A young boy in a blue long-sleeved shirt and green pants is walking from left to right across a dusty, unpaved area. In the background, there is a weathered building with peeling plaster and several windows with shutters. One window has blue shutters, another has yellow, and a third has white. To the right, the front end of a damaged, light-colored car is visible. A large tree trunk is on the far left.

Planning for  
the regeneration  
of listed buildings  
for vulnerable  
social groups  
using Zero-Energy  
and Circular Principles

*the case of the refugee  
settlements of Alexandra's  
Avenue in Athens, Greece*

by Nikol Dimitriou  
[5356016]  
29<sup>th</sup> of June 2022

Andy van den Dobbelsteen  
Olga Ioannou  
Stefan van der Spek

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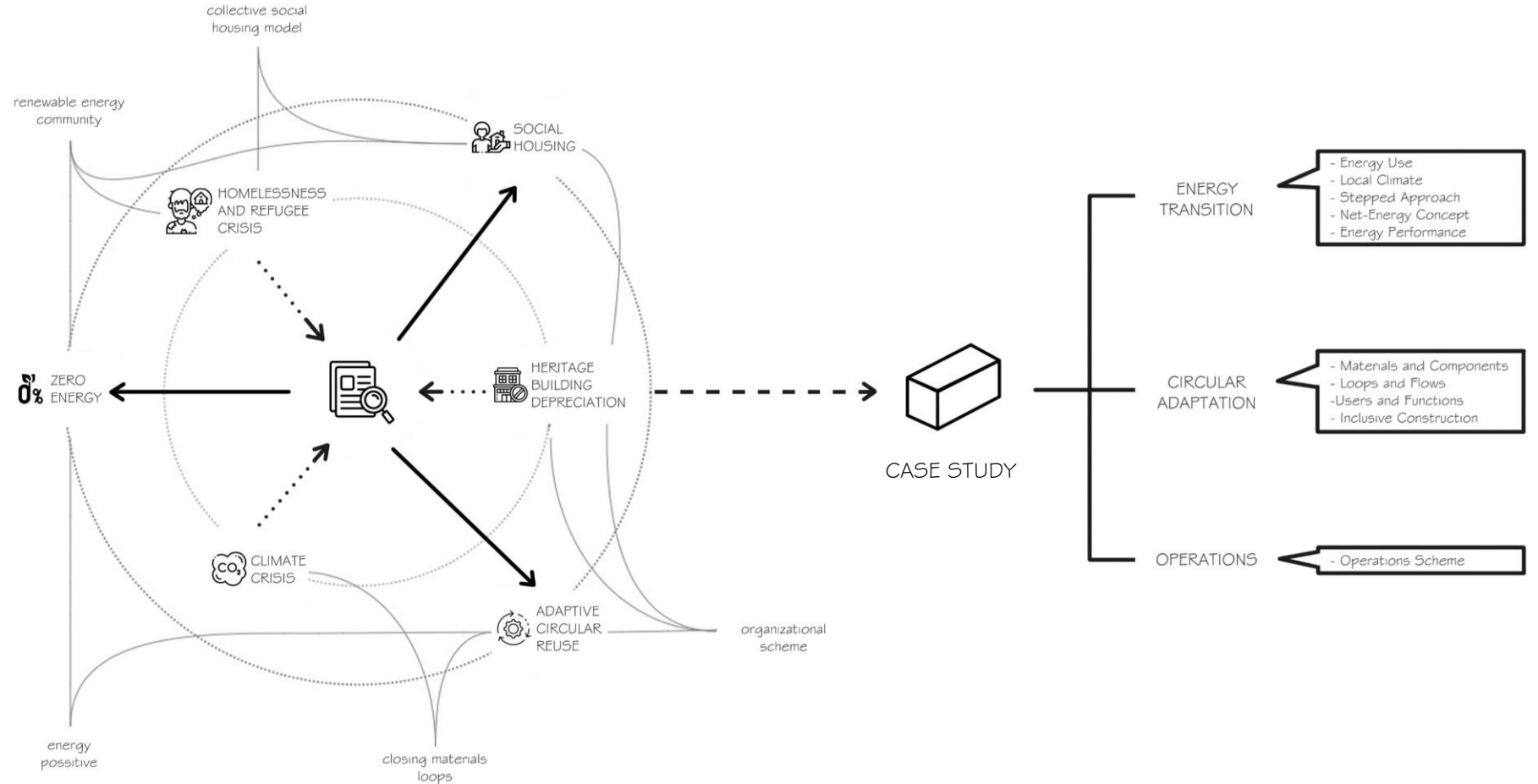
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# Building Depreciation



Stergiopoulos, G. (2016). Abandoned Buildings in Athens Greece Vol. 1-003 [Photograph]. Flickr

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## Homelessness



Wardkian, C. (2016). An impossible hope [Photograph]. Getty Images

## Building Depreciation



Stergiopoulos, G. (2016). Abandoned Buildings in Athens Greece Vol. 1-003 [Photograph]. Flickr

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### Climate Crisis



### Homelessness



### Building Depreciation



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## EU Policies & Plans

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**PARIS2015**  
UN CLIMATE CHANGE CONFERENCE  
**COP21·CMP11**



European Commission (2020). Renovation Wave [Logo]. ERA

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Proposed Approach

EU Policies & Plans

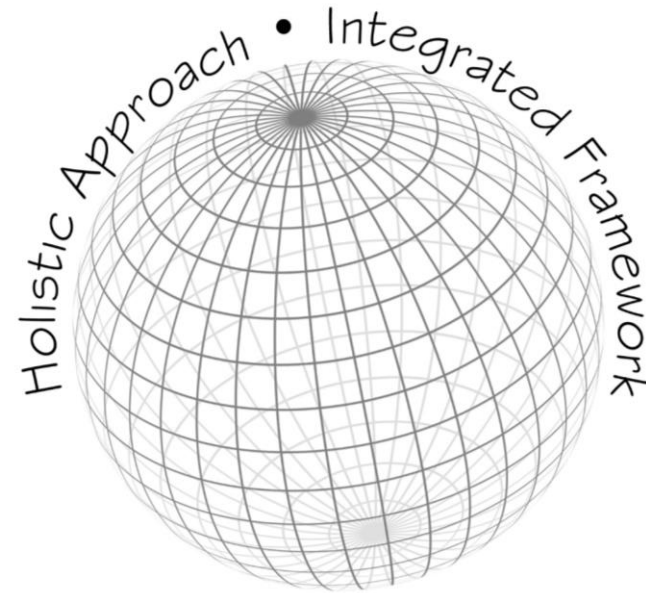
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Author (2022). Holistic Approach & Integrated Framework [Scheme]



European Commission (2020). Renovation Wave [Logo]. ERA

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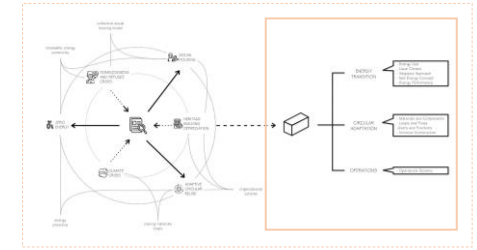
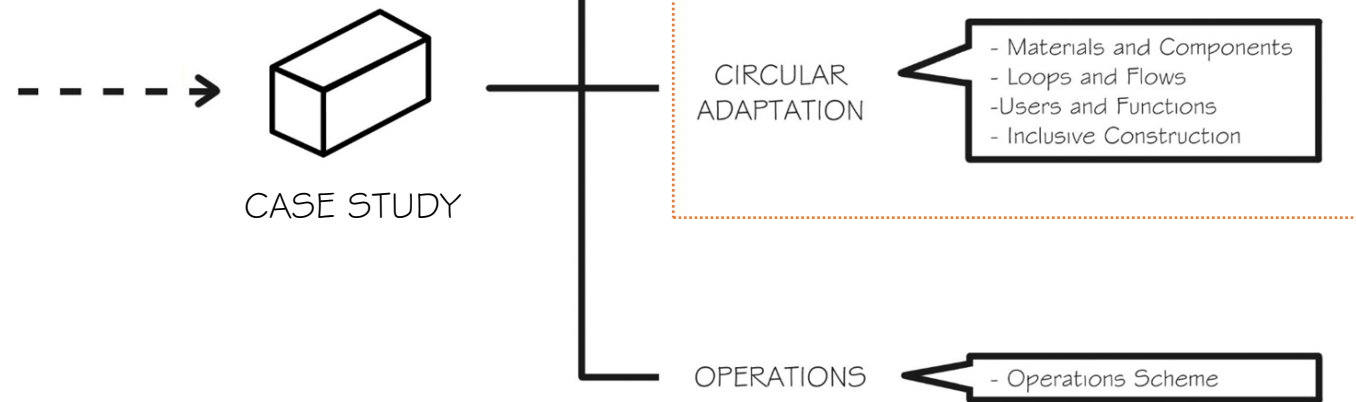
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“Prosfygika”

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Google maps (2021). Map of Athens, Greece [Edited]

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Unknown (2019). Aerial photo of the refugee settlements of Alexandria's Avenue. Proto Thema.

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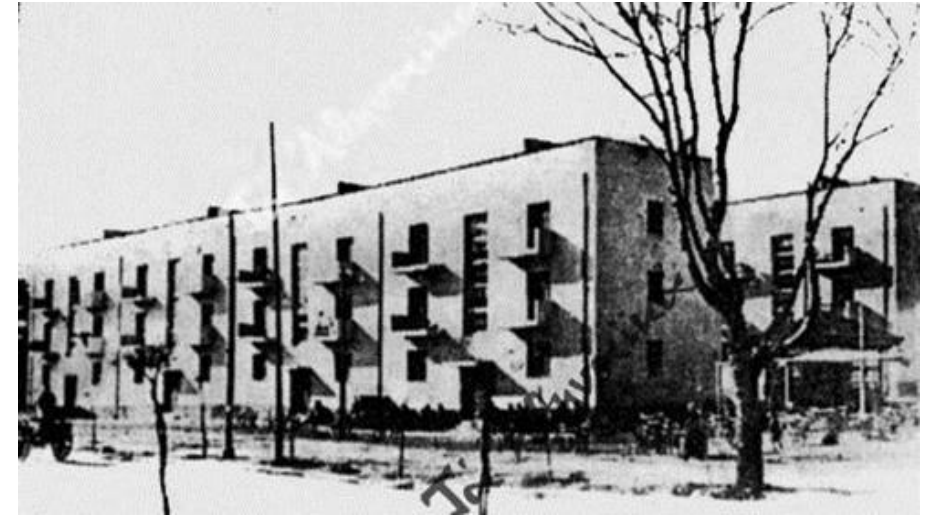
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Unknown (1936-1938). The refugee settlements of Alexandra's Avenue after their construction. Ta Athinaika.



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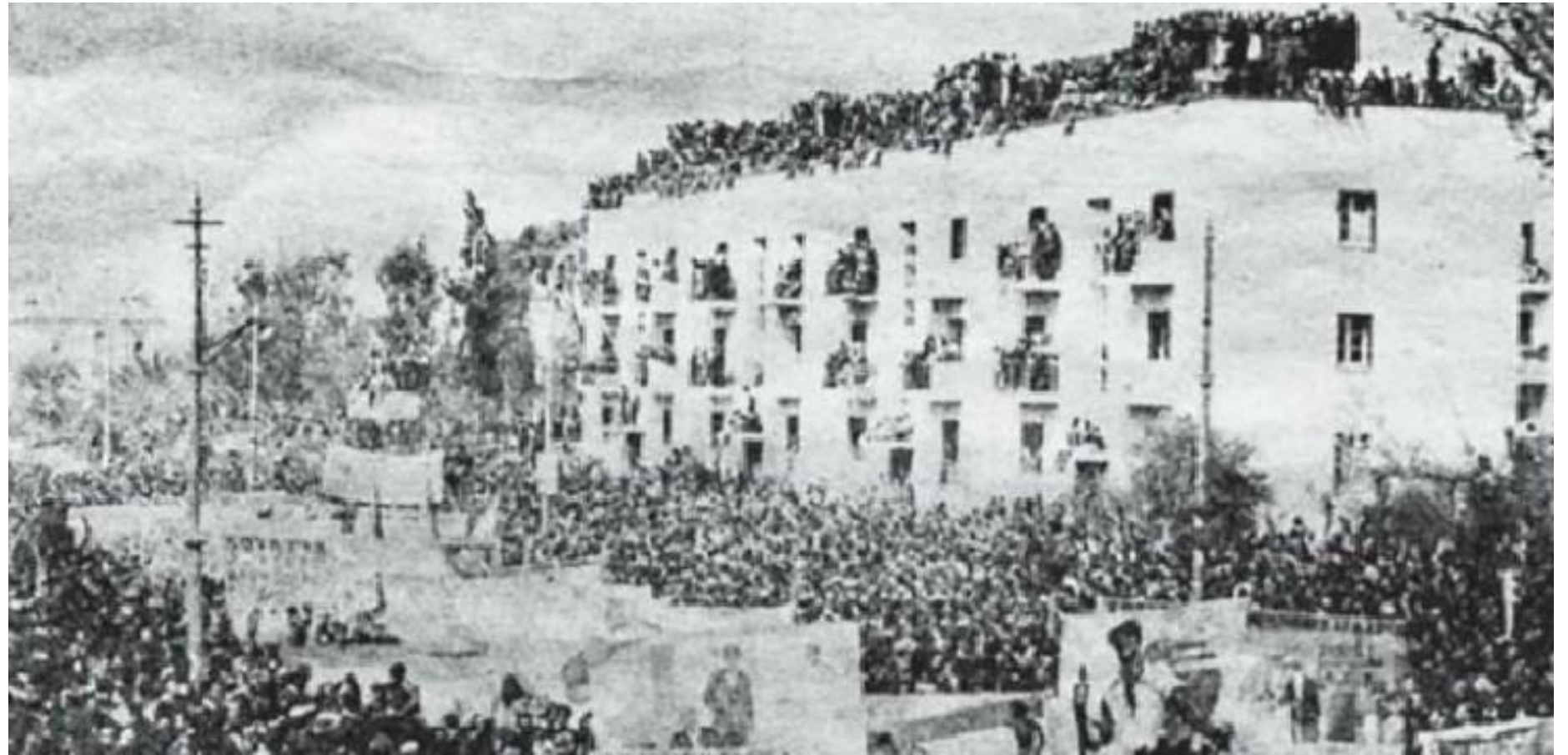
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Unknown (1944). The "Prosfygika" during the civil war. ERT Open.

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Unknown (2019). The marks from bullets and shells thrown by the British from the Lycabettus hill, during civil war, are visible till today. Lifo.



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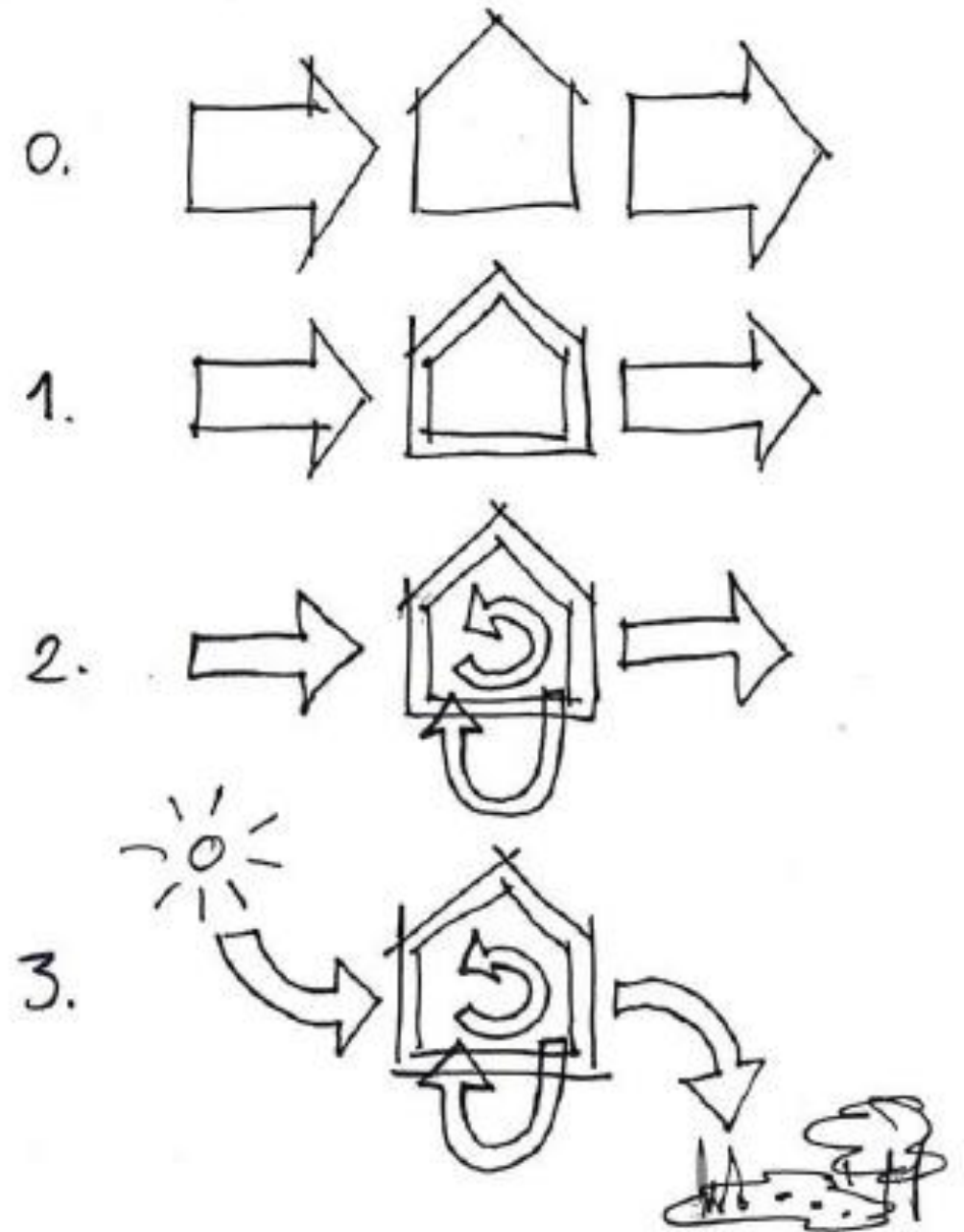
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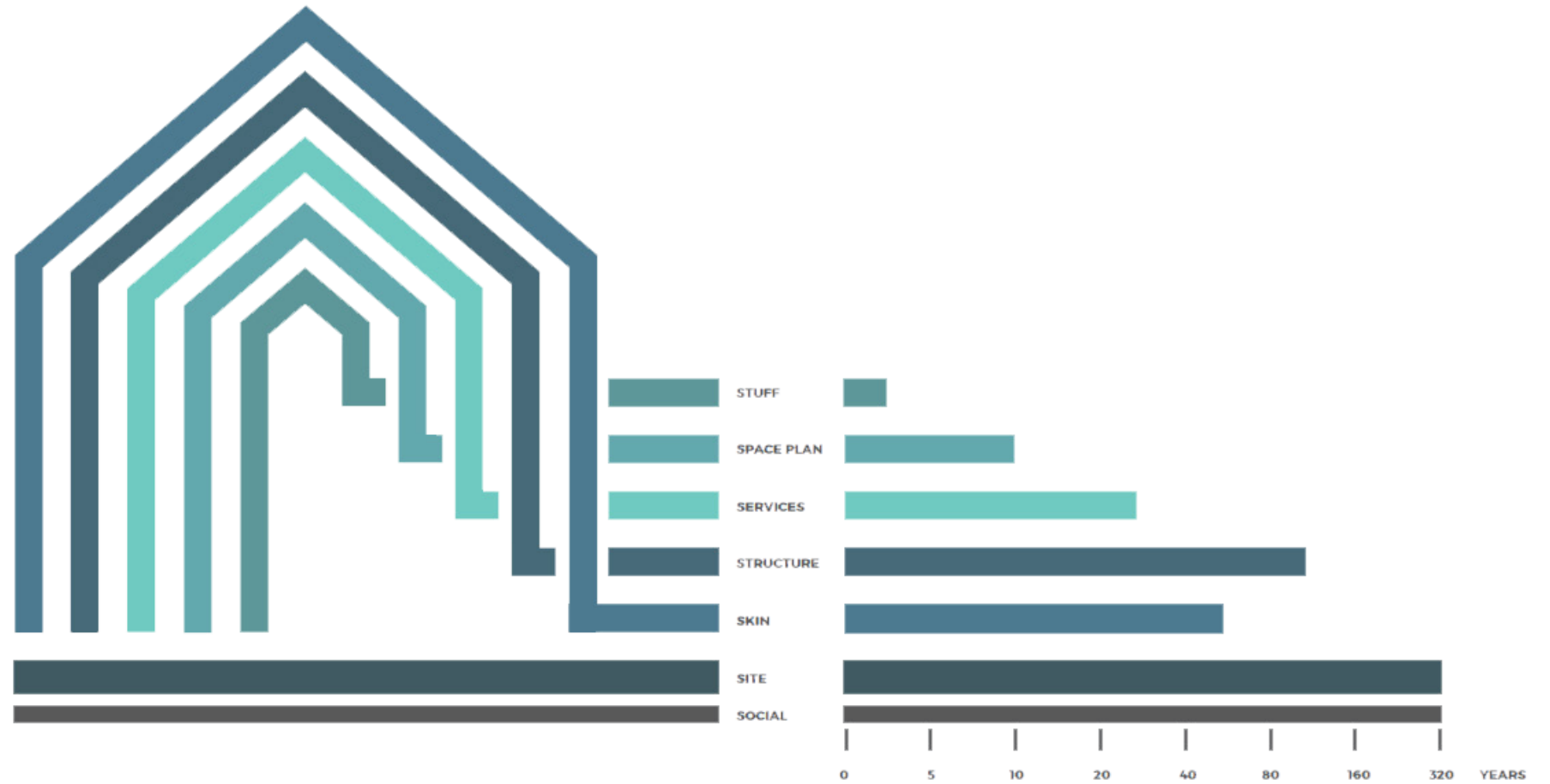
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Brand, S. (1994). *Shearing Layers*.

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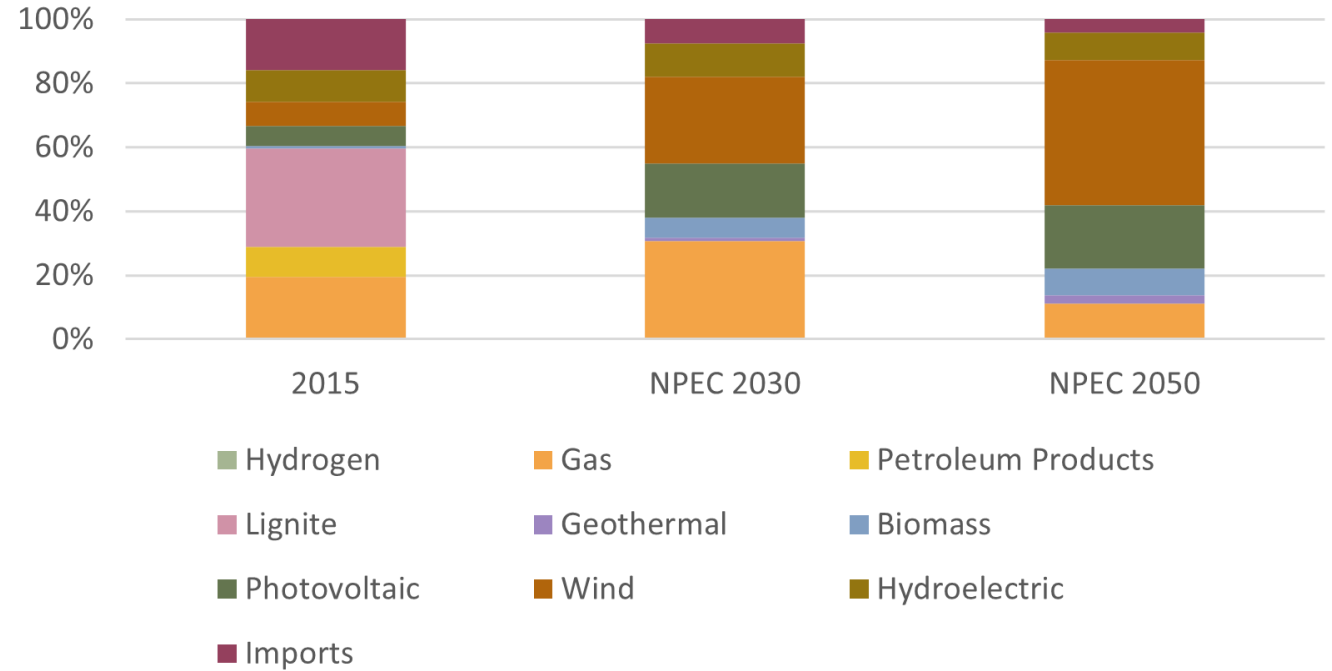
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## Gross Electricity Generation by Fuel Type [in TWH]



Retrieved Data: Hellenic Republic (2020). Long-Term Strategy for 2050. Ministry of Environment and Energy, p.46

**25%**

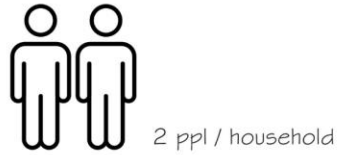
of electricity in Greece is produced by renewable energy sources

**60%**

of electricity in Greece will be produced by renewable energy sources, by 2030

# Introduction

## The Case Study



2 ppl / household



110 m²

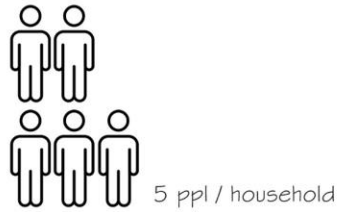
4.95 MWh<sub>prim</sub>  
or 17.80 GJ<sub>prim</sub>

90 kWh<sub>prim</sub>  
or 324 MJ<sub>prim</sub>

ELECTRICITY CONSUMPTION  
for a 110 m² household of 2 persons

Counting Period	Consumption [kWh]	Total [kWh]
08.12.2020 - 08.04.2021	852 daily 235 nocturne	4049
08.04.2021 - 09.08.2021	1002 daily 411 nocturne	
09.08.2021 - 09.12.2021	1253 daily 296 nocturne	

## Energy Transition & Circular Adaptation



5 ppl / household



55 m²

1.98 MWh<sub>prim</sub>  
or 7.12 GJ<sub>prim</sub>

180 kWh<sub>prim</sub>  
or 647 MJ<sub>prim</sub>

ELECTRICITY CONSUMPTION  
for a 55 m² household of 5 persons

Counting Period	Consumption [kWh]	Total [kWh]
19.11.2020 - 22.03.2021	1829	3935
22.03.2021 - 21.07.2021	1041	
21.07.2021 - 22.11.2021	1065	

## Operational Plan

## Visualizations

YEARLY AVERAGE TOTAL of a HOUSEHOLD 3992 kWh

$$3992 \text{ kWh} / 0.4 = 9980 \text{ kWh}_{\text{prim}} = 9.9 \text{ MWh}_{\text{prim}}$$

$$9.9 \text{ MWh} * 3.6 = 35.6 \text{ GJ}_{\text{prim}}$$

## Conclusions

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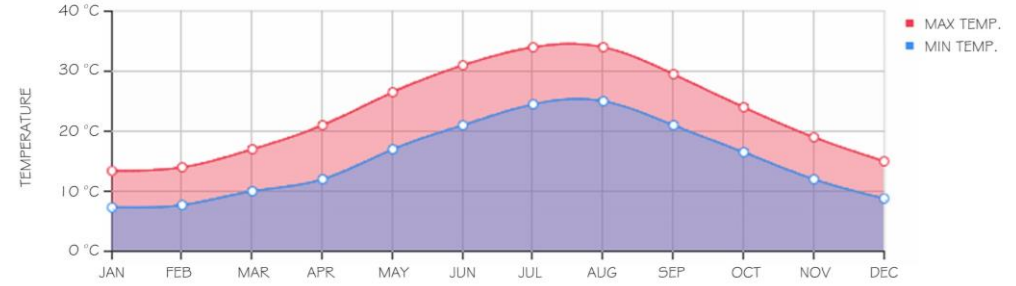
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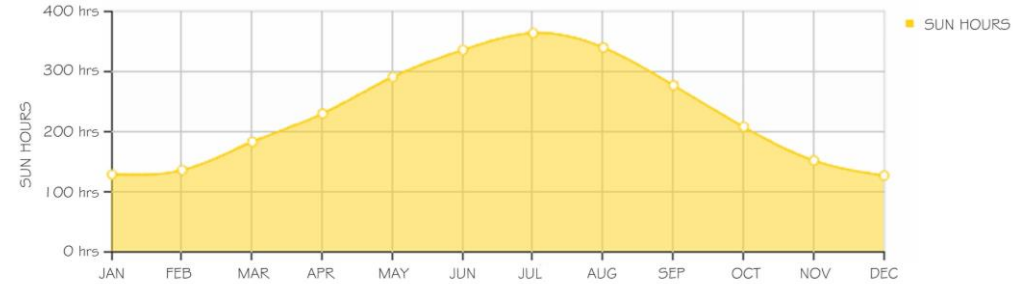
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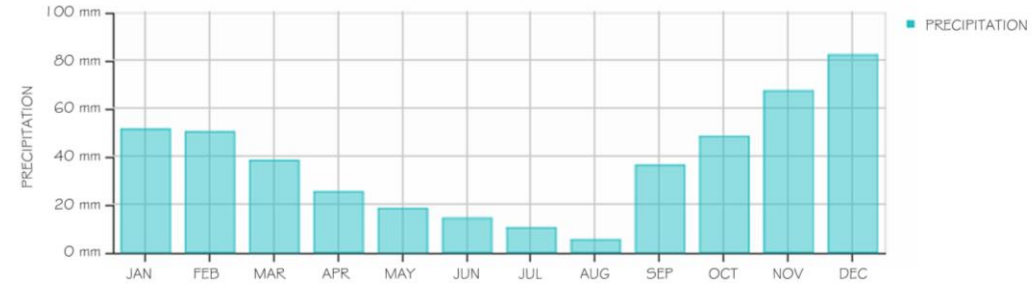
Average min and max temperatures in Athens, Greece



Average monthly sun hours in Athens, Greece



Average precipitation (rain/snow) in Athens, Greece



Average relative humidity in Athens, Greece



# Introduction

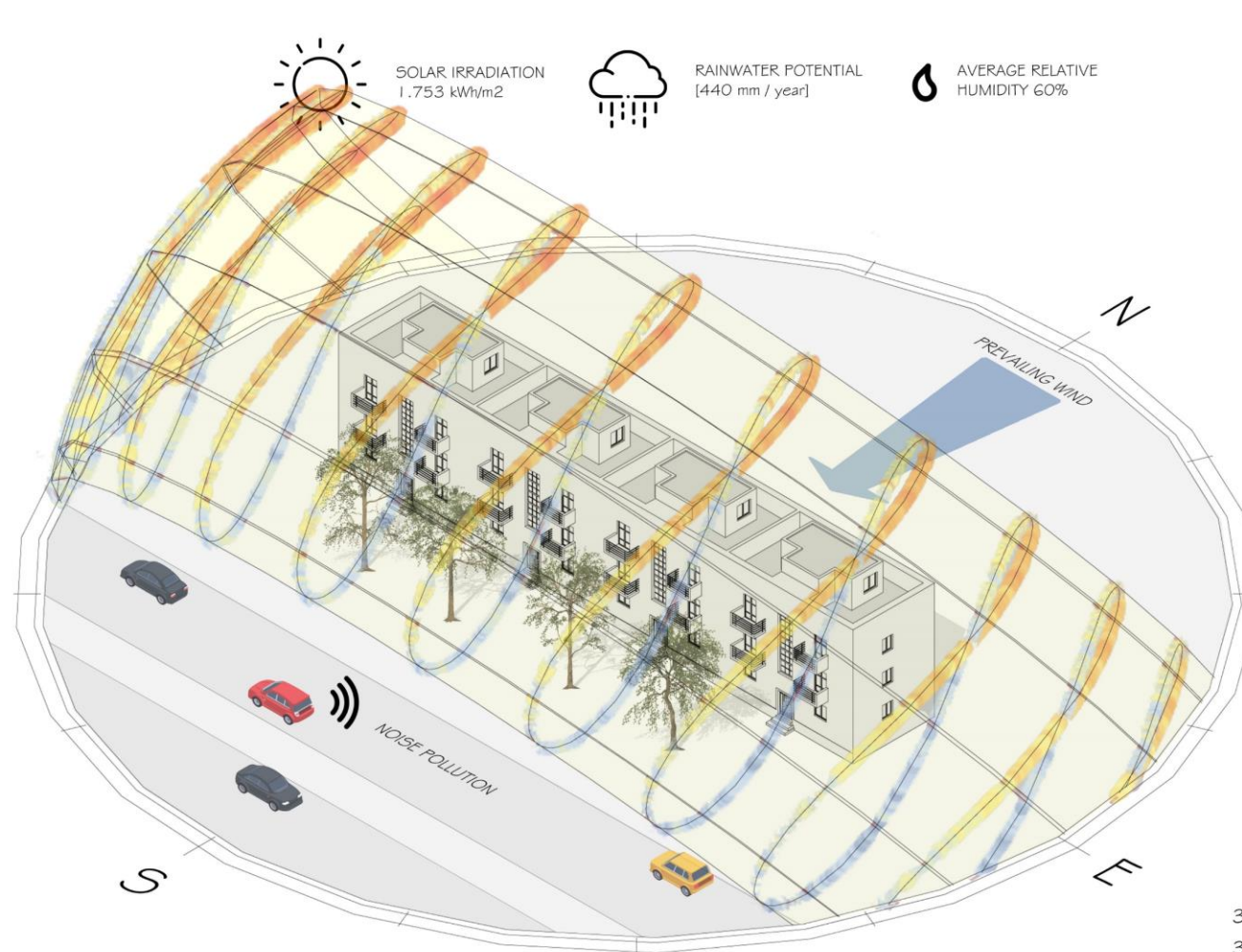
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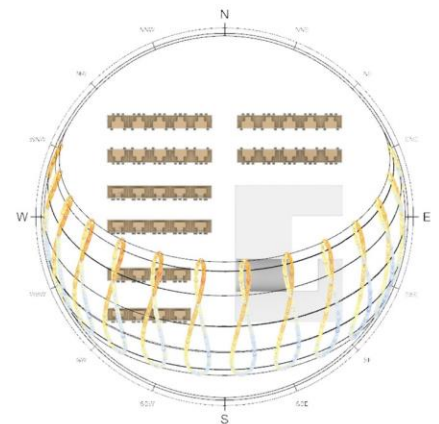
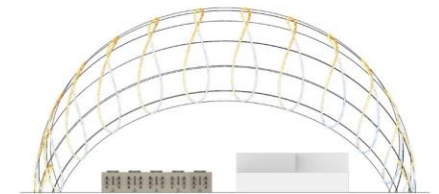
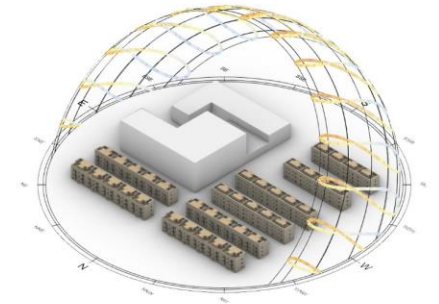
SOLAR IRRADIATION  
1.753 kWh/m<sup>2</sup>

RAINWATER POTENTIAL  
[440 mm / year]

AVERAGE RELATIVE HUMIDITY  
60%

SOIL TEMPERATURE  
17°C | 4m deep

LOCATION: ATHENS  
LATITUDE: 37.9 N  
LONGITUDE: 23.7 E  
ELEVATION: 135m  
TIME ZONE: +2h



°C  
37.20  
33.74  
30.28  
26.82  
23.36  
19.90  
16.44  
12.98  
9.52  
6.06  
2.60

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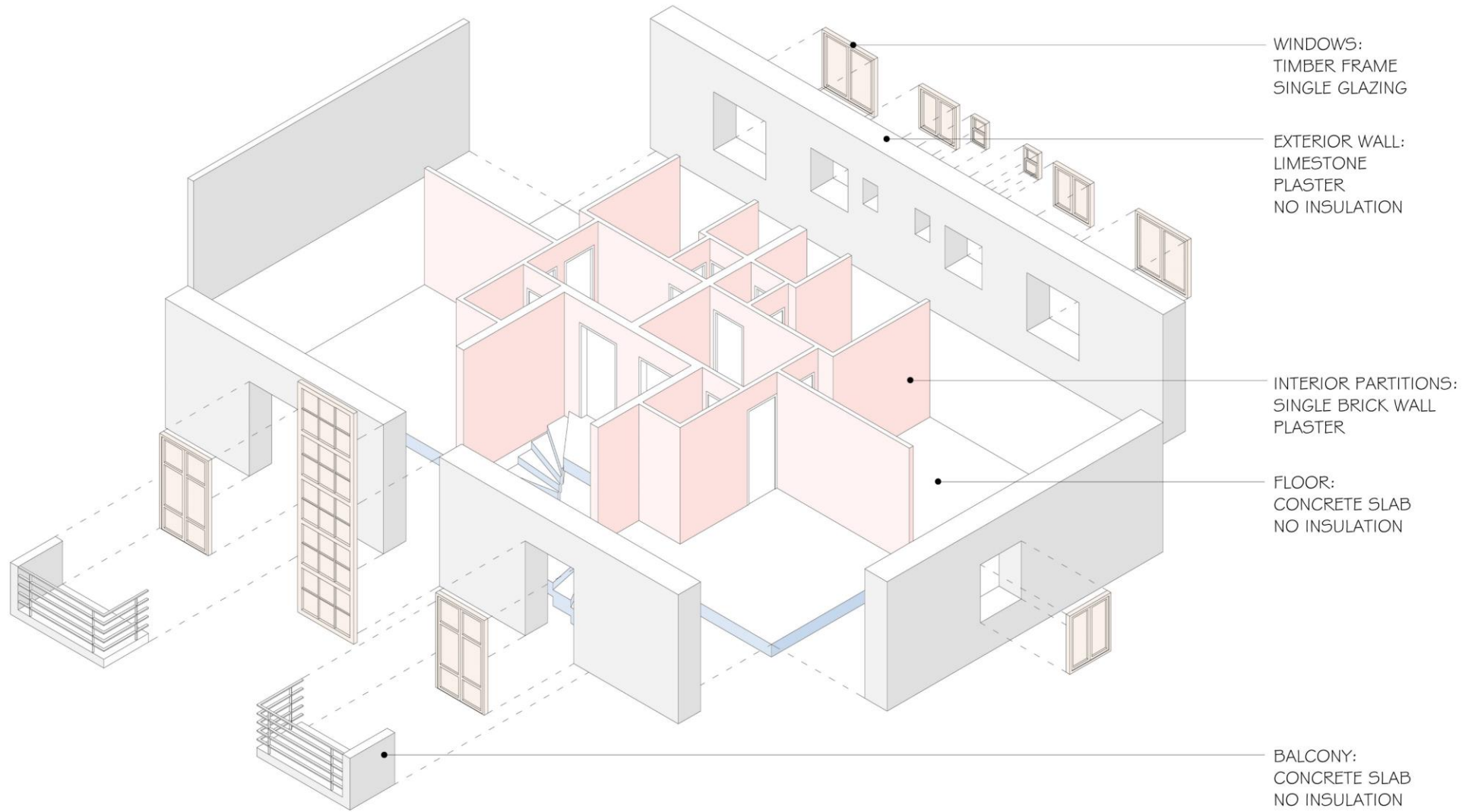
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TYPICAL FLOOR | EXPLODED AXONOMETRIC VIEW

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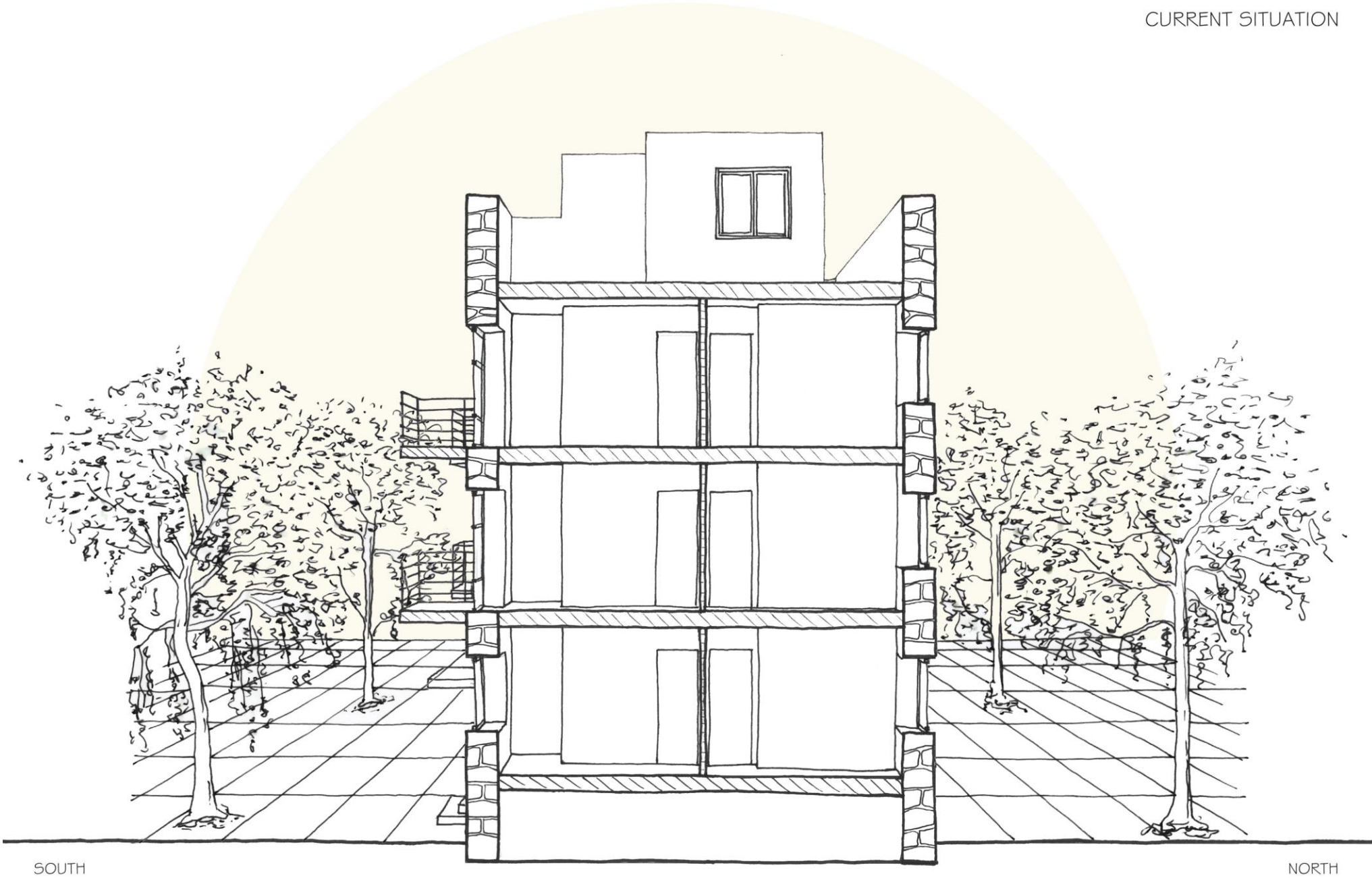
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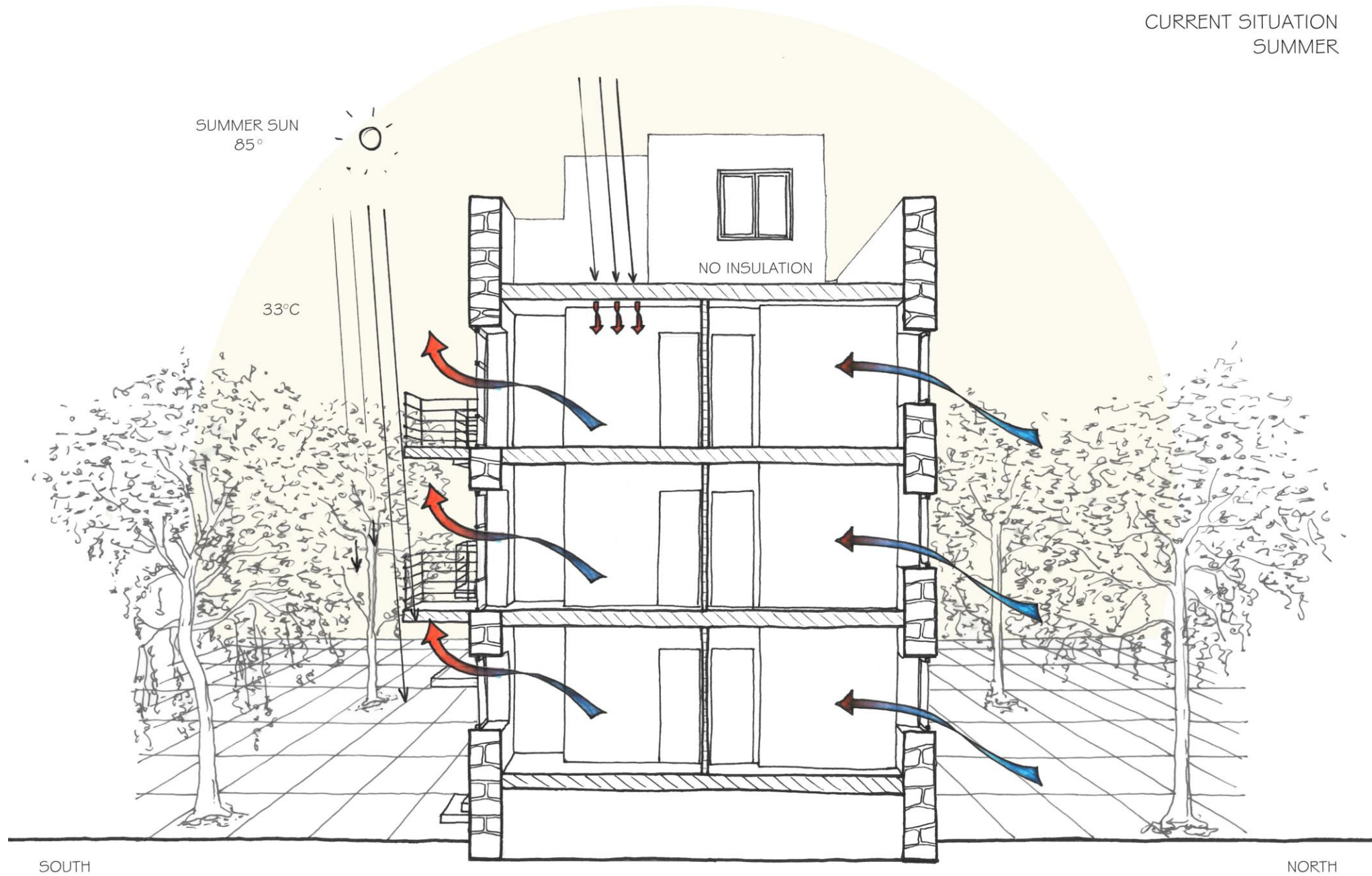
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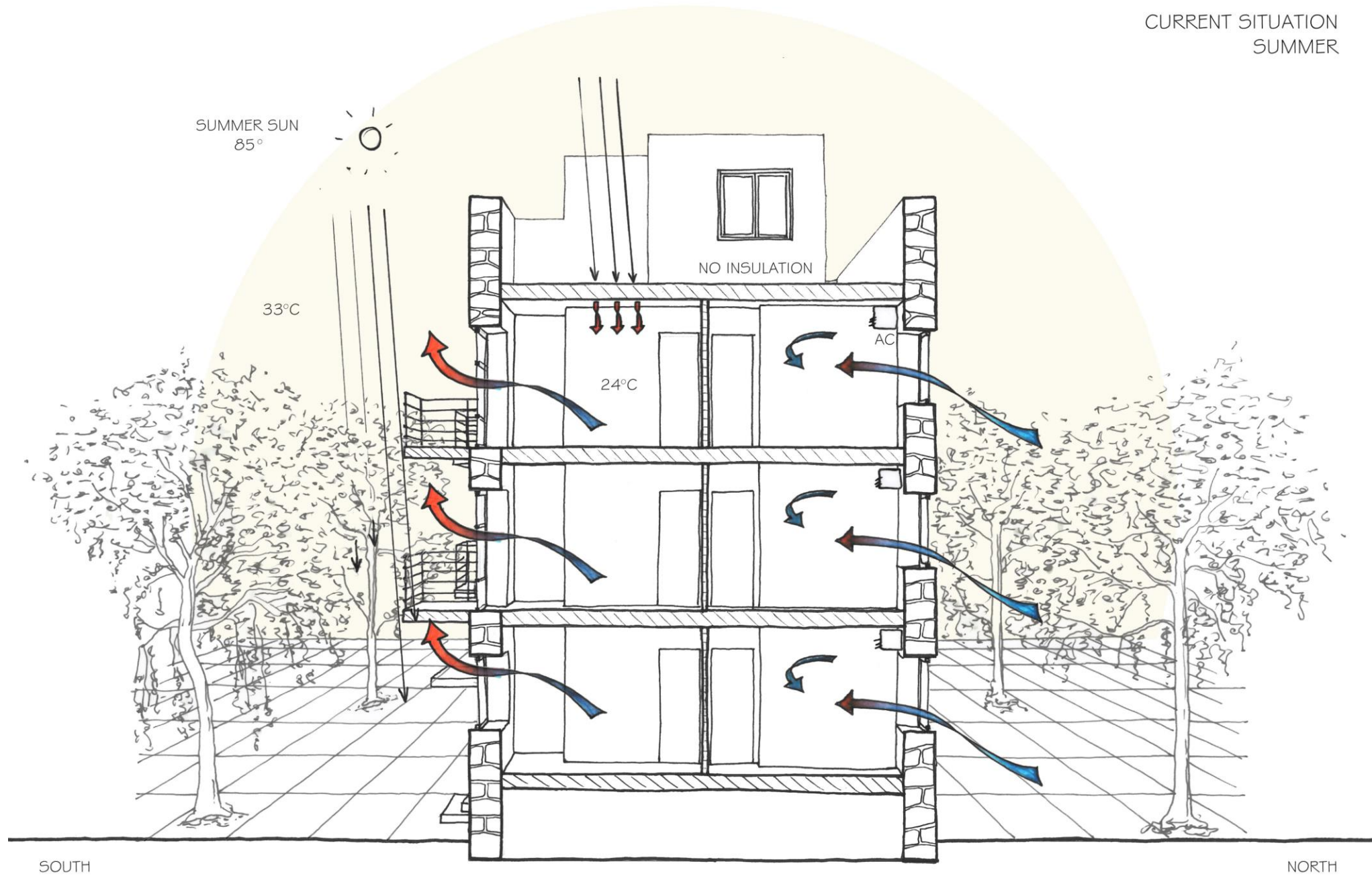
SOUTH

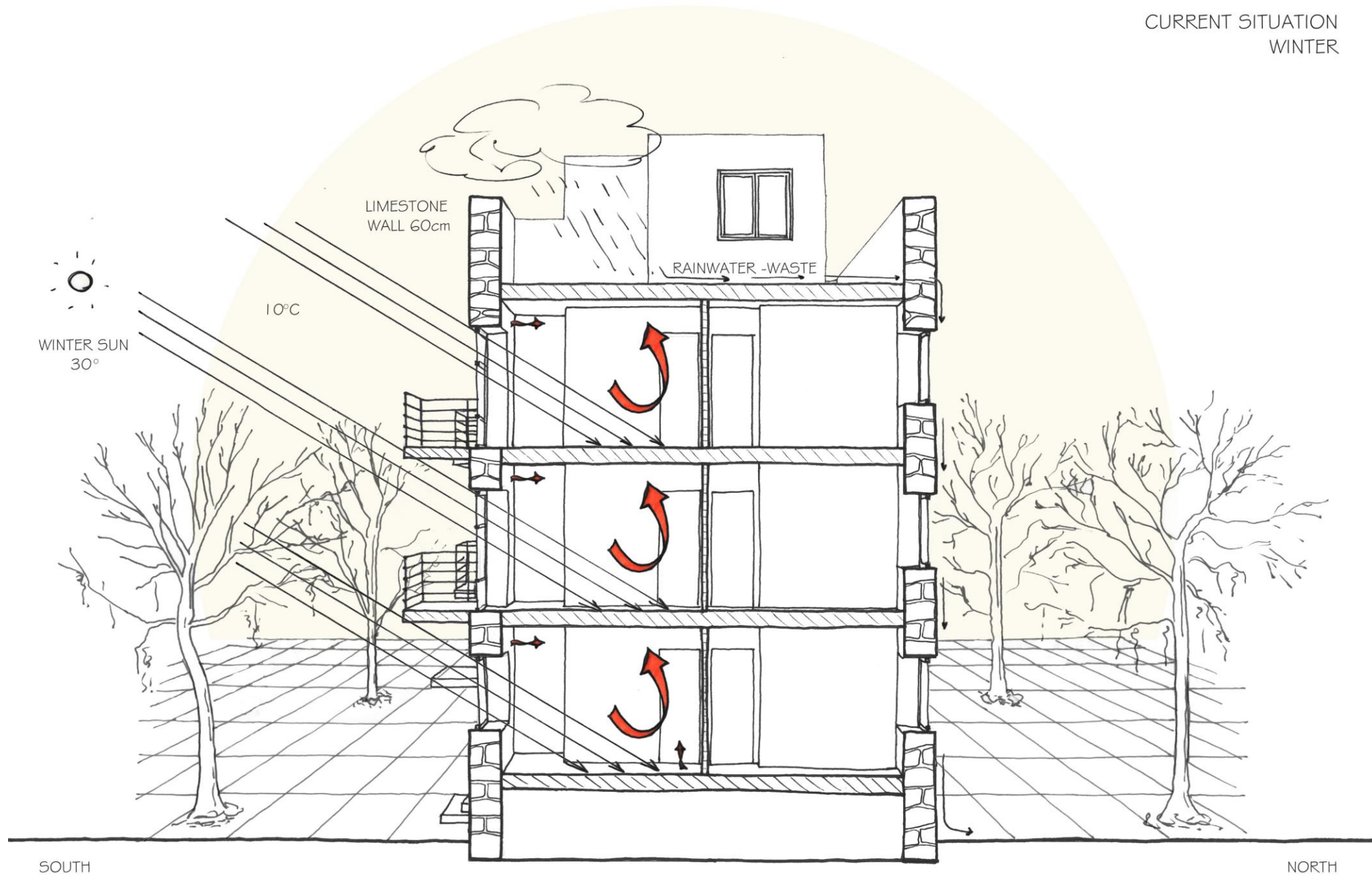
NORTH

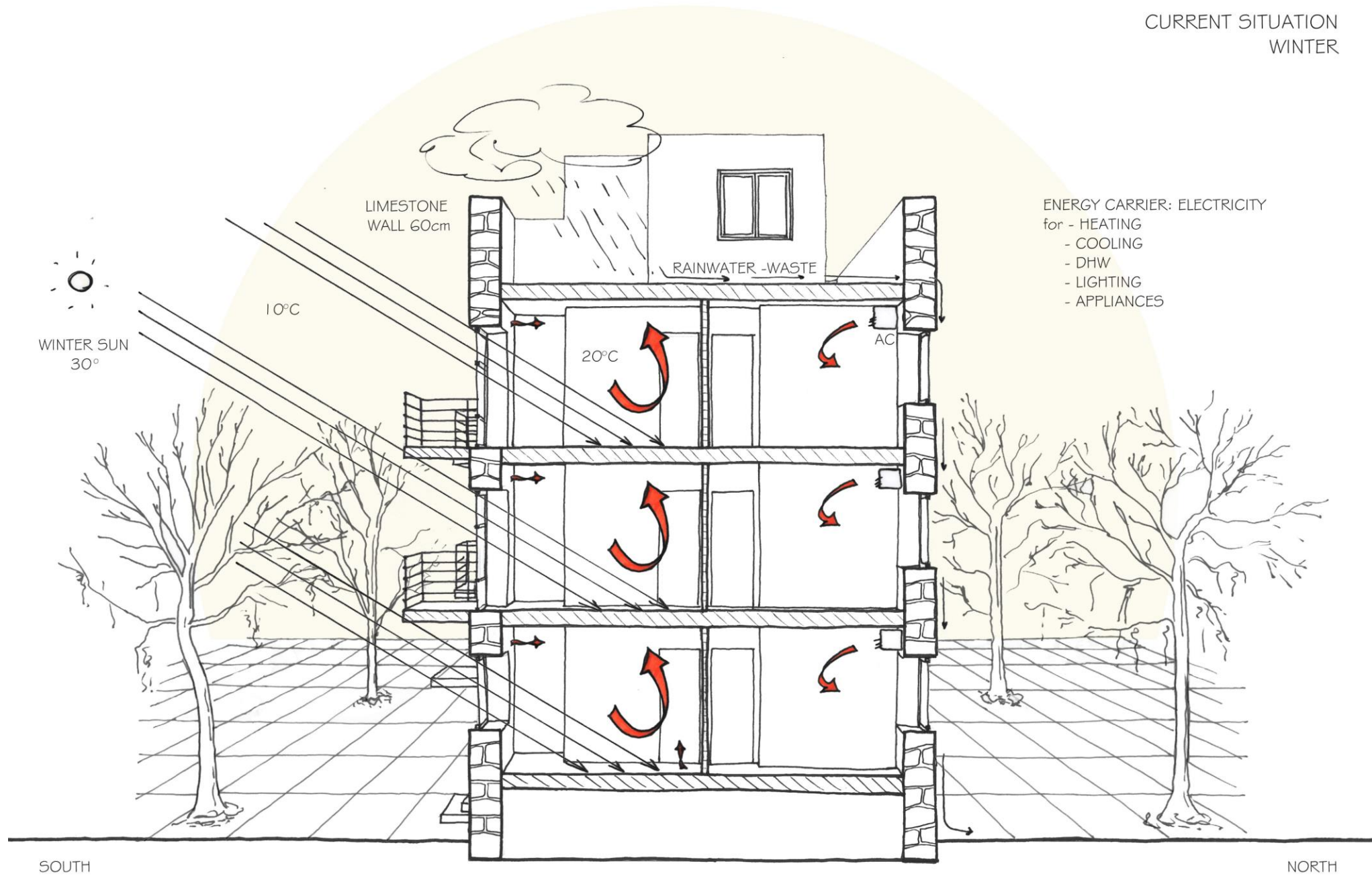


SOUTH

NORTH







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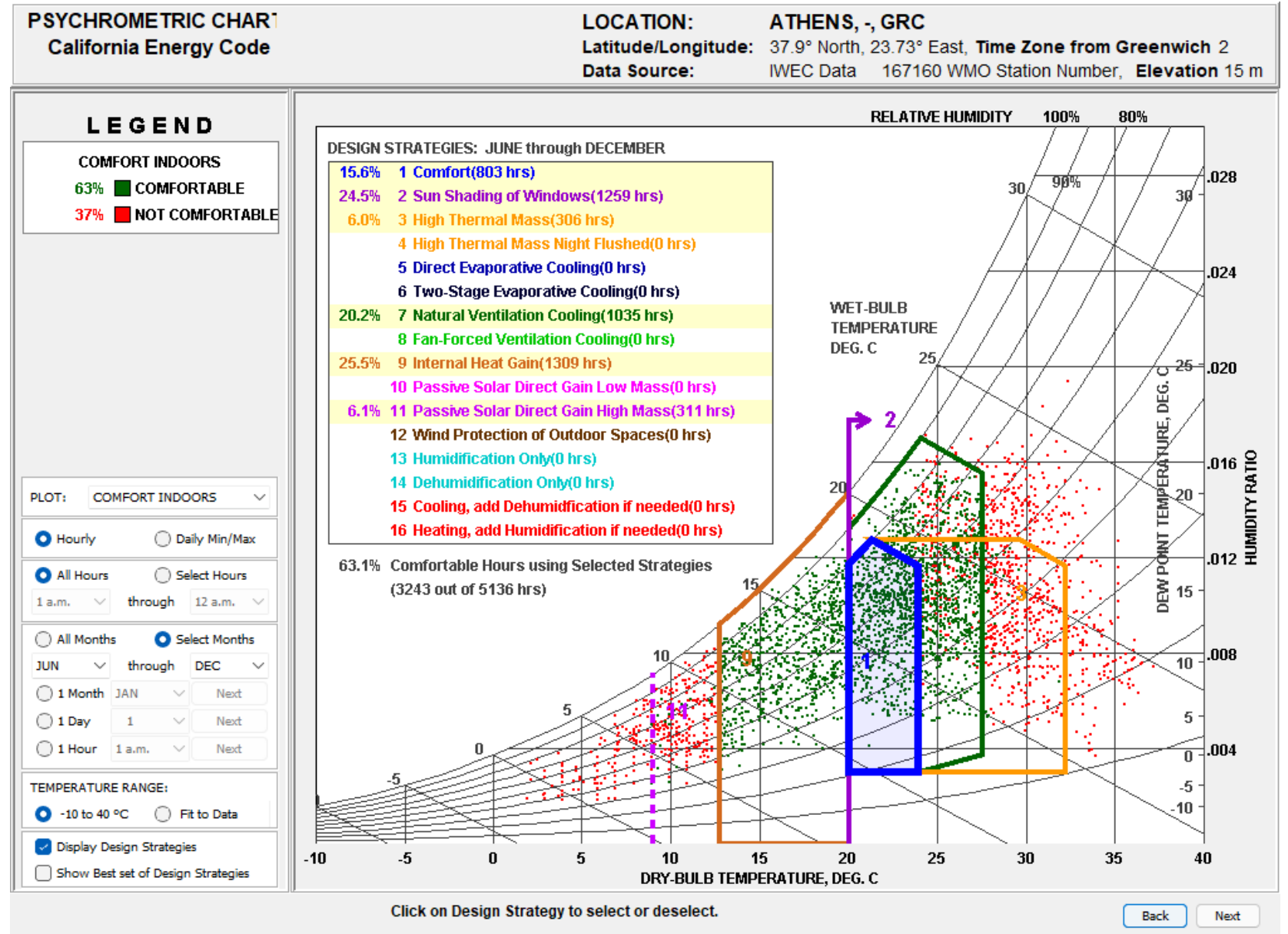
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Climate Consultant. (2022). Psychrometric Chart for existing situation of "Prosfygika", Athens, Greece [Chart].

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	Building Envelope					
	Exterior Wall (South)	Exterior Wall (Rest)	Window	Balcony	Roof	Ground Floor
Existing Construction	masonry wall / no insulation	masonry wall / no insulation	single glazing	separate slab / no insulation	concrete slab / no insulation	slab on ground / no insulation
Retrofitting Measures	vegetation	internal insulation	upgrade	insulate balcony	insulate top floor slab	insulation on top of ground floor slab
	solar chimney	external insulation	secondary glazing	cut-off balcony	green roof	insulation under ground floor slab
	second skin façade	-	replace (double pane)	new balcony	photovoltaic	additional floor / basement
	greenhouse	-	adjustable or fixed shading	-	top-up floor	-

Building Envelope Retrofit Matrix | Inspired from “The façade refurbishment toolbox matrix”, by Konstantinou T. (2015).

Option	Heritage			Energy Performance		Total
	Preserves Facade	Allows Visual Contact	Preserves Design of Facade	Reduce	Produce	
Vegetation	+	++	+++	++	+	9
Solar Chimney	++	+++	+++	+	++	11
Second Skin Facade	+++	+++	+	+++	+++	13
Greenhouse	+++	+++	++	+++	+++	14

Comparison of south façade options.

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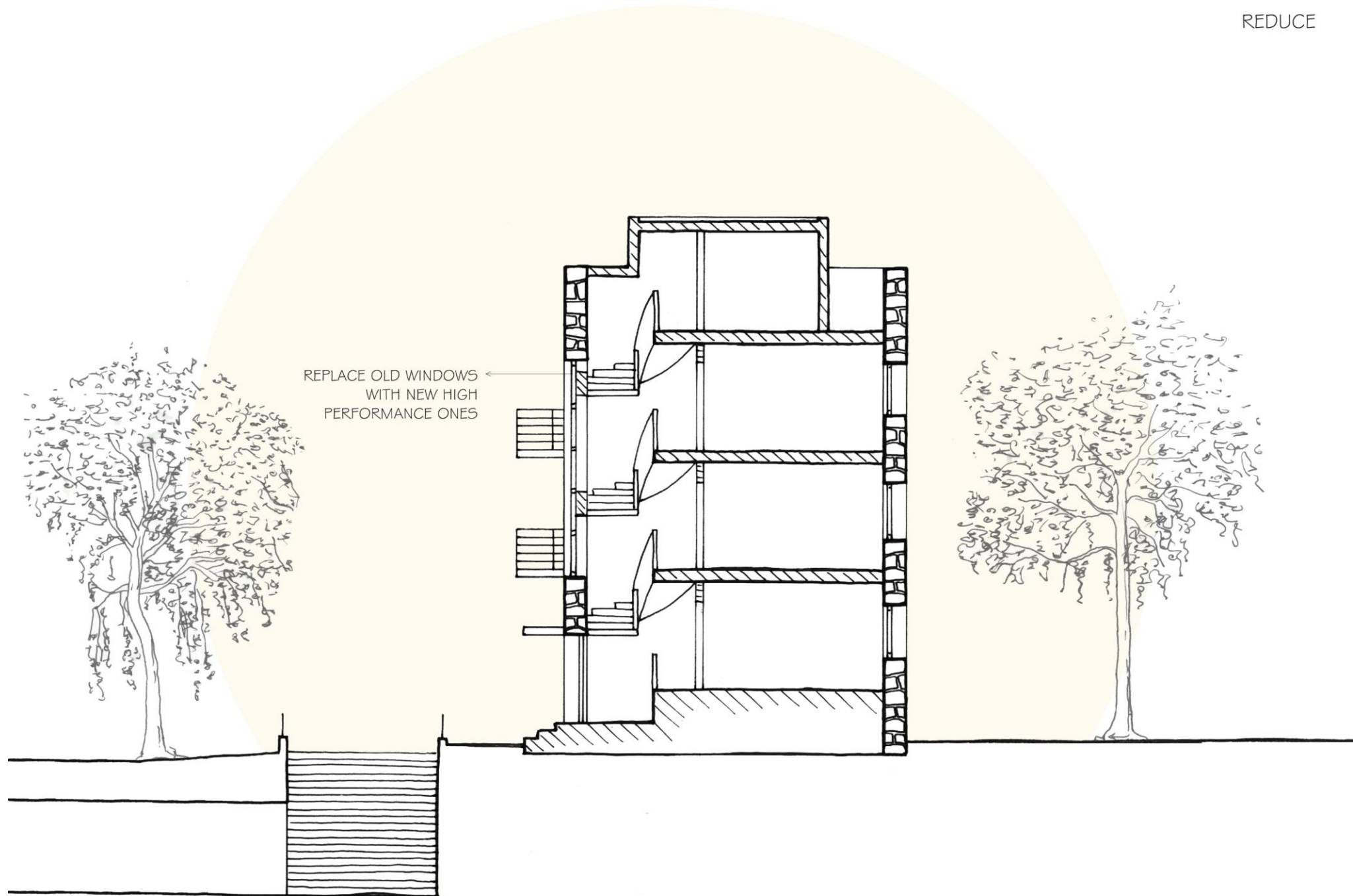
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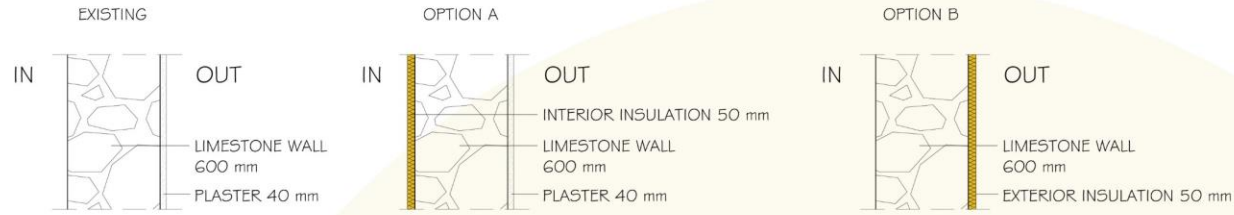
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REDUCE



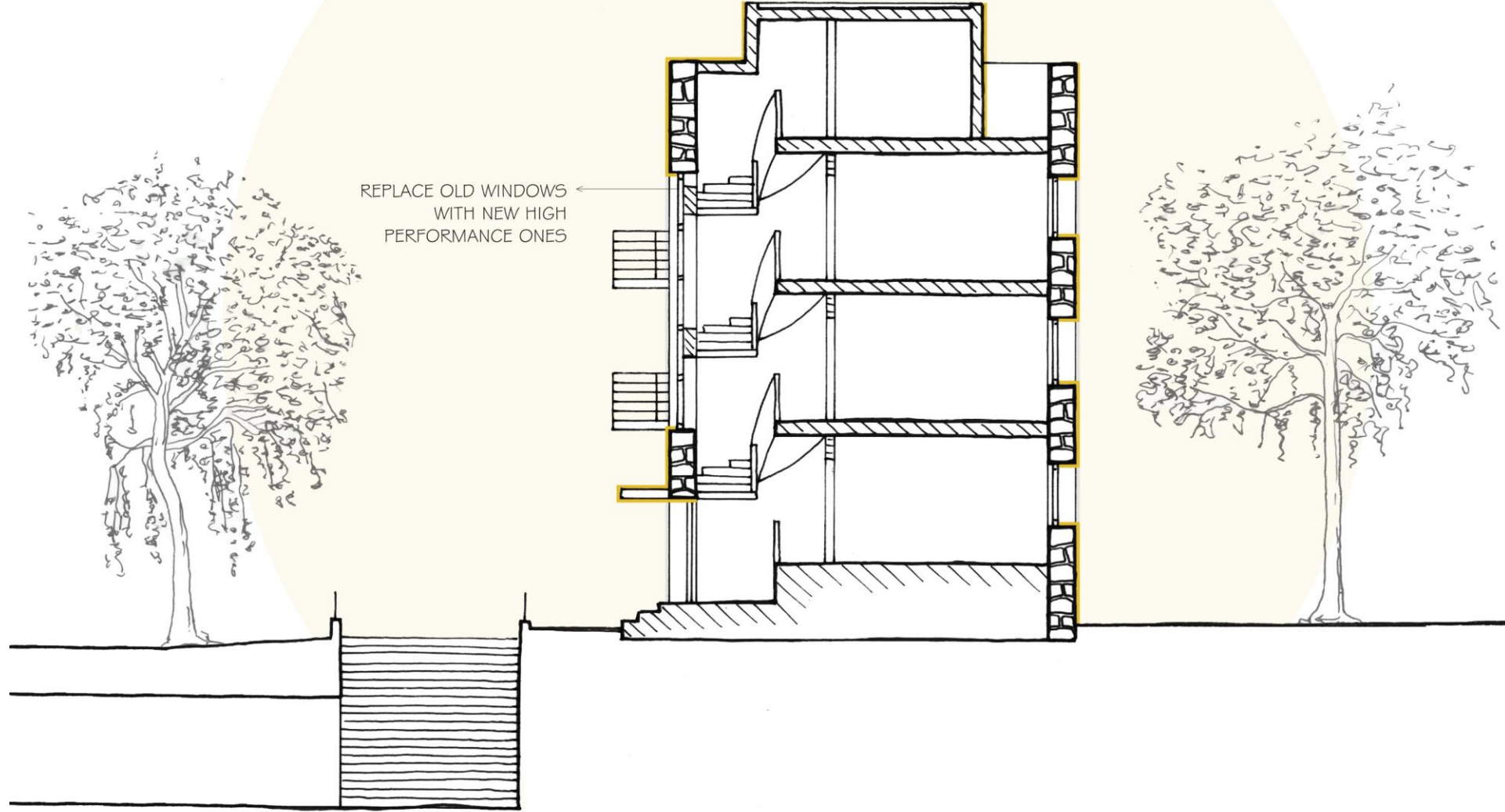
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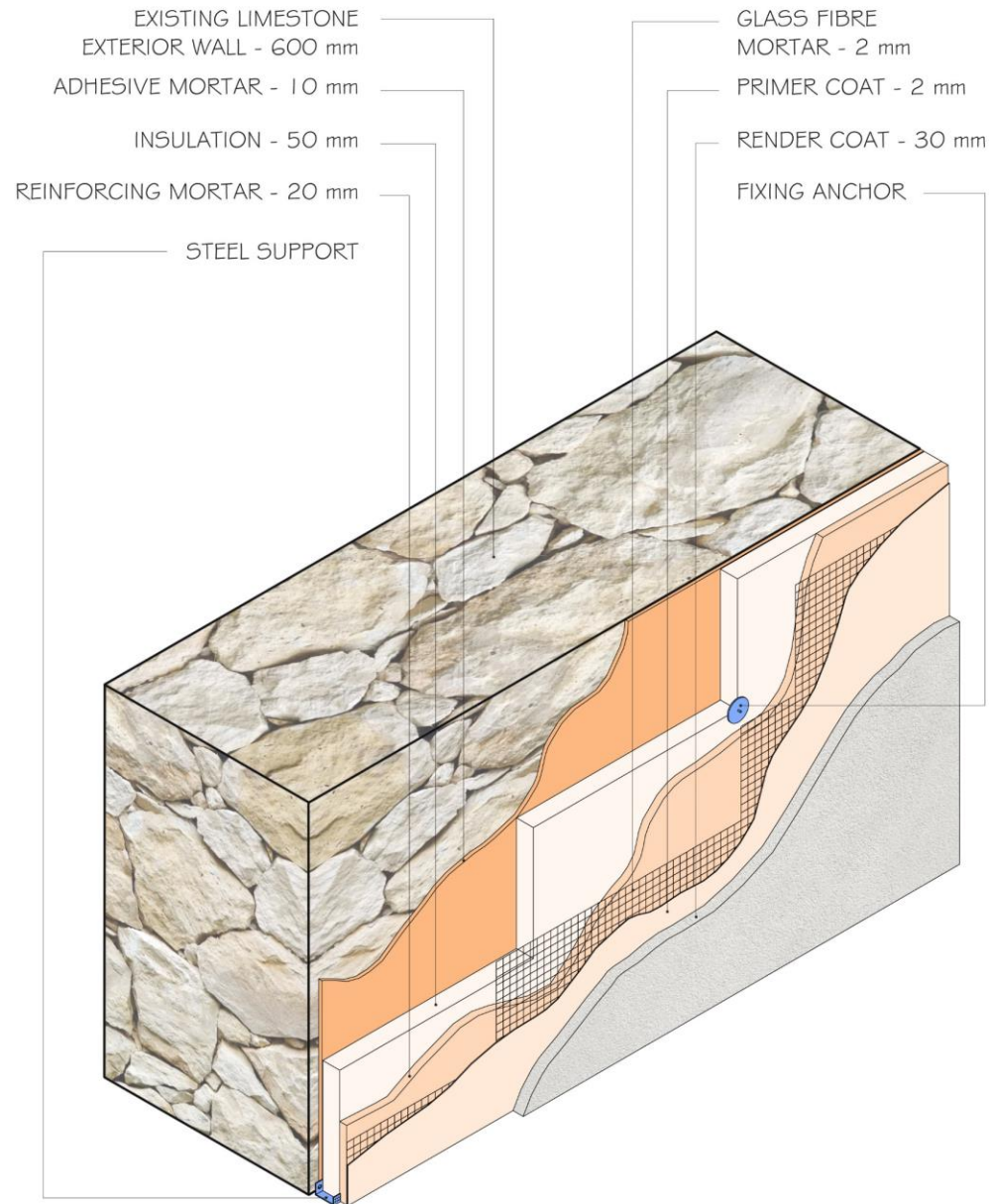
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EXTERNAL FACADE INSULATION



NORTH FACADE: LIMESTONE WALL WITH PLASTER COAT

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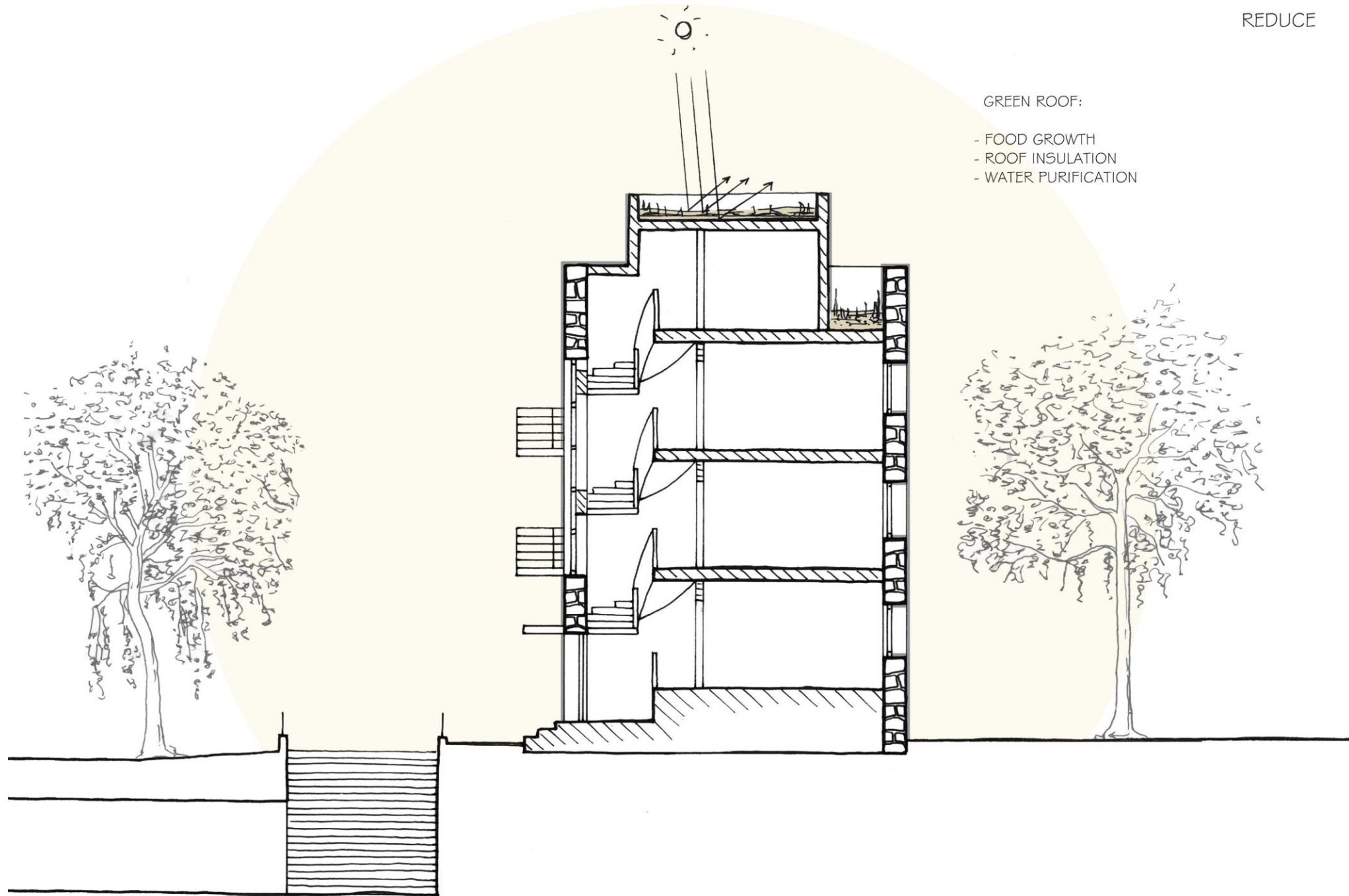
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REDUCE



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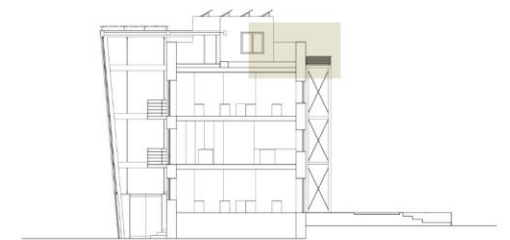
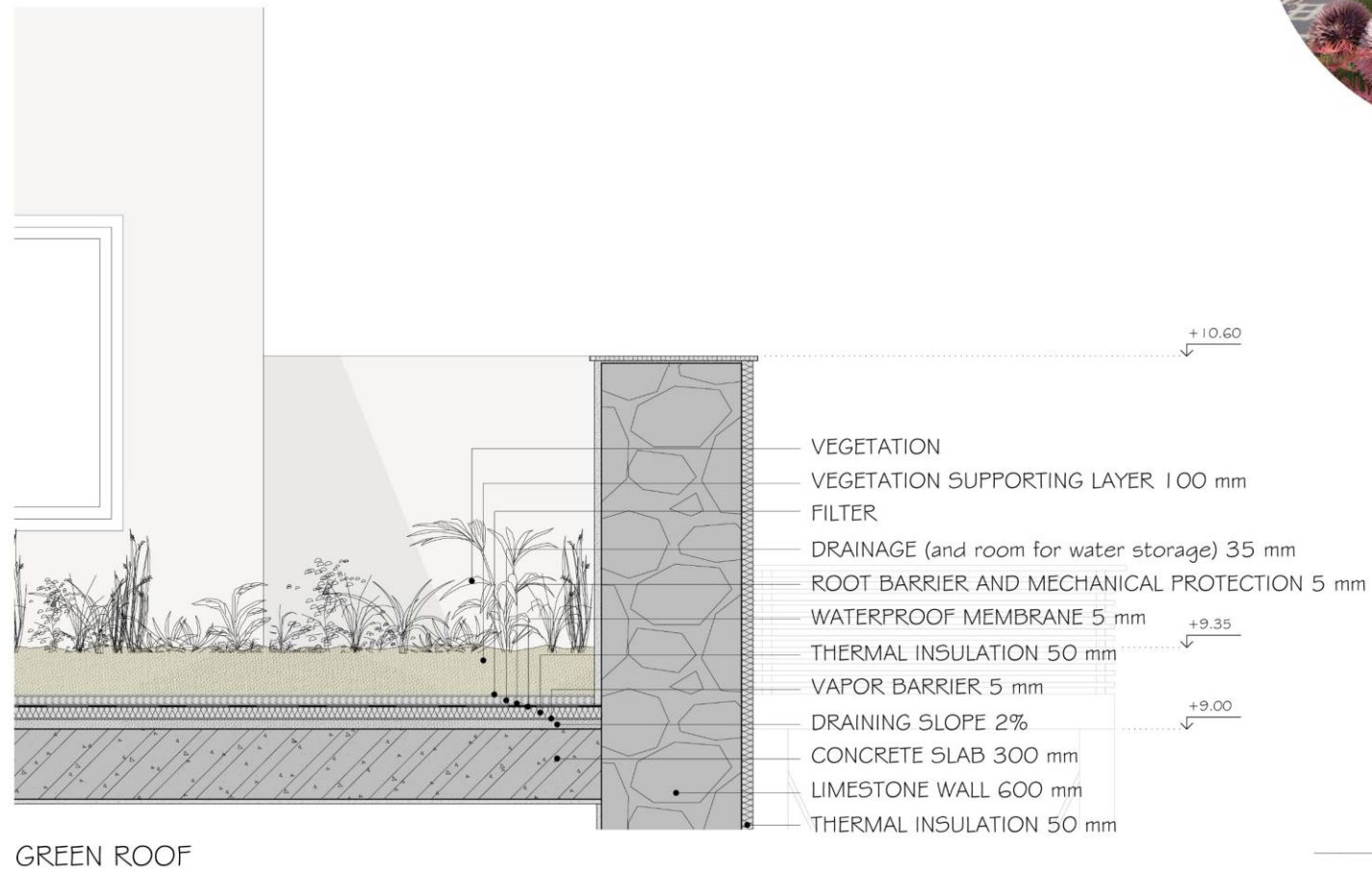
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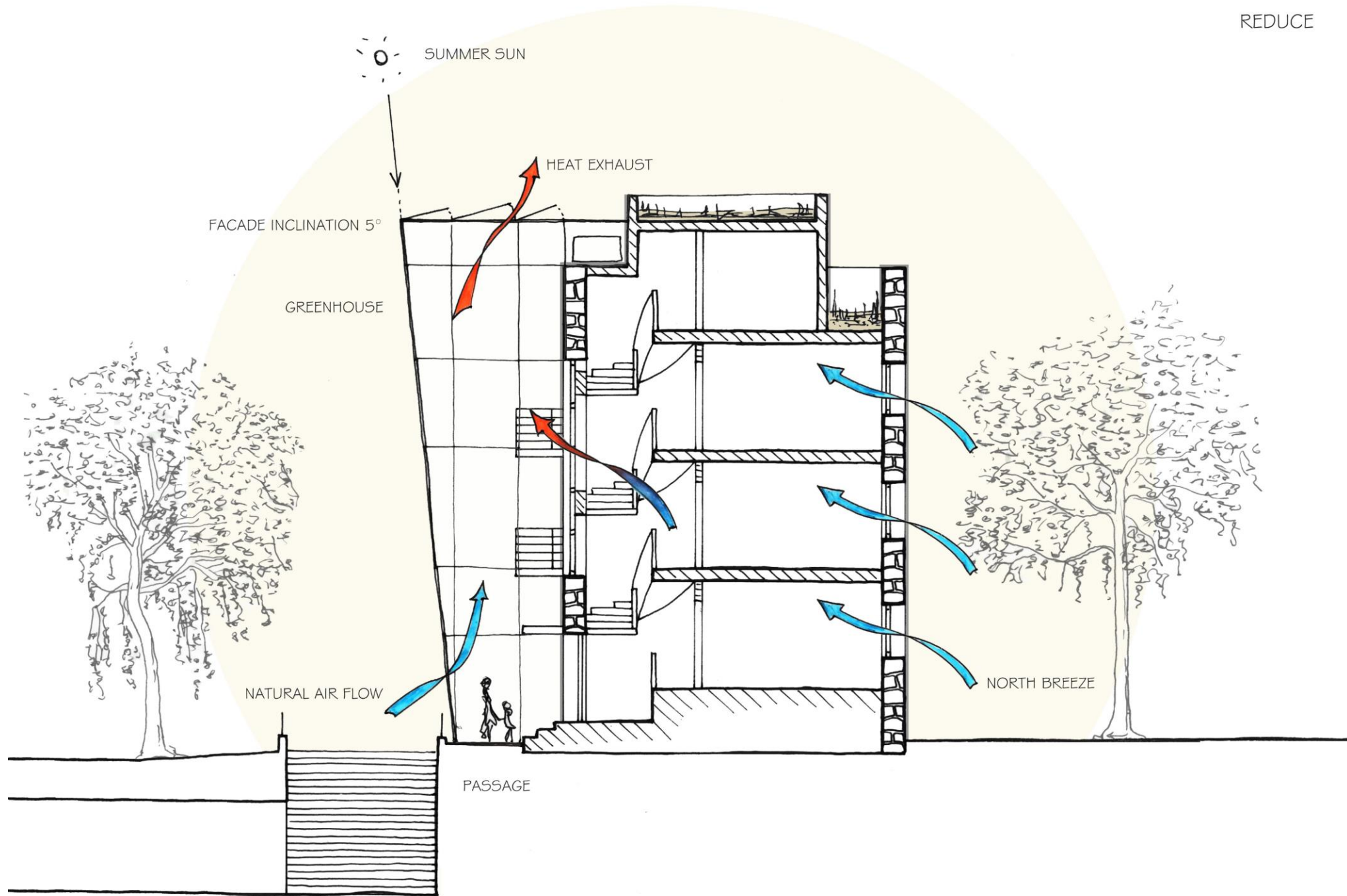
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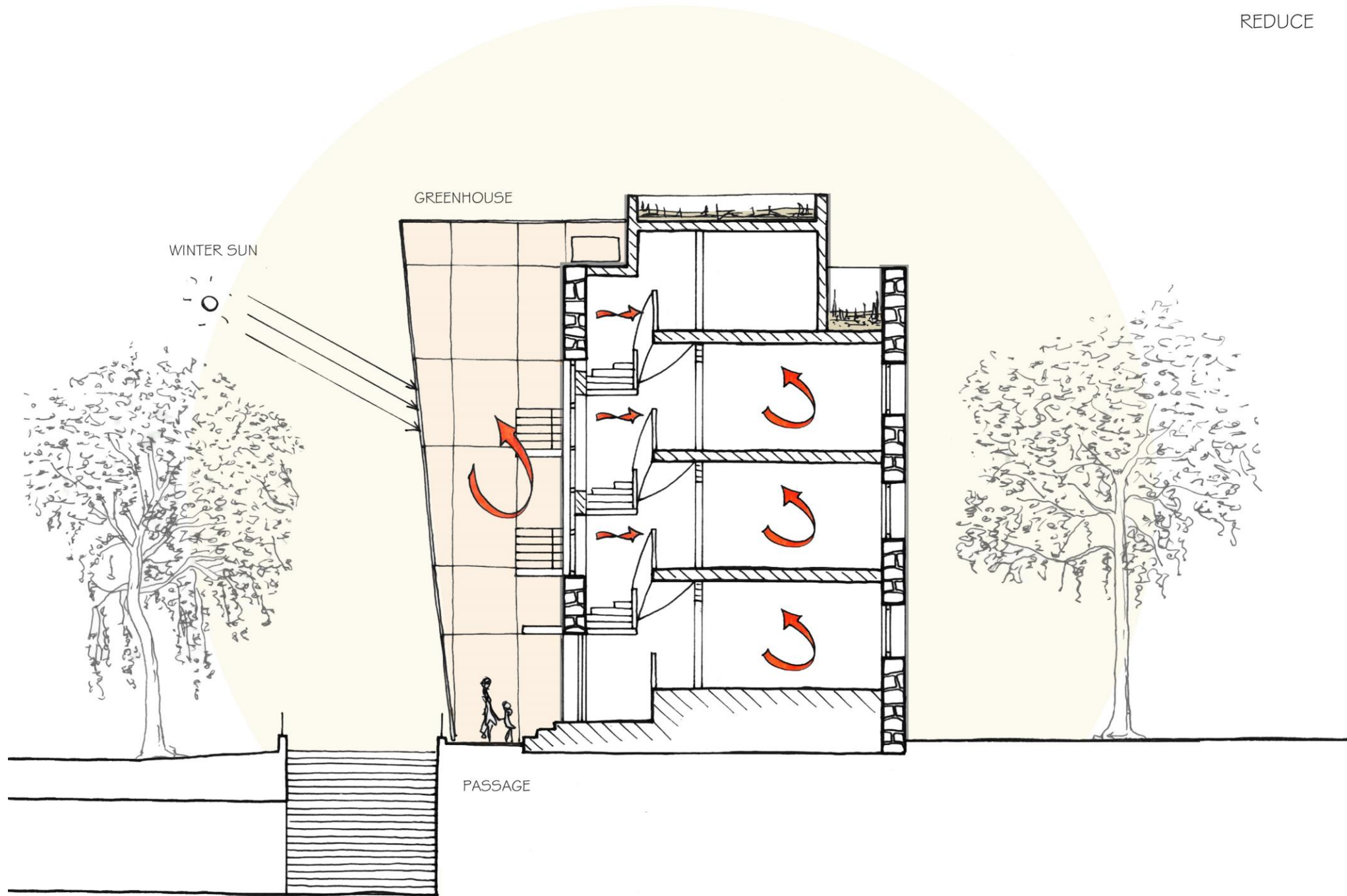
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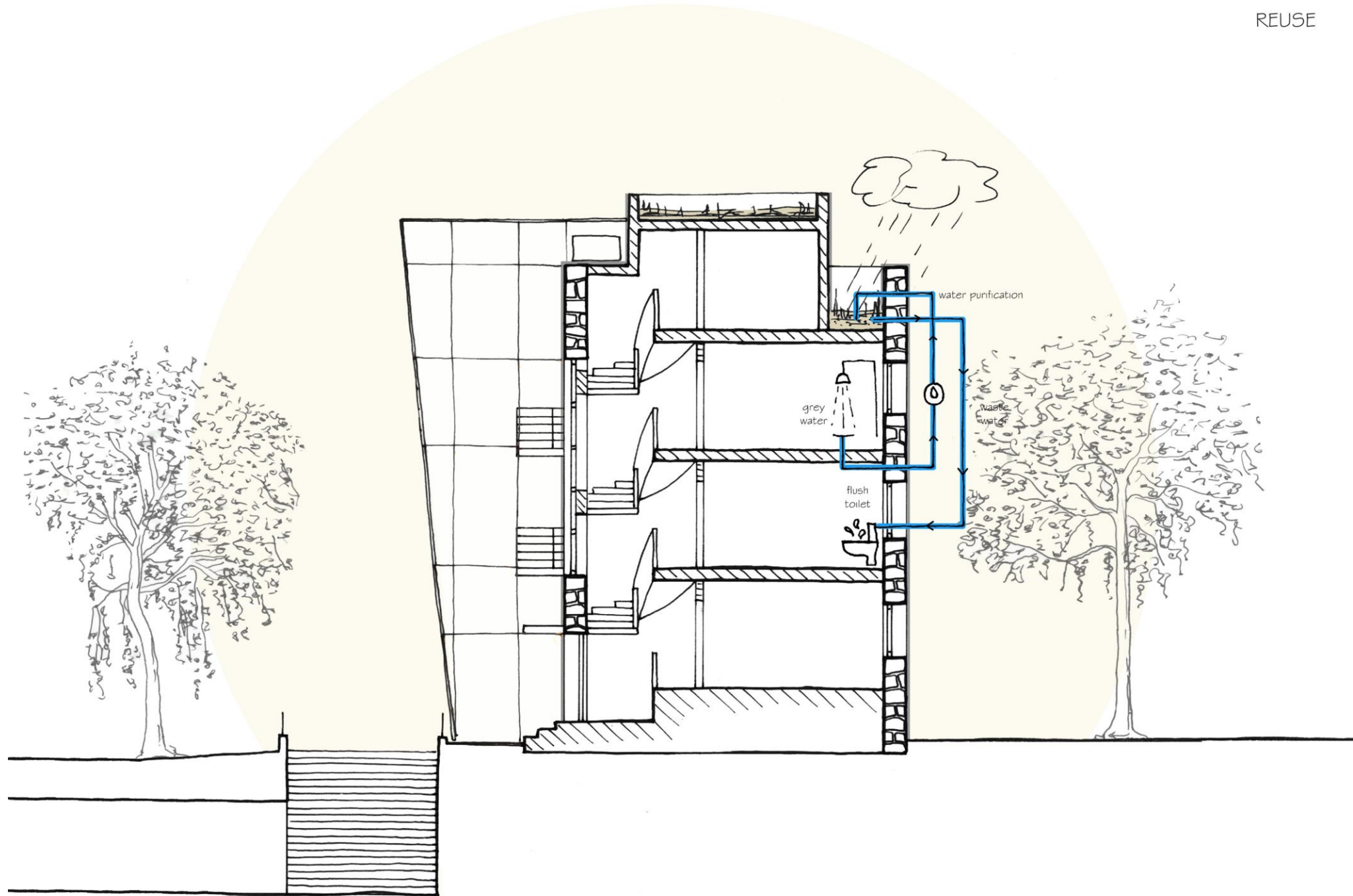
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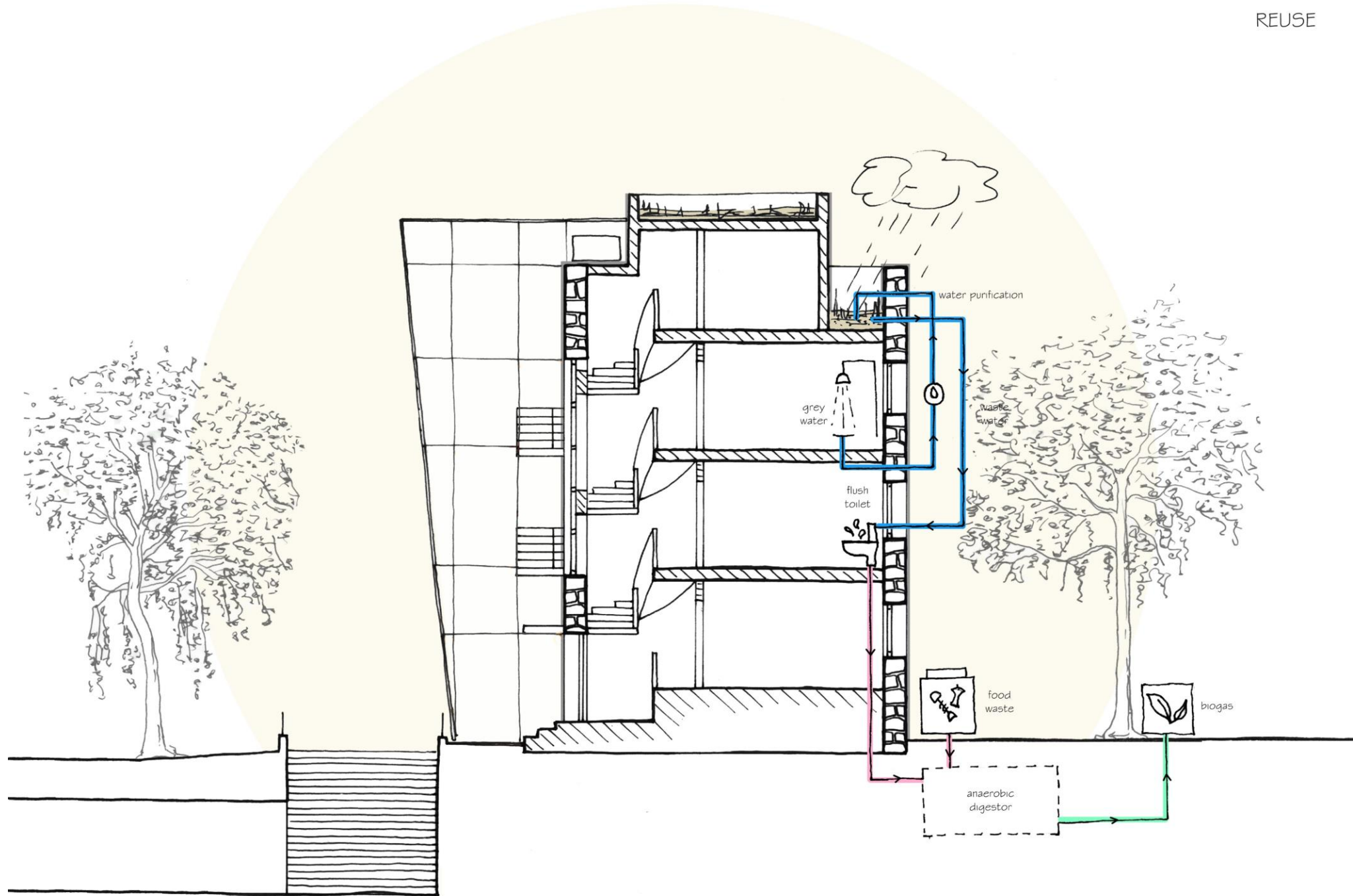
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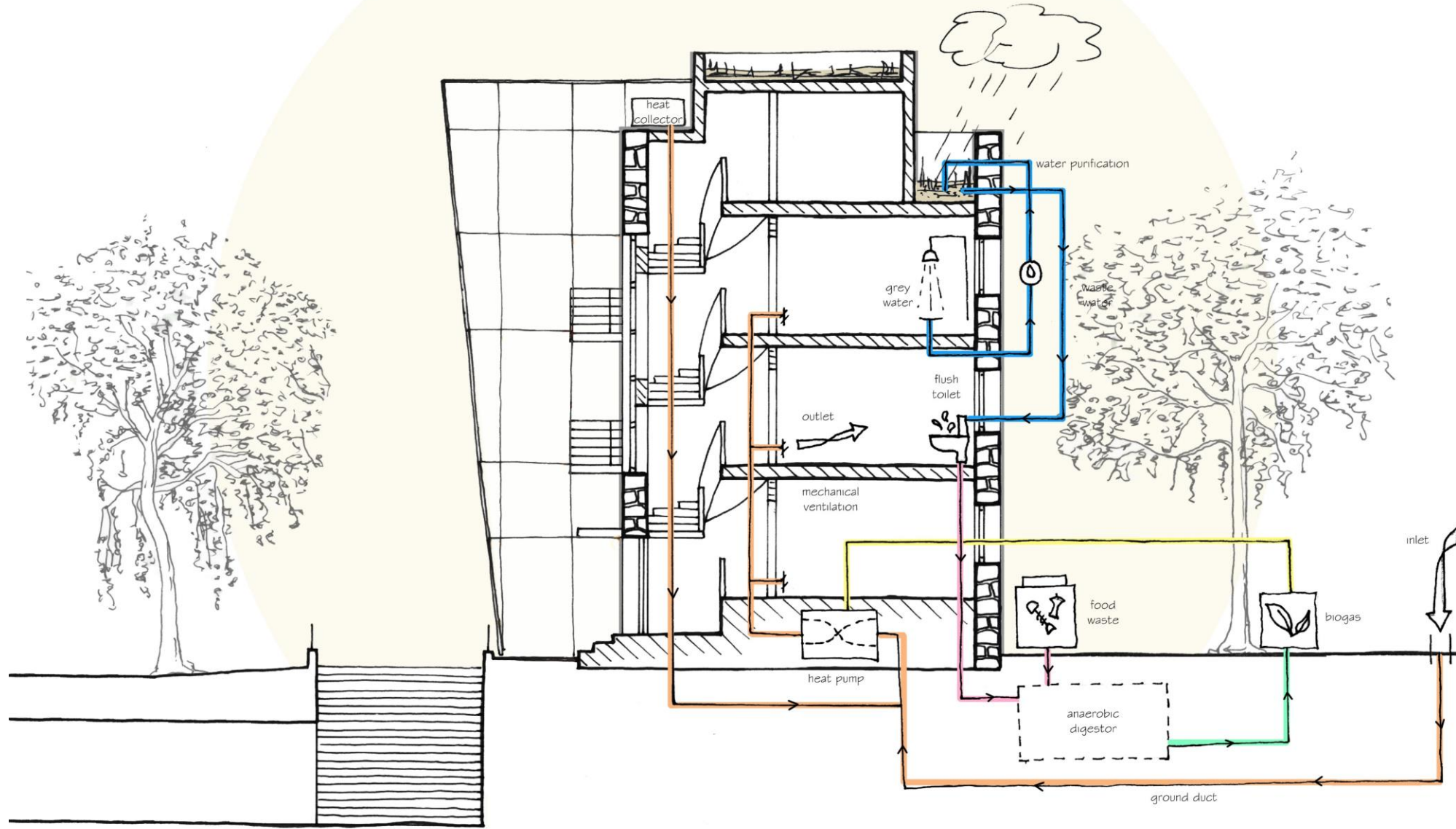
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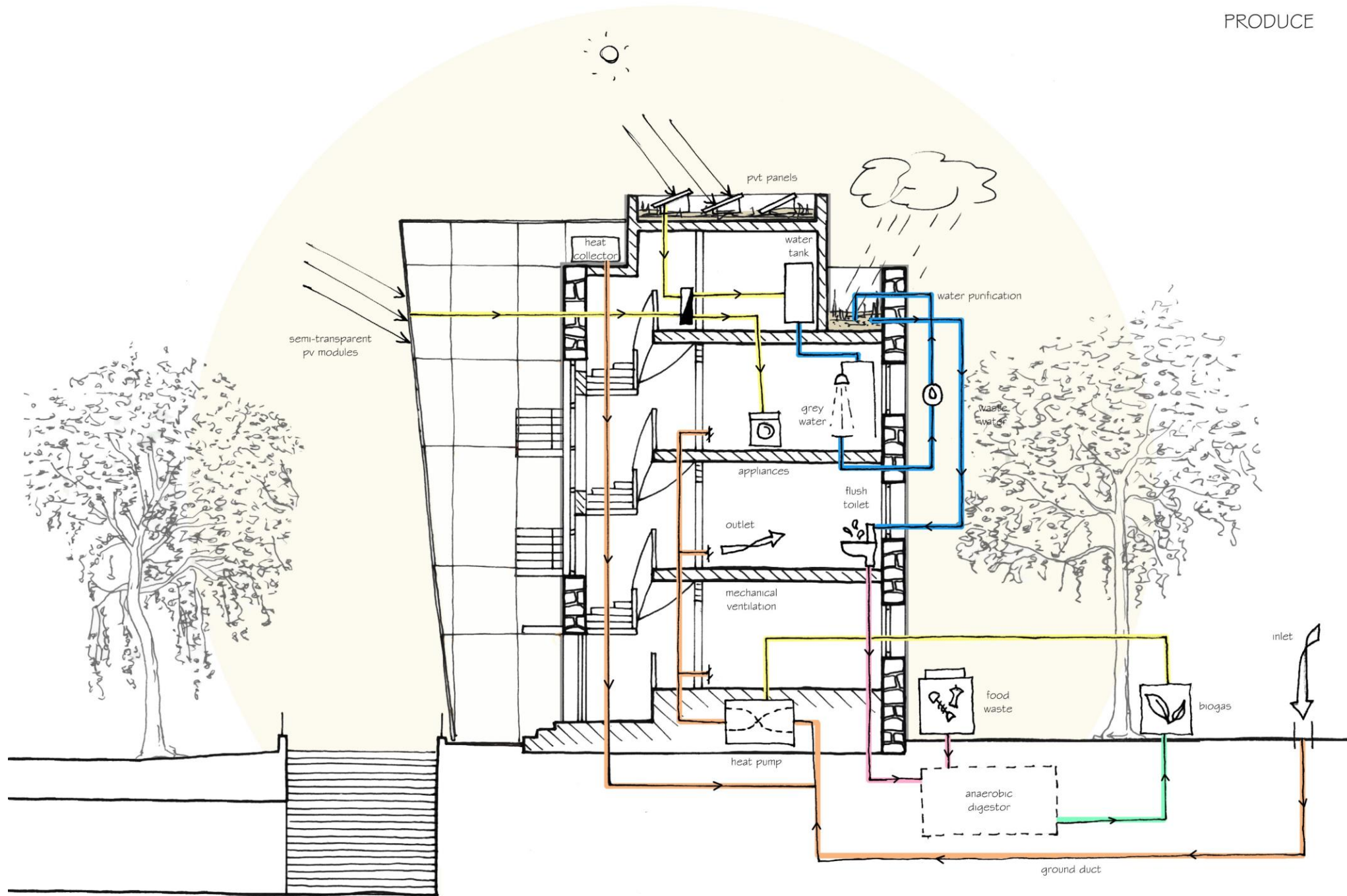
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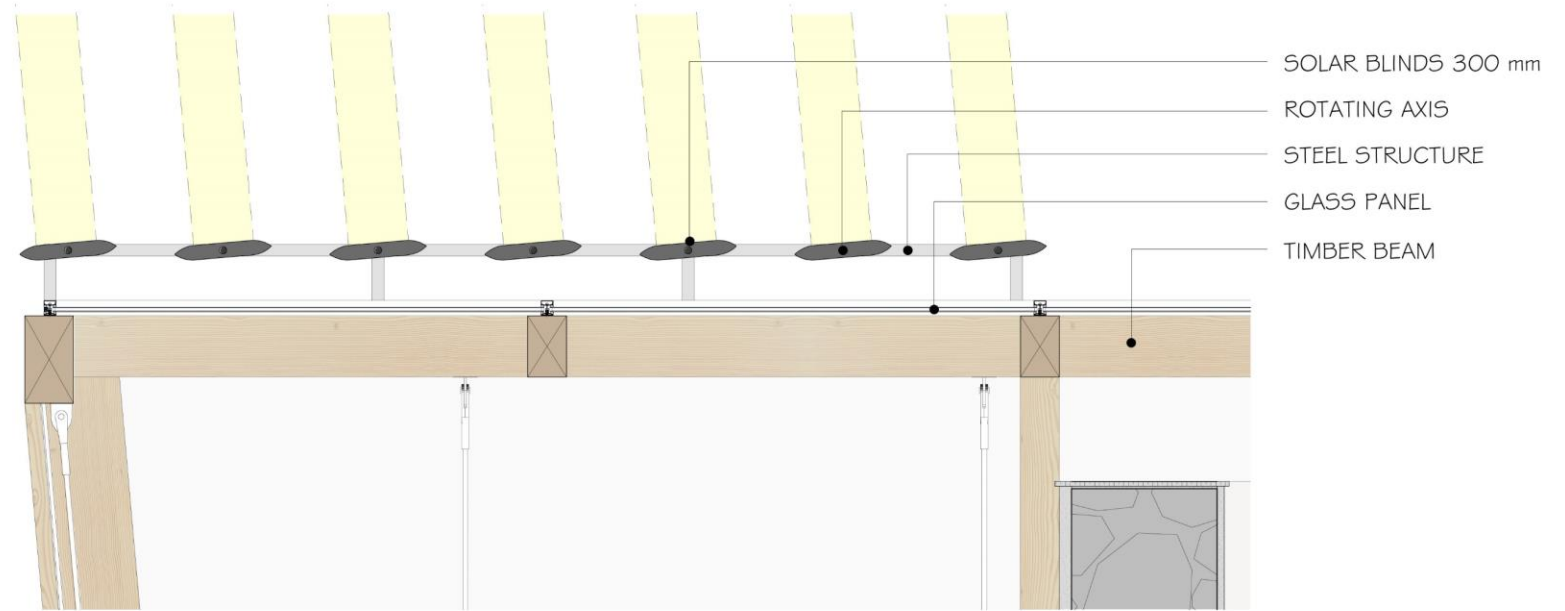
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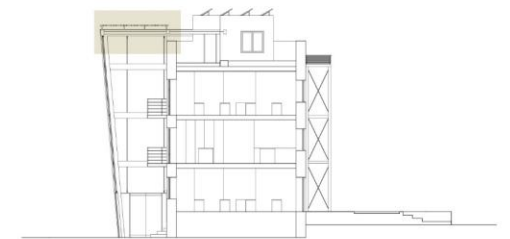
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ROTATING SOLAR BLINDS



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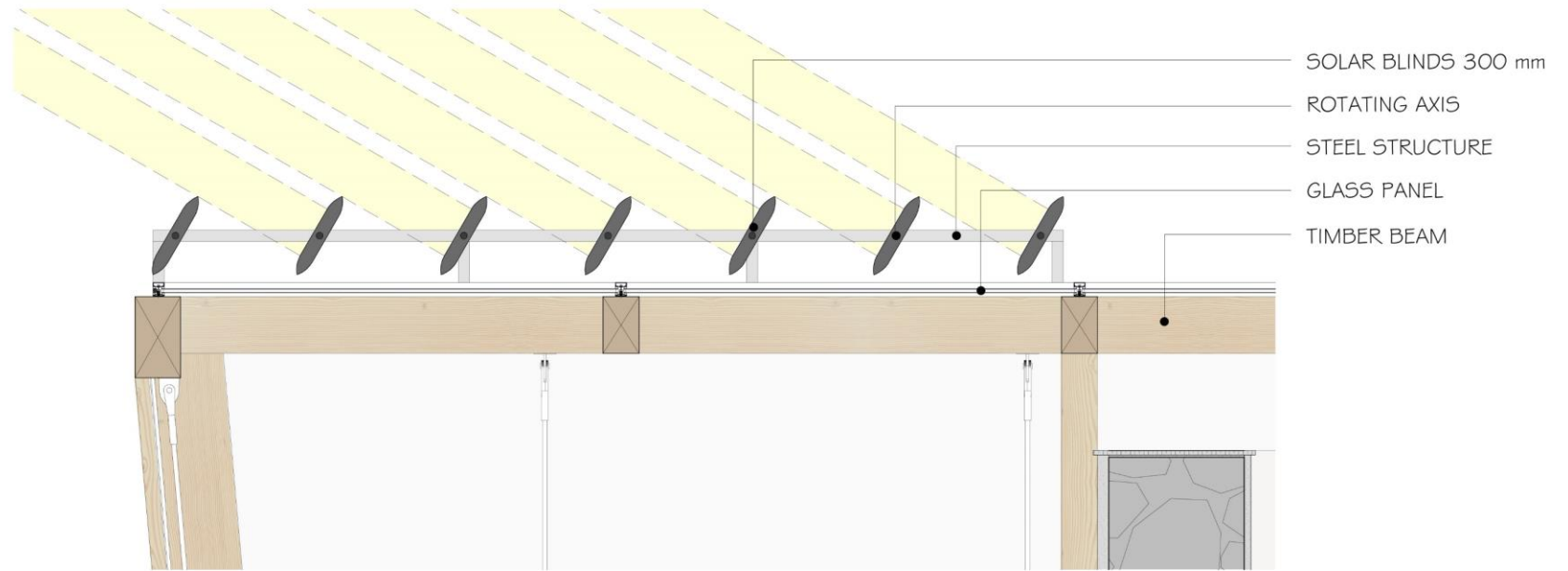
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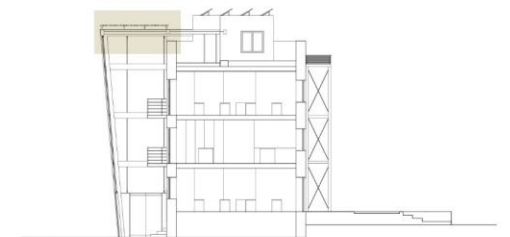
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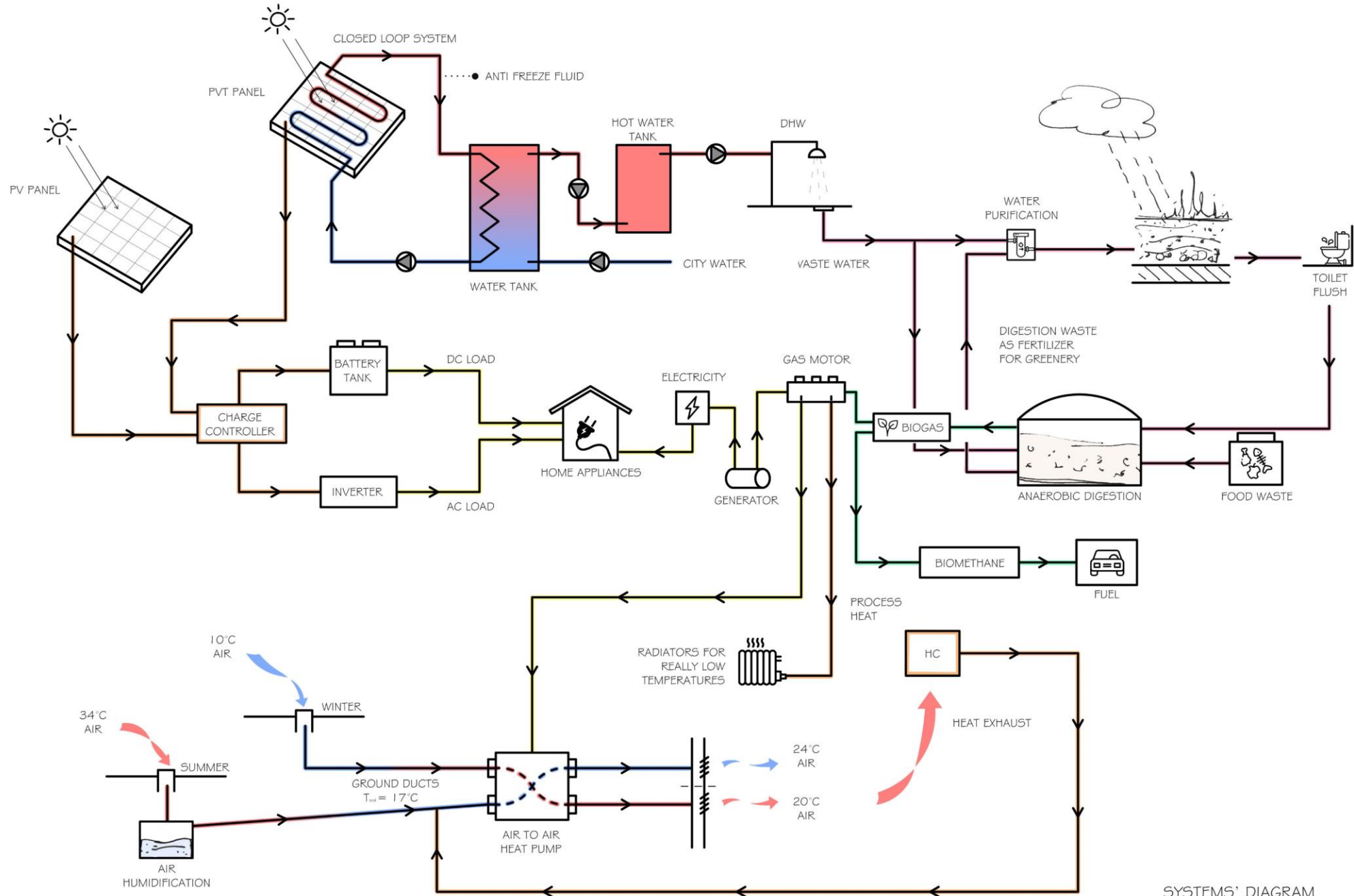
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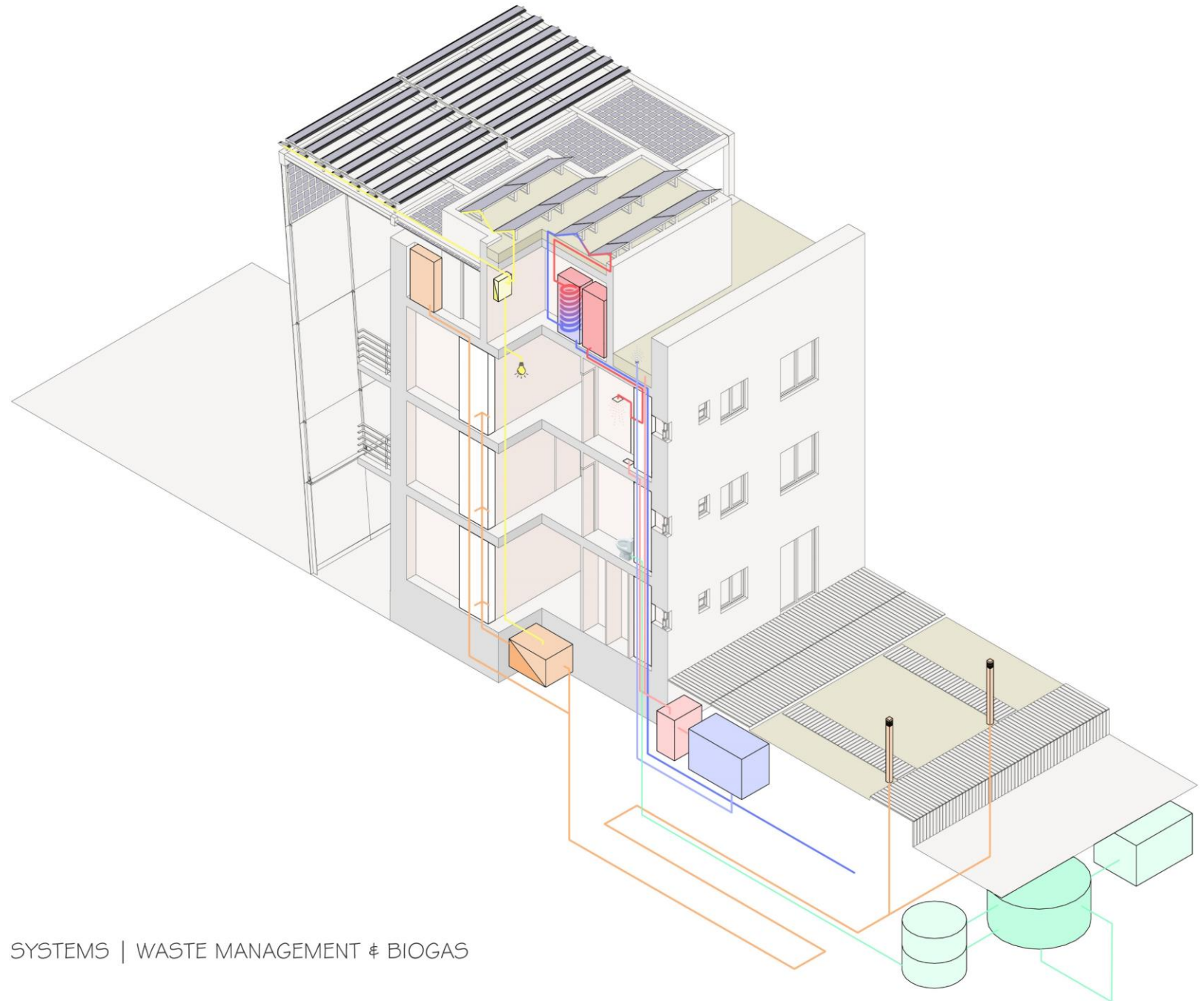
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SYSTEMS | WASTE MANAGEMENT & BIOGAS

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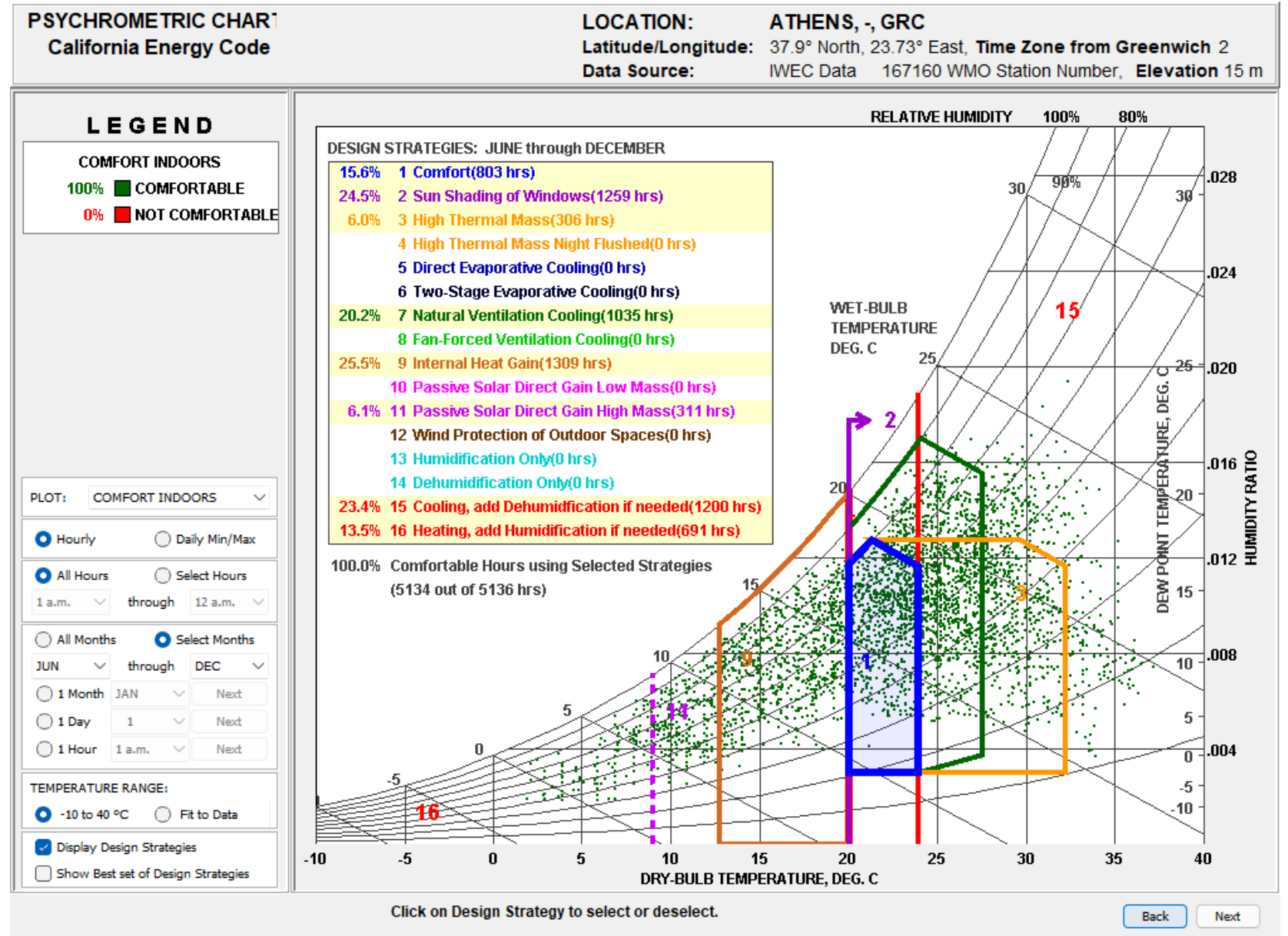
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Climate Consultant. (2022). Psychrometric Chart for improved situation of "Prosfygika", Athens, Greece [Chart].

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Electricity Demand	kWh	Electricity Production	kWh
Heating	72,898	PV-Systems	0
Cooling	50,594	Wind Turbine	0
Ventilation	0	Other	0
Appliances	36,180		
DHW	45,547		
MRE	0		
Other	0		
Total	205,219	Total	0

Net energy use **205,219** kWh

**Table 3.2b.** Author (2022). Electricity demand and Production of existing situation as communal space [Calculations Results].

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Electricity Demand	kWh	Electricity Production	kWh
Heating	72,898	PV-Systems	0
Cooling	50,594	Wind Turbine	0
Ventilation	0	Other	0
Appliances	36,180		
DHW	45,547		
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Other	0		
<b>Total</b>	<b>205,219</b>	<b>Total</b>	<b>0</b>

Net energy use **205,219** kWh

**Table 3.2b.** Author (2022). Electricity demand and Production of existing situation as communal space [Calculations Results].

Electricity Demand	kWh	Electricity Production	kWh
Heating	7,110	PV-Systems	0
Cooling	35,727	Wind Turbine	0
Ventilation	0	Other	0
Appliances	36,180		
DHW	45,547		
MRE	0		
Other	0		
<b>Total</b>	<b>124,564</b>	<b>Total</b>	<b>0</b>

Net energy use **124,564** kWh

**Table 3.4.** Author (2022). Electricity demand after the passive measures [Calculations Results].

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Electricity Demand	kWh	Electricity Production	kWh
Heating	72,898	PV-Systems	0
Cooling	50,594	Wind Turbine	0
Ventilation	0	Other	0
Appliances	36,180		
DHW	45,547		
MRE	0		
Other	0		
<b>Total</b>	<b>205,219</b>	<b>Total</b>	<b>0</b>

Net energy use **205,219** kWh

**Table 3.2b.** Author (2022). Electricity demand and Production of existing situation as communal space [Calculations Results].

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Electricity Demand	kWh	Electricity Production	kWh
Heating	7,110	PV-Systems	0
Cooling	35,727	Wind Turbine	0
Ventilation	0	Other	0
Appliances	36,180		
DHW	45,547		
MRE	0		
Other	0		
<b>Total</b>	<b>124,564</b>	<b>Total</b>	<b>0</b>

Net energy use **124,564** kWh

**Table 3.4.** Author (2022). Electricity demand after the passive measures [Calculations Results].

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Electricity Demand	kWh	Electricity Production	kWh
Heating	7,110	PV-Systems	0
Cooling	35,727	Wind Turbine	0
Ventilation	0	Biogas	7,200
Appliances	36,180		
DHW	45,547		
MRE	0		
Other	0		
<b>Total</b>	<b>124,564</b>	<b>Total</b>	<b>0</b>

Net energy use **117,364** kWh

**Table 3.5.** Author (2022). Electricity demand and production after the reduce and reuse measures [Calculations Results].

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Electricity Demand	kWh	Electricity Production	kWh
Heating	72,898	PV-Systems	0
Cooling	50,594	Wind Turbine	0
Ventilation	0	Other	0
Appliances	36,180		
DHW	45,547		
MRE	0		
Other	0		
<b>Total</b>	<b>205,219</b>	<b>Total</b>	<b>0</b>

Net energy use **205,219** kWh

**Table 3.2b.** Author (2022). Electricity demand and Production of existing situation as communal space [Calculations Results].

Electricity Demand	kWh	Electricity Production	kWh
Heating	7,110	PV-Systems	0
Cooling	35,727	Wind Turbine	0
Ventilation	0	Other	0
Appliances	36,180		
DHW	45,547		
MRE	0		
Other	0		
<b>Total</b>	<b>124,564</b>	<b>Total</b>	<b>0</b>

Net energy use **124,564** kWh

**Table 3.4.** Author (2022). Electricity demand after the passive measures [Calculations Results].

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Electricity Demand	kWh	Electricity Production	kWh
Heating	7,110	PV-Systems	0
Cooling	35,727	Wind Turbine	0
Ventilation	0	Biogas	7,200
Appliances	36,180		
DHW	45,547		
MRE	0		
Other	0		
<b>Total</b>	<b>124,564</b>	<b>Total</b>	<b>0</b>

Net energy use **117,364** kWh

**Table 3.5.** Author (2022). Electricity demand and production after the reduce and reuse measures [Calculations Results].

Electricity Demand	kWh	Electricity Production	kWh
Heating	3,782	PV-Systems	129,939
Cooling	35,727	Wind Turbine	0
Ventilation	3,810	Biogas	7,200
Appliances	24,180		
DHW	45,547		
MRE	0		
Other	0		
<b>Total</b>	<b>113,046</b>	<b>Total</b>	<b>137,139</b>

Net energy use **-24,093** kWh

**Table 3.6.** Author (2022). Electricity demand and production after applying the steeped approach [Calculations Results].

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X 24.000 times  
[2.000 W]

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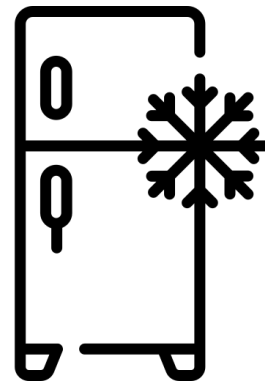
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X 24.000 times  
[2.000 W]

X 8 years  
[200-400 W]



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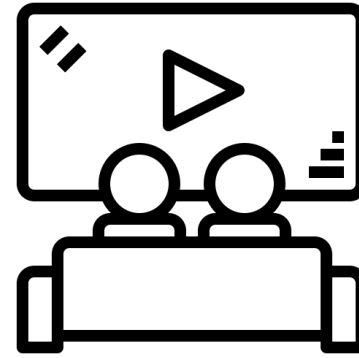
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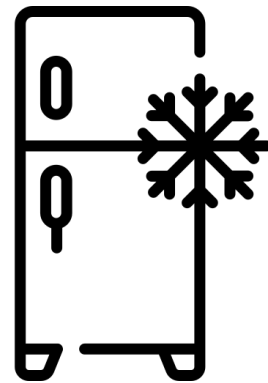


X 24.000 times  
[2.000 W]

X 8 years  
[200-400 W]



X 34 years  
42'' LED TV [80 W]



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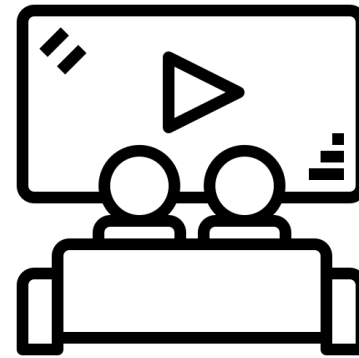
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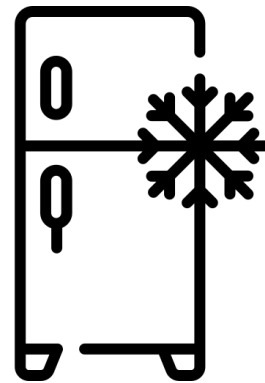
X 24.000 times  
[2.000 W]

X 8 years  
[200-400 W]



X 34 years  
42'' LED TV [80 W]

X 6 years  
family apartment



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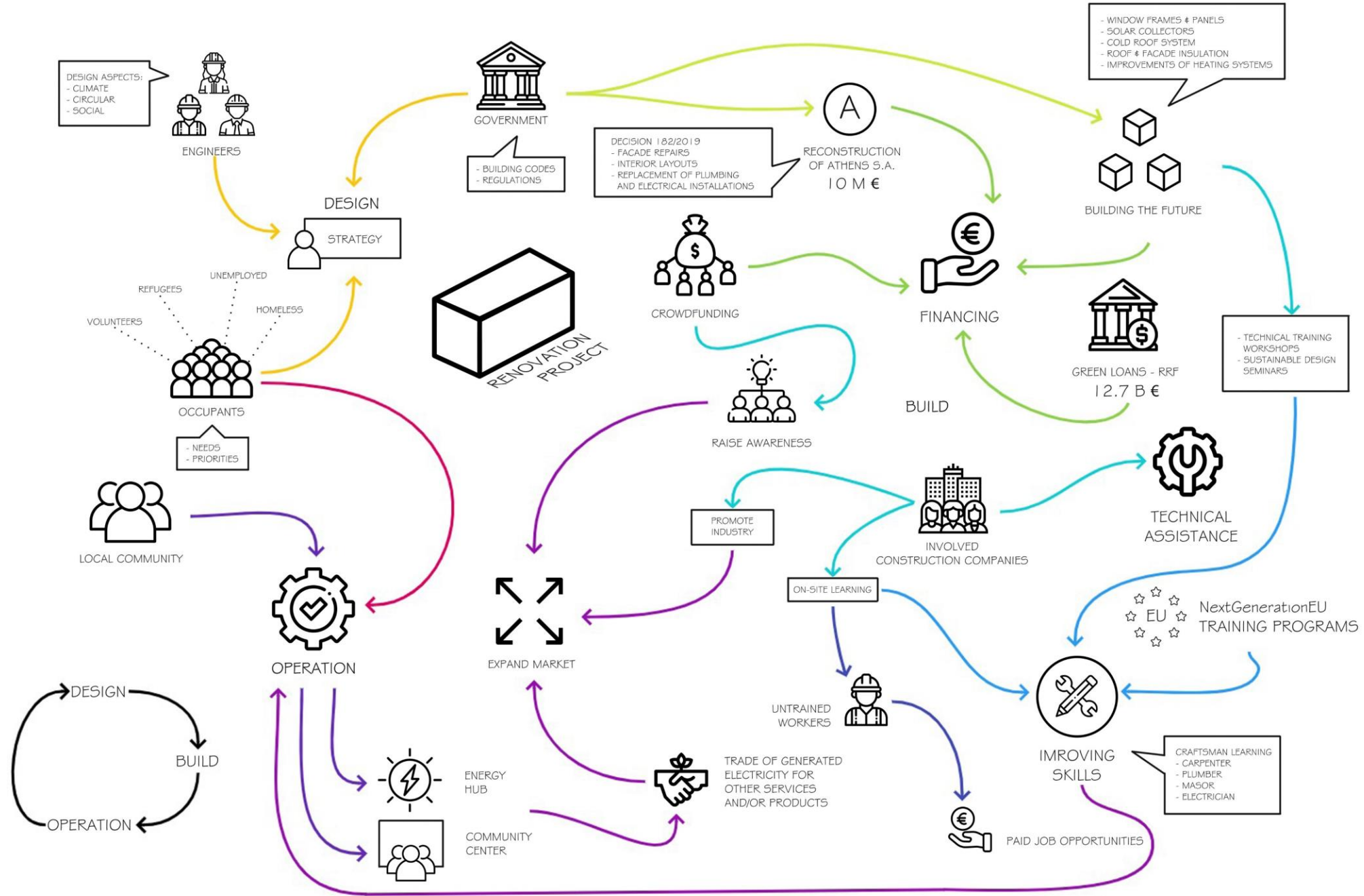
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Co-Hab Athens

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**Downsize Athens** ↓ **Decommodify Properties** 

**Liberate Land make public space** 

**Re-localize economy** 

**Renovate buildings enhance habitat quality** 

**Self-management Share resources** 

Co-Hab Athens (xx). Concept based on Oerlikon train station [Sketch]. <https://nena1.ch/>

Klaprozenbuurt



Space & Matters (xx). Klaprozenbuurt [Photograph]. <https://www.spaceandmatter.nl/>

SUM

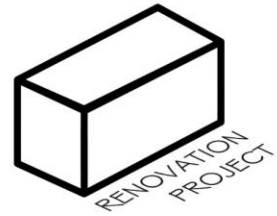


SUM team (2022). SUM's prototype in Wuppertal, Germany [Photograph]. <https://www.linkedin.com/company/team-sum/>

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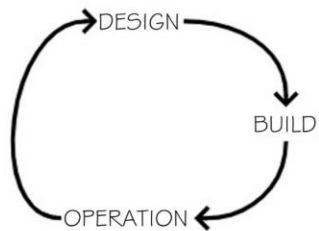
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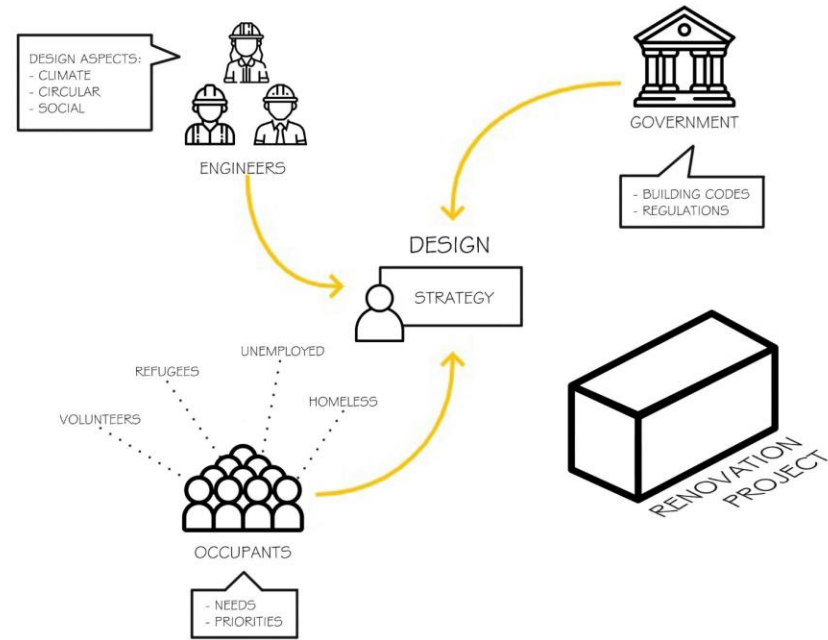
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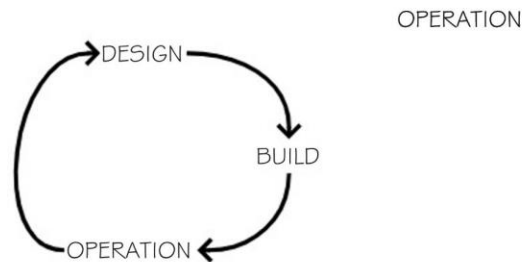


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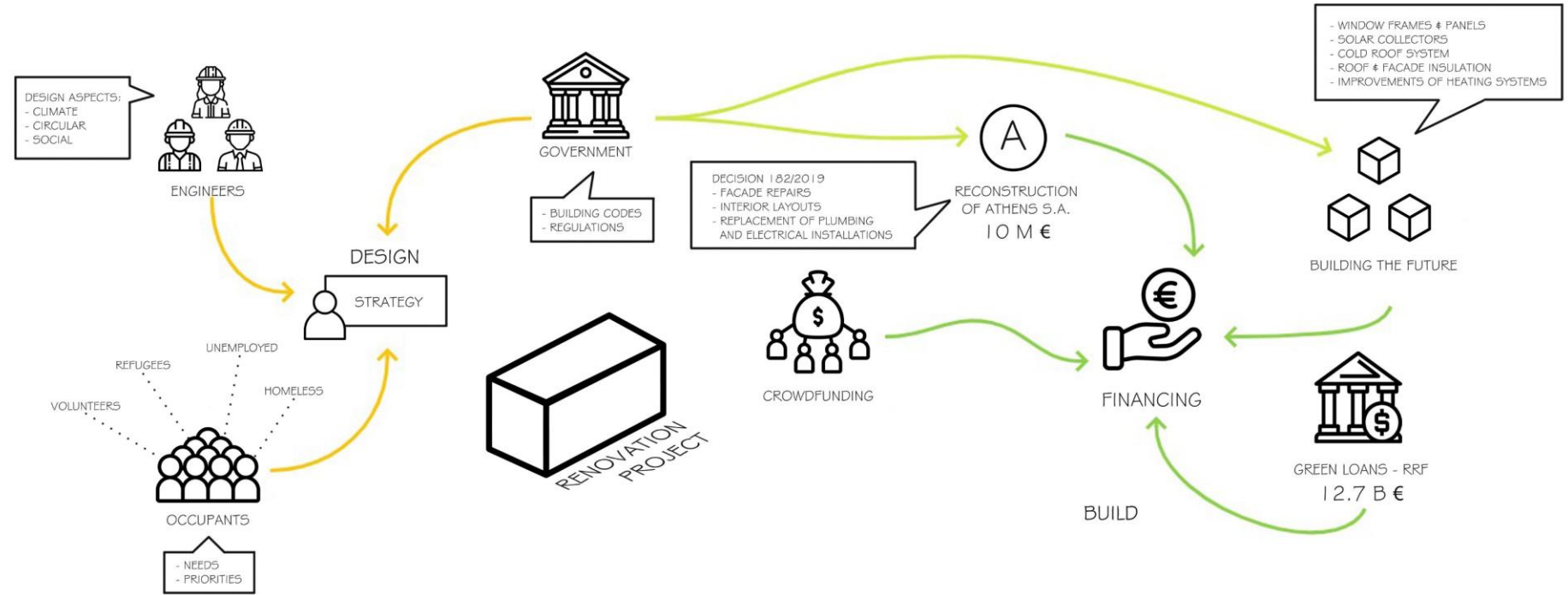
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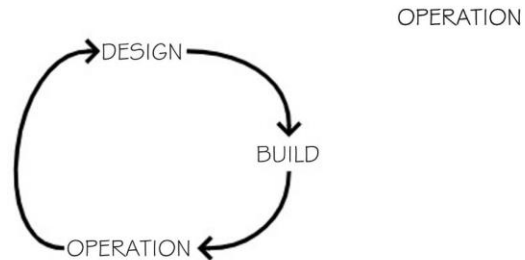
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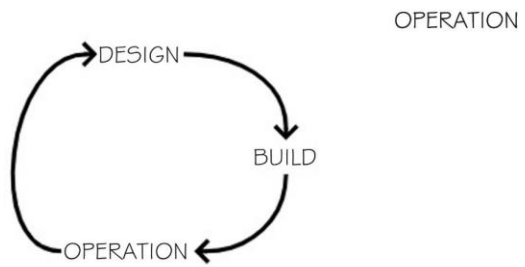
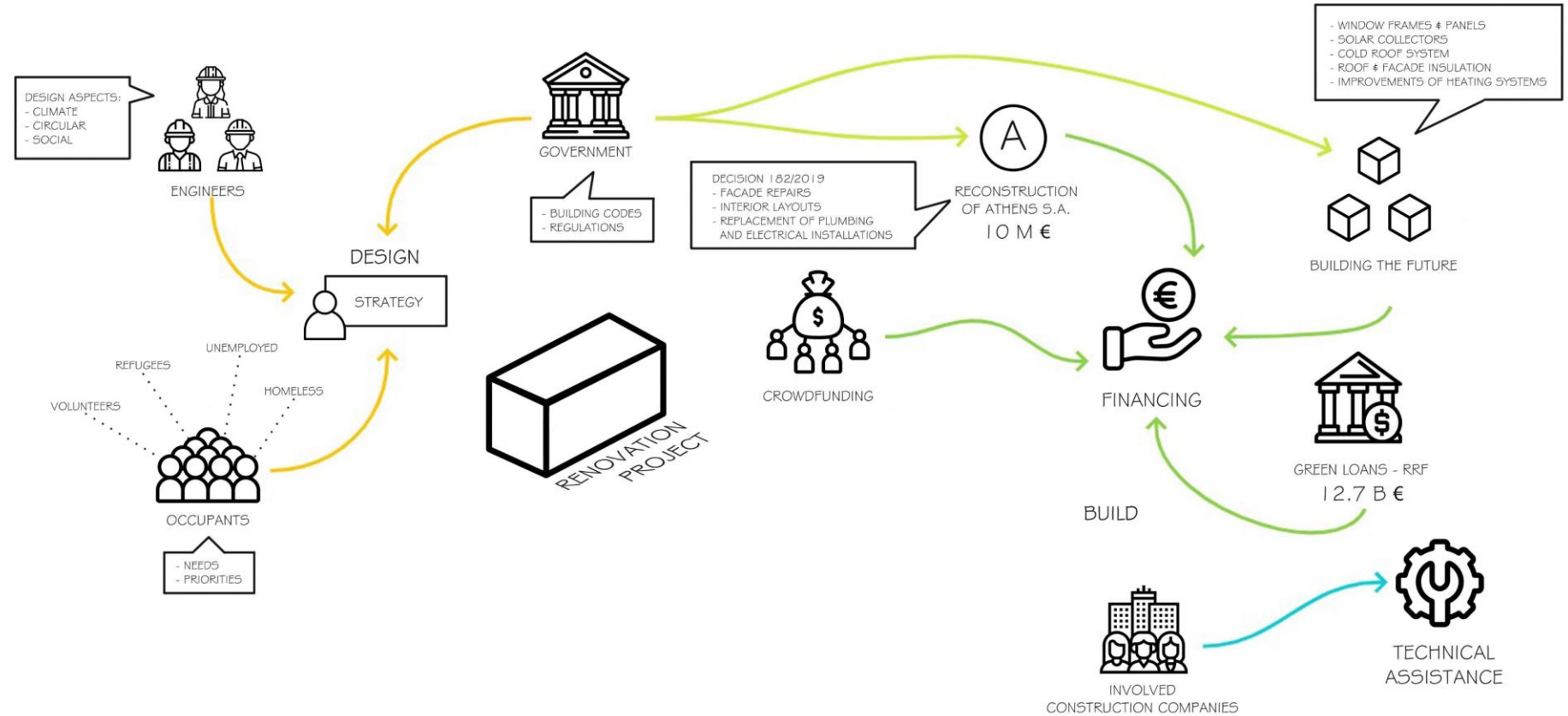
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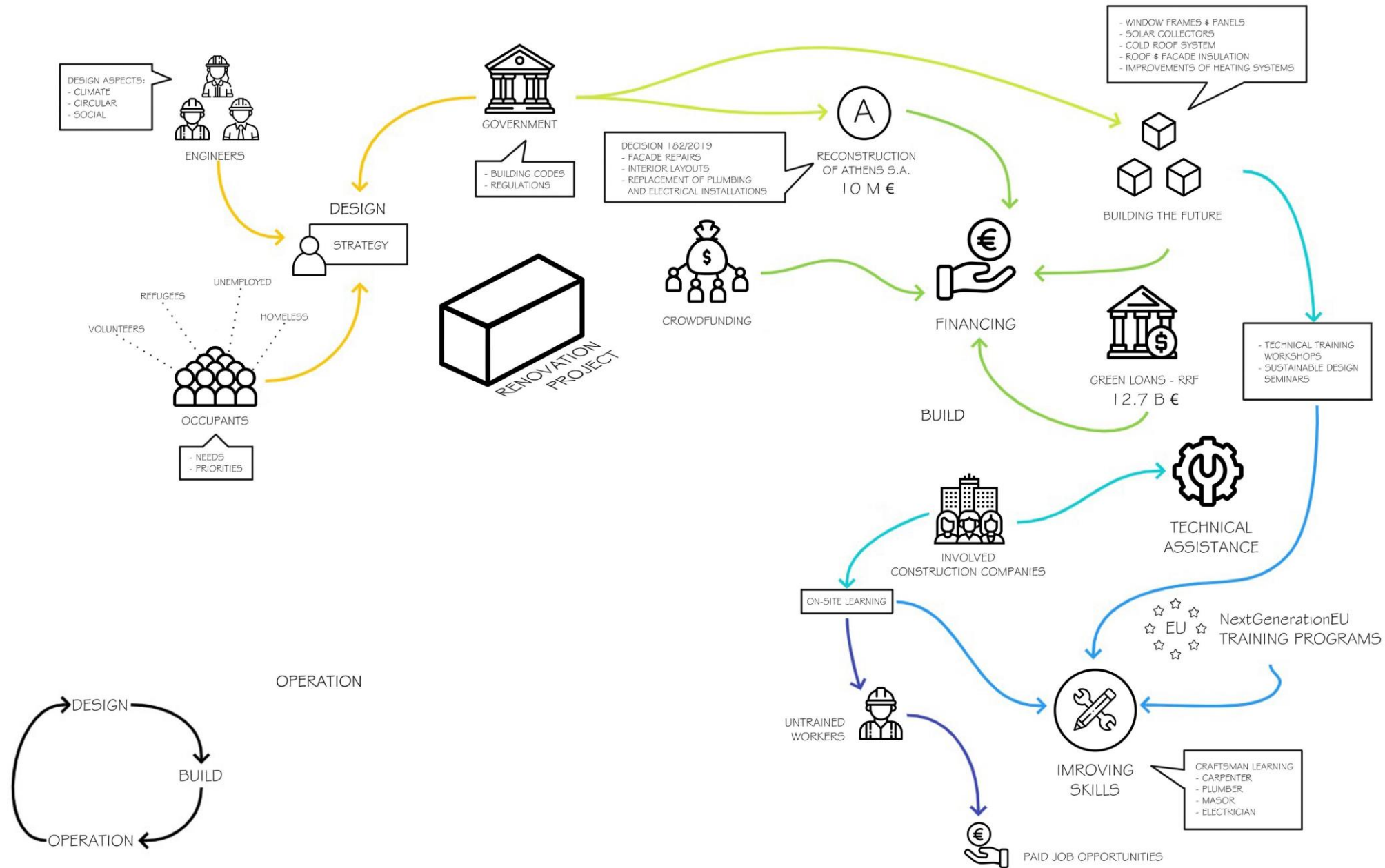
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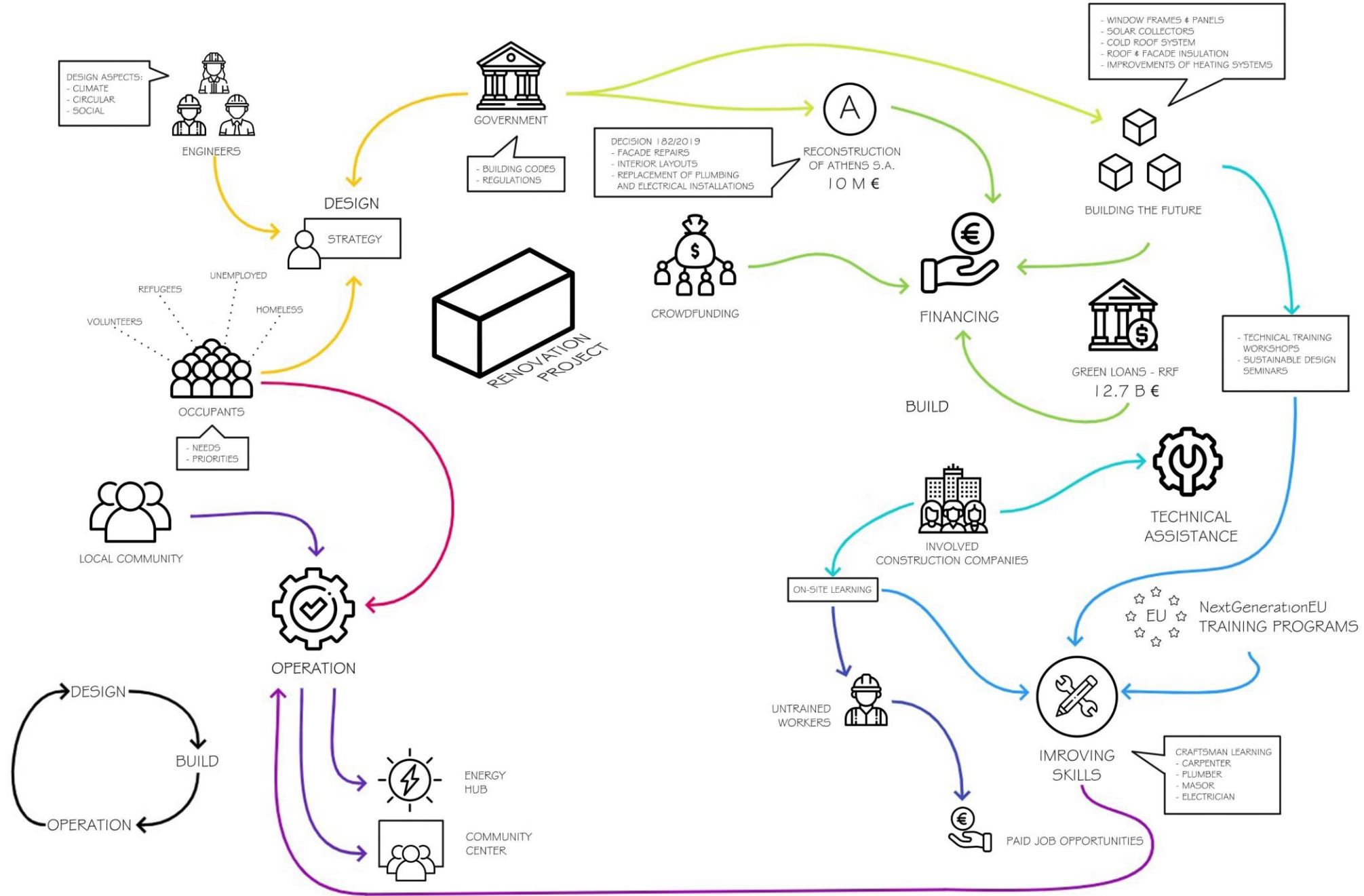
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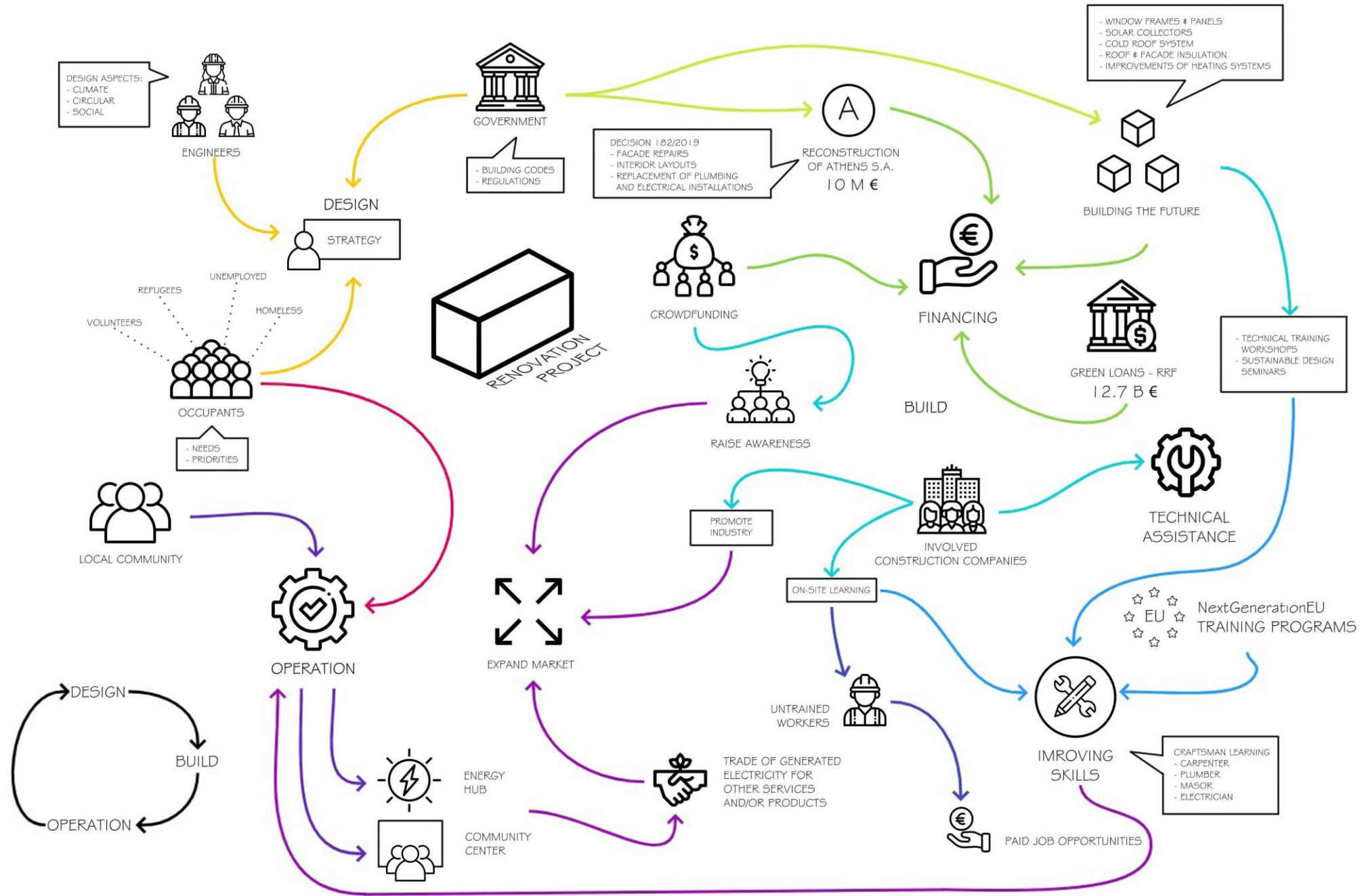
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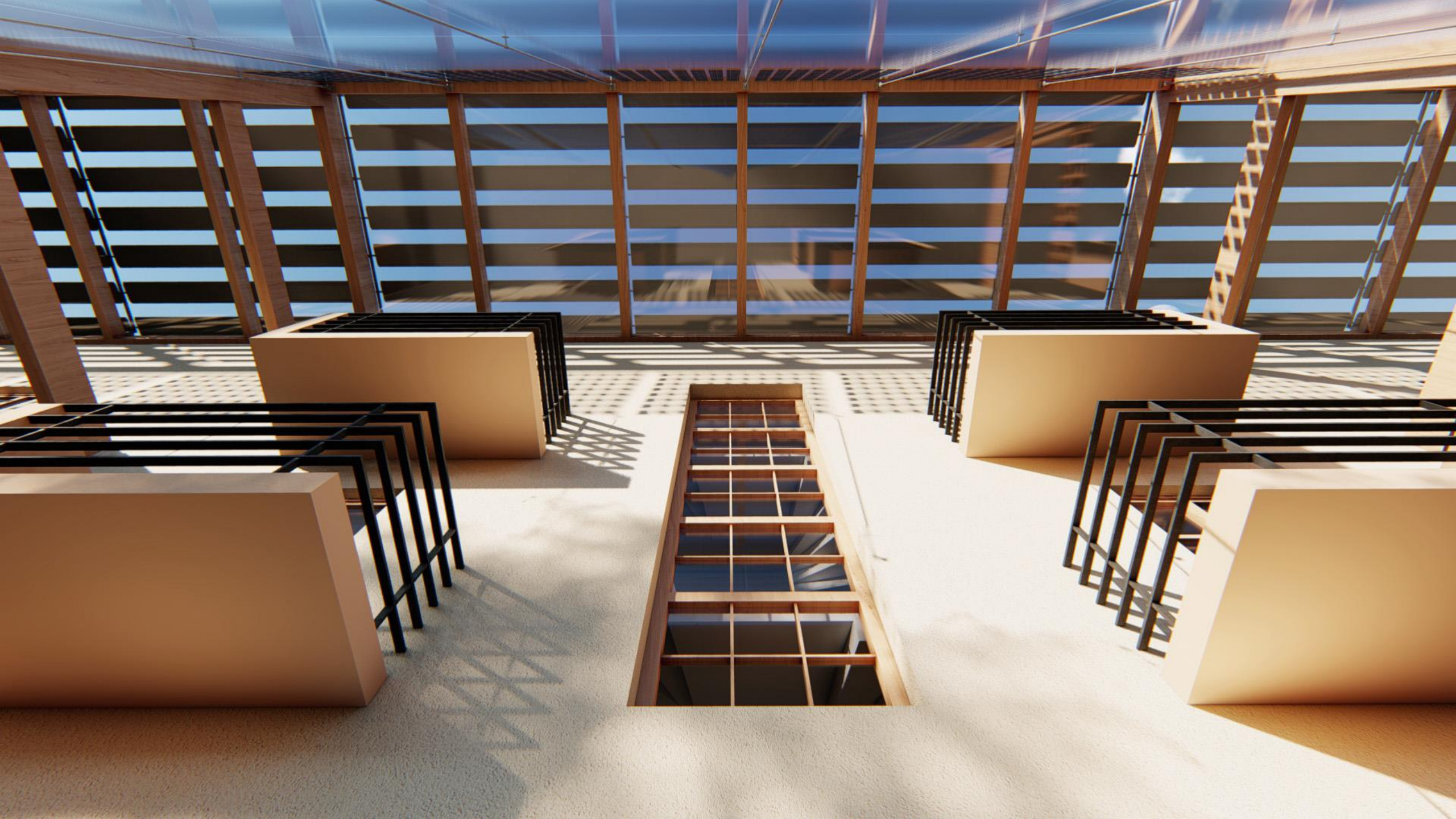
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- Synergies & Conciliations
- Affordability & Accessibility
- & Inclusive Framework
- Energy Consumption & Social Inequalities
- Benefits & Opportunities

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# SUSTAINABLE DEVELOPMENT GOALS





THANK YOU