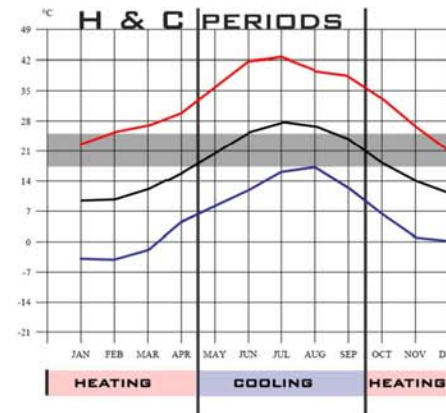


ZERO EMISSIONS SOLAR HOUSE IN ATHENS



SCENARIO

This project concerns the design of a zero carbon dwelling in the centre of Athens. The three bedroom dwelling will host a typical Greek family of four people and will also include a working space.

THE CLIMATE

Greece has a hot and dry climate combined with an extended heating period. During the summer, natural ventilation and vegetation will provide natural cooling. During the winter, passive solar heating is incorporated in the design with the use of the sunspace, the morphology of the volumes and the size of the glazing facades.

ARRANGEMENT

The arrangement of the house is formed around a central atrium based on the vernacular architecture of the Mediterranean. The main spaces of the house are located around a central atrium taking advantage of its lighting and thermal effect. The atrium in-between the enclosed spaces of the house makes cross ventilation possible, improves the microclimate and allows daylight to penetrate the northern rooms. The living room and the working space of the house are located towards south. The bedroom and the



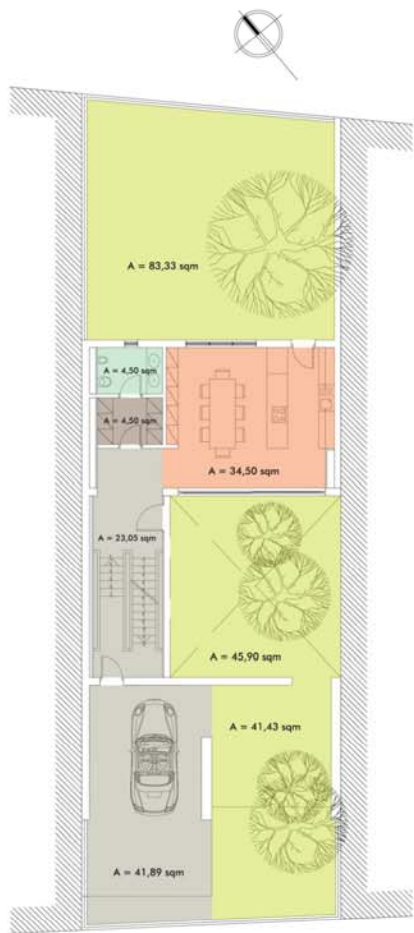
BASEMENT

GROUND FLOOR

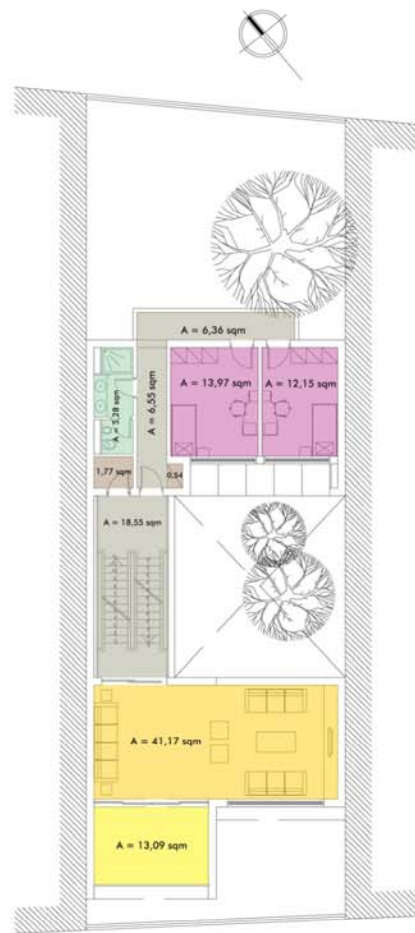
1ST FLOOR

2ND FLOOR

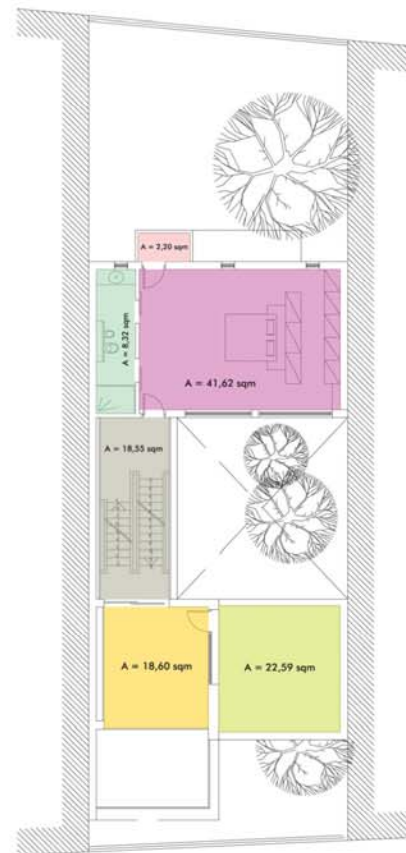
ZERO EMISSIONS SOLAR HOUSE IN ATHENS



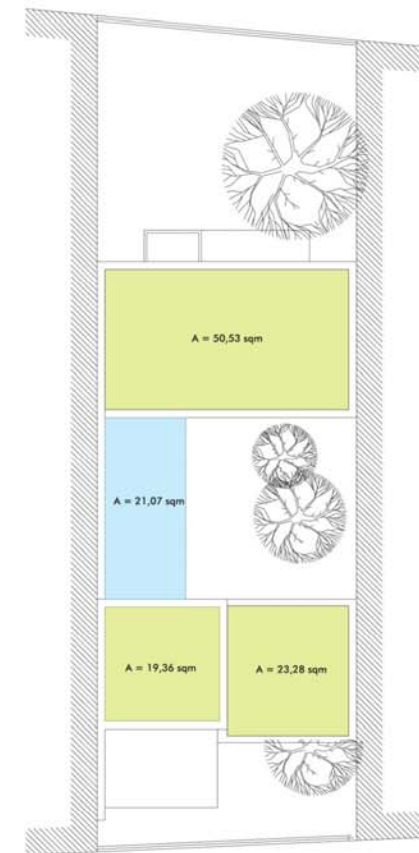
GROUND FLOOR



1ST FLOOR

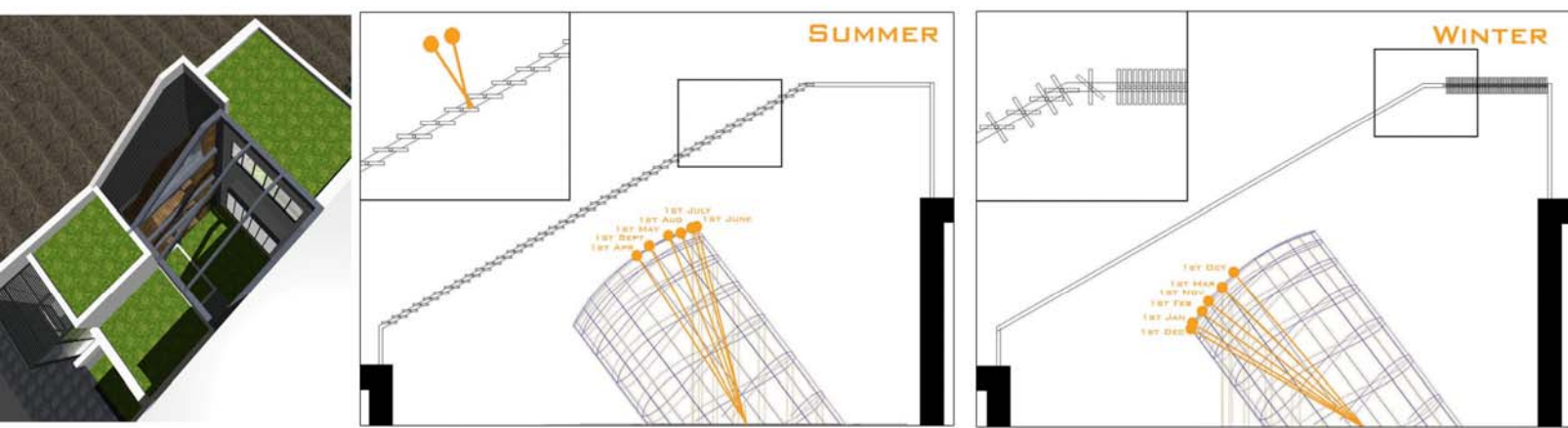


2ND FLOOR



UPPER PLAN

ZERO EMISSIONS SOLAR HOUSE IN ATHENS



LIGHTING STRATEGIES:

- Atrium
- Window sizes (S-N)
- Double height living room
- Morphology of the volumes
- Glazing ceiling

LIGHTING:

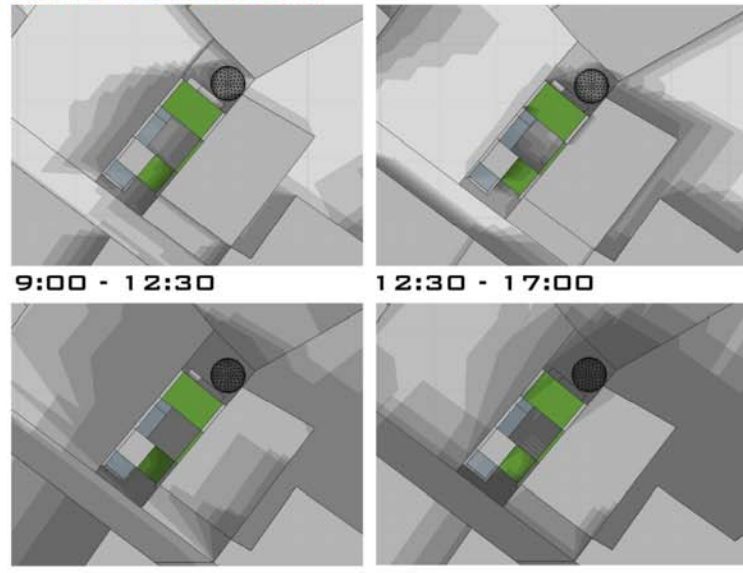
Taking those cases as a meter of evaluation, the building is designed in a way that will allow sunlight to penetrate the atrium and the northern spaces of the dwelling.

Furthermore, the windows facing the sun are equipped with louvers that can completely shade their area or slide to allow visual contact to the outside. The same technique is used to the atrium.

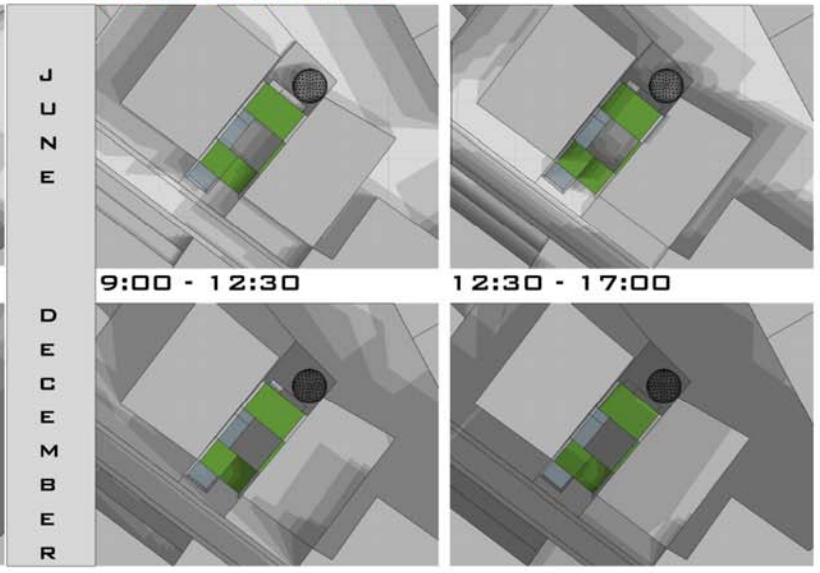
SHADOW ANALYSIS

Shadow analysis was conducted for two extreme cases. The first is the current situation with the surrounding buildings in current heights. The second case is the worst case where all the surrounding buildings are replaced with new ones built up to the maximum permitted height.

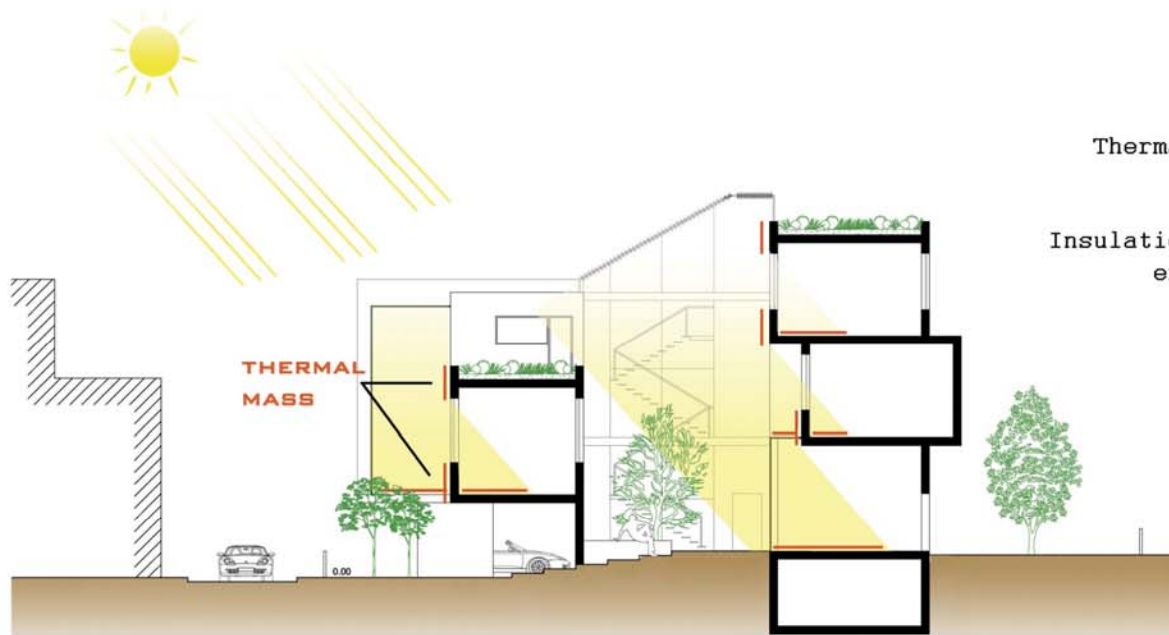
CASE 1: CURRENT



CASE 1: FUTURE



ZERO EMISSIONS SOLAR HOUSE IN ATHENS



HEATING:

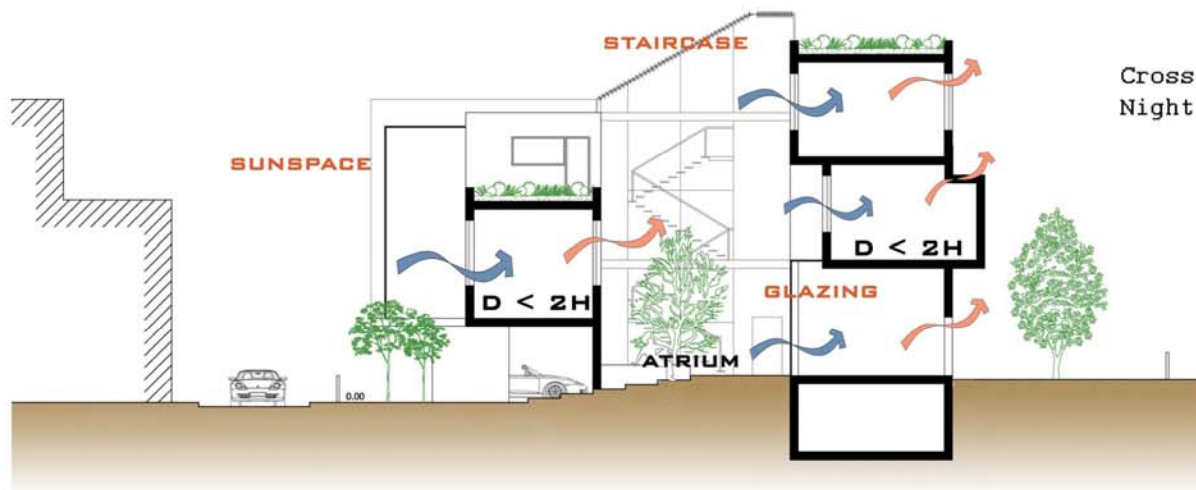
Sunspace
 Thermal mass (to floors and walls)
 Solar radiation
 Insulation (low Uvalues at the envelope) - green roofs
 PV panels

COOLING:

Cross ventilation will provide comfort during days that external temperatures are not too high. Additionally, natural ventilation will introduce chilled air from the atrium into the house. Furthermore, in the heart of the summer night ventilation will remove heat absorbed by thermal mass during daytime cooling the building down.

HEATING

During the winter period, solar radiation heats up the internal of the sunspace and the staircases providing heat to the rest of the house. Moreover, thermal mass absorbs heat during daytime to release it later in the night when it is most needed. Moreover, Super insulated walls and green roofs provide stable internal temperatures in contrast to the external temperature fluctuations.



COOLING:

Cross ventilation (natural)
 Night ventilation (combined with thermal mass)
 Vegetation
 Shading

ACTIVE MEANS

PV panels will provide hot water
 Ground source heat pumps will provide heating and cooling. The distribution will be done under floor with the circulation of water. The tank at the basement will gather rainwater that will be used in the toilets and for irrigation.

We would like to thank **TEAM 4** for the hospitality and the help throughout this workshop and especially **Adam Berler** for his guidance and useful advices



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