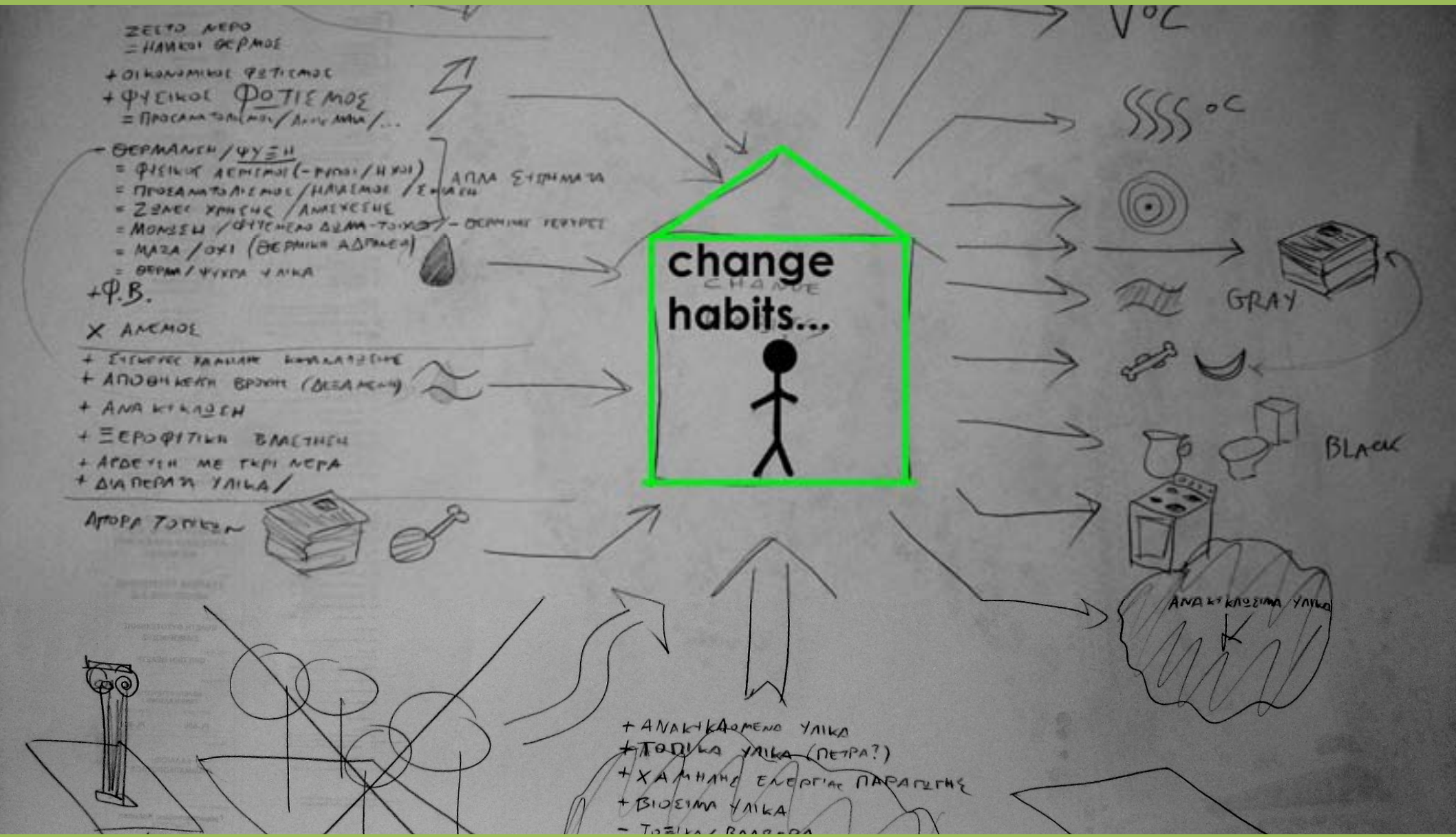
Designing a “green” Passive Solar House with Zero Carbon Emissions

ECOWEEK workshop



doxiadis+

Georgiadou Danai, Ilia Polytimi, Kottis Ioannis, Bitrou Maria, Sarantopoulou Georgia ,Christodoulou Eleni

Microclimate Analysis

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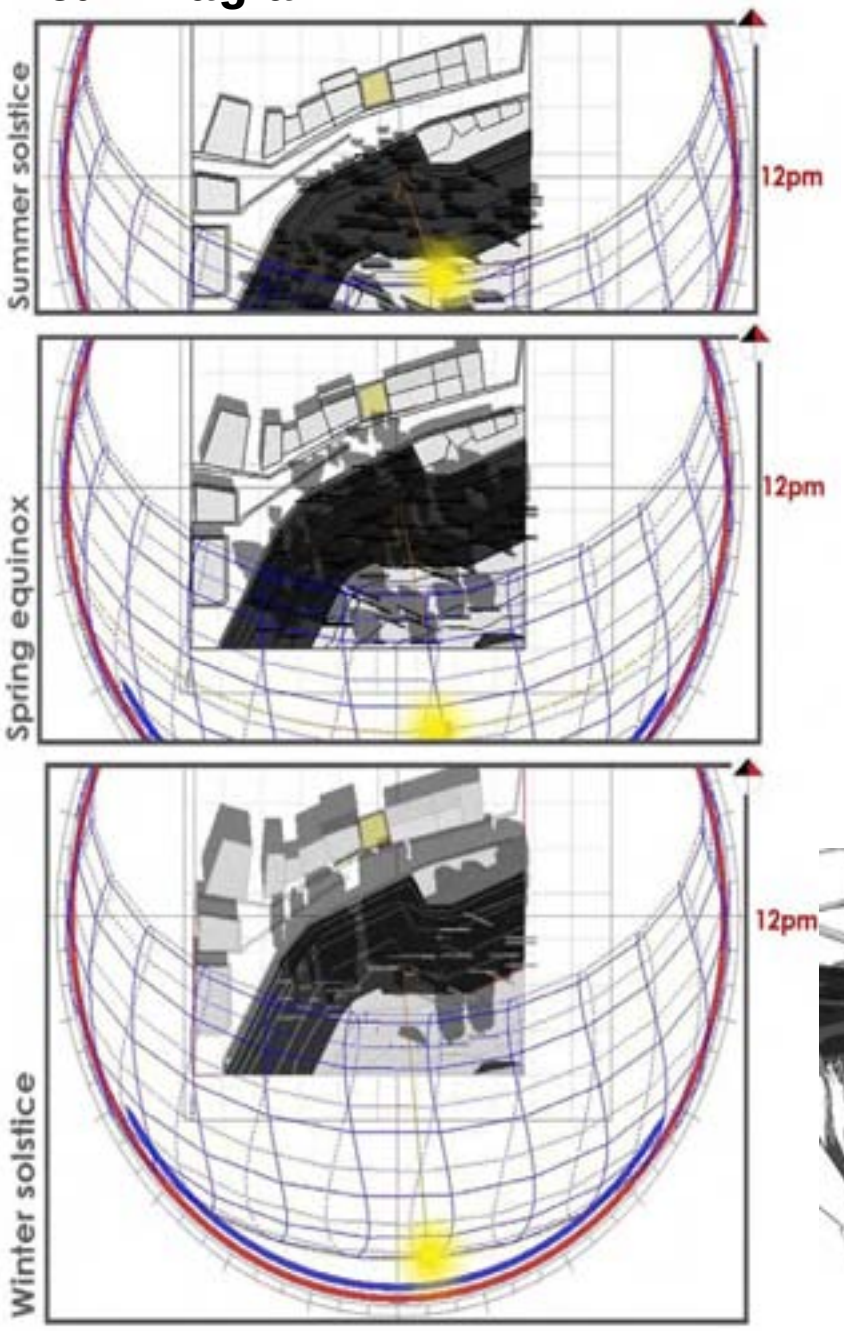
Sun Diagram



Orientation

South facing,
nearby Philopappos hill

Temperature

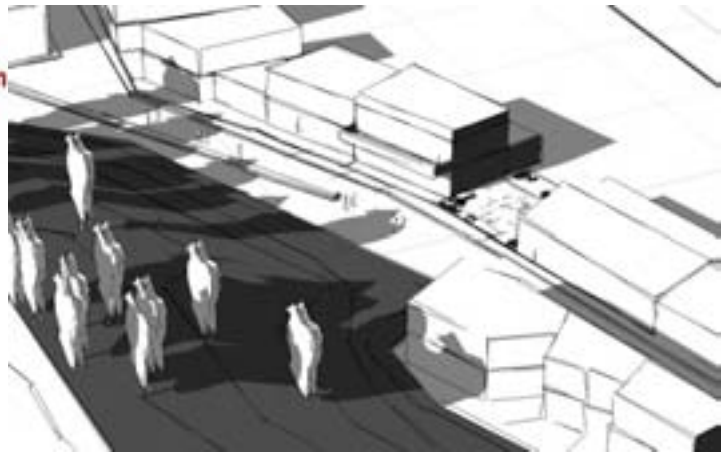
min 9°C(January),
max 28°C (July)

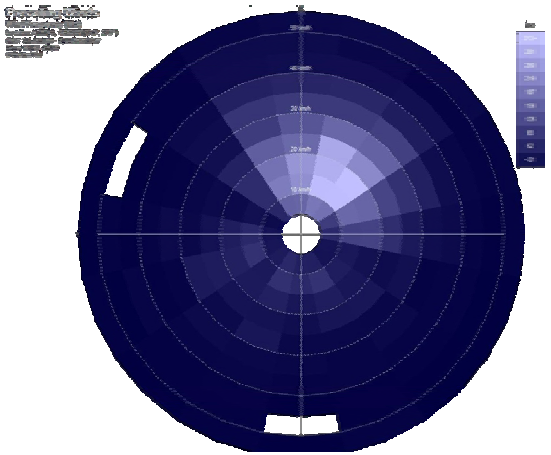
Rainfall

32mm per month on average

Prevailing Winds

North-East Winds





Solar Study

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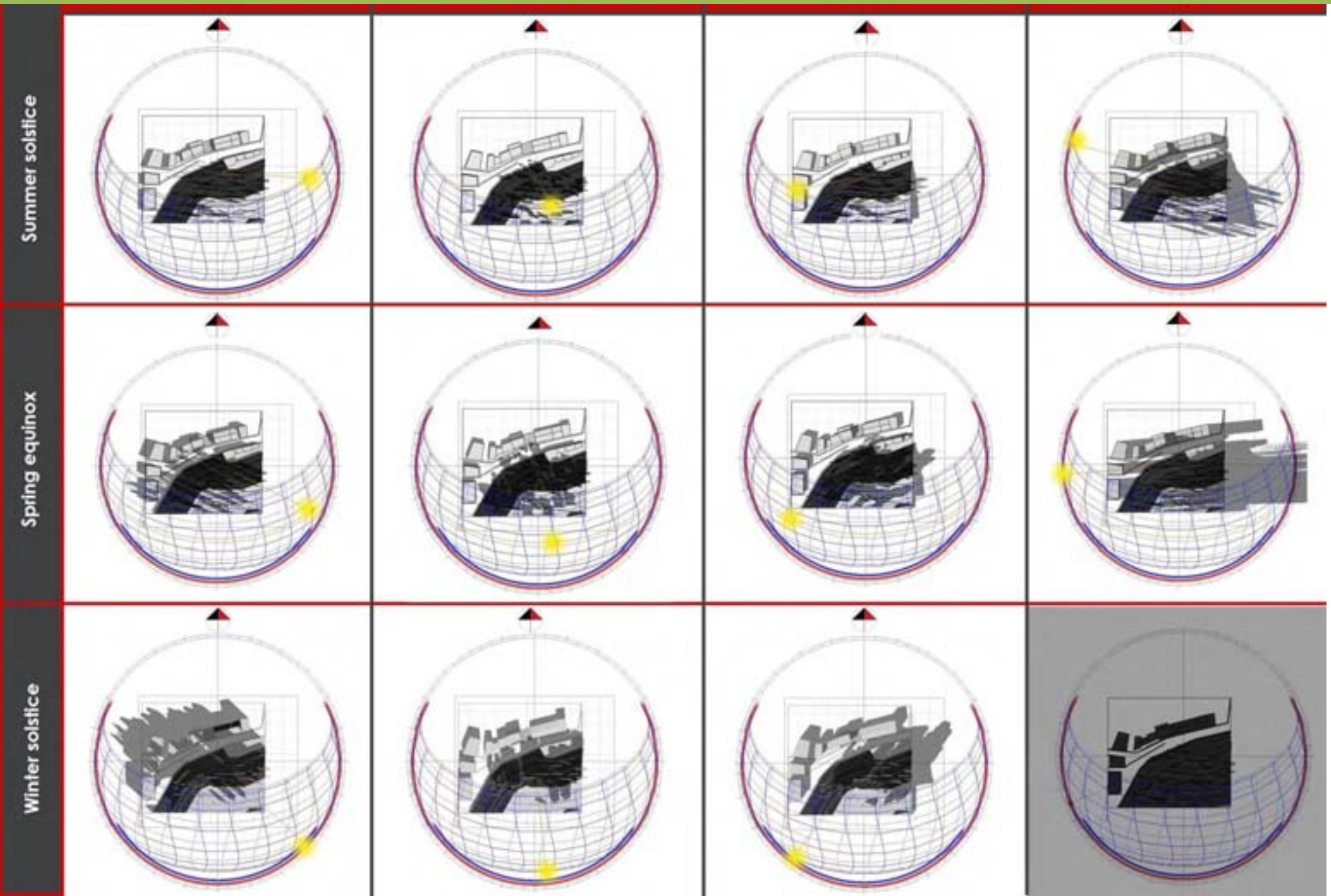

Summary Design Strategies

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Strategies for saving energy

- **Passive**
  - Ventilation
  - Cooling
  - Heating
  - Lighting
  - Water
- **Active**
  - Heat Pump
  - Water Tank

Strategies for producing energy

- **Passive**
  - Waste (compost)
- **Active**
  - Photovoltaics
  - Solar collectors

Programmatic Distribution according to thermal demands

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Winter Strategies

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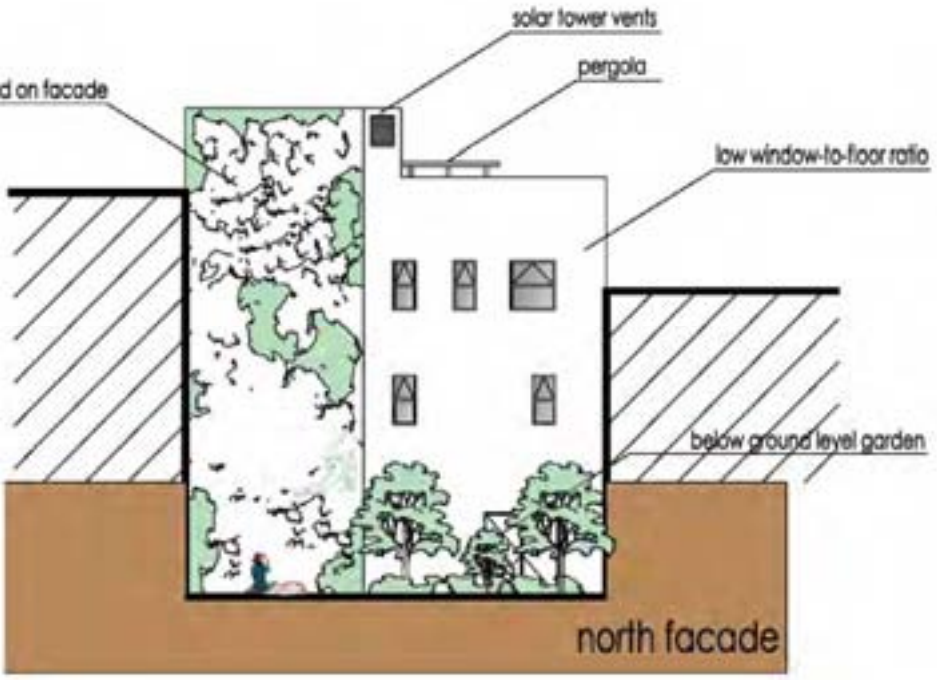

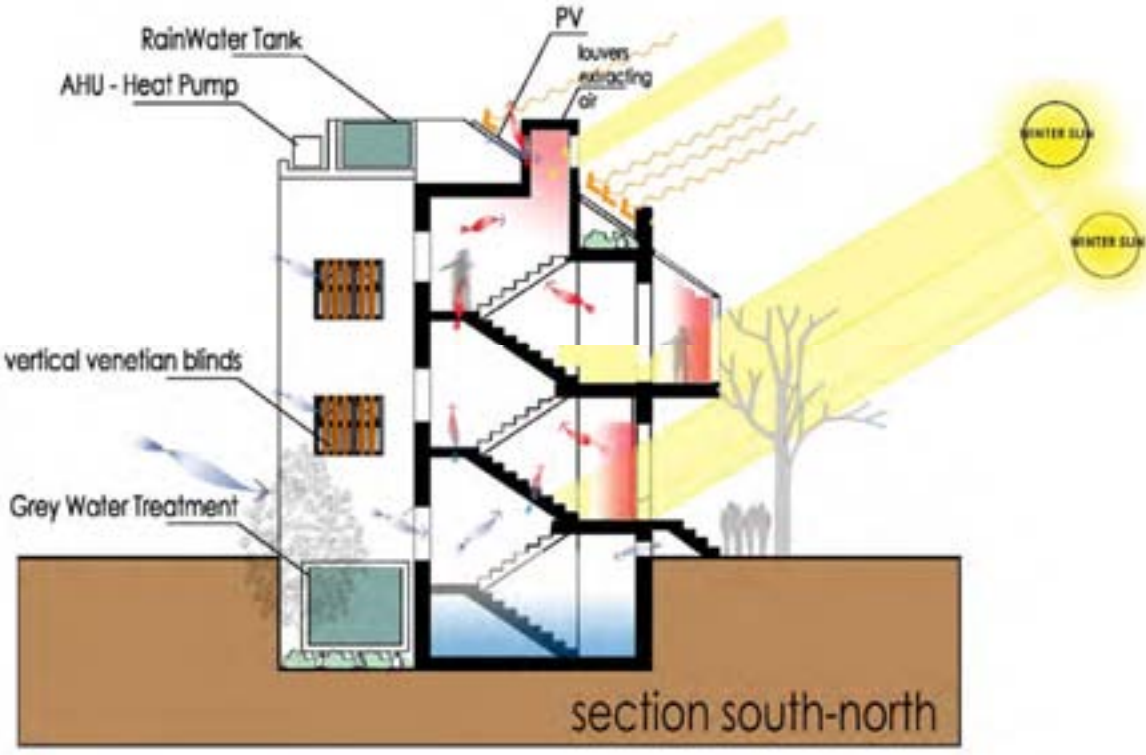

Summer Strategies

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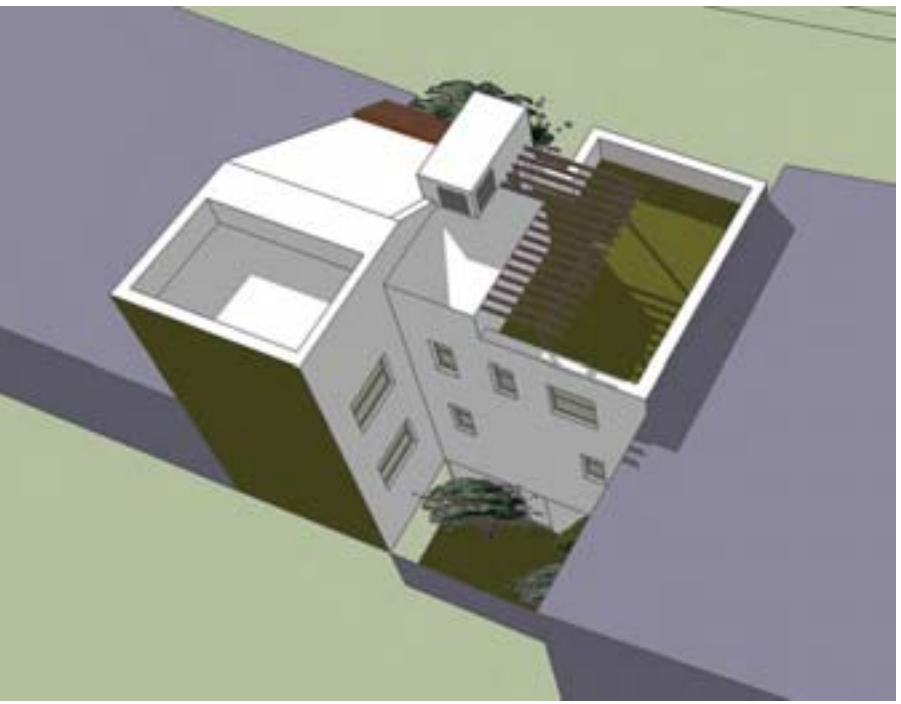

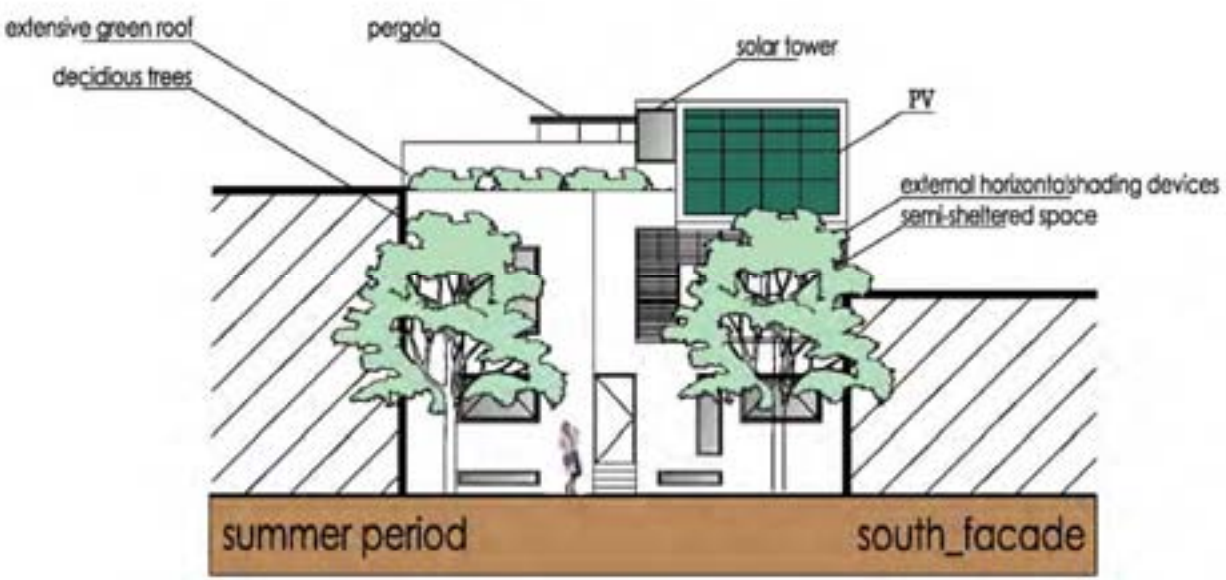

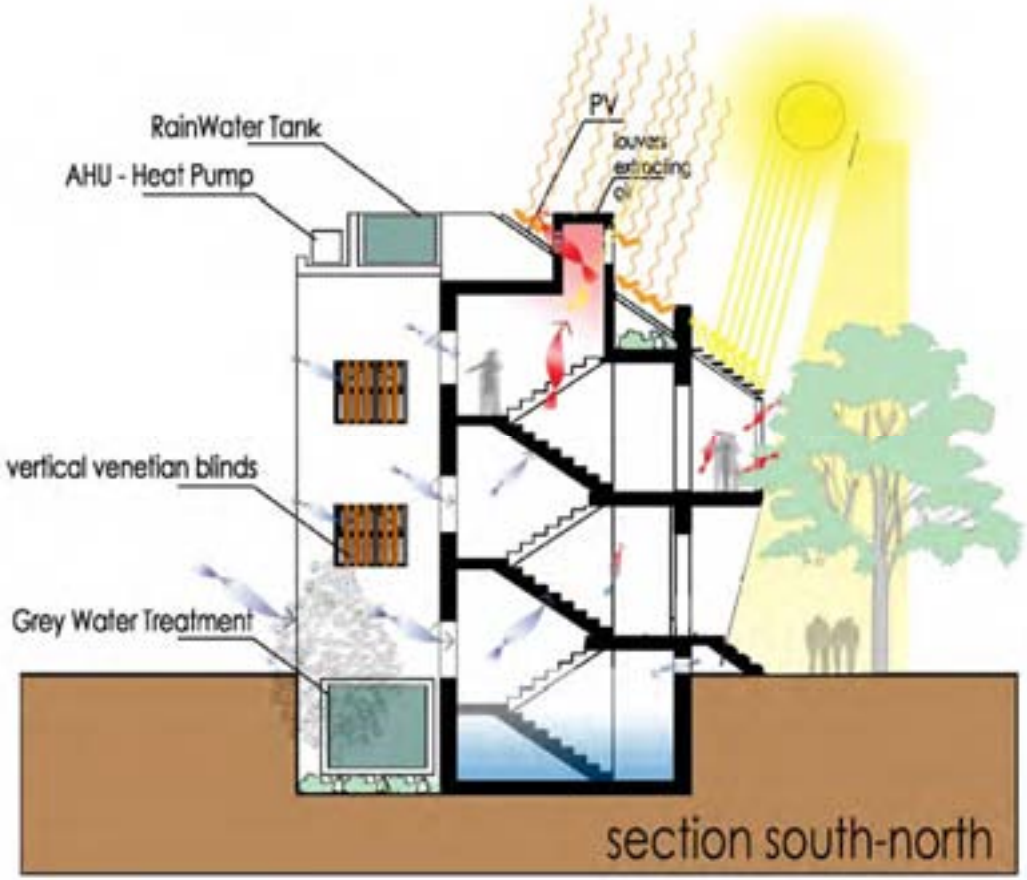

Materials _ Envelope

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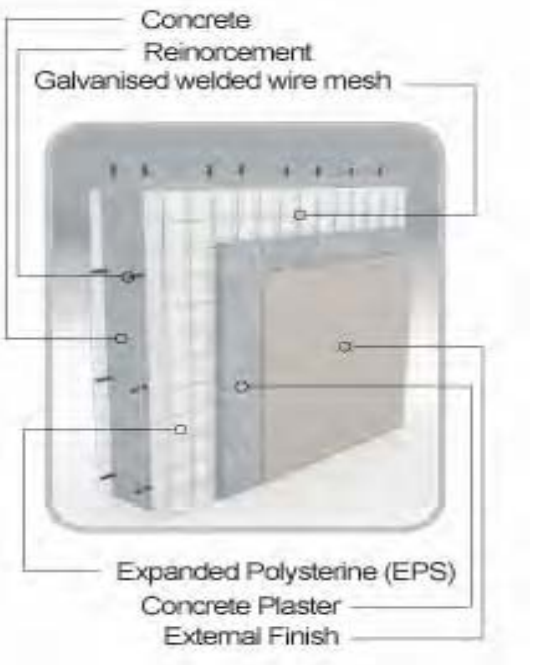
Main Structure: eco concrete

1. less embodied energy
2. great sustainability due to high-volume fly ash concrete
3. reduction of the amount of CO2 released



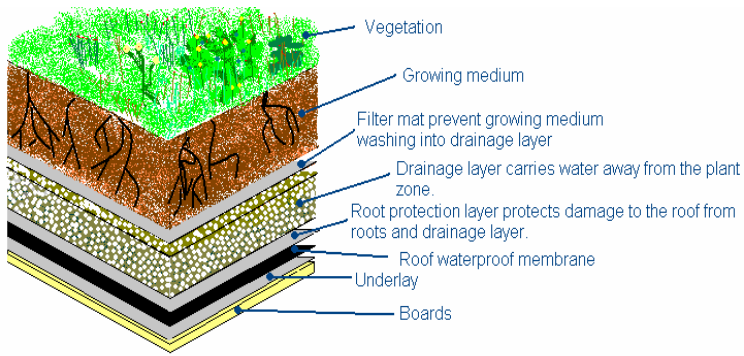
Wall: Ecobest Construction System

1. Energy Efficiency(savings up to 80% on heating and cooling requirements)
2. Fast Installation
3. Environmentally Friendly

(reduced consumption of fossil fuels, recycled steel ,polystyrene CFC's)

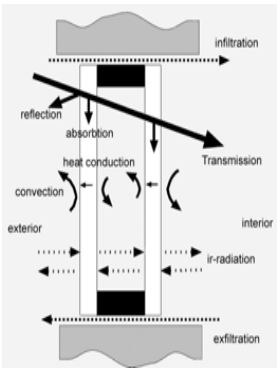
Extensive Green Roof

1. Savings on energy heating and cooling
2. Filtration of airborne particulates
3. CO_2/O_2 exchange
4. Moderation of the urban Heat Island Effect
5. Sound Insulation
6. Food Production (herbs, vegetables)



Low – E Double Glazing (argon filled)

Type of window	U_g-value (W/m²K)		
single glazing	5.7		
	Gap between panes		
	6mm	12mm	16mm
double glazing (air filled)	3.7	3.4	3.3
double glazing (argon gas filled)	3.5	3.3	3.2
triple glazing (air filled)	2.9	2.6	-
triple glazing (argon gas filled)	2.8	2.5	-



Frame configuration	U_f-value (W/m²K)
wood, plastic	1.5 ... 2
reclaimed steel	2.5
metallic profiles	> 4.5

Shading Strategies

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Wooden venetian blinds

1. absorb and reflect up to 80% of solar radiation

2. 40% energy savings from reducing the use of AC

Trees

Acer negundo

Deciduous
Max height: 6-10m
Max width: 15m

Pseudoacacia

Deciduous
No water requirement
Max height: 15m
Max width: 10m

Cercis siliquastrum

Deciduous
Max height: 10m
No specific requirements

Pinus Pinea

Evergreen
Max height: 25m
No specific requirements

Shading Strategies

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Winter Solstice (21st December)

Summer Solstice (21st June)

Active Systems

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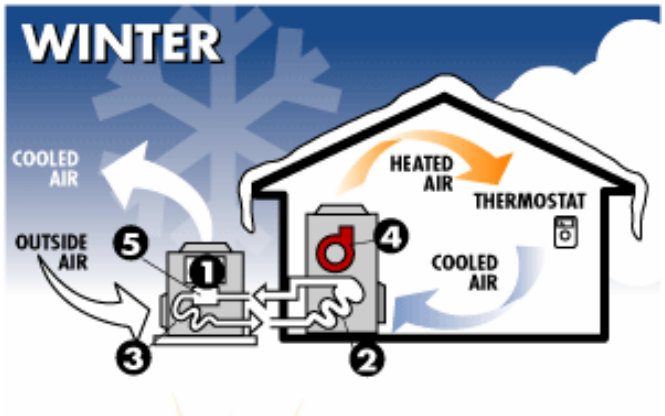
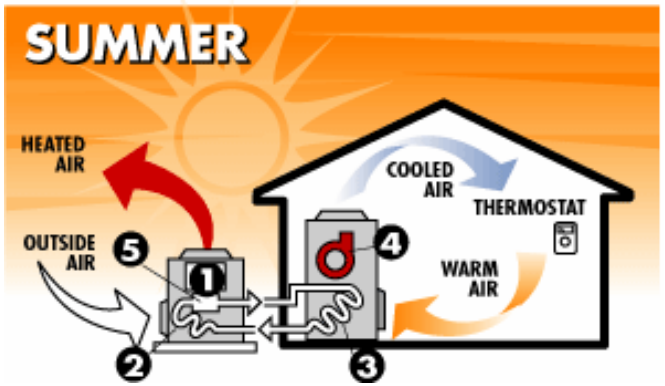
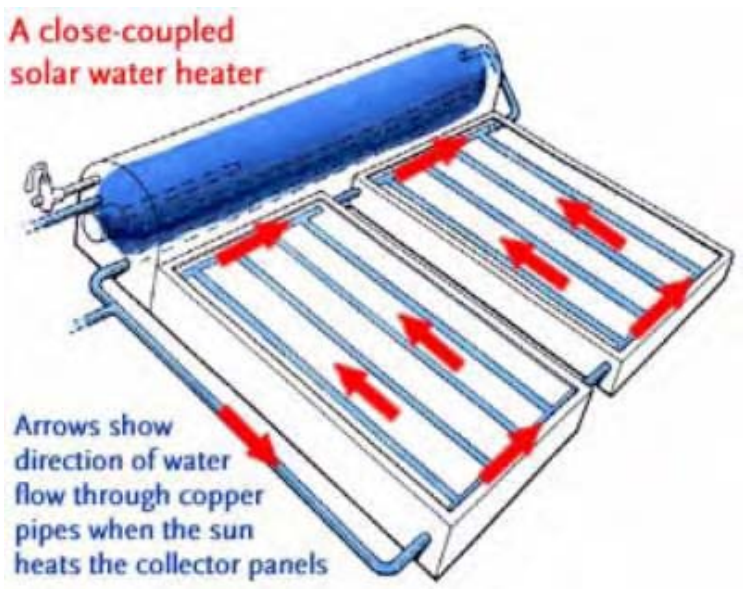
Heat pump





Photovoltaics integrated on the façade

Solar collectors roof mounted



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