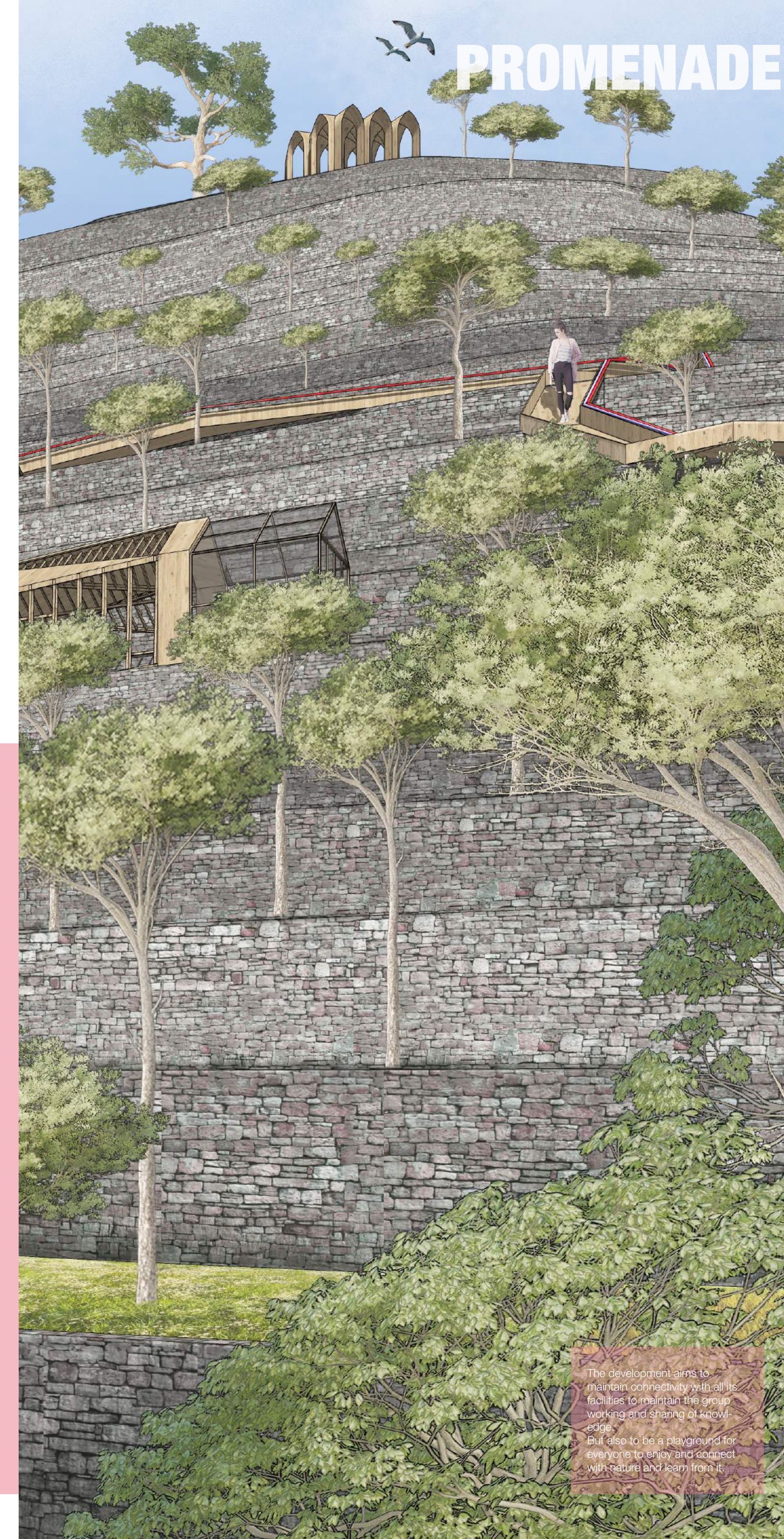
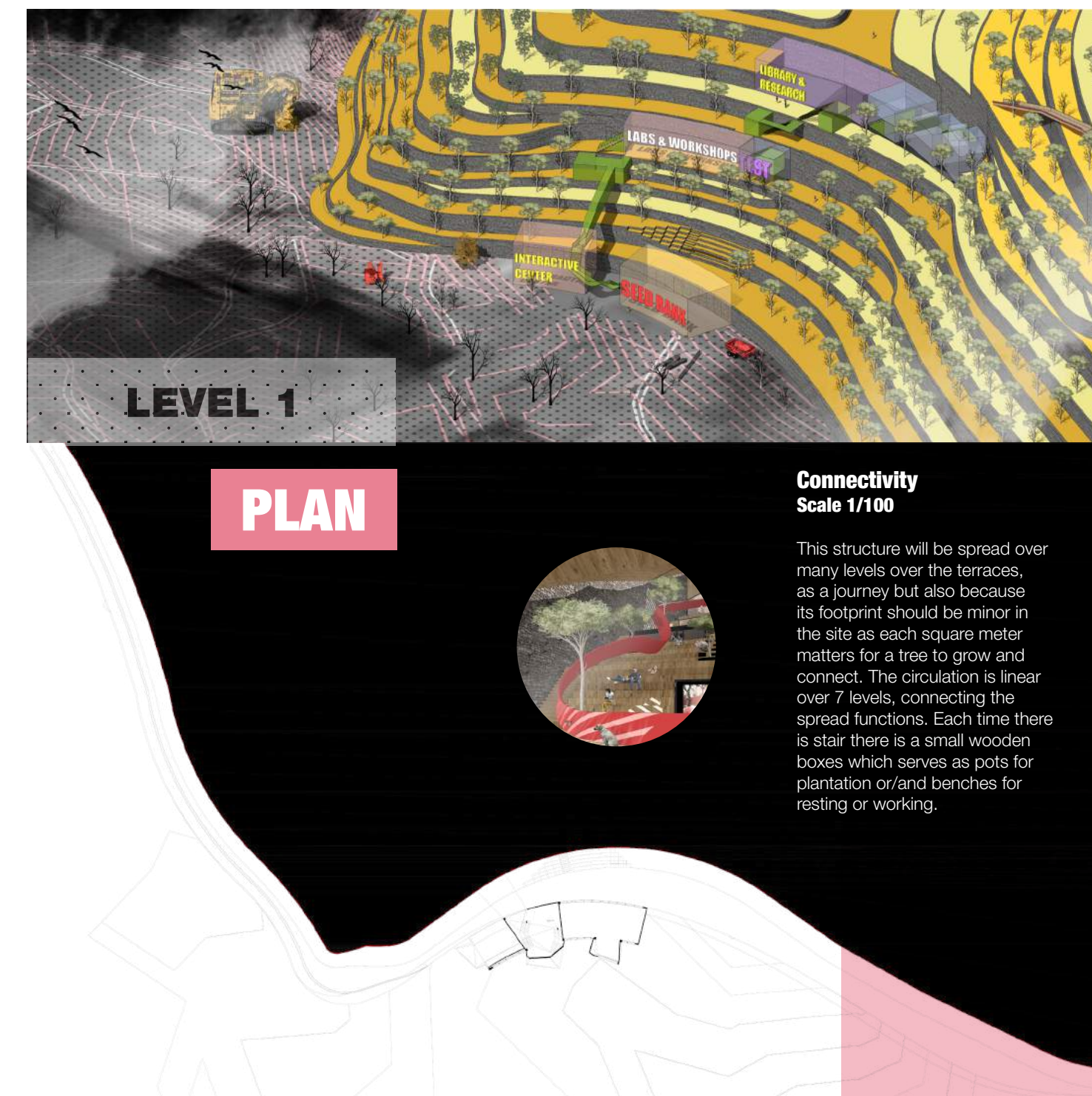
3- Materialization



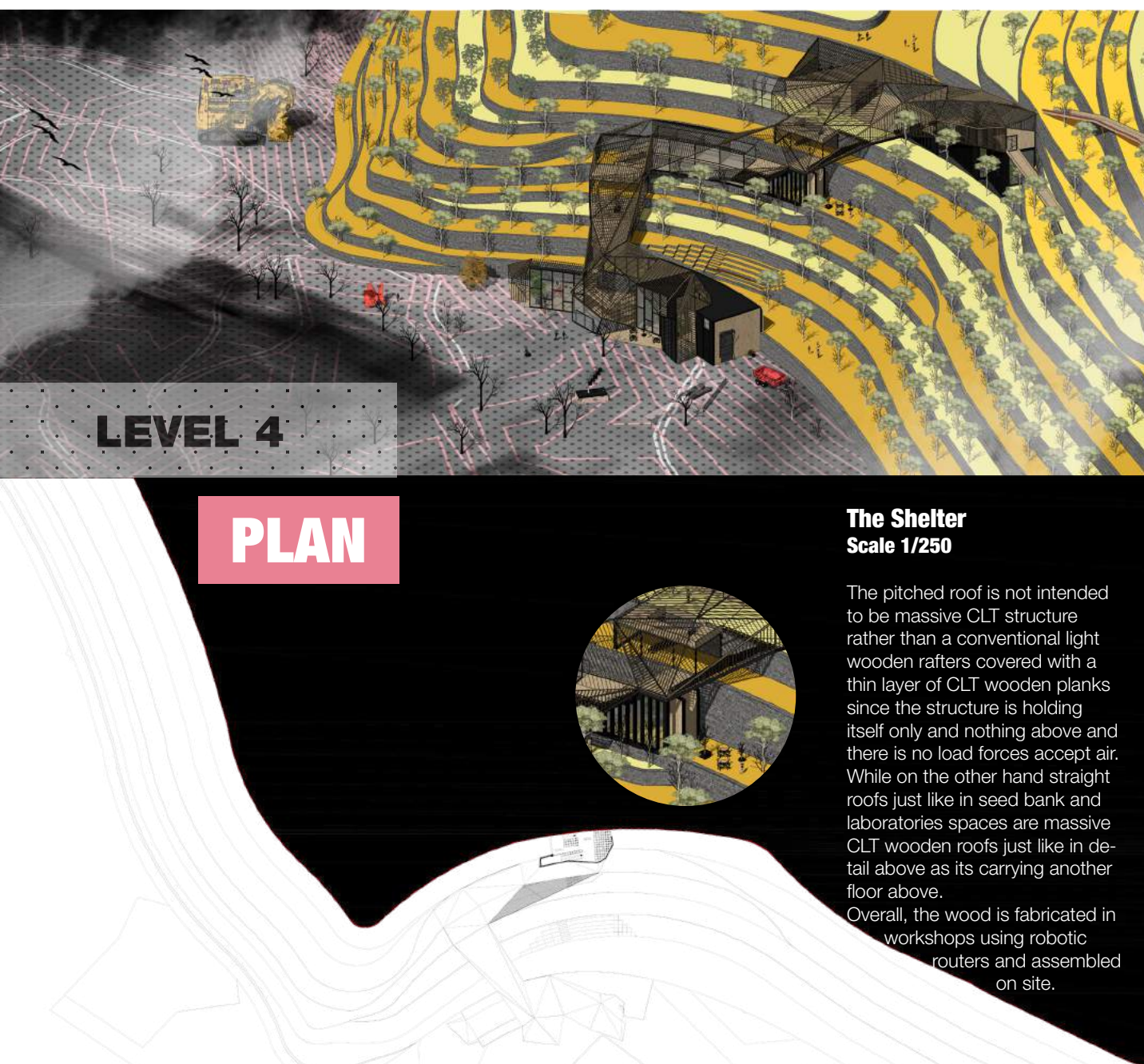
# SOFTENING THE EDGES

Connecting people and the neighboring settlements with nature is the main purpose of this development. Besides the environmental healing people also are currently in an urgent need to connect with nature in order to shape better wellbeing and healthy body and soul to achieve a complete cycle.





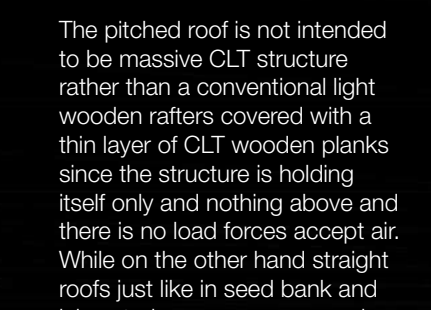




LEVEL 4

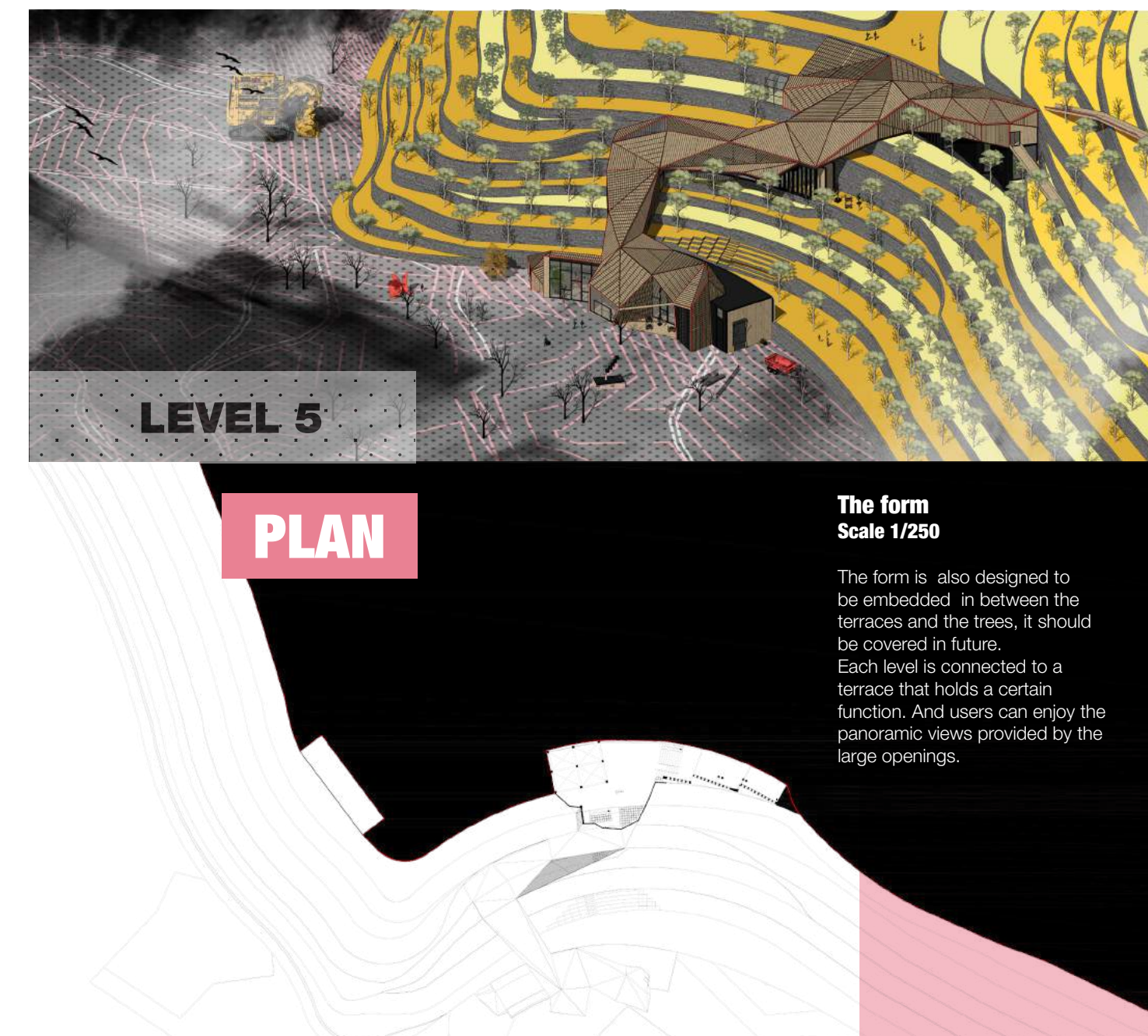
PLAN

The Shelter  
Scale 1/250



The pitched roof is not intended to be massive CLT structure rather than a conventional light wooden rafters covered with a thin layer of CLT wooden planks since the structure is holding itself only and nothing above and there is no load forces except air. While on the other hand straight roofs just like in seed bank and laboratories spaces are massive CLT wooden roofs just like in detail above as its carrying another floor above.

Overall, the wood is fabricated in workshops using robotic routers and assembled on site.



LEVEL 5

PLAN

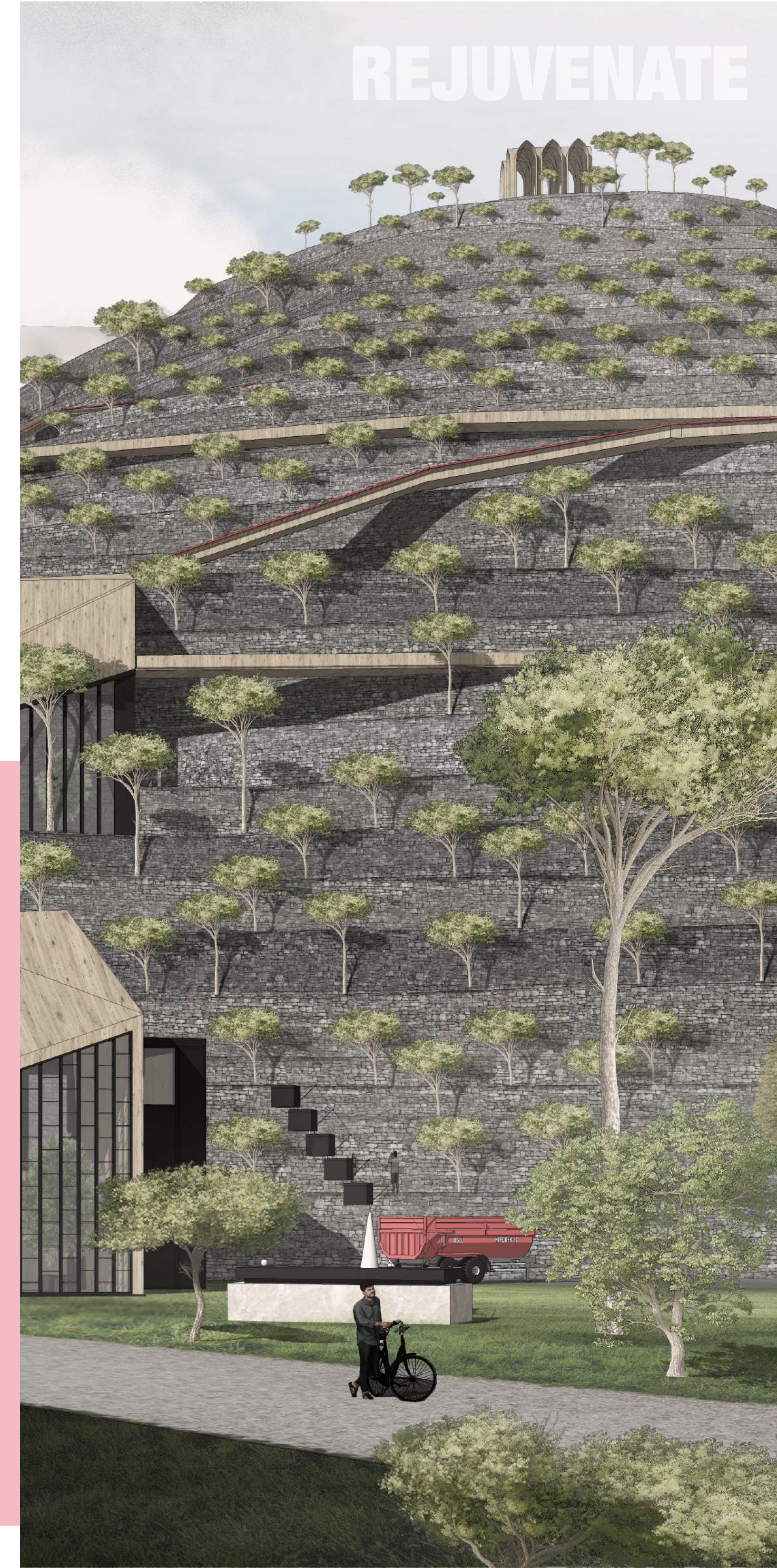
The form  
Scale 1/250

The form is also designed to be embedded in between the terraces and the trees, it should be covered in future. Each level is connected to a terrace that holds a certain function. And users can enjoy the panoramic views provided by the large openings.

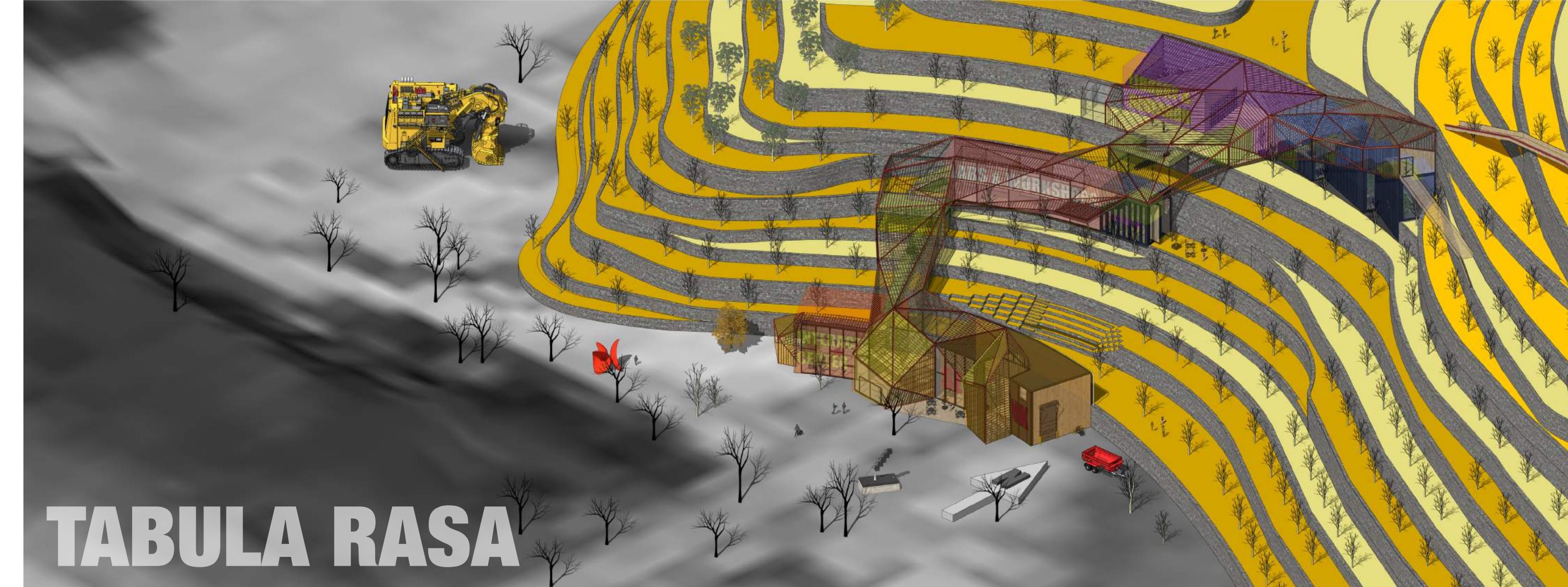
The porosity in this structure is also present to create the experience of in & out. The wood knots that work as plant bases are also like filling to the users, they maintain their yellow color and gradual transitions in the structure.



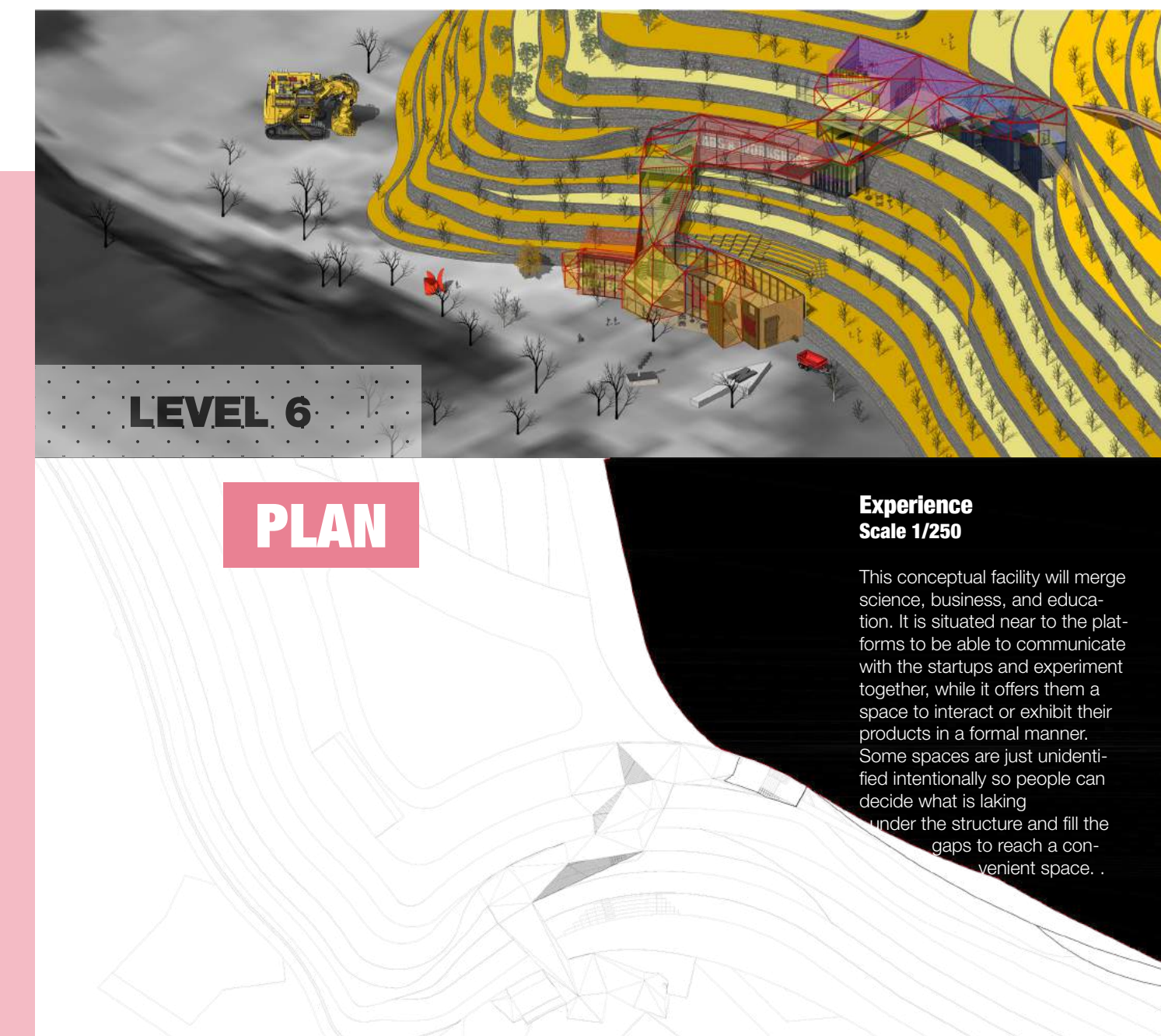
GEODESIC



REJUVENATE



TABULA RASA



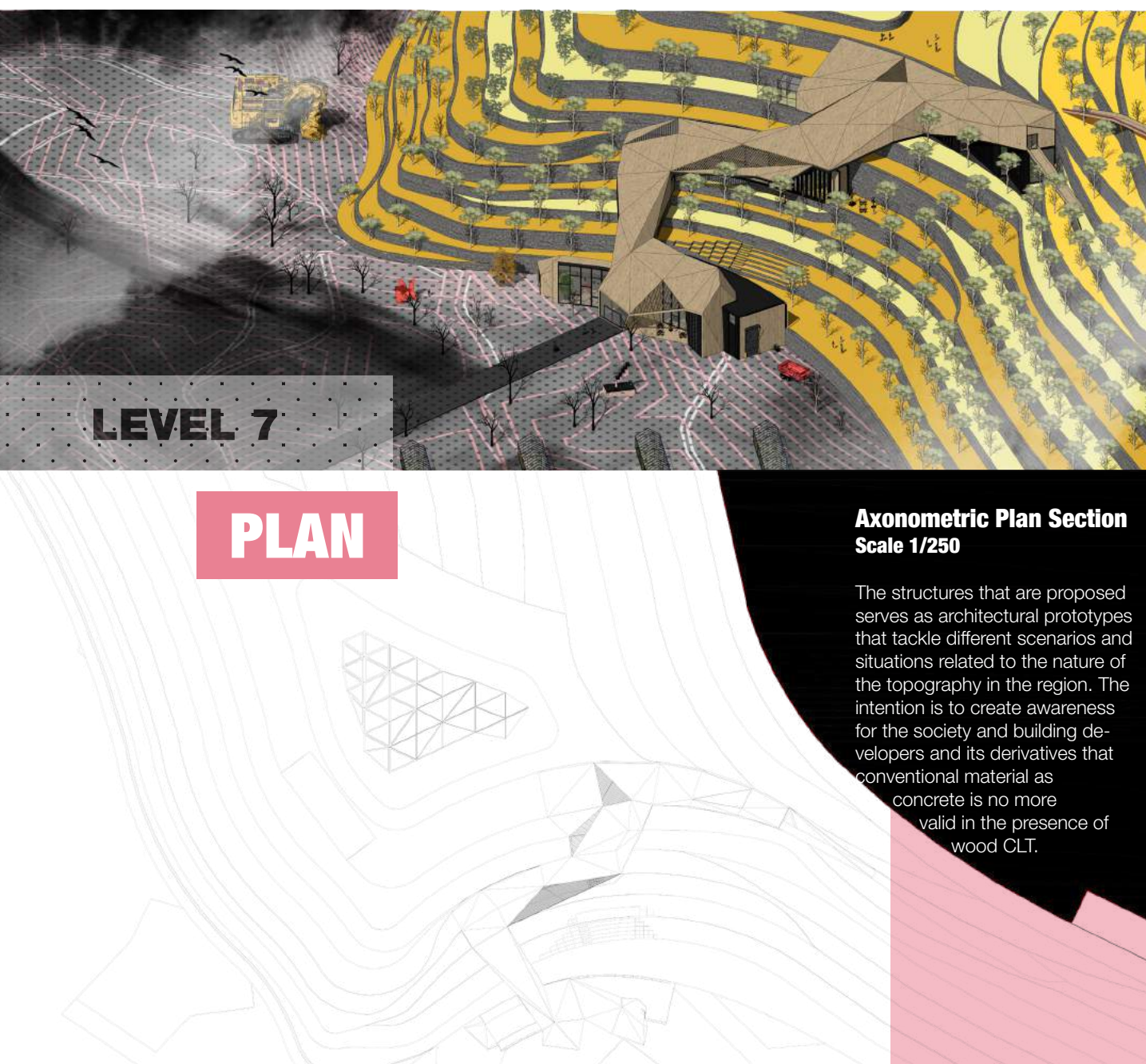
LEVEL 6

PLAN

Experience  
Scale 1/250

This conceptual facility will merge science, business, and education. It is situated near to the platform to be able to communicate with the startups and experiment together, while it offers them a space to interact or exhibit their products in a formal manner. Some spaces are just unidentified intentionally so people can decide what is taking under the structure and fill the gap with their own content space.

The porosity in this structure is also present to create the experience of in & out. The wood knots that work as plant bases are also like filling to the users, they maintain their yellow color and gradual transitions in the structure.



LEVEL 7

PLAN

Axonometric Plan Section  
Scale 1/250

The structures that are proposed serves as architectural prototypes that tackle different scenarios and situations related to the nature of the topography in the region. The intention is to create awareness for the society and building developers and its derivatives that conventional material as concrete is no more valid in the presence of wood CLT.

The porosity in this structure is also present to create the experience of in & out. The wood knots that work as plant bases are also like filling to the users, they maintain their yellow color and gradual transitions in the structure.

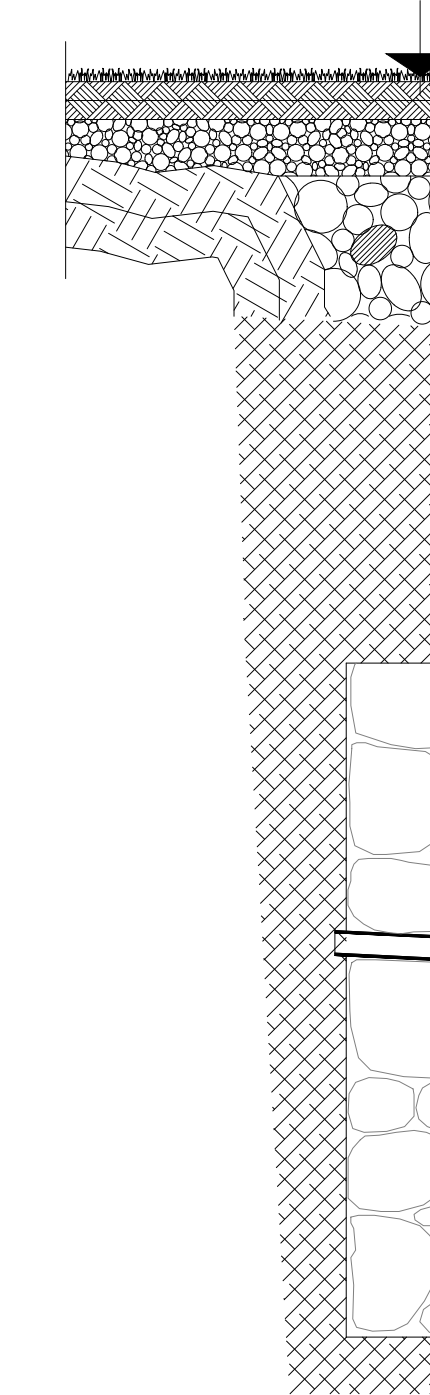


RESILIENCE



Old Phoenician big stone walls used to be backed up by Granite columns to reinforce the structure from any natural cataclysmic events.

Load bearing stone wall detail.  
Soil Level



Soil 15-25 cm minimum  
Gravel 25 cm  
Pebbles stones 50 cm  
Natural fill  
Interlocked stones  
Water pipe channel and reinforcement, made from copper.  
Water duct drainage cavity

This perspective section shows the interaction happening between the structure and the terraces on one hand, and the relationship between inside and outside on the other. Moreover it also shows the lightness of the roofing system where 180mm x 100mm rafters are covered with 25 mm CLT plywood that are engineered and cut to fit and fixed with spiral bolts.

Thank you!