Creative Empathy

Works at MCA

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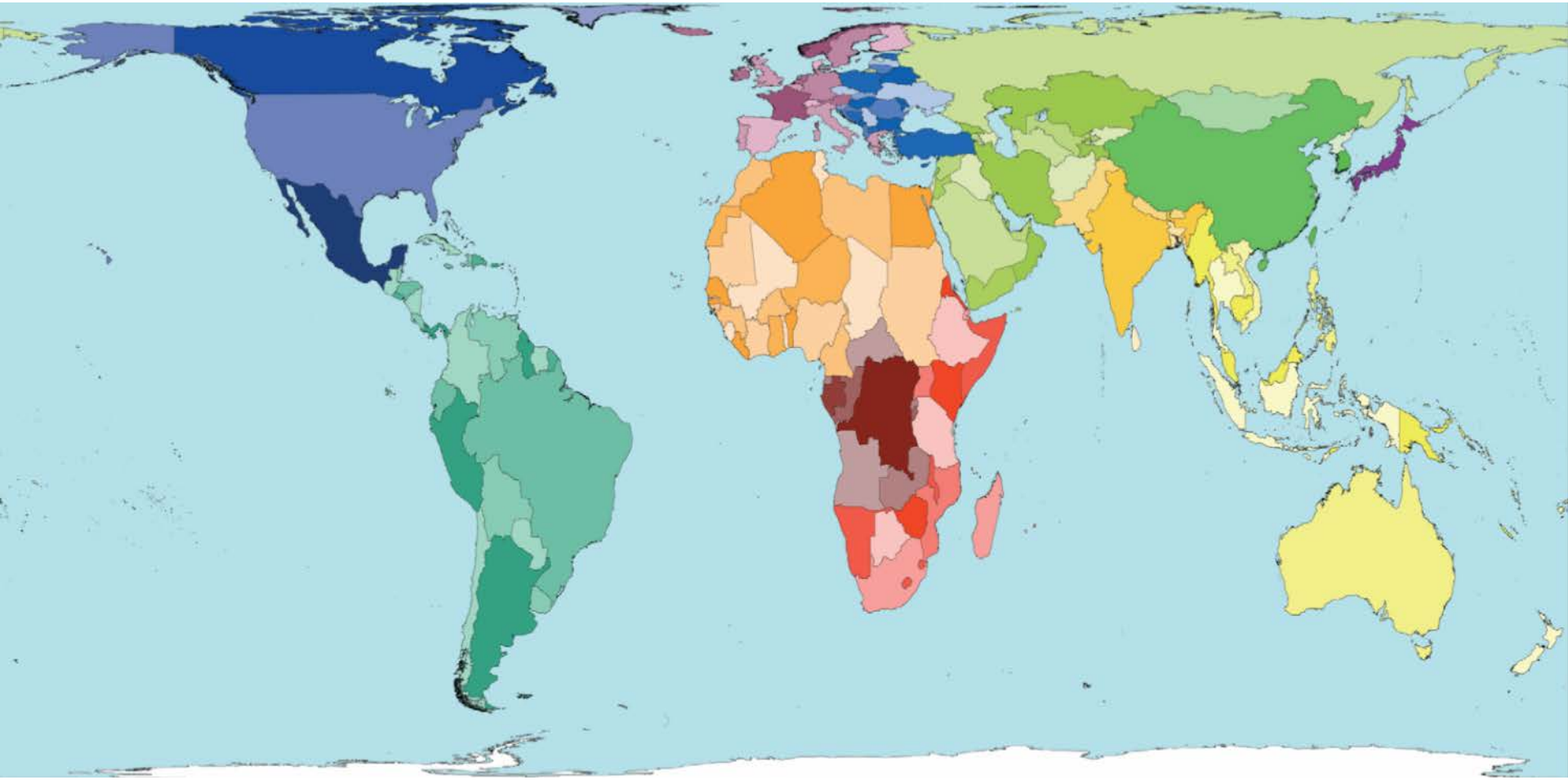
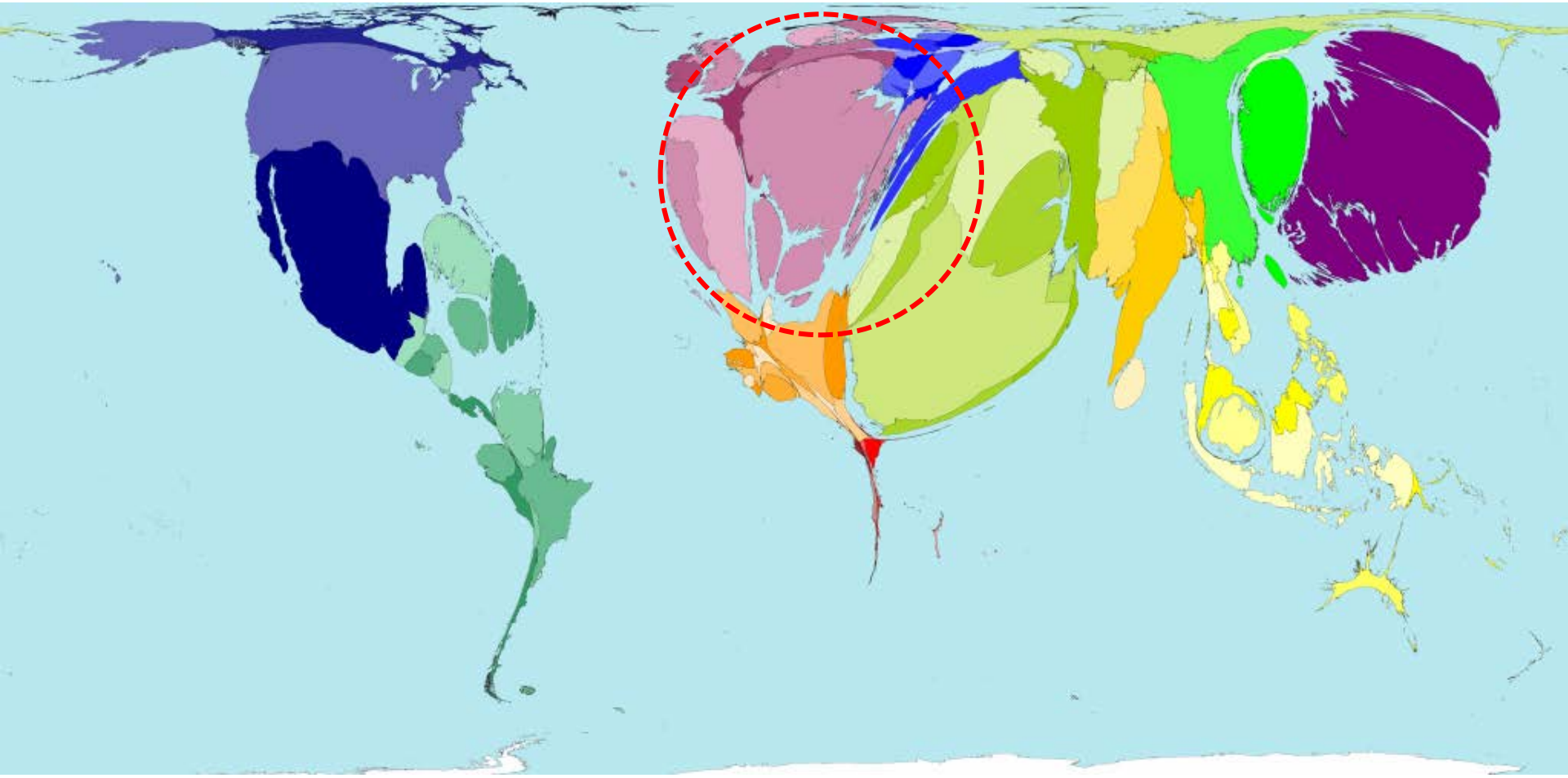
MC A

vision

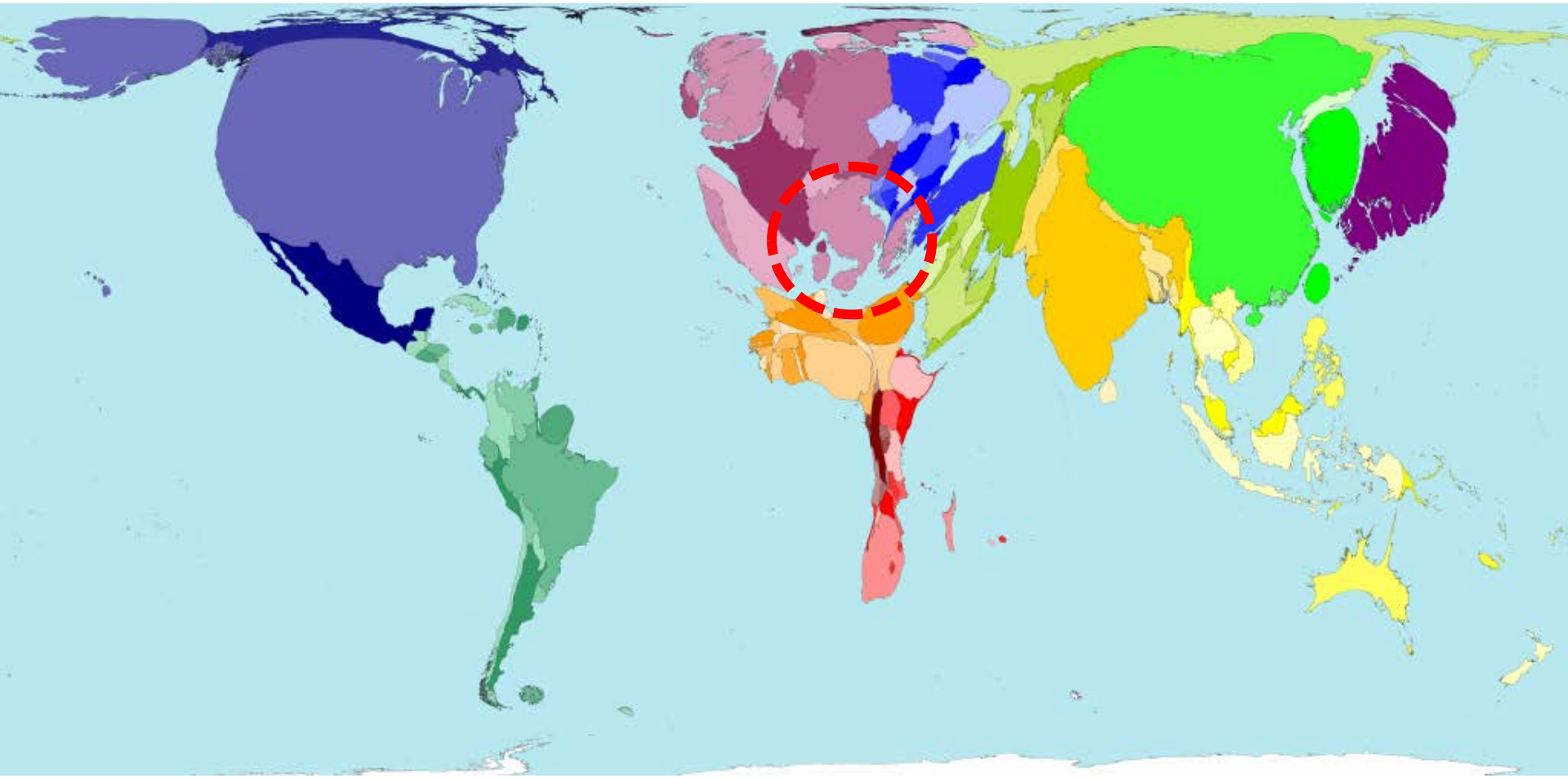


Planet Earth



Oil power

Looking Earth from a different point of view…



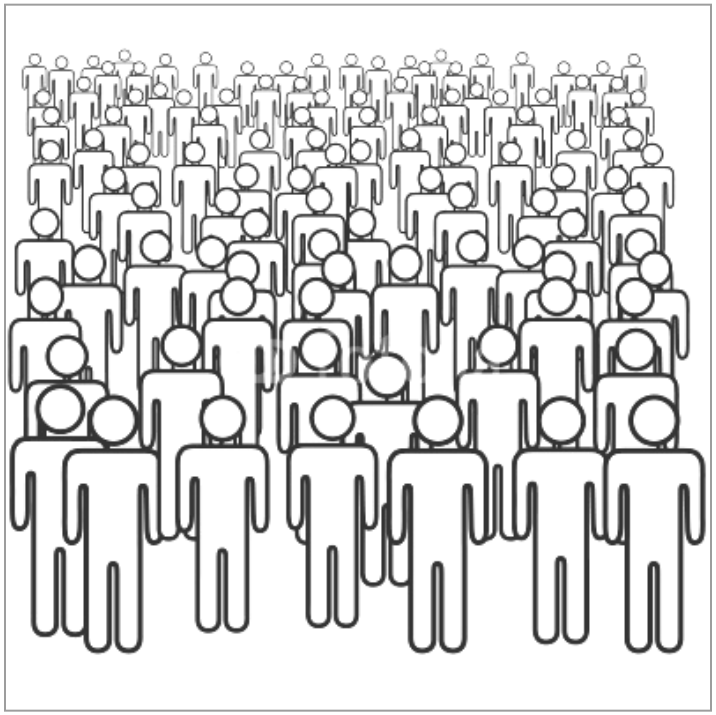
Ecological footprint

…is related to human demand on the Earth's ecosystems. It measures how much land and water area a human population requires to produce the resource it consumes and to absorb its wastes, using prevailing technology.

http://www.footprintnetwork.org , http://www.worldmapper.org

Today we need 1,5 equivalent planet Earths to provide the resources we need in a sustainable way

http://www.panda.org/about_our_earth/all_publications/living_planet_report/



The **ecological footprint** is a measure of human demand on the Earth's ecosystems.

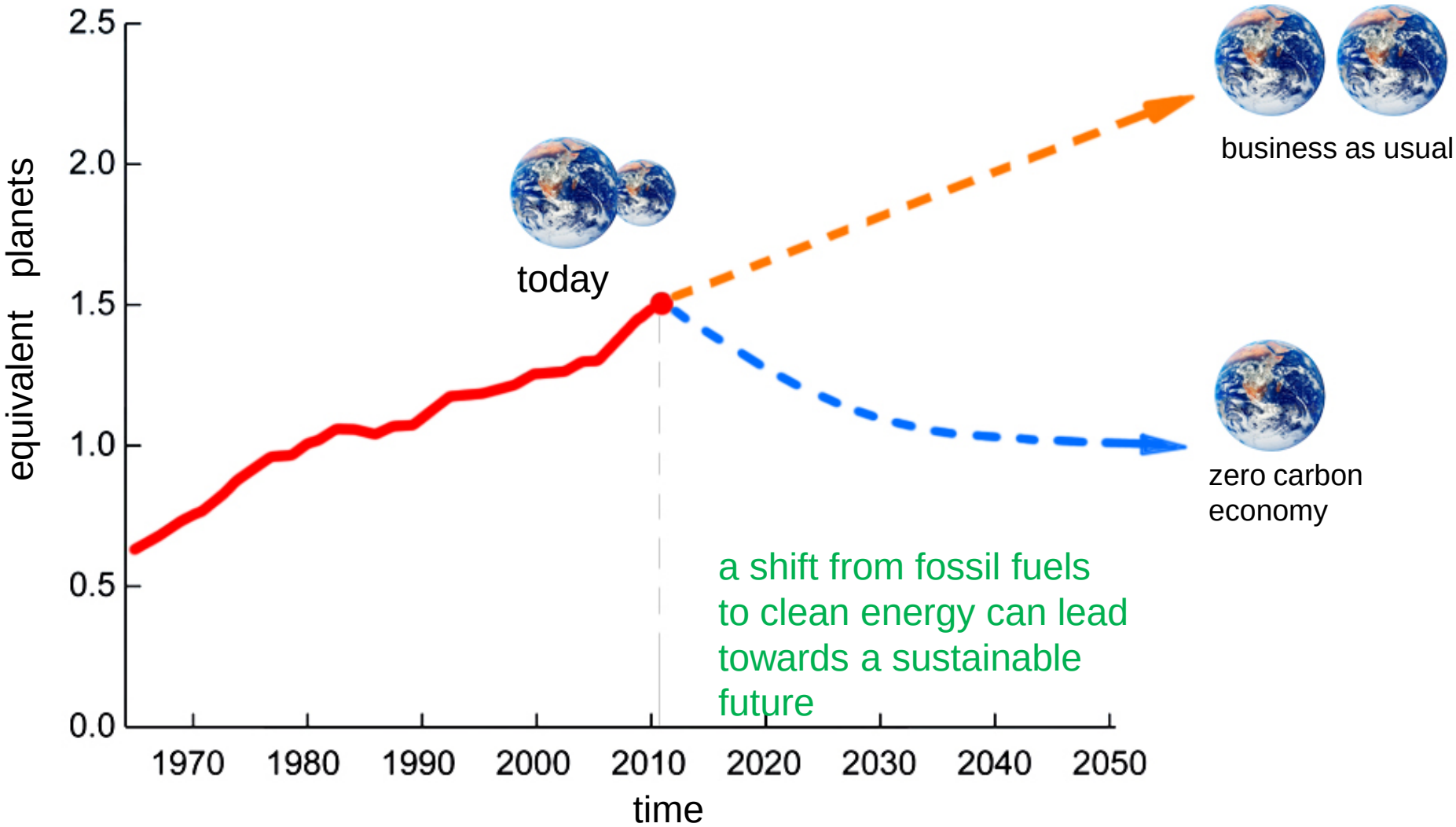
Biocapacity is a measure of the available supply of natural resources.

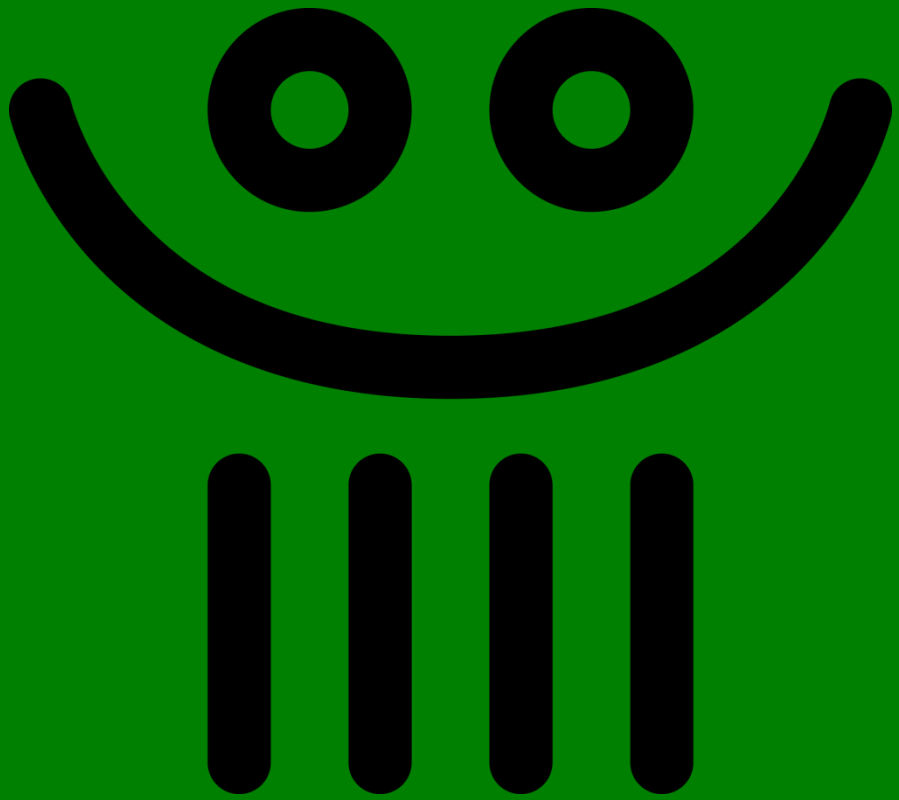
Both indexes are expressed in hectares of productive land

http://www.footprintnetwork.org

impact

Ecological footprint trend: 2050 scenarios



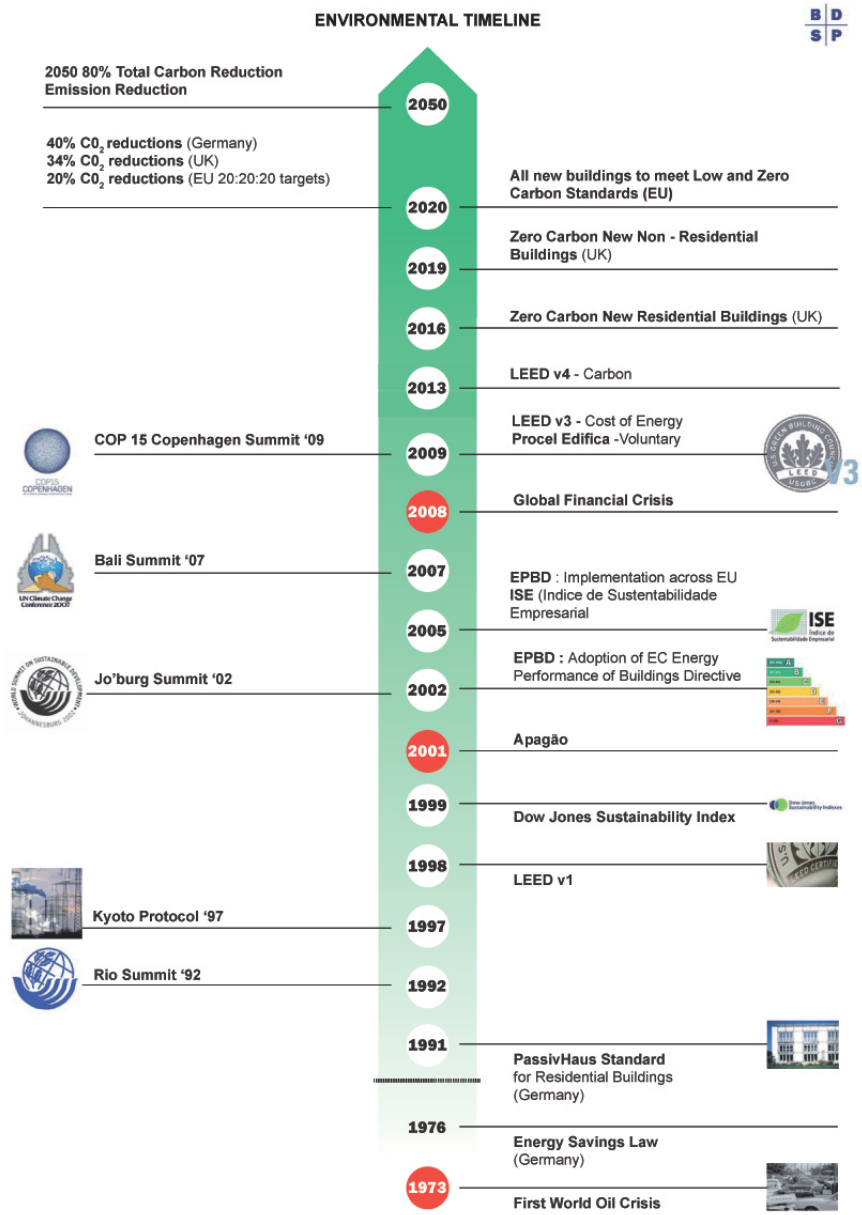


why is so important?

green schools

Today VS Tomorrow / Short Term v. Long Term Perspective

- Future regulations / legislation
- Fuel cost & carbon quotas
- Technological developments / innovation
- Beyond compliance
- Maximizing independence
- Demographic transitions
- Remaining competitive



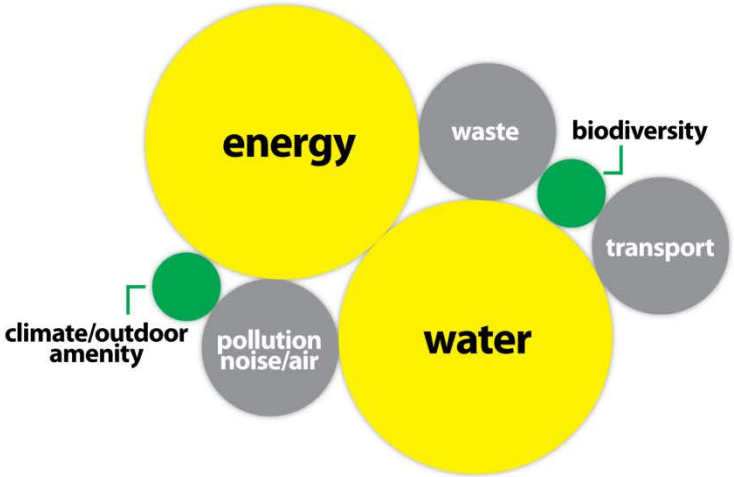
green schools

Implementing best practices in managing climate-related costs is the minimum required to remain competitive

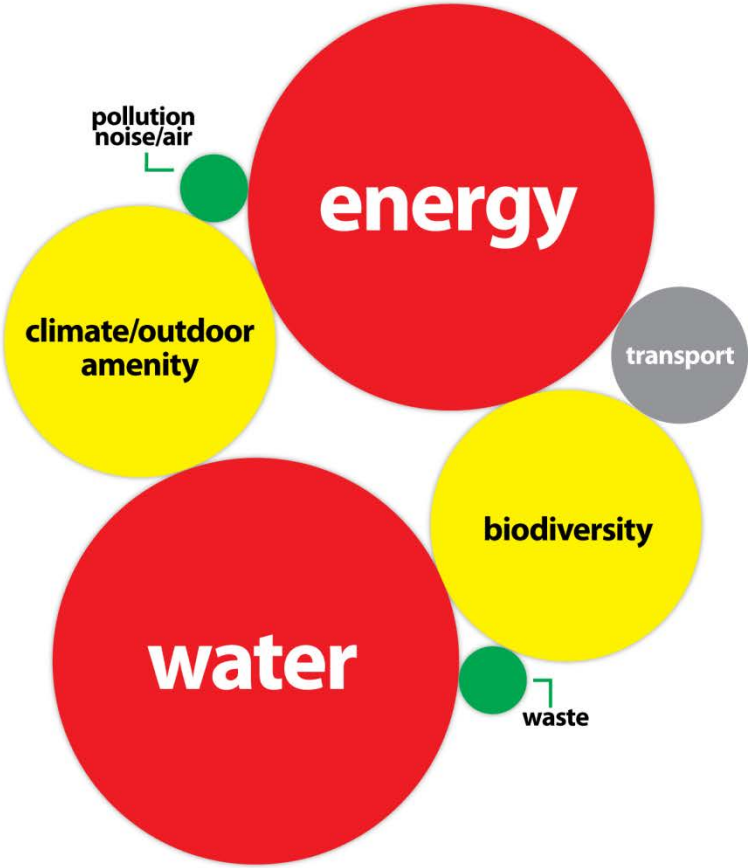
Go beyond operational effectiveness and become strategic

green schools
environmental factors

today



tomorrow



- extremely relevant
- very relevant
- relevant
- not very relevant

green schools

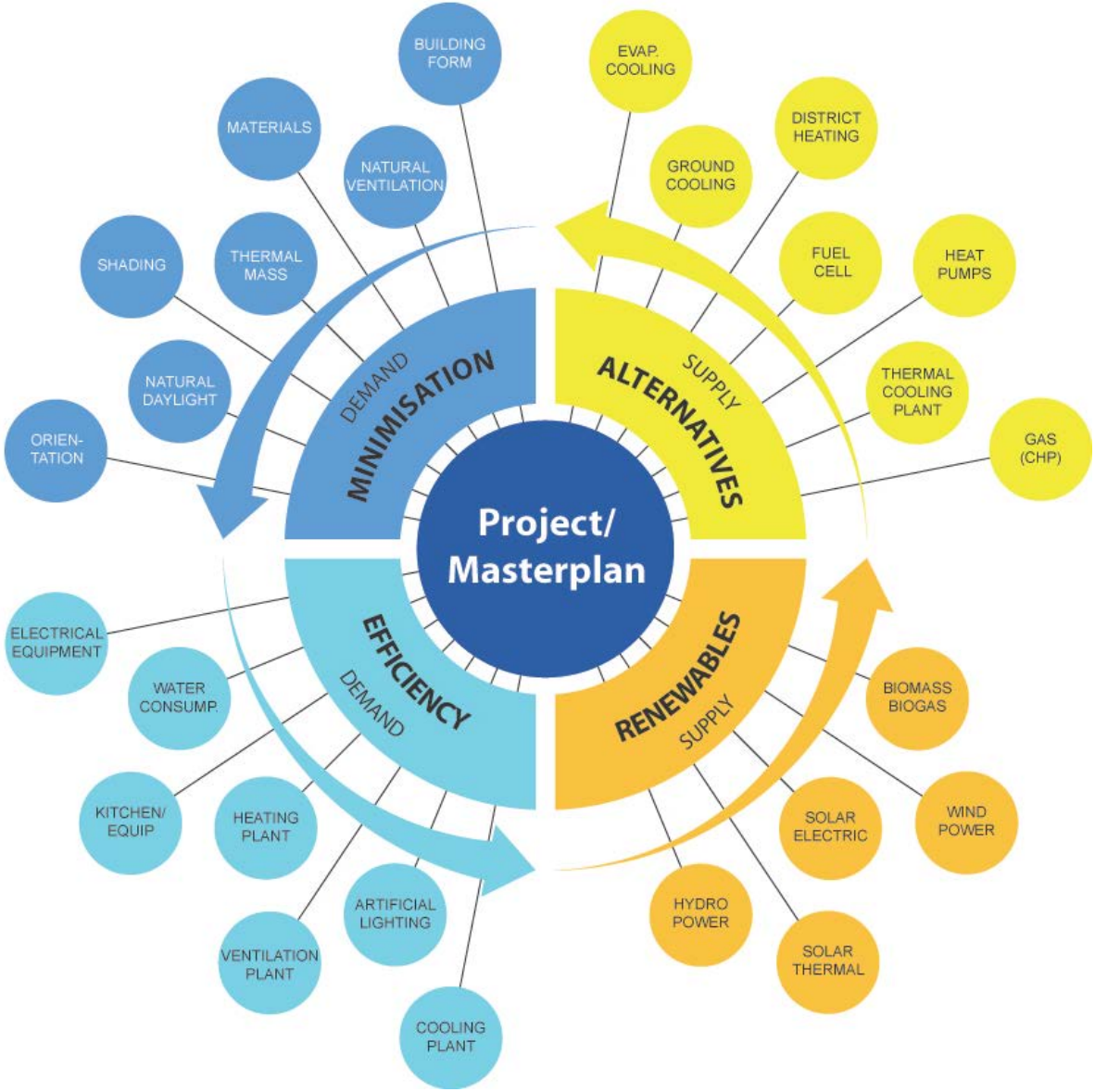
Design Methodology

sustainability

green schools

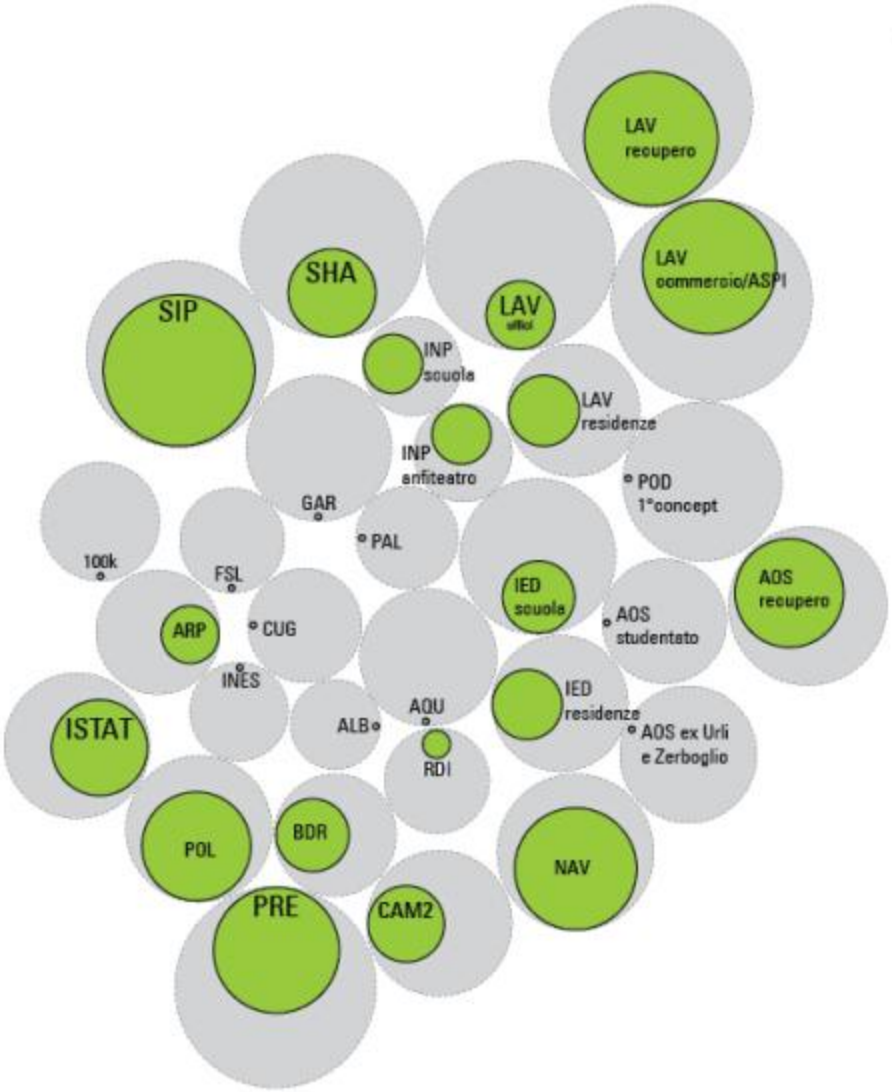
Design Methodology

Environmental Design Approach is to design low carbon buildings that naturally respond to the dynamics of the local external environment whilst providing an internal environment that is comfortable to end users.

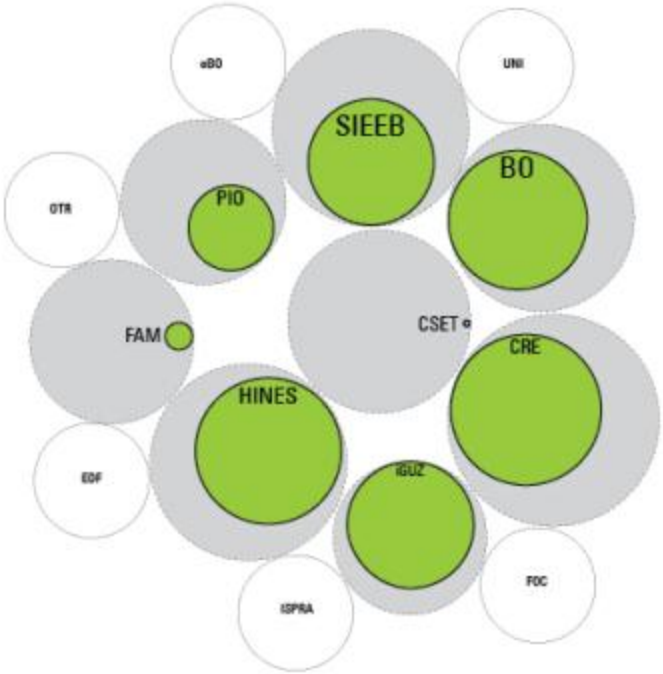


Responsability

HVAC CO_2 equivalent emissions per unit area



DESIGNED



BUILT

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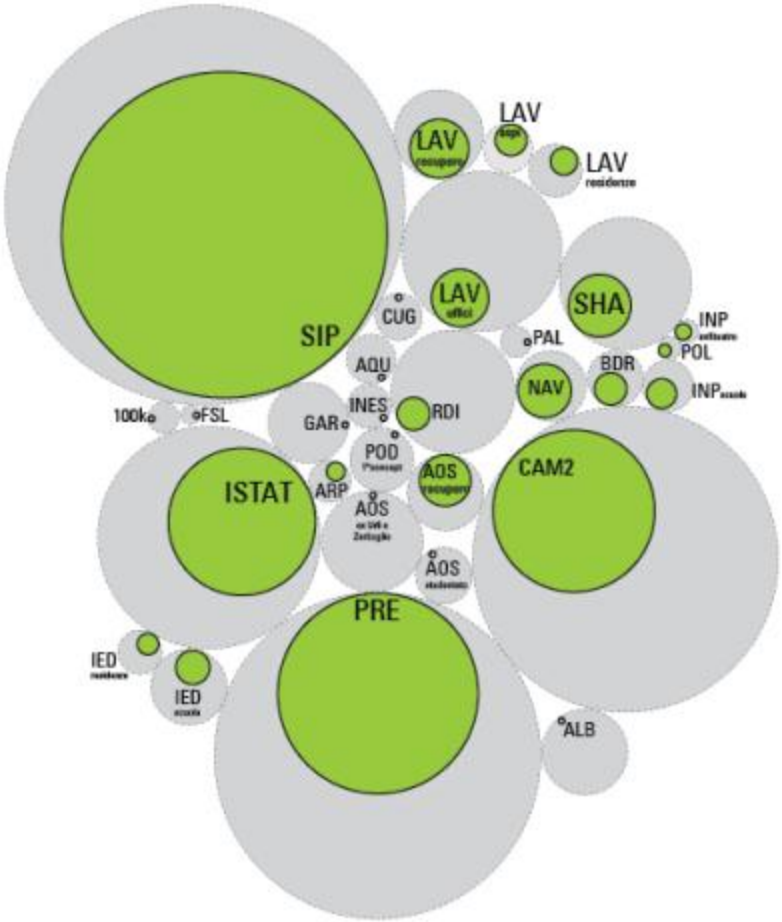
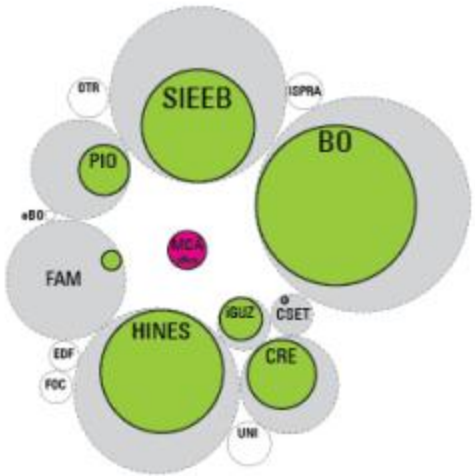
HVAC CO_2 equivalent emissions



DESIGNED



BUILT

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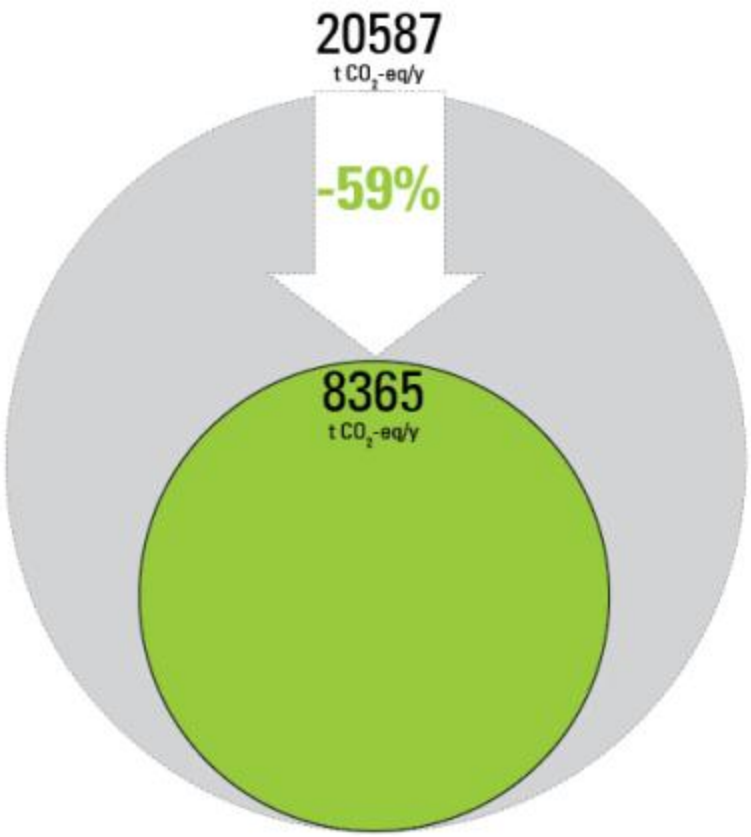
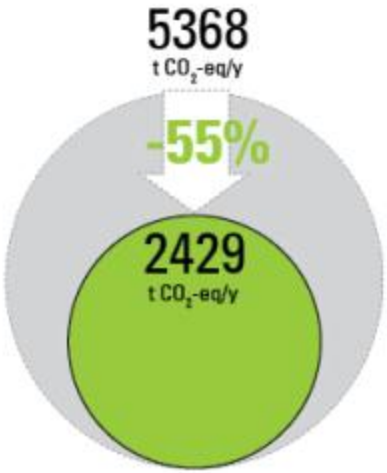
HVAC CO_2 equivalent emissions





DESIGNED

BUILT

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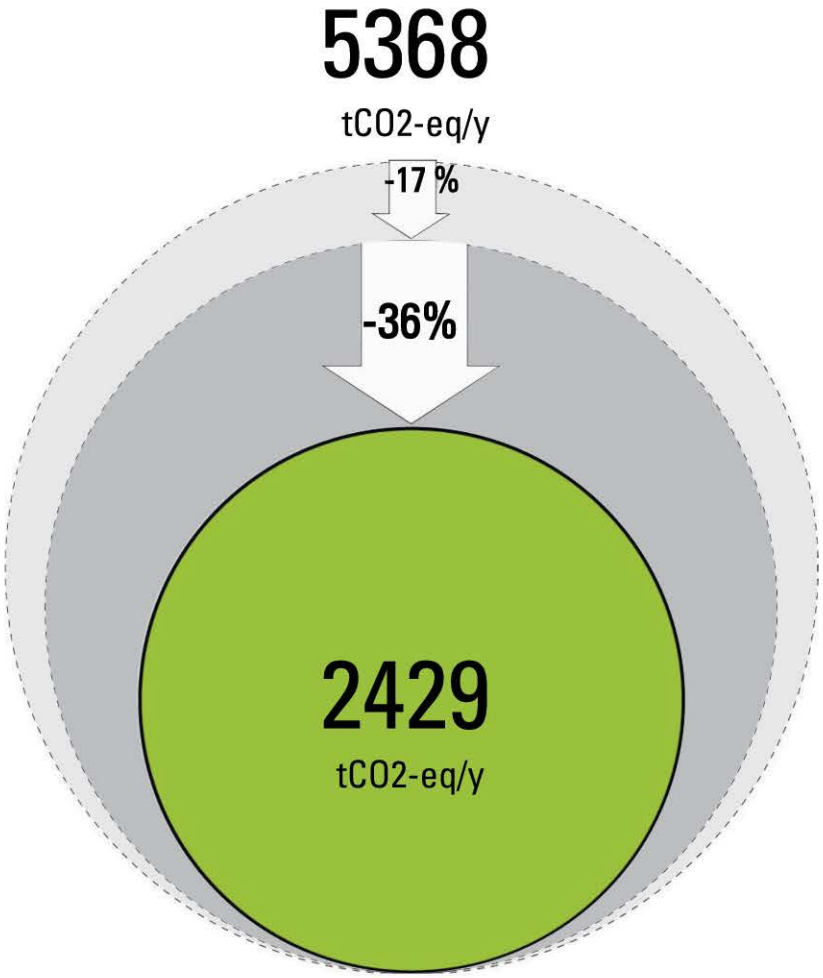
BUILT PROJECTS



-17% thanks to technology

-36% thanks to architectural design!

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From 2006 onwards MCA buildings and office activity have saved about

8225 ton CO_2-eq

This data is referred only to the actual constructed buildings analyzed in this survey

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8225 ton CO_2-eq are equal to…

..a round trip to the Moon on a space shuttle

..or a soccer championship matchday in UK

..139 millions cups of coffee consumed every day in Italy

..2 billions e-mails

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works at MCA

from 2006 onwards

-8225 ton CO_2-eq

-18900 oil barrels

-2550 oil tons

1.75 mln US $ savings on energy bills

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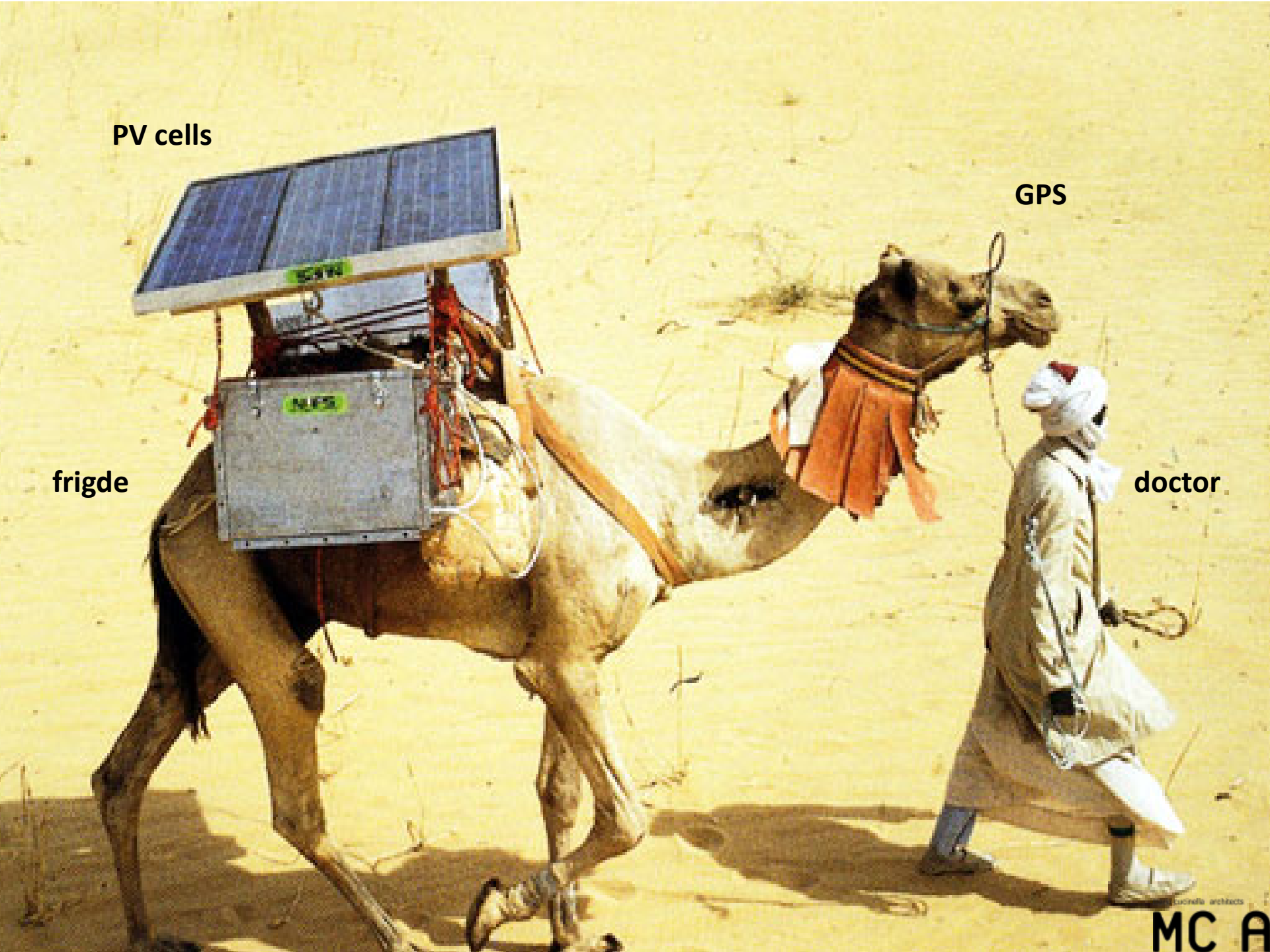
Diversity of cultures
and
ecosolutions will be essential
for
people in the future

Smart guy

For a smart (eco) solutions


MC A

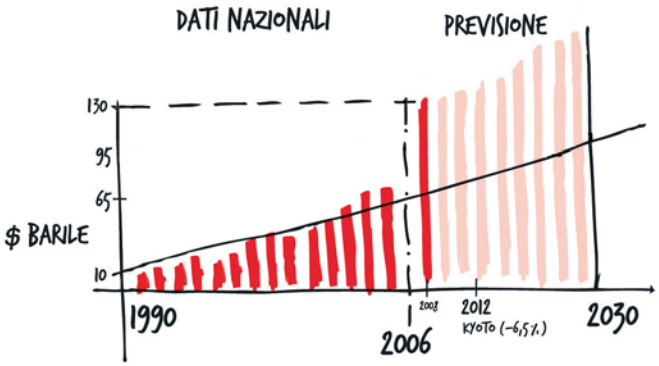

PV cells
GPS
frigde
doctor
MC A

For a new social housing plan

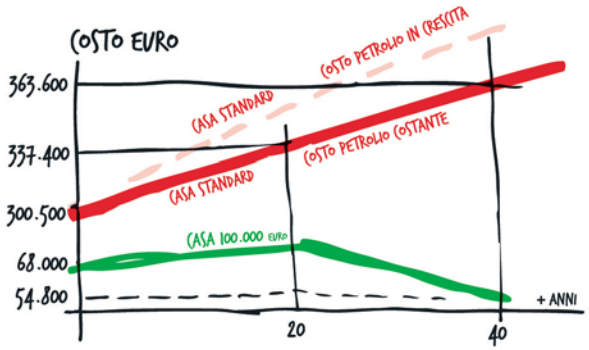
(under costruction)

Makno & Consulting

PREZZO DEL PETROLIO



AUMENTI COSTI CASA IN 20 ANNI

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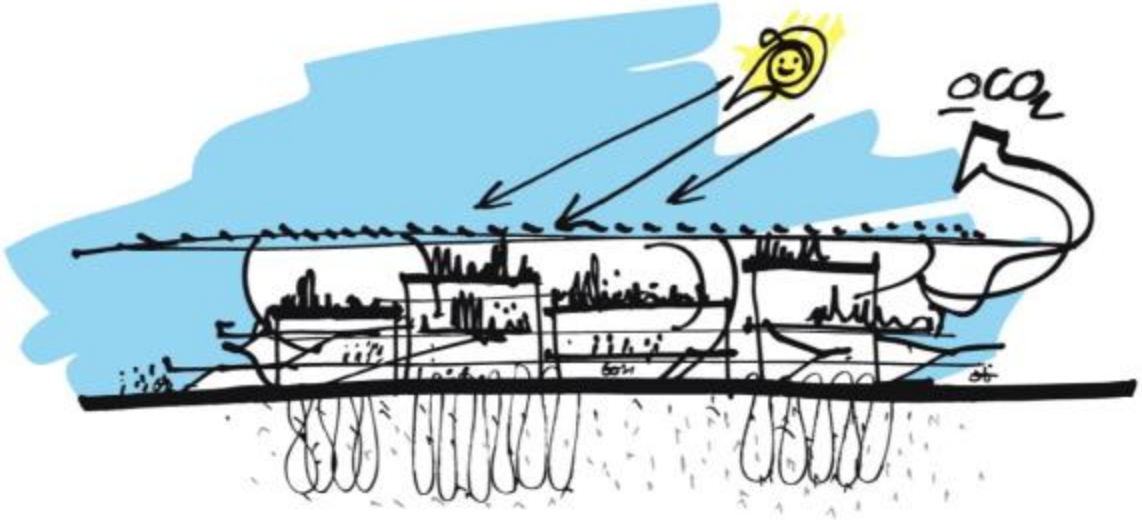

A HOME FOR €100.000

LOW COST, DREAM HOME
LOW ENVIRONMENTAL IMPACT

ZERO BILLS, ZERO CO_2

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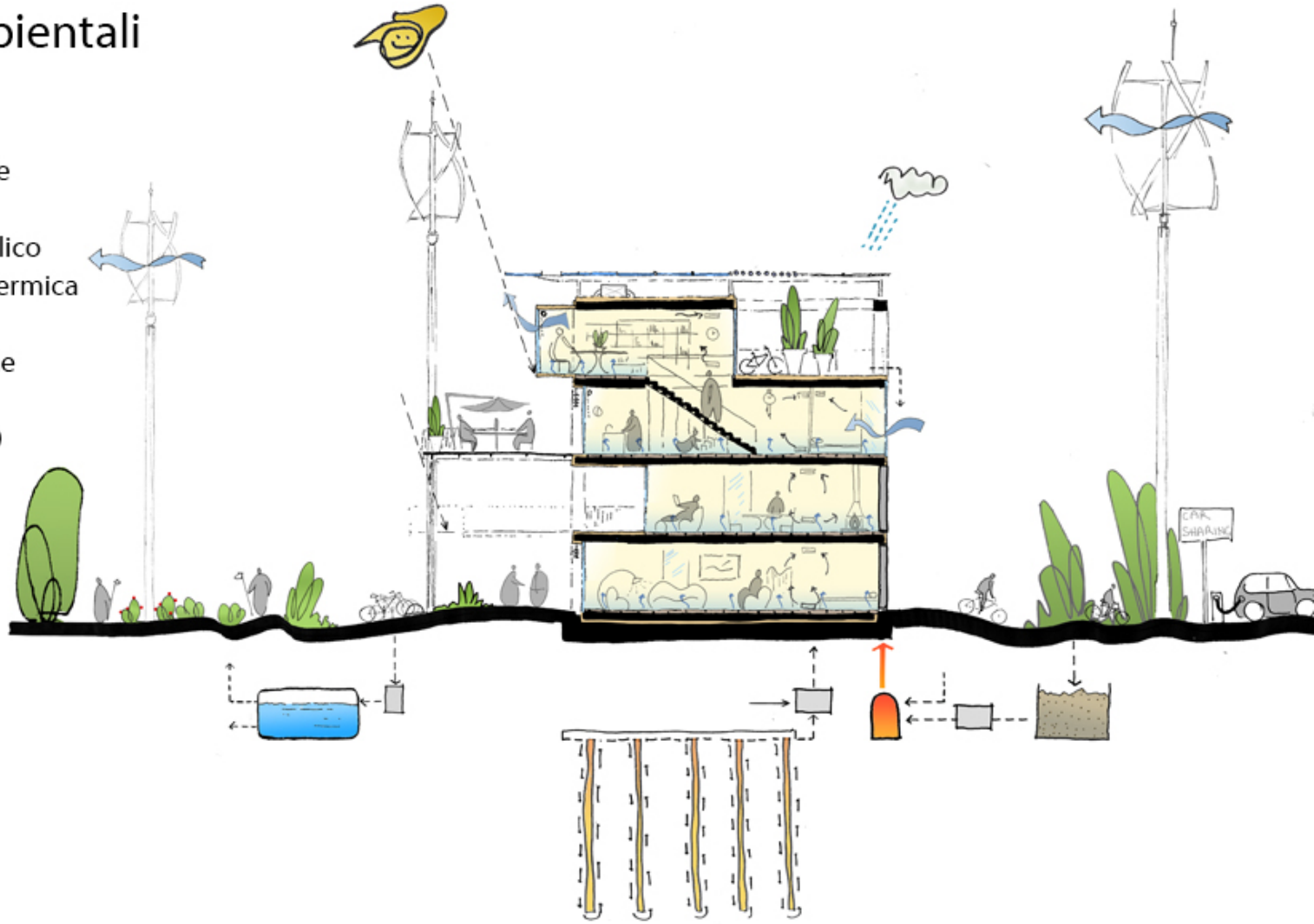
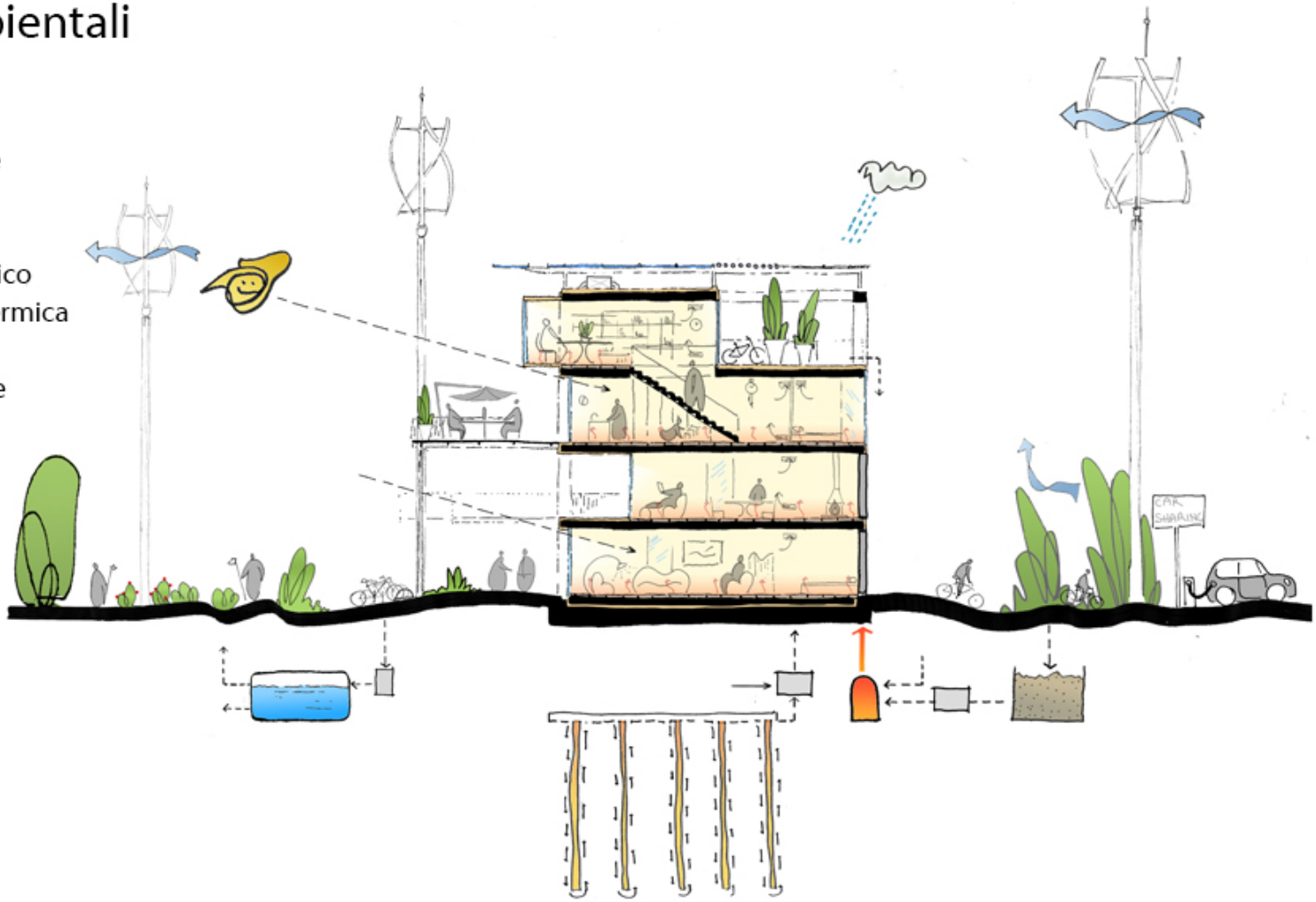
strategie ambientali estate

zero emissioni di CO_2
orientamento ottimale
protezione solare
impianto solare ed eolico
pompa di calore geotermica
caldaia a biomassa
raccolta acque piovane
mobilità pulita
orti urbani - cibo km 0
inerzia termica
spazi verdi



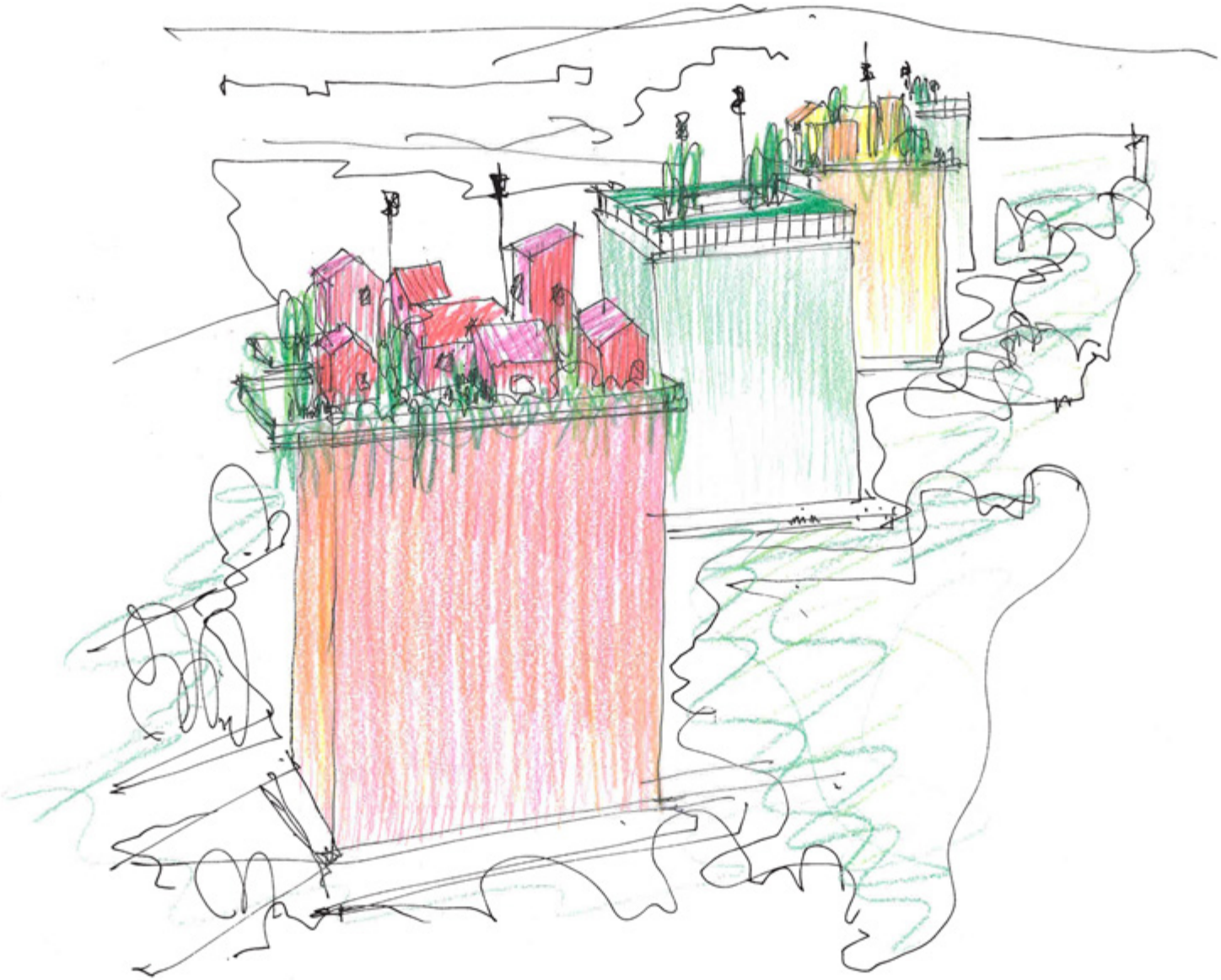
strategie ambientali inverno

zero emissioni di CO_2
orientamento ottimale
apporti solari
involucro ben isolato
impianto solare ed eolico
pompa di calore geotermica
caldaia a biomassa
raccolta acque piovane
mobilità pulita



Aler

Nuovi alloggi per studenti



strategie ambientali
estate - inverno

retrofit involucro esistente
raccolta acque piovane
sopraelevazione a basso consumo
solare termico e fotovoltaico
allaccio al teleriscaldamento

New Headquarter for ARPA

Agency for the protection of the environment

Ferrara Italy
(under costruction)

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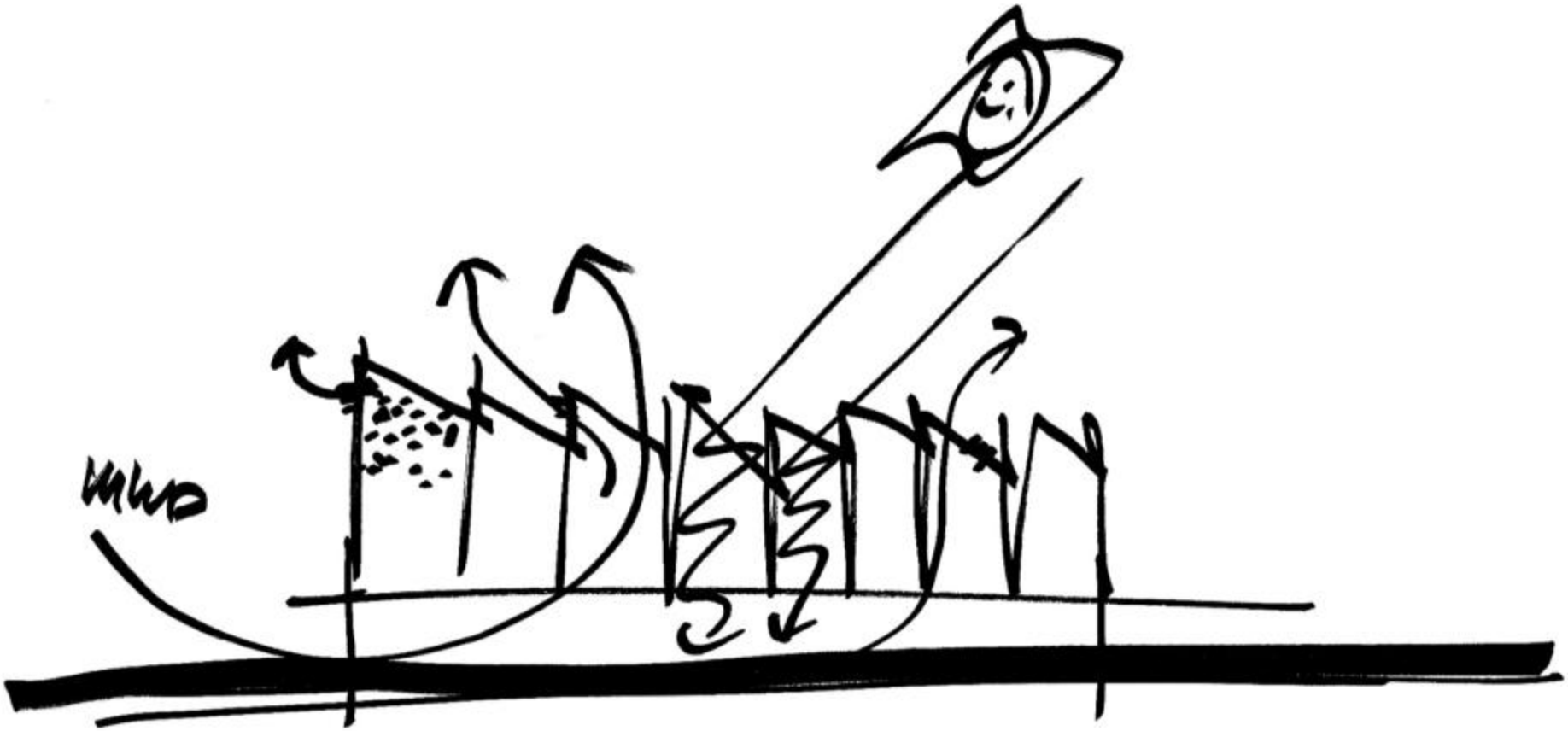

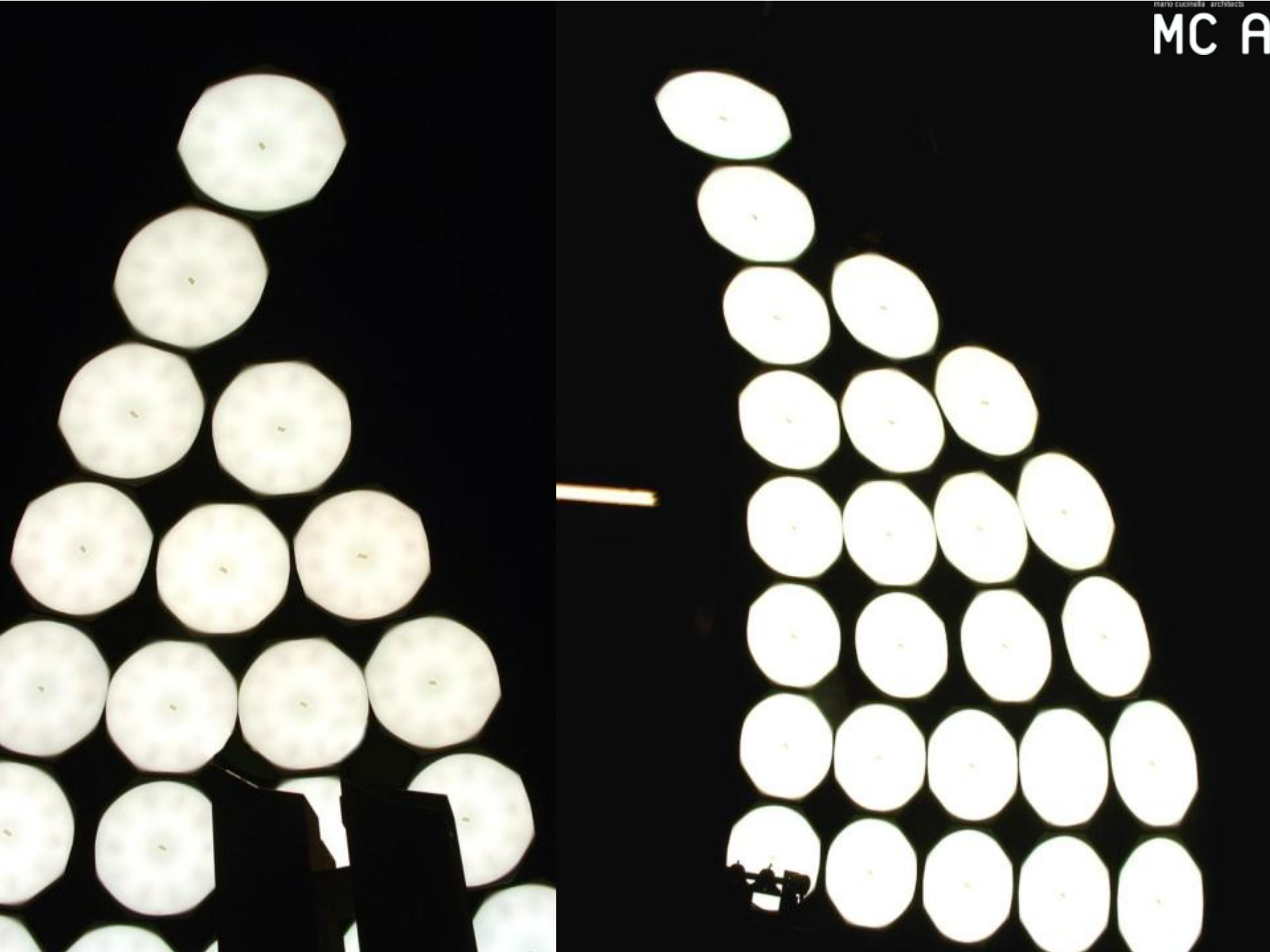
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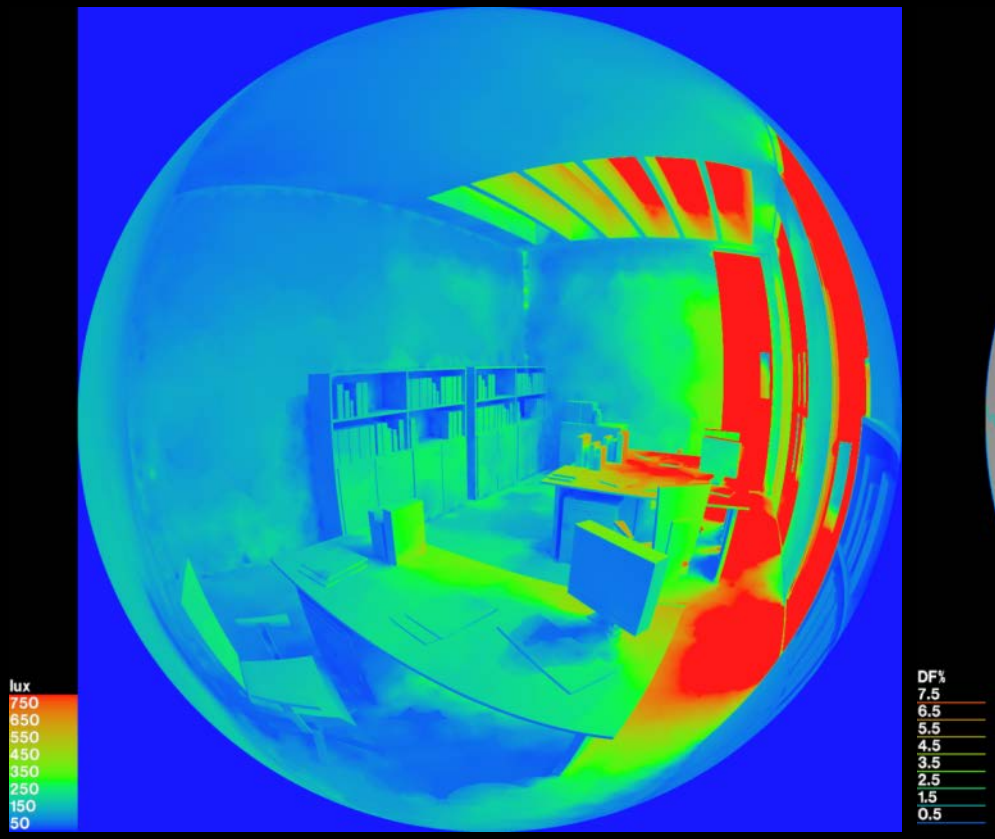
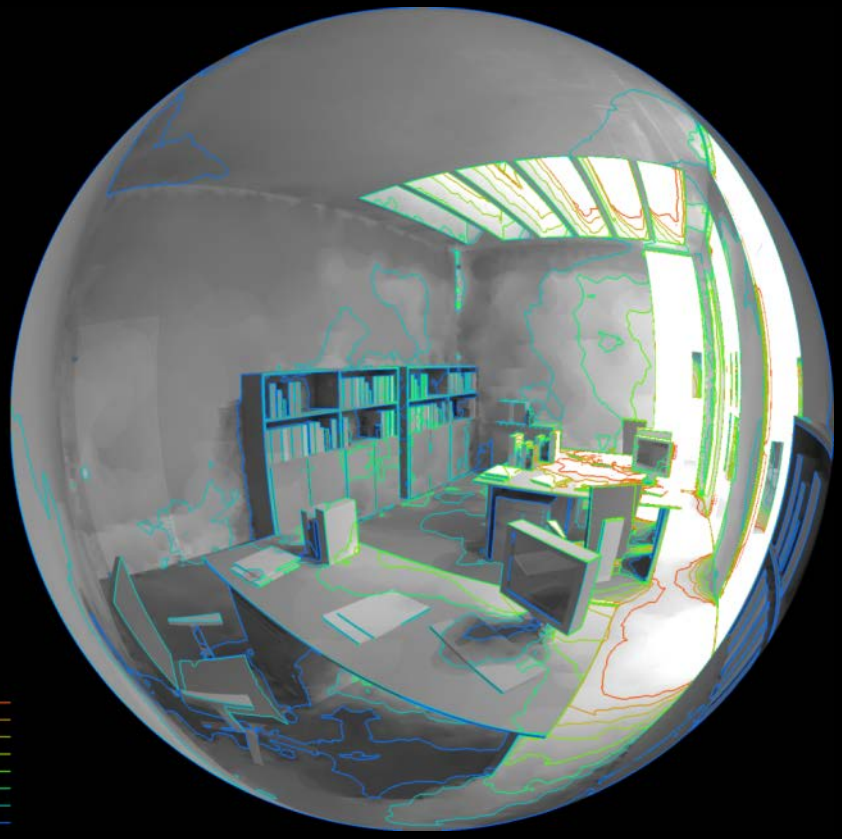
Office type 4

Daylight factor analysis performed with Radiance



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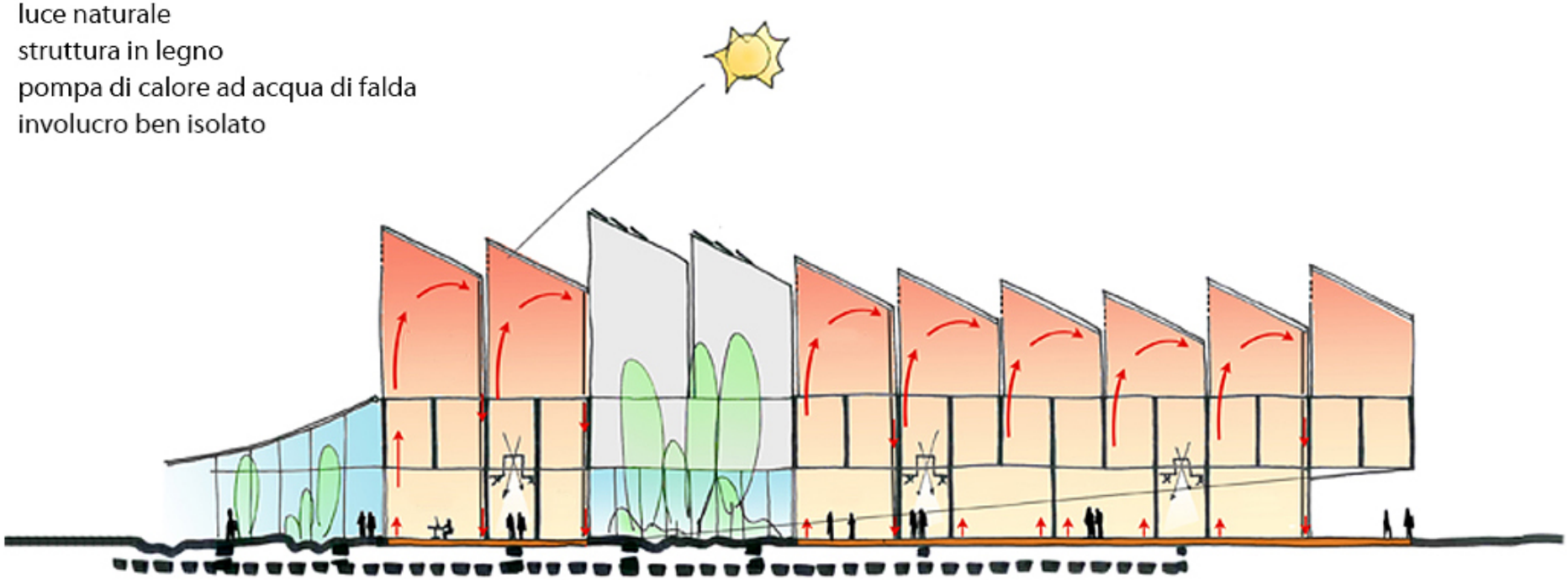
strategie ambientali
inverno

camino solare
effetto serra
luce naturale
struttura in legno
pompa di calore ad acqua di falda
involucro ben isolato



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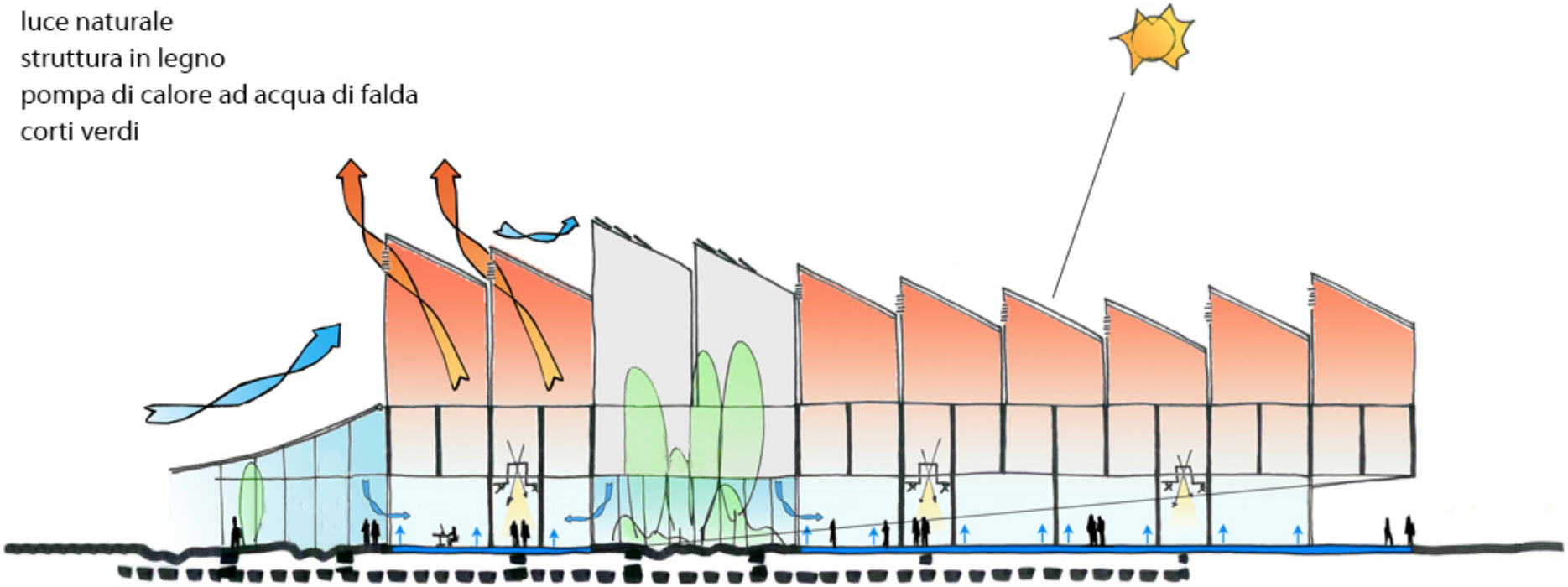
strategie ambientali
estate

schermature solari camino
ventilazione naturale
luce naturale
struttura in legno
pompa di calore ad acqua di falda
corti verdi



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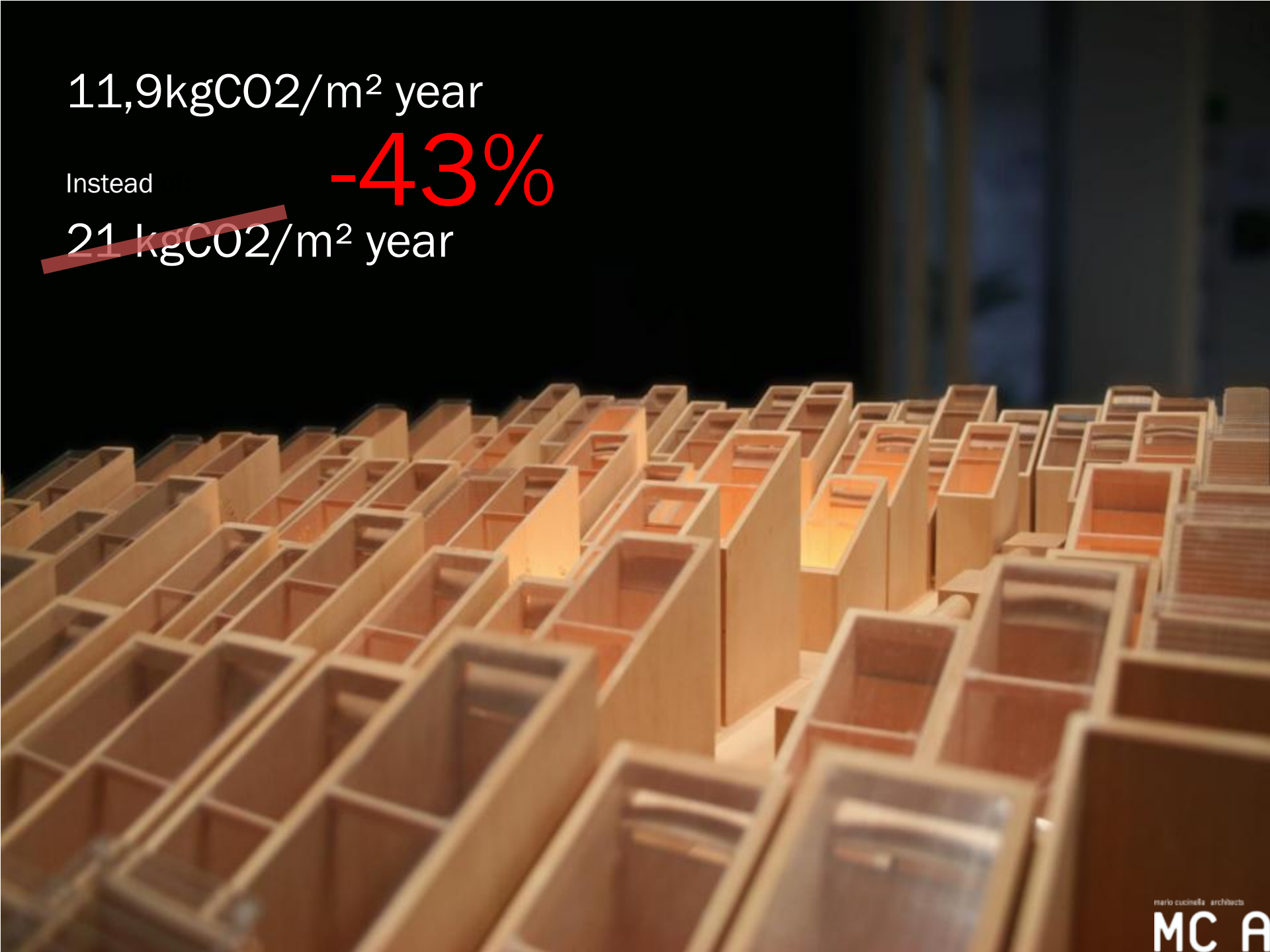
11,9kgCO2/m² year

Instead

-43%

~~21 kgCO2~~/m² year

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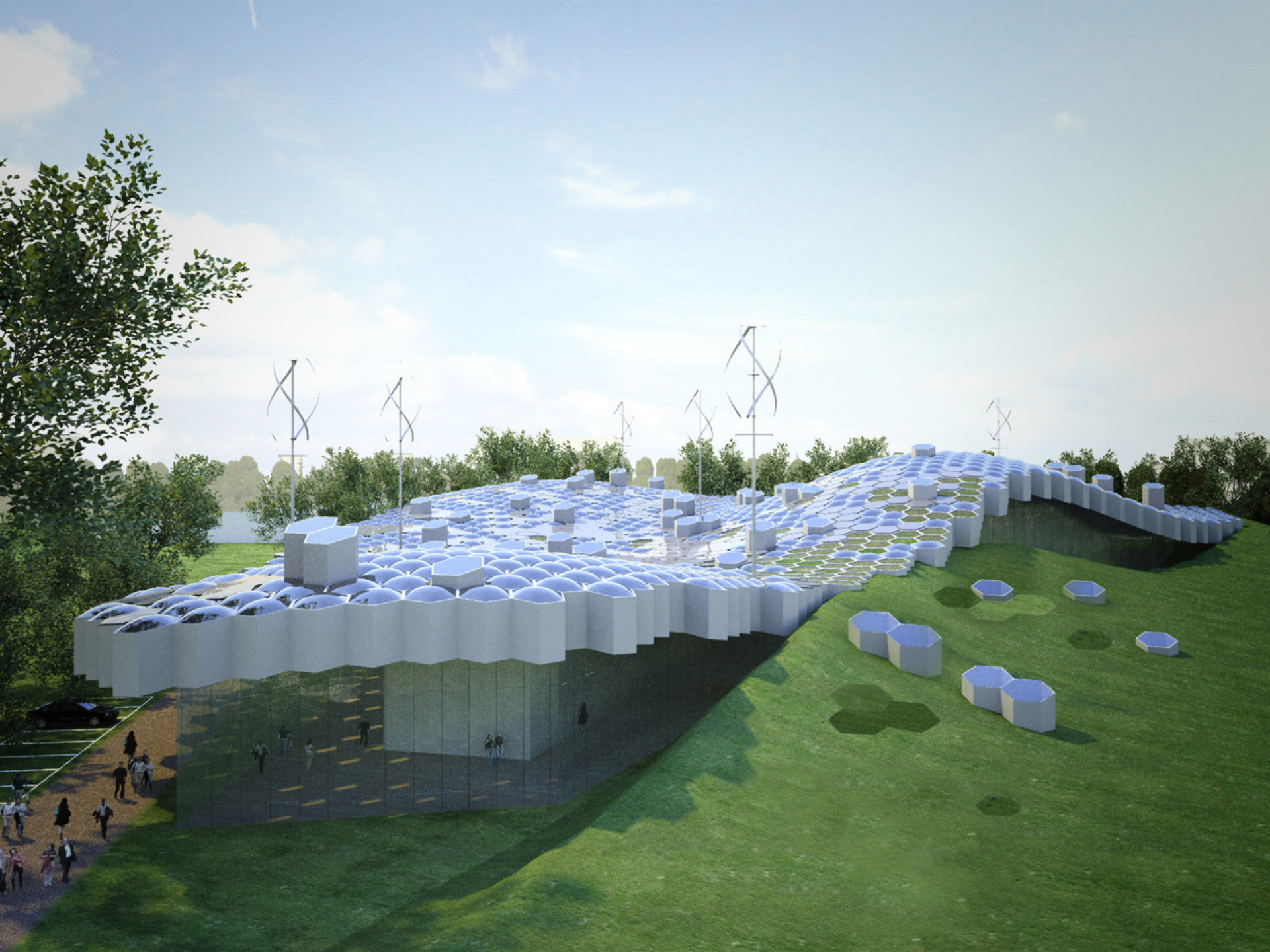
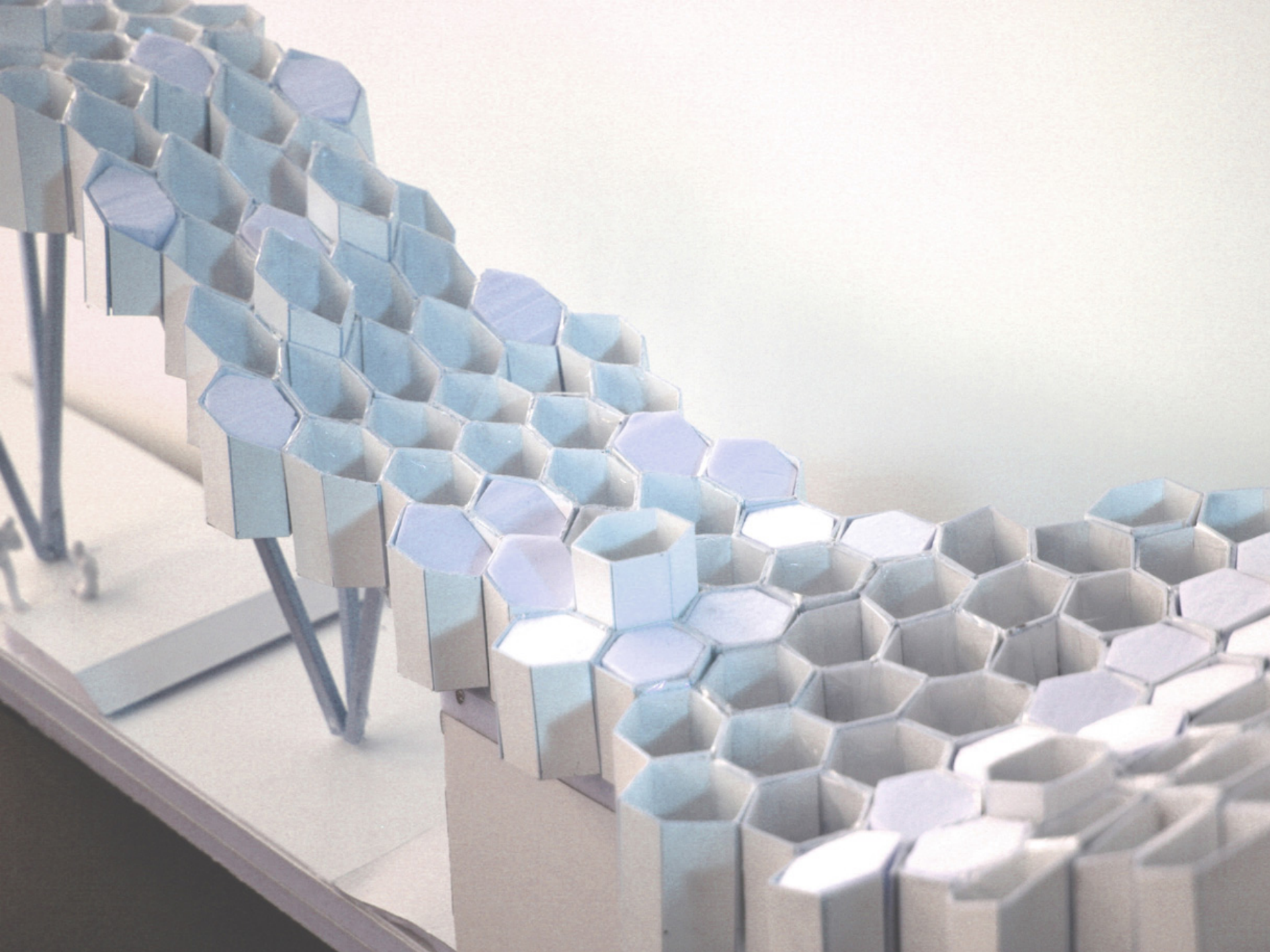
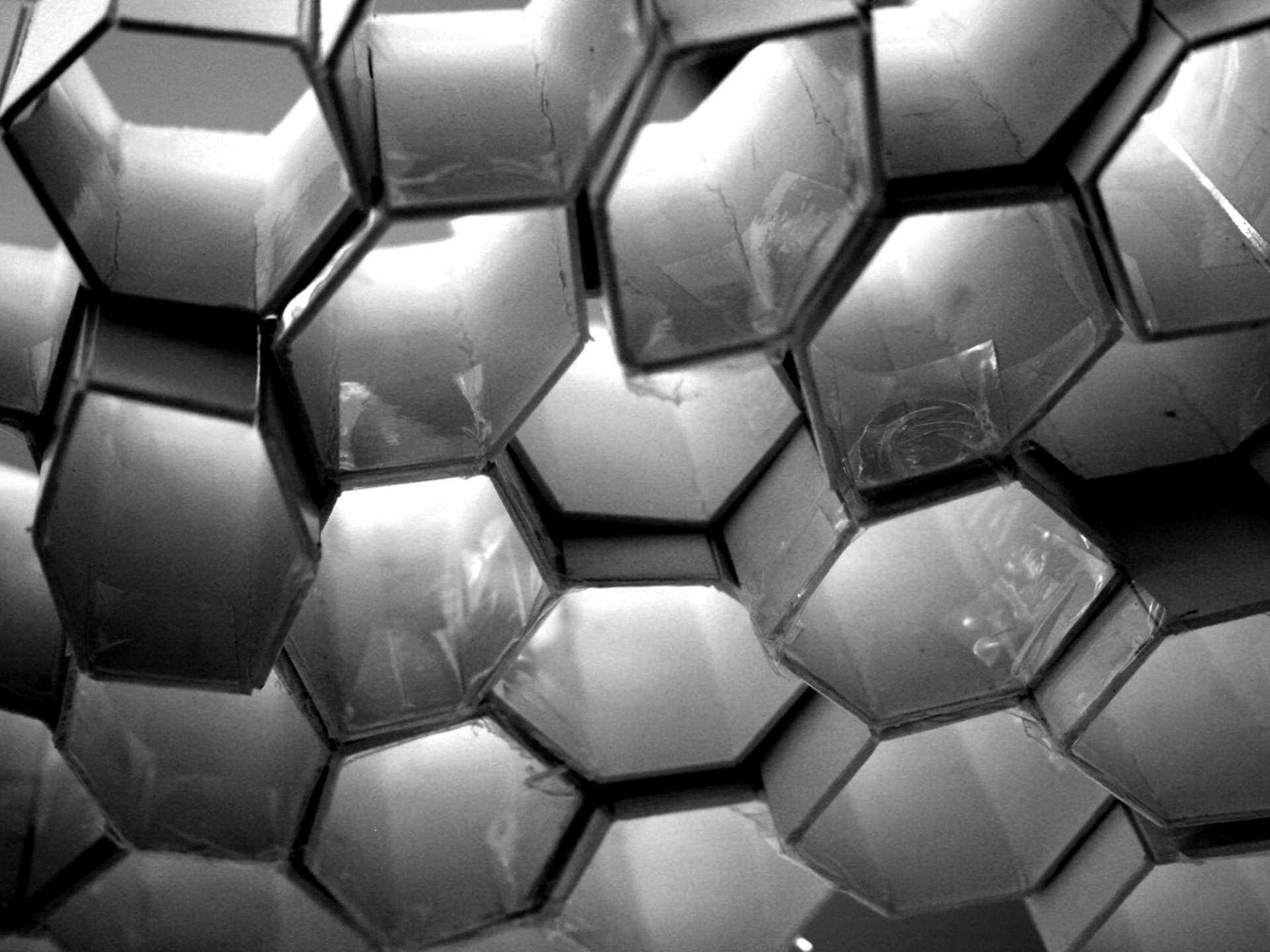
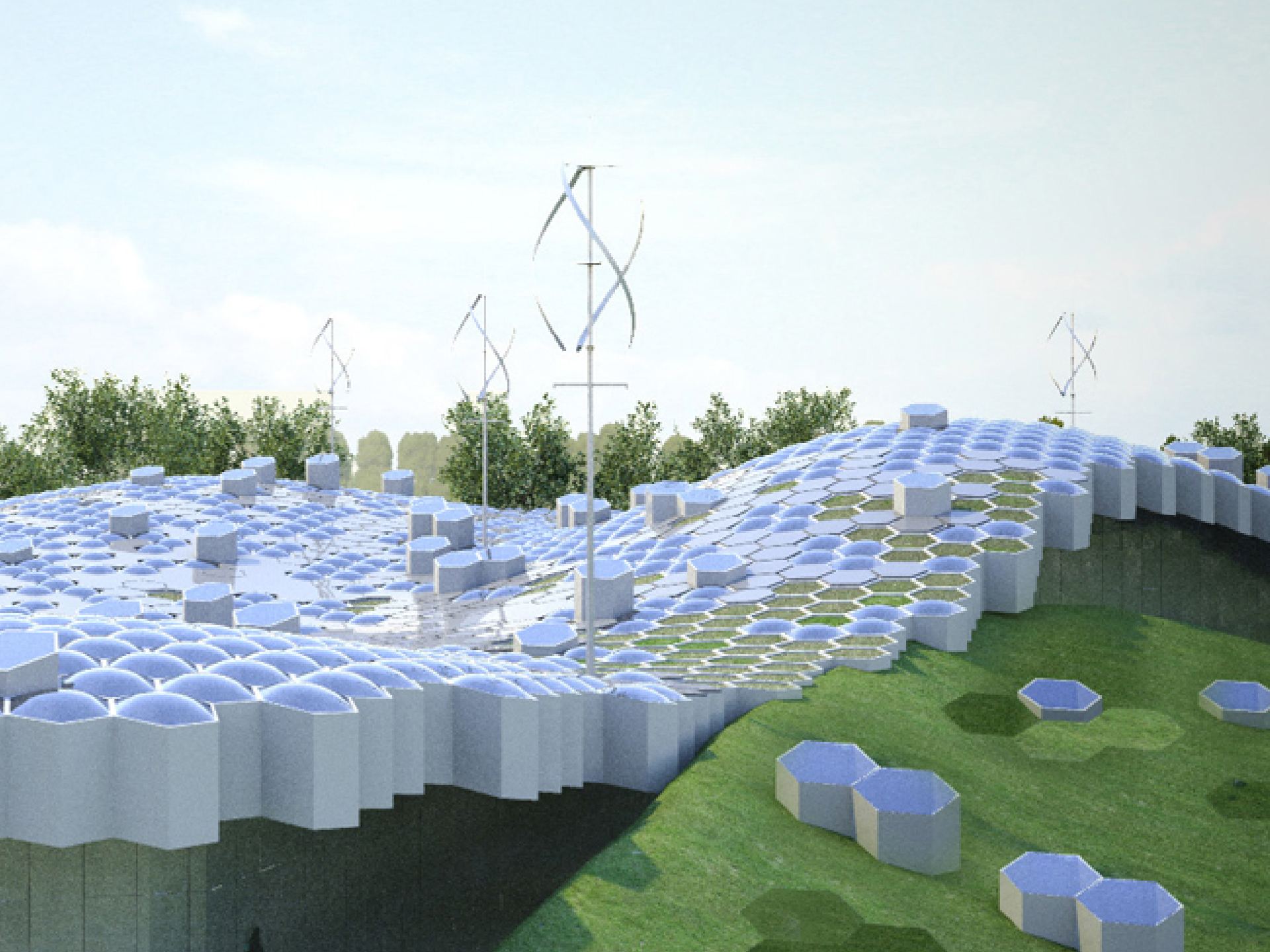
Competition for the Bord Gais Networks Control Center

ireland









3M Headquarter in Europe Milan

MIPIM Award for green building 2011

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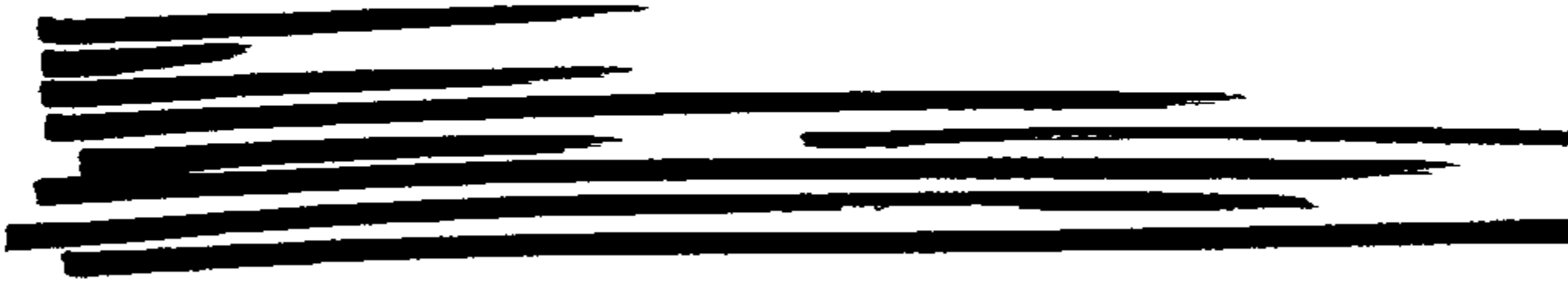


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mario cucinella architects
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maria cucinella architects

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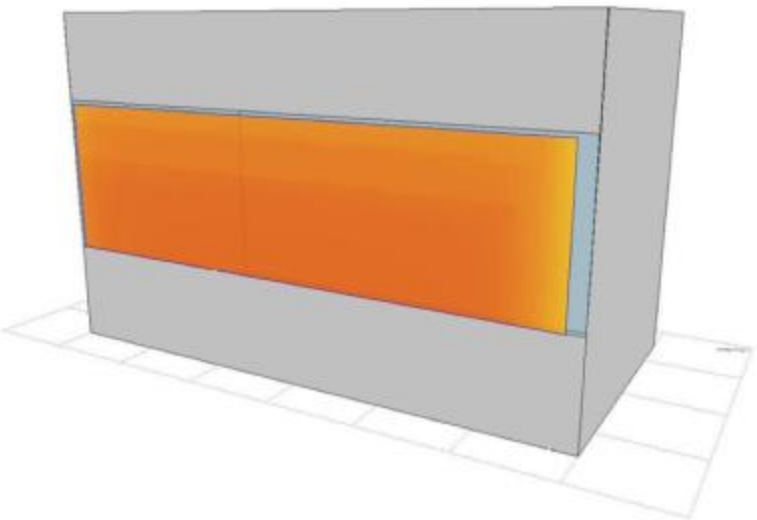
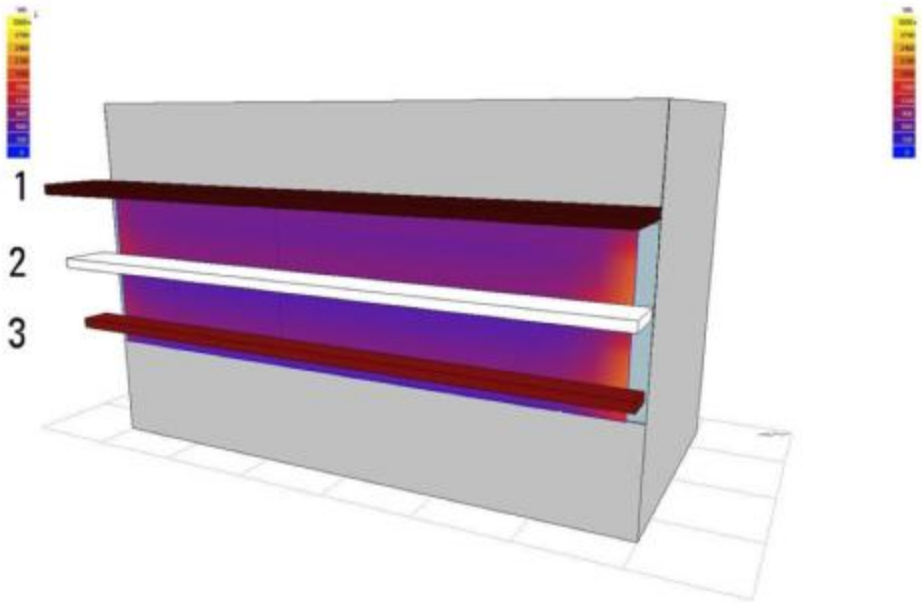
PROSPETTO OVEST

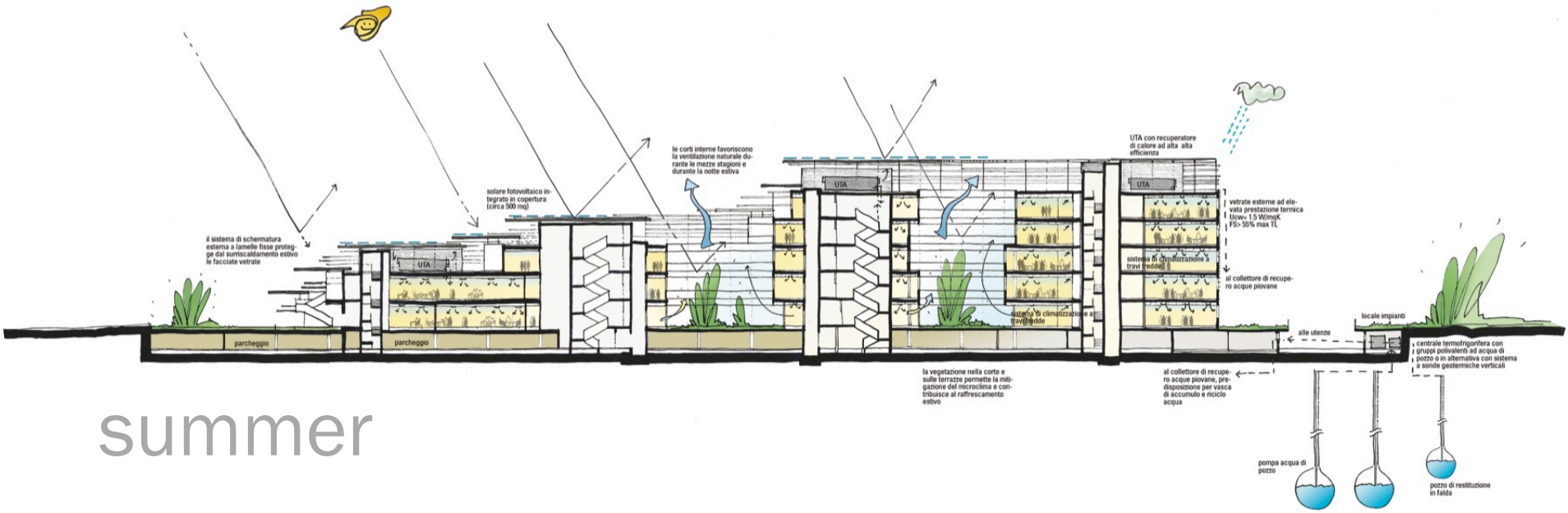
senza lamelle frangisole



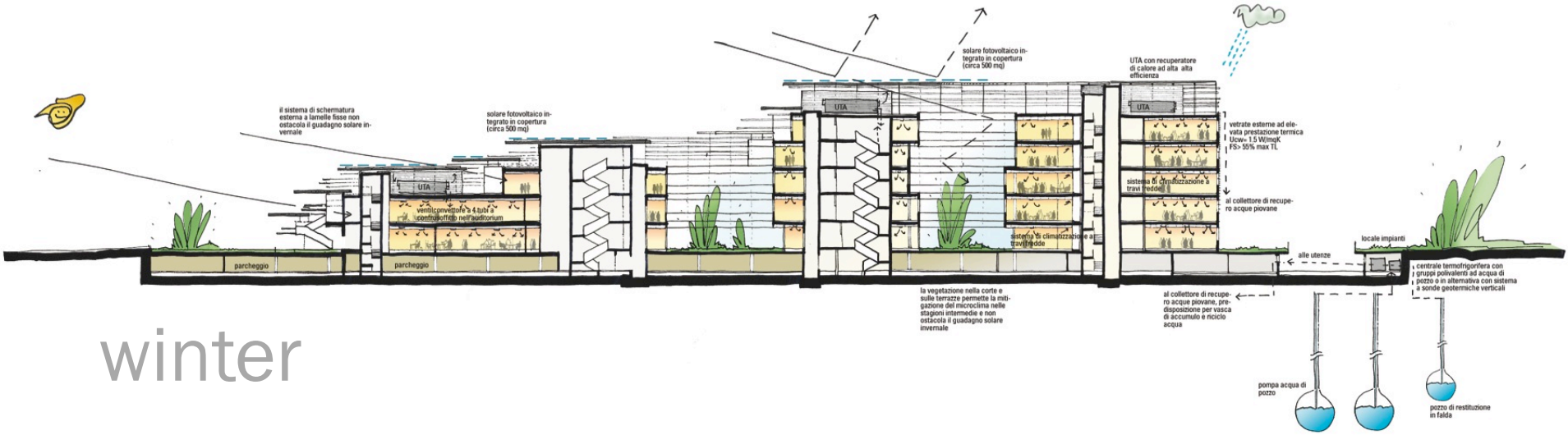
con lamelle frangisole



percentuale di riduzione dell'irraggiamento solare
in ESTATE dovuto alle schermature esterne
FRONTE OVEST = 66%



summer



winter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Parallelo

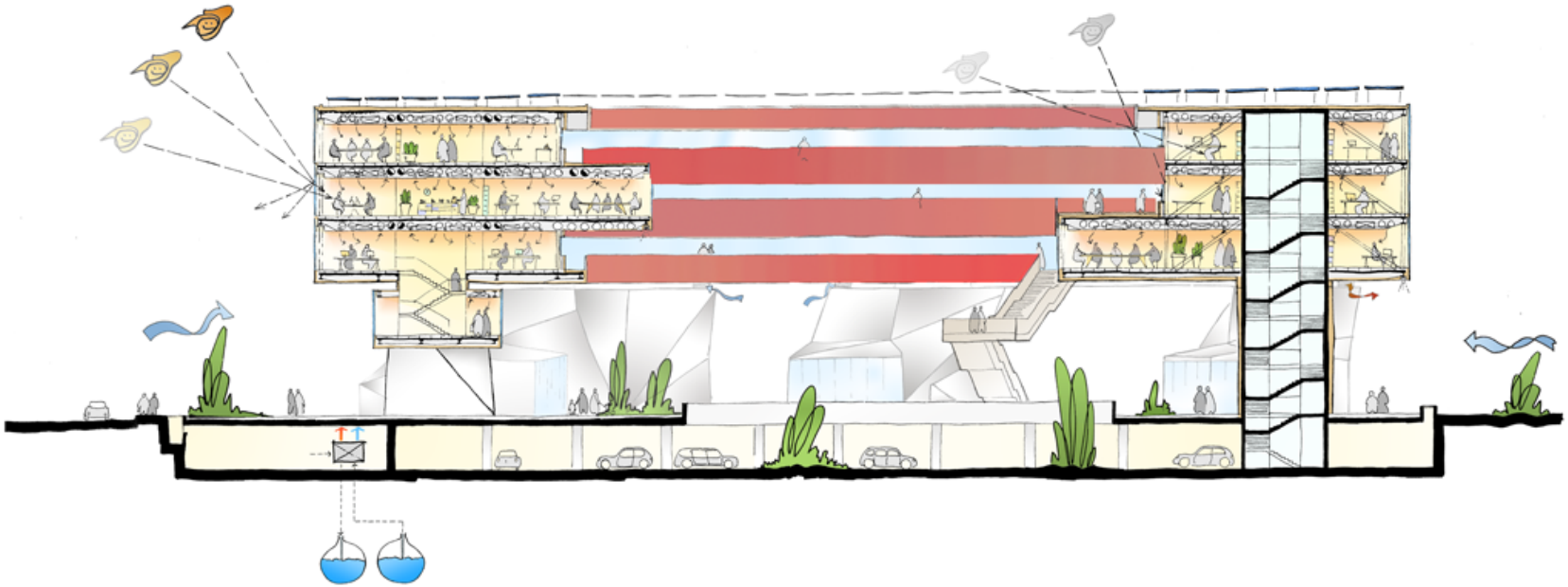
Office building in Milan

CENED certification


DECIMA

strategie ambientali
estate - inverno

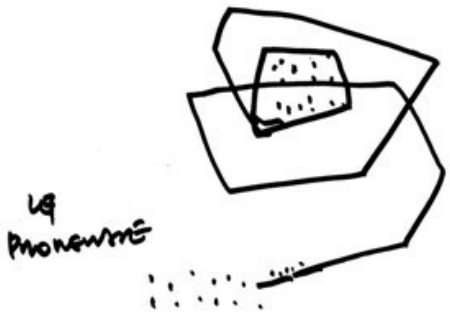
0 emissioni CO_2 per la climatizzazione - impianto fotovoltaico - pompa di calore ad acqua di falda



Cugnaux

International competition for the Multicultural Center

France


LE
PHONEME

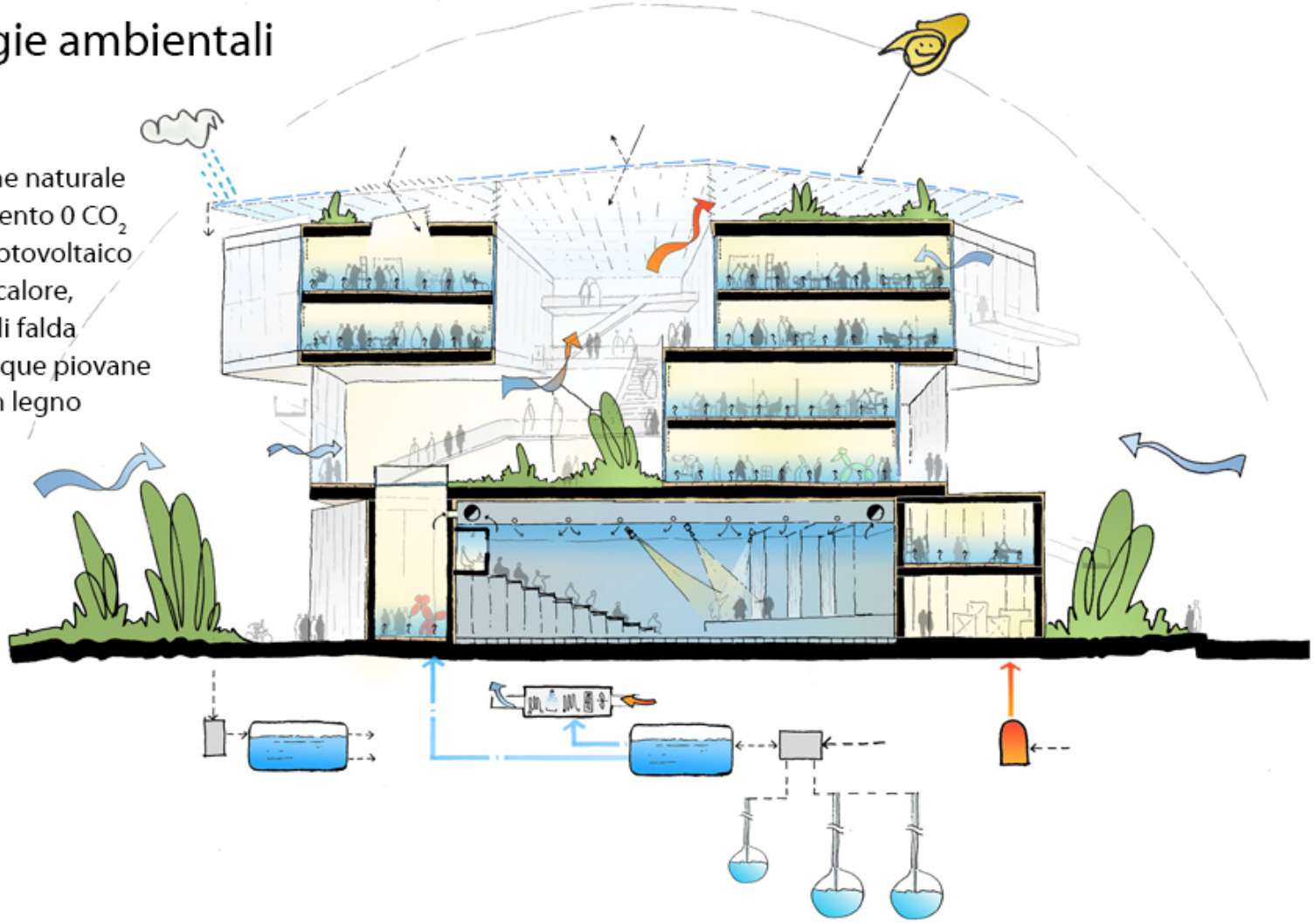

LE PROGRAMME


MEDIATHEQUE
ÉCOLE DES ARTS
PÔLE MULTICULTUREL DE CUGNAUX
ACCUEIL
EXPOSITION


parvis
zone piétonne
zone de livraison
zone dépose minute
parking vélos
arrêt bus
parking public
parking personnel
Avenue de Francazal
Avenue François Mitterrand
access/sortie controlé

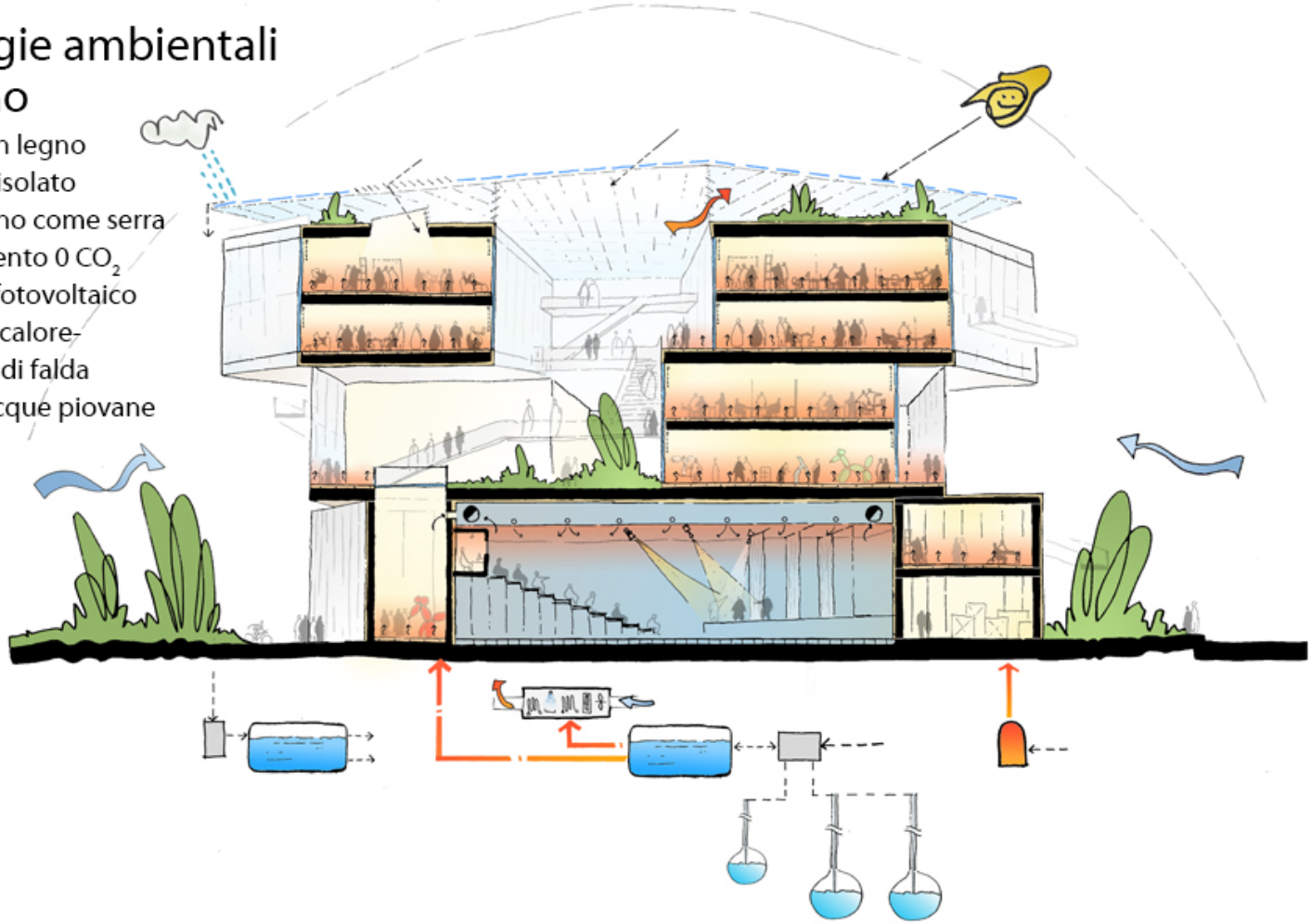
strategie ambientali estate

ventilazione naturale
raffrescamento 0 CO_2
impianto fotovoltaico
pompa di calore,
ad acqua di falda
raccolta acque piovane
struttura in legno



strategie ambientali inverno

struttura in legno
involucro isolato
atrio interno come serra
riscaldamento 0 CO_2
impianto fotovoltaico
pompa di calore-
-ad acqua di falda
raccolta acque piovane



GHANA

Office building in Accra

Green stars certification

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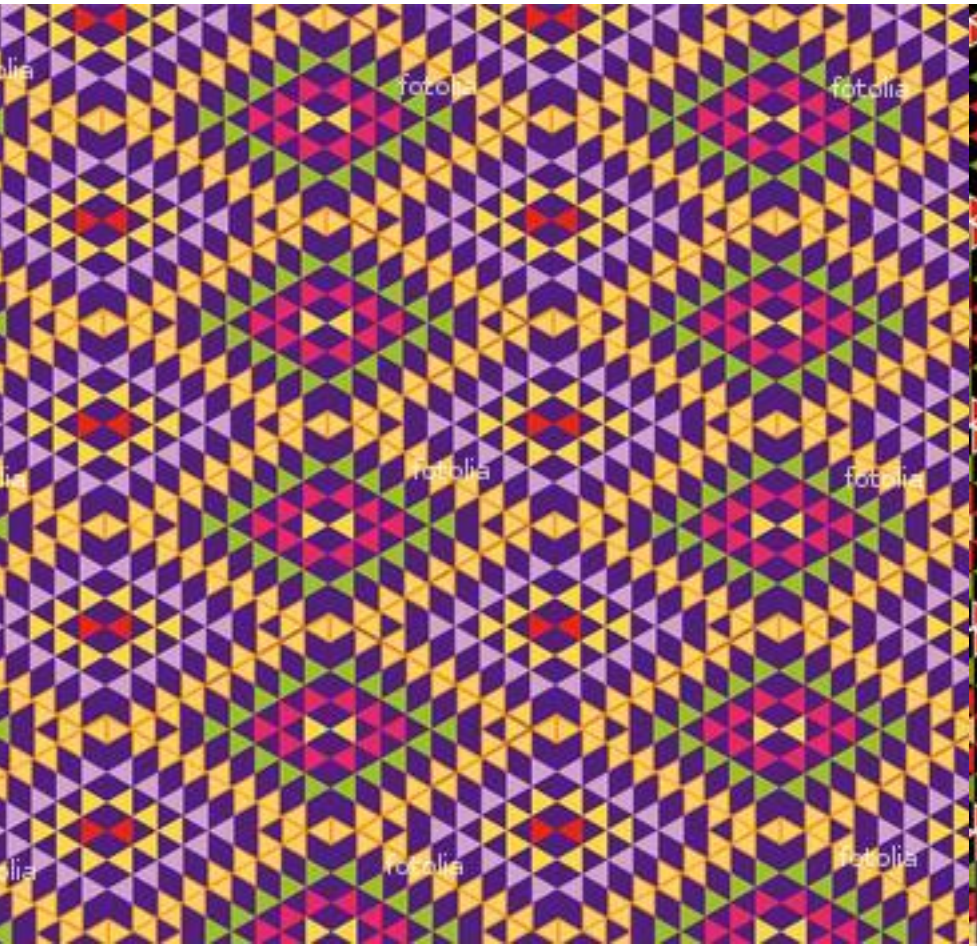
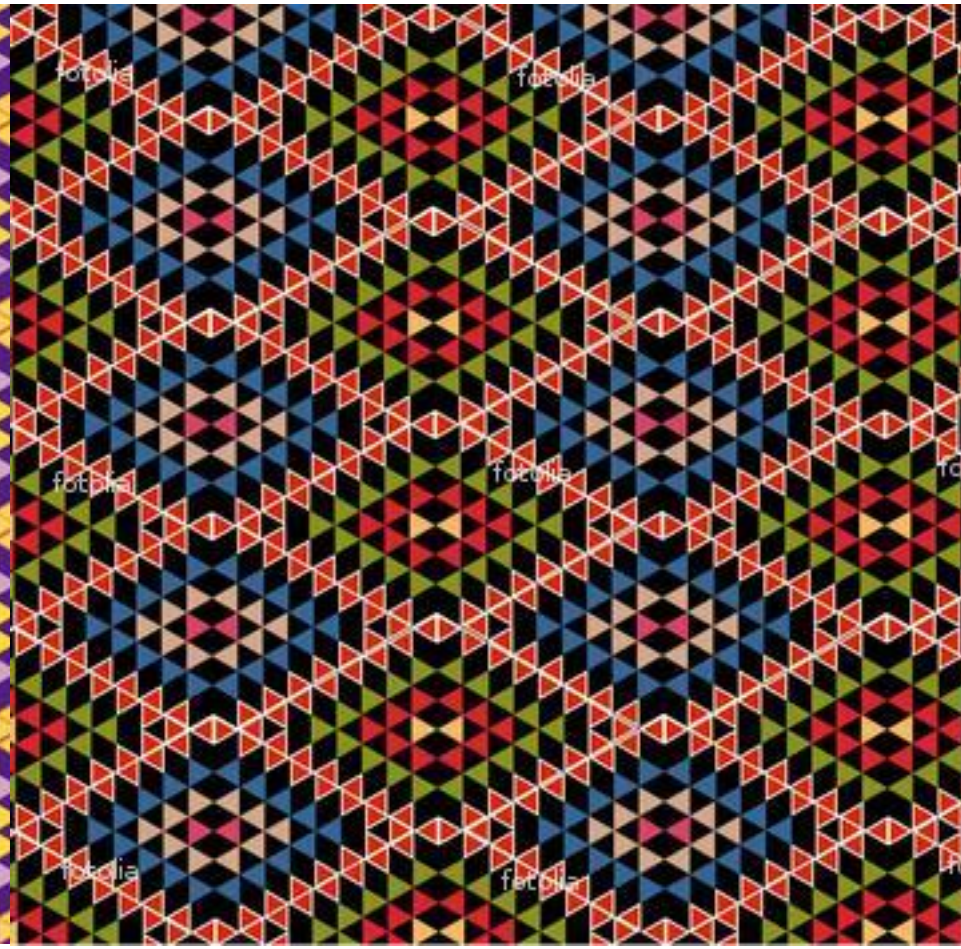
MC A


mario cucinella architects
MC A


mario cucinella architects
MC A



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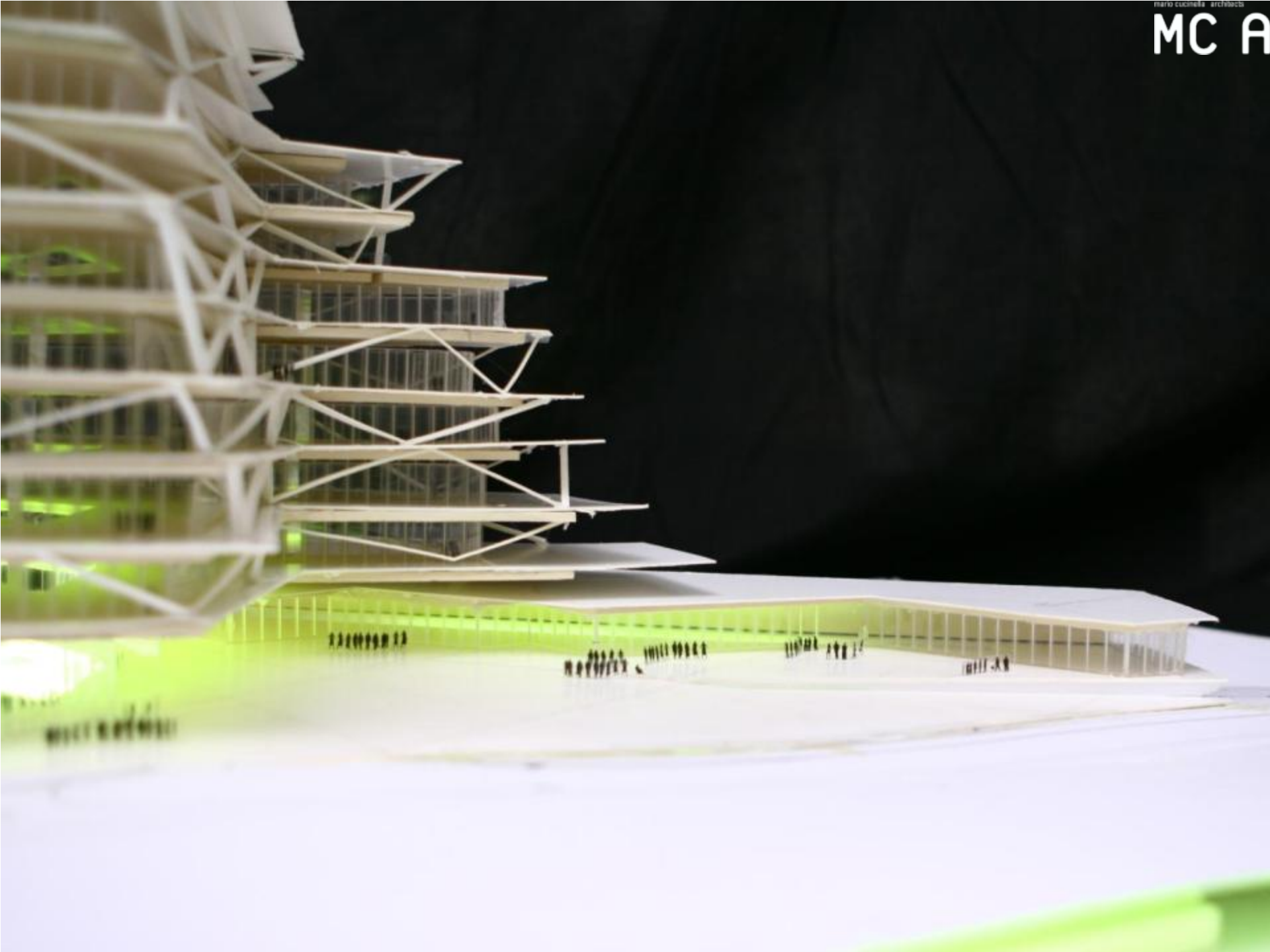
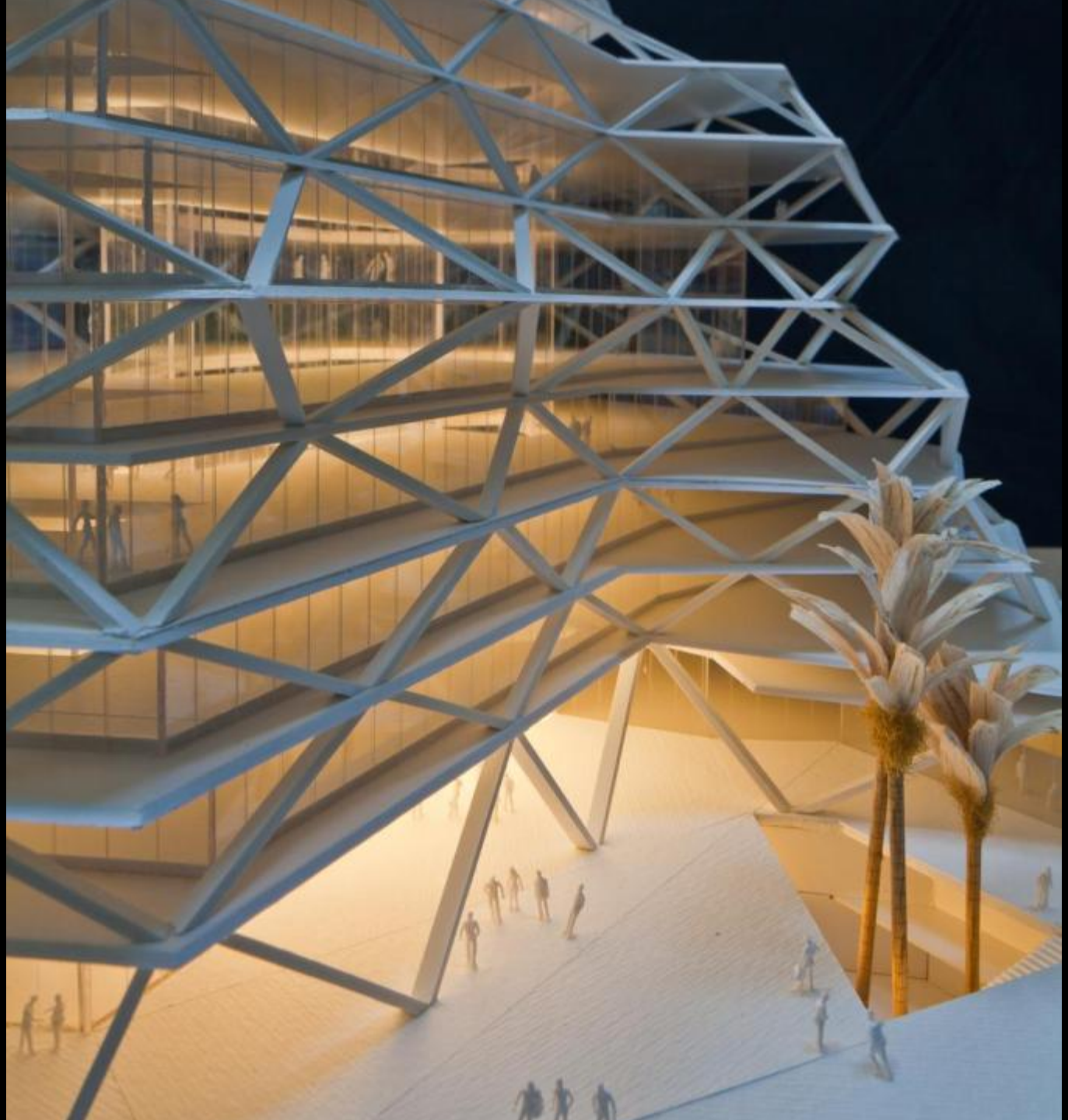
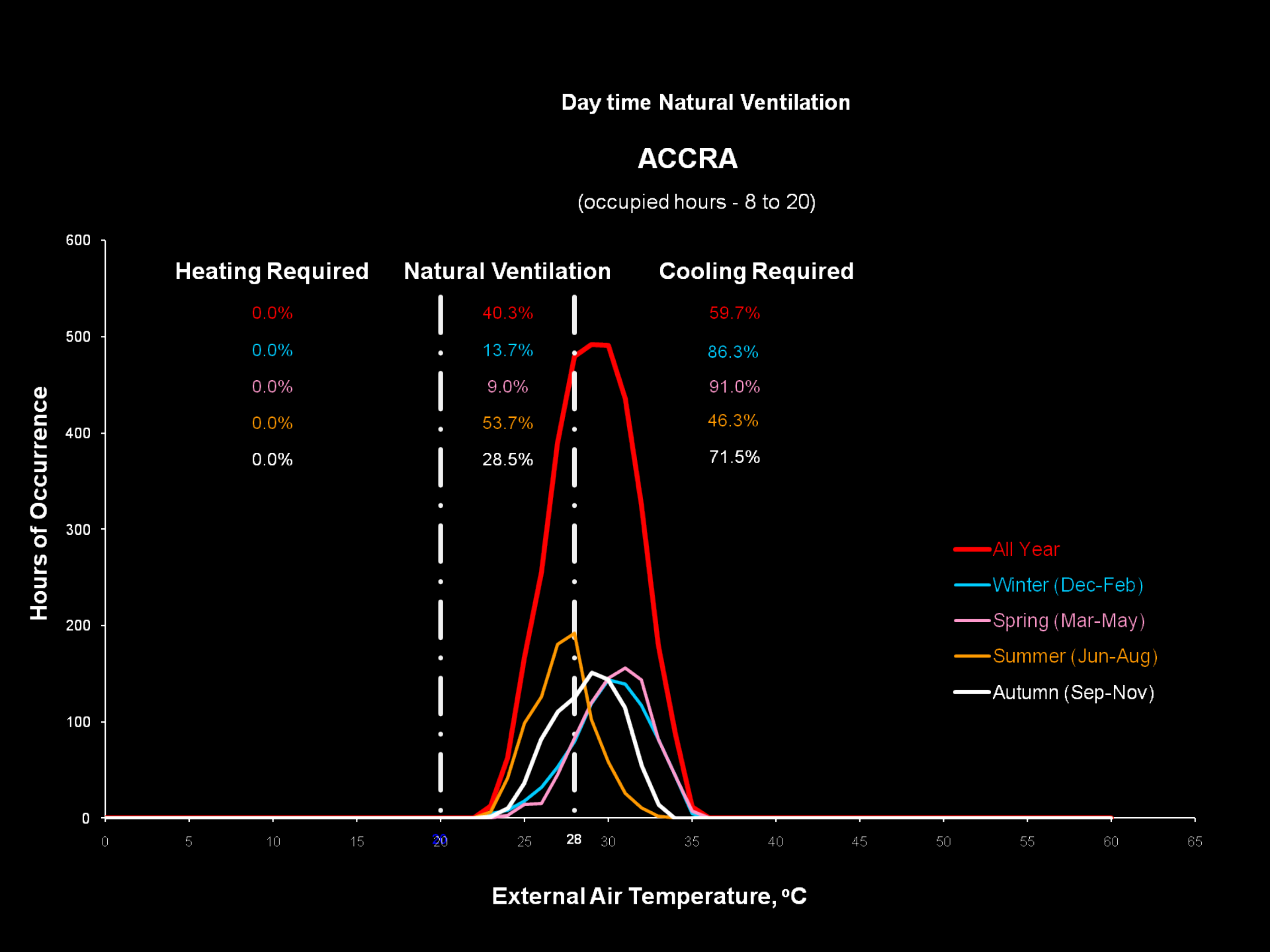
MC A


mario cucinella architects
MC A

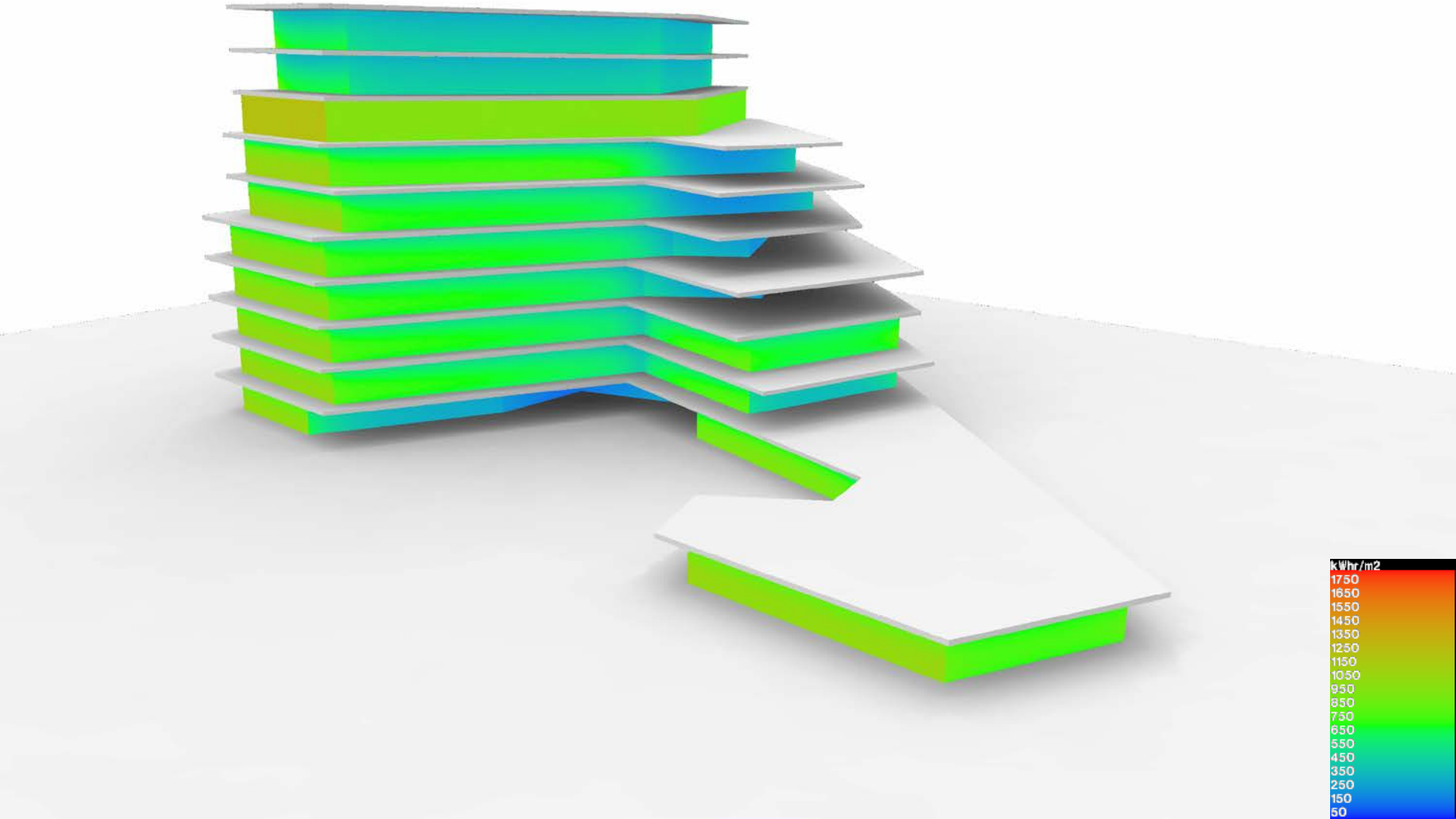


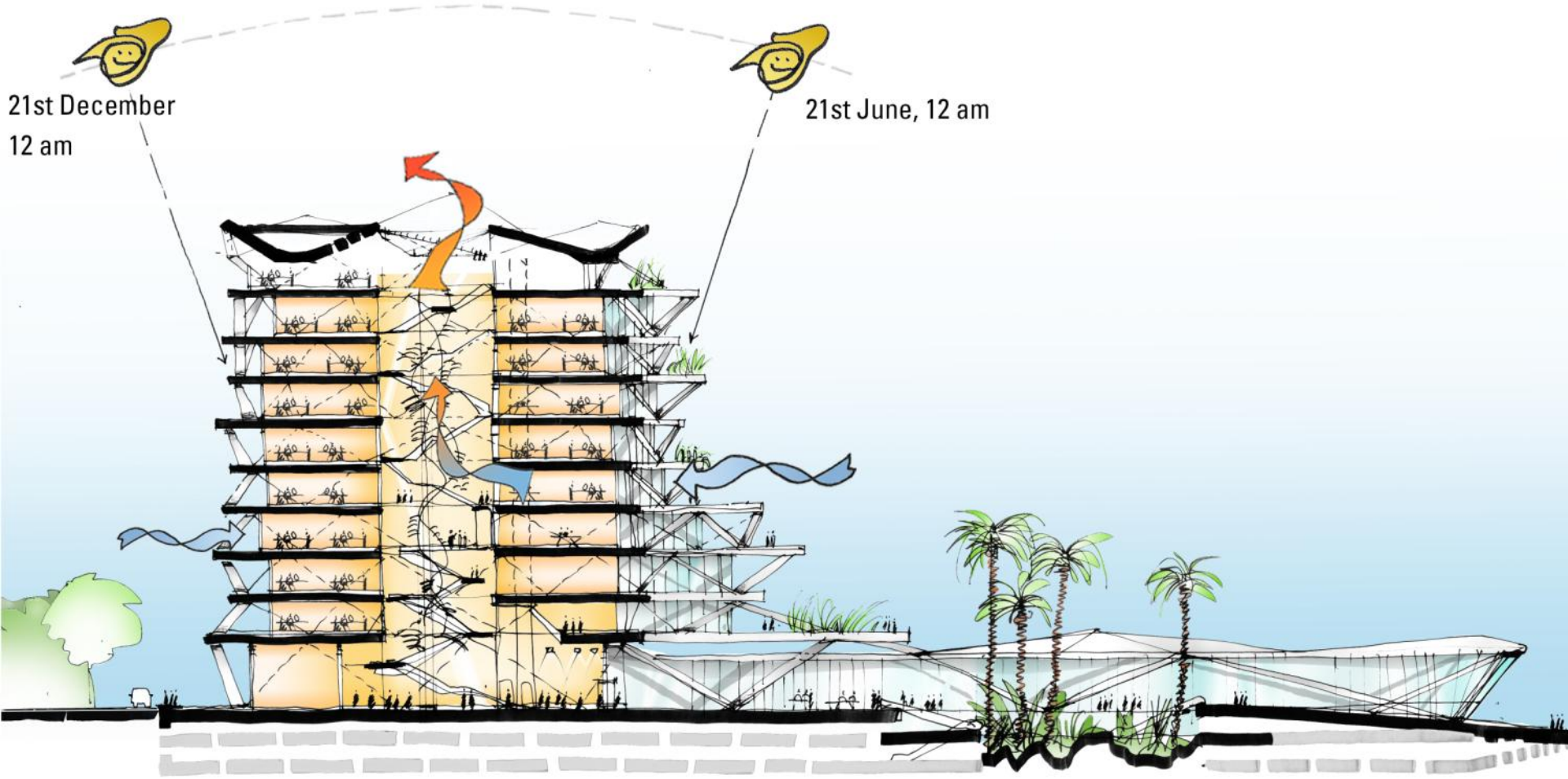
mario cucinella architects

MC A


Day time Natural Ventilation
ACCRA
(occupied hours - 8 to 20)
Heating Required
Natural Ventilation
Cooling Required
0.0%
0.0%
0.0%
0.0%
0.0%
40.3%
13.7%
9.0%
53.7%
28.5%
59.7%
86.3%
91.0%
46.3%
71.5%
All Year
Winter (Dec-Feb)
Spring (Mar-May)
Summer (Jun-Aug)
Autumn (Sep-Nov)
Hours of Occurrence
600
500
400
300
200
100
0
0
5
10
15
20
25
28
30
35
40
45
50
55
60
65
External Air Temperature, °C

Environmental Design – Irradiation Mapping

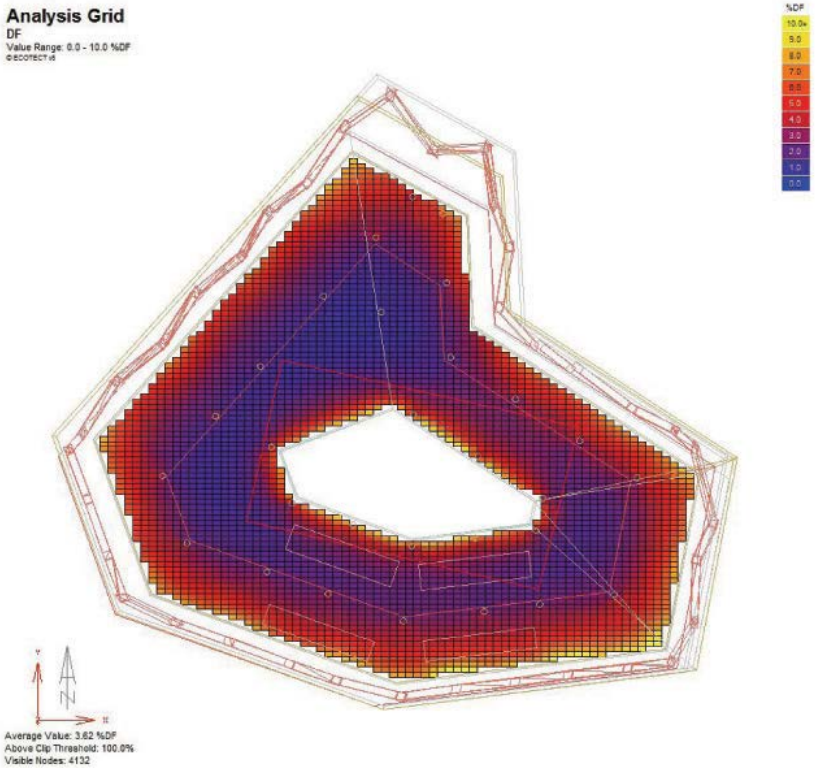



21st December
12 am
21st June, 12 am

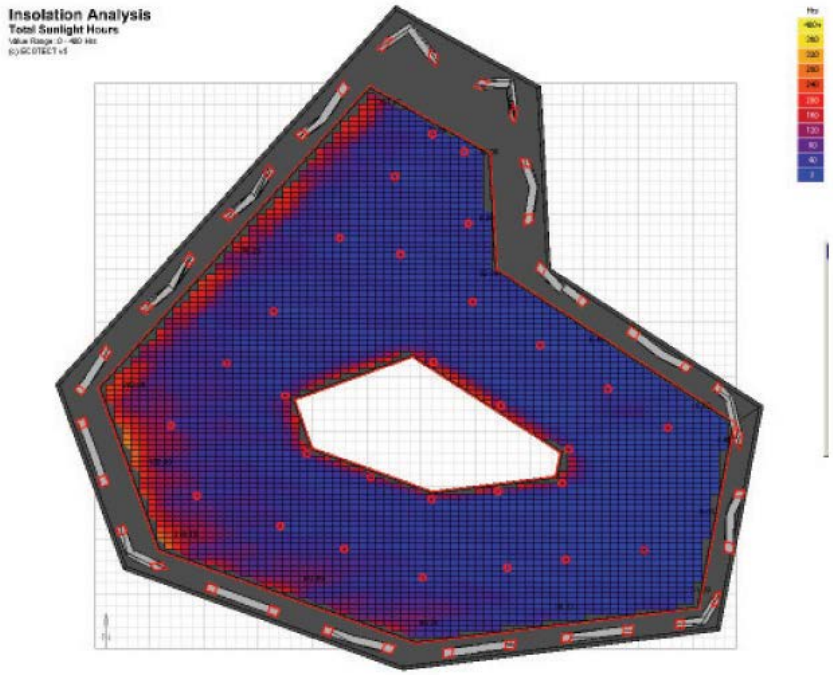
-50% cooling peak load thanks to the overhangs!

Daylight analysis

Glare analysis



Average Daylight Factor on a Typical Floor



Glare Analysis

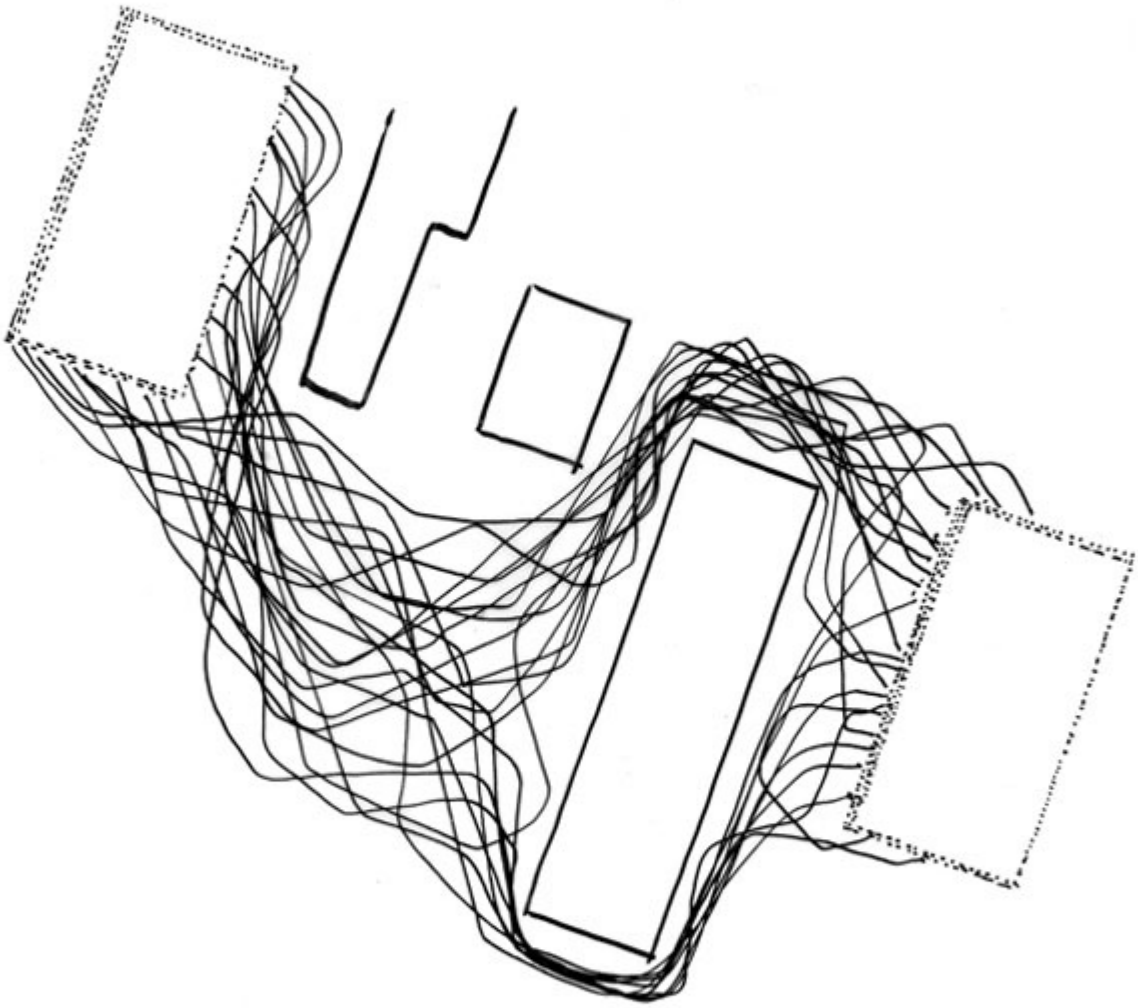
Average daylight factor 3.62%

Discomfort hours << 1h/day

Shantex

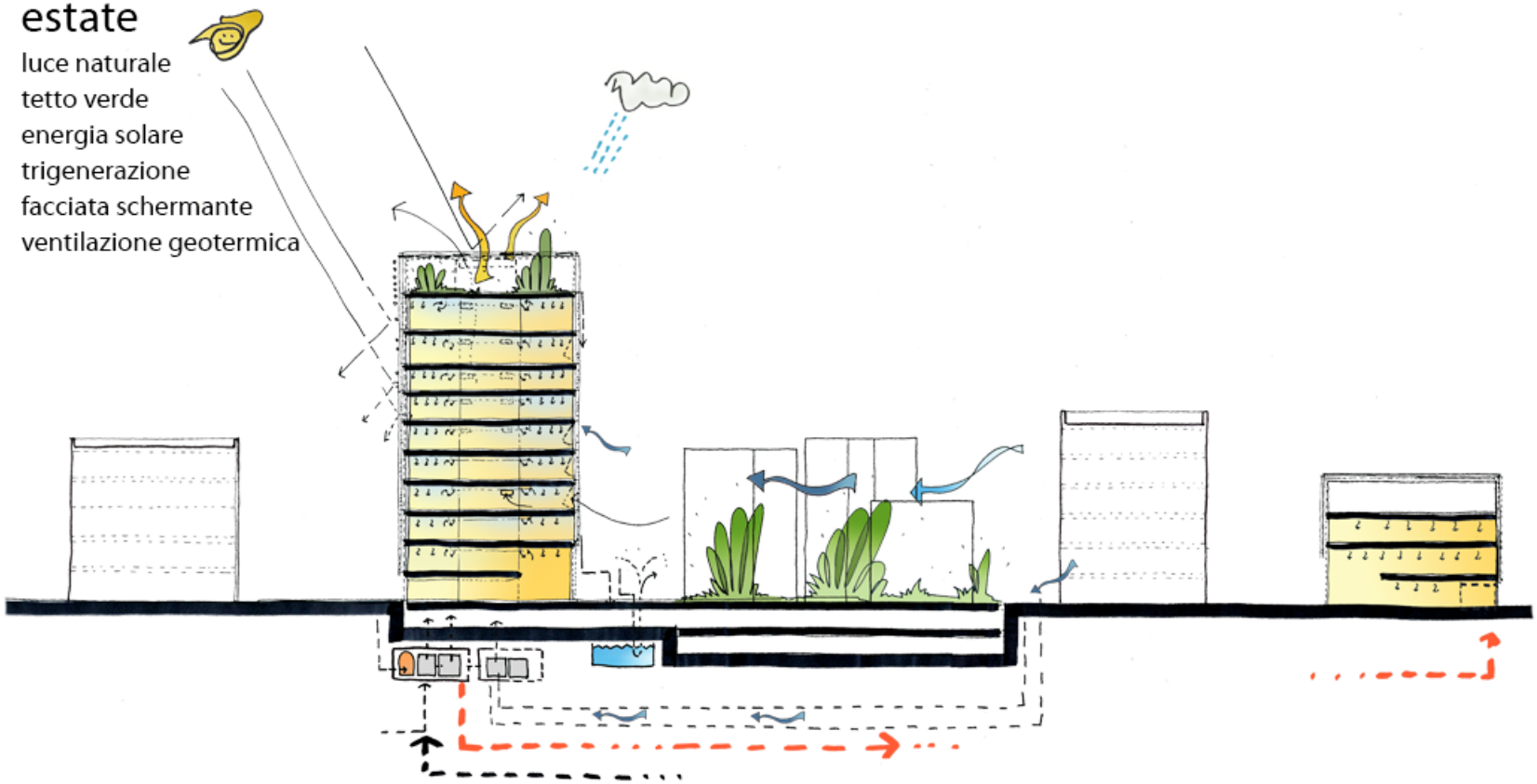
New Headquarter

China



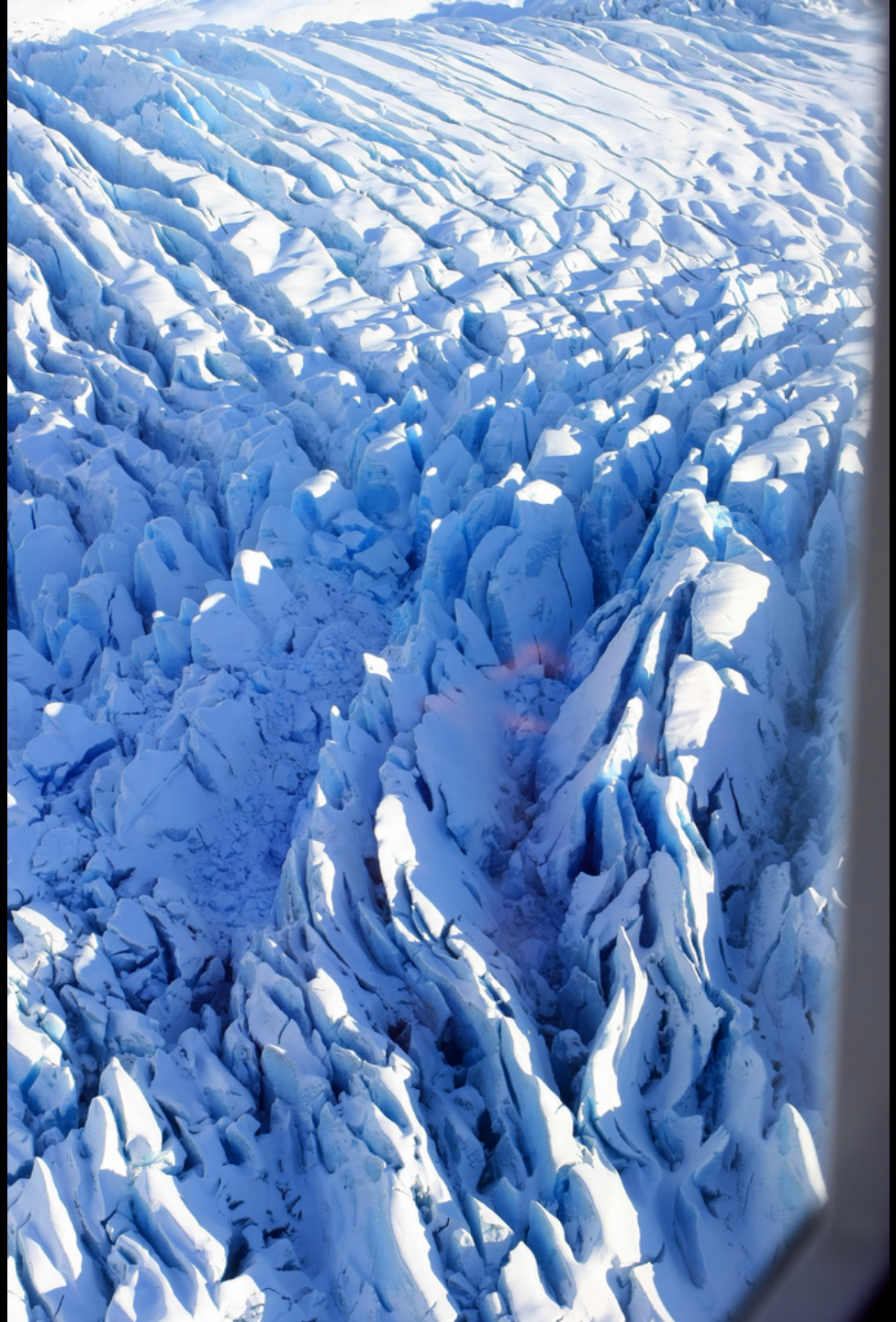
strategie ambientali
estate

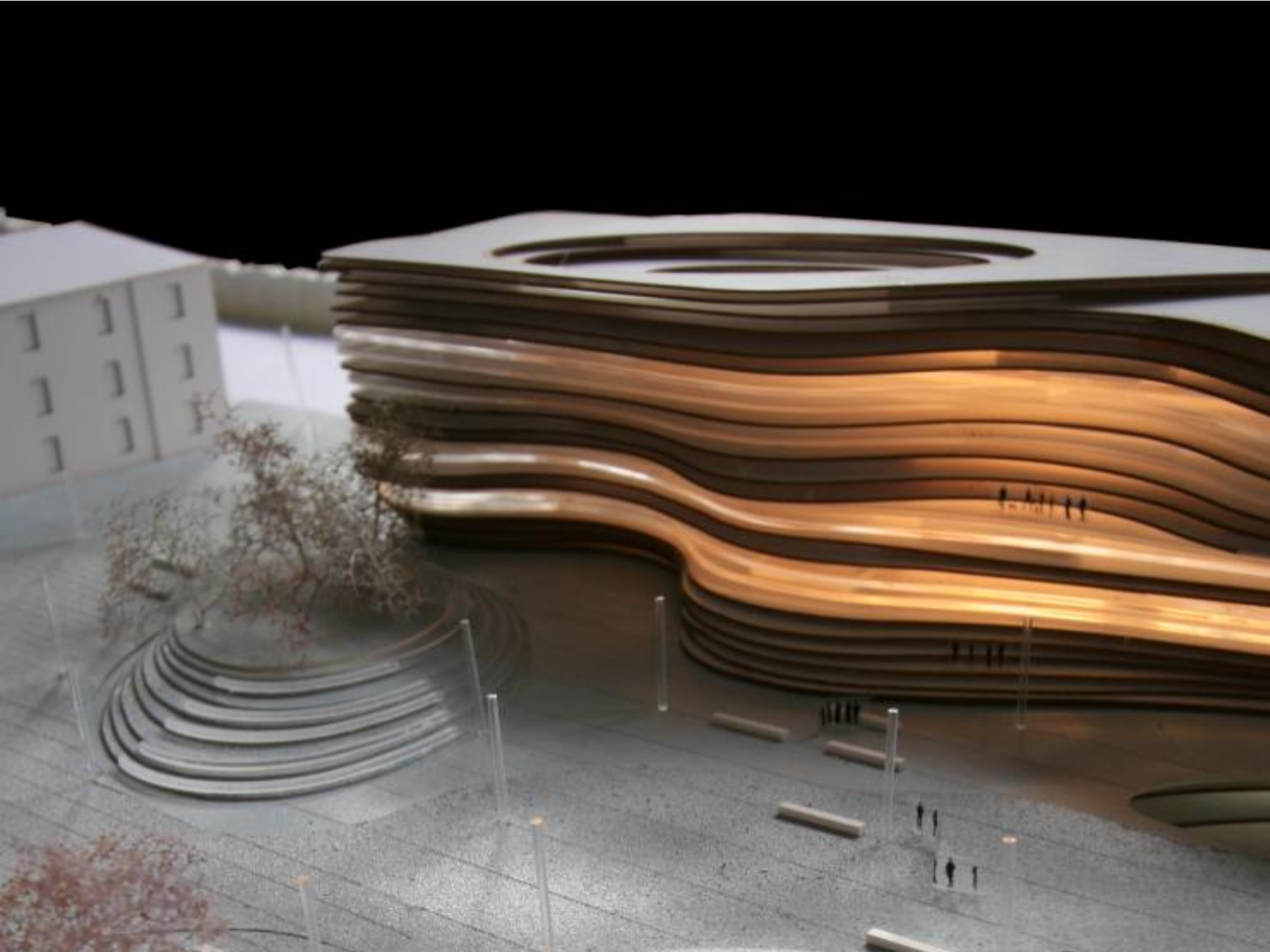
luce naturale
tetto verde
energia solare
trigenerazione
facciata schermante
ventilazione geotermica

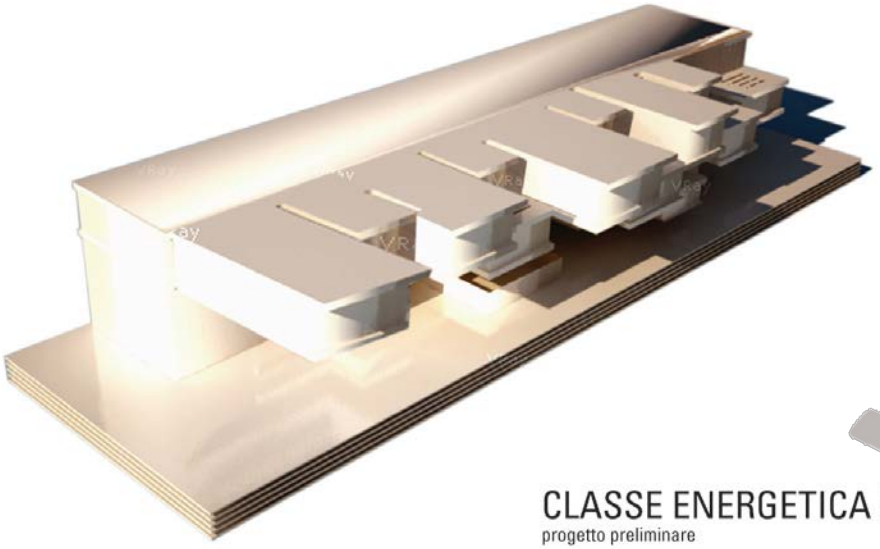


AOSTA

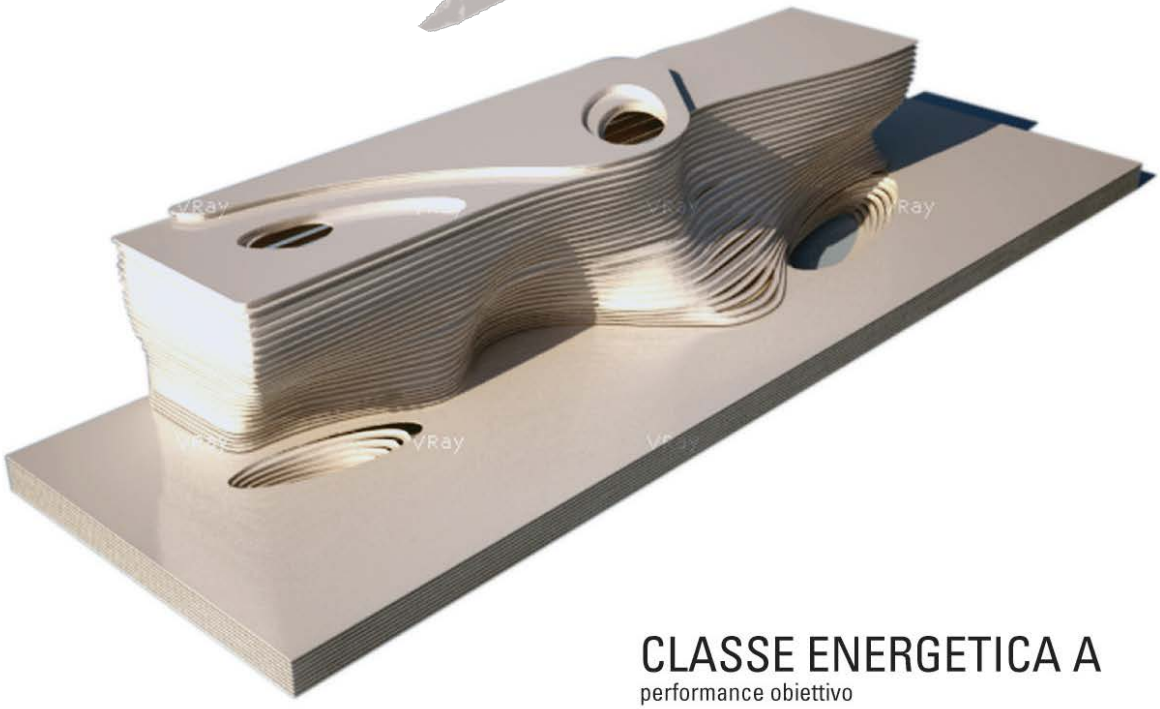
New university campus





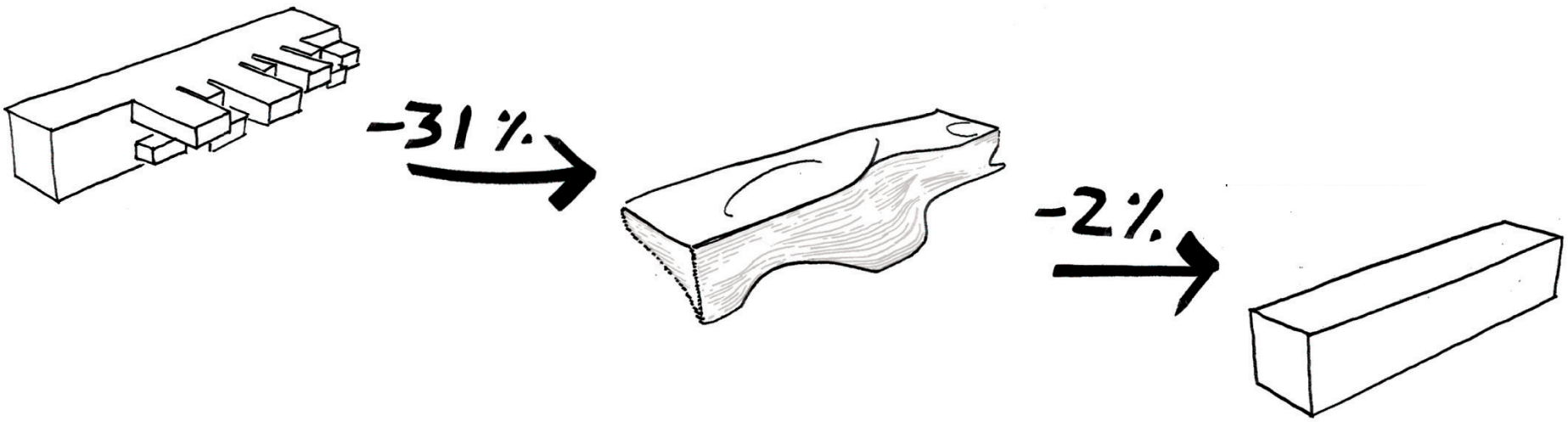


CLASSE ENERGETICA B
progetto preliminare



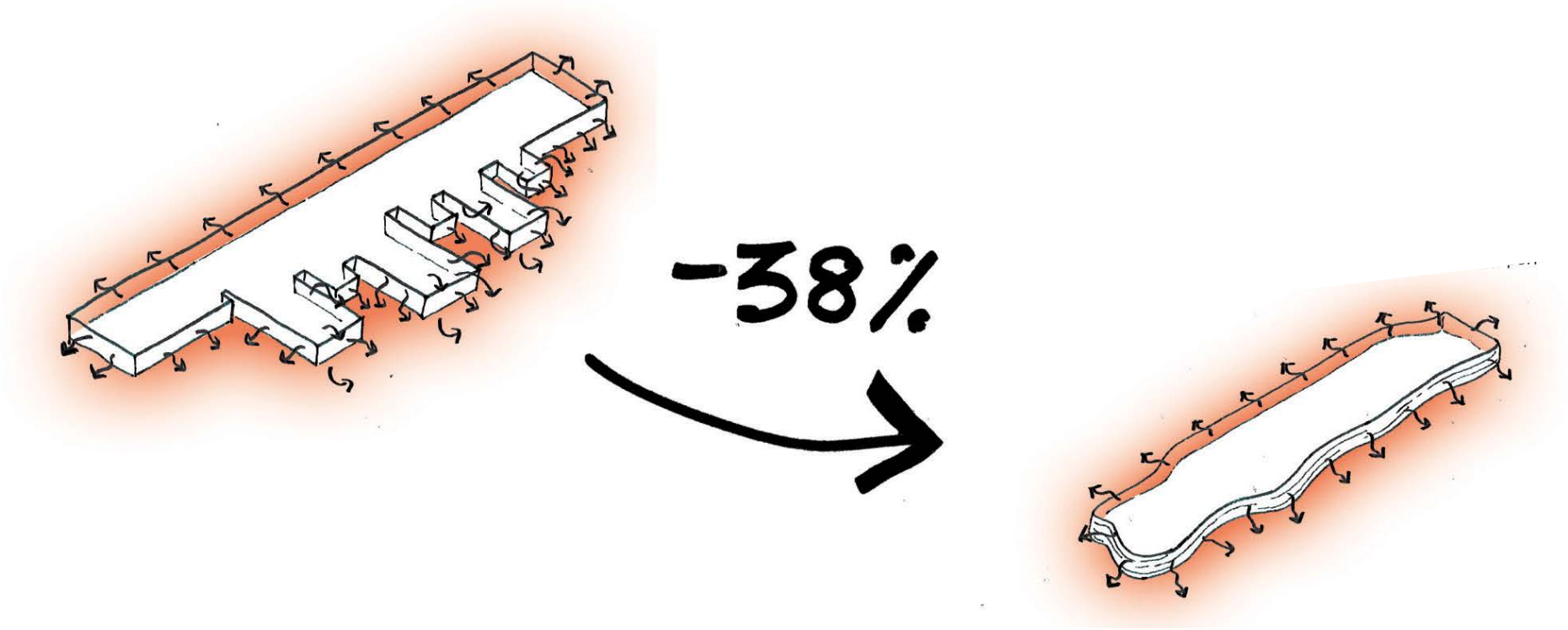
CLASSE ENERGETICA A
performance obiettivo

1. shape efficiency -31% surface to volume ratio



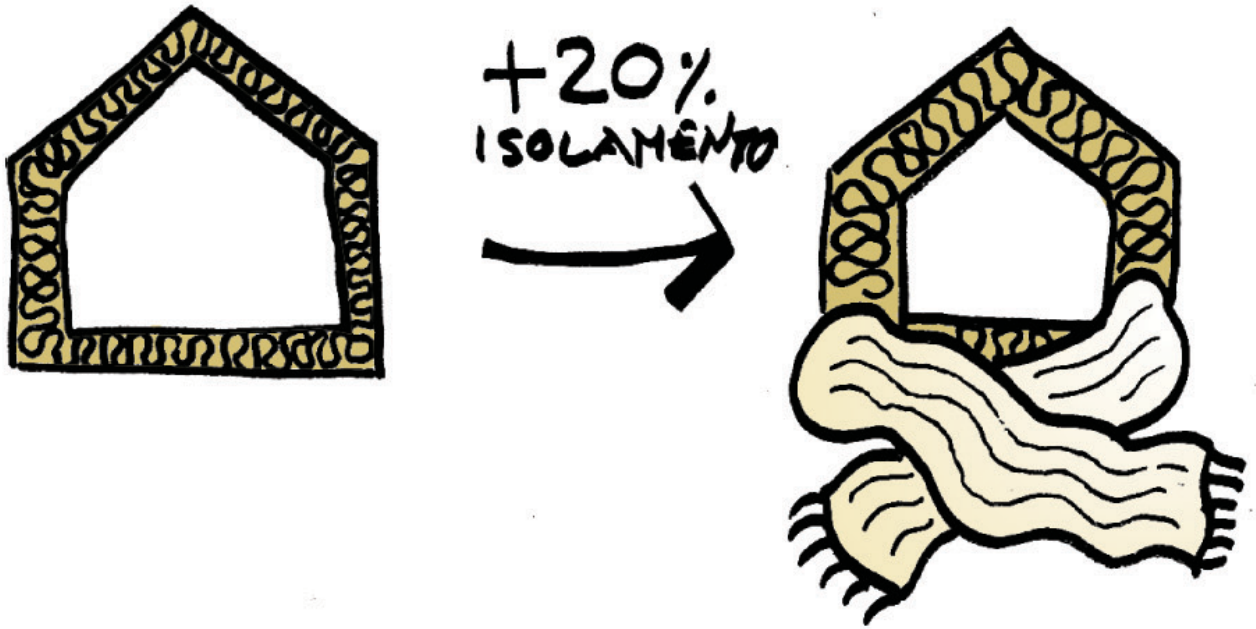
S/V 0.39 → 0.27 → 0.26

2. shape efficiency -38% envelope surface



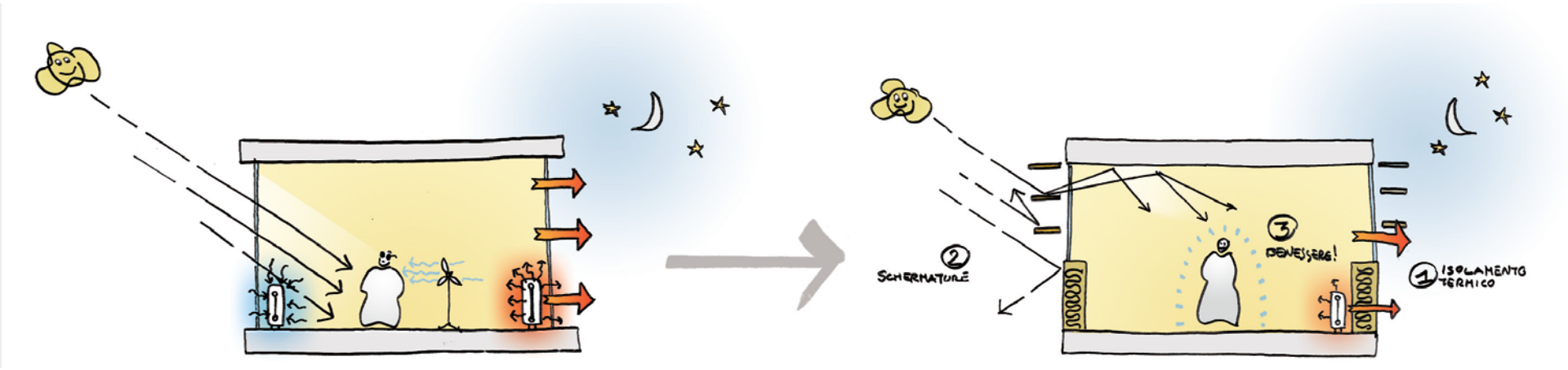
13084 mq → 8120 mq

3. Insulation levels +20%



U wall	0.15	W/m2 °C	0.11	W/m2 °C
U windows	1.3	W/m2°C	1.1	W/m2°C

4. Optimising envelope design

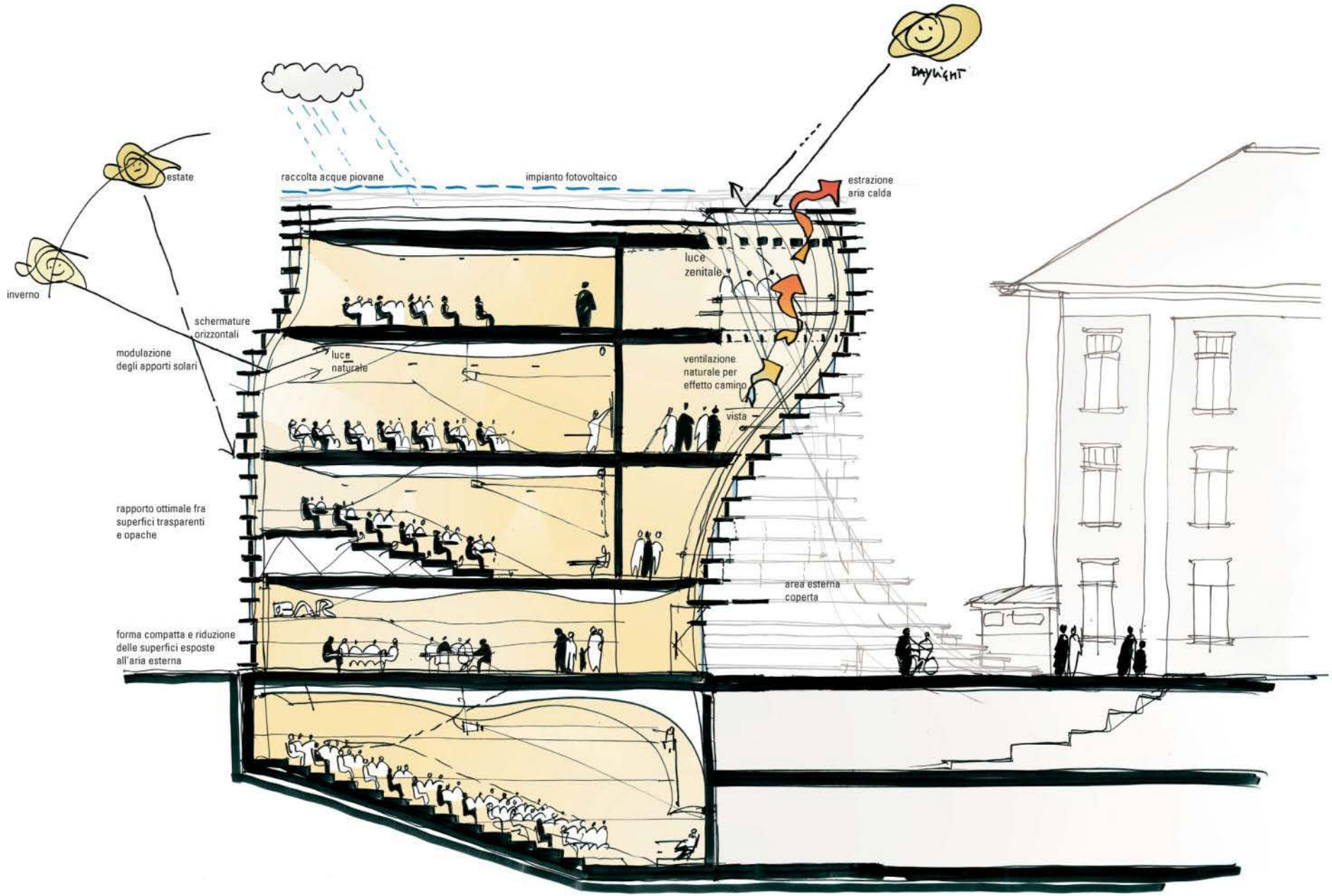


shading design

diffuse light

visual comfort

thermal comfort


DAYLIGHT
estate
inverno
raccolta acque piovane
impianto fotovoltaico
estrazione
aria calda
luce
zenitale
schermature
orizzontali
modulazione
degli apporti solari
luce
naturale
ventilazione
naturale per
effetto camino
vista
rapporto ottimale fra
superfici trasparenti
e opache
area esterna
coperta
BAR
forma compatta e riduzione
delle superfici esposte
all'aria esterna

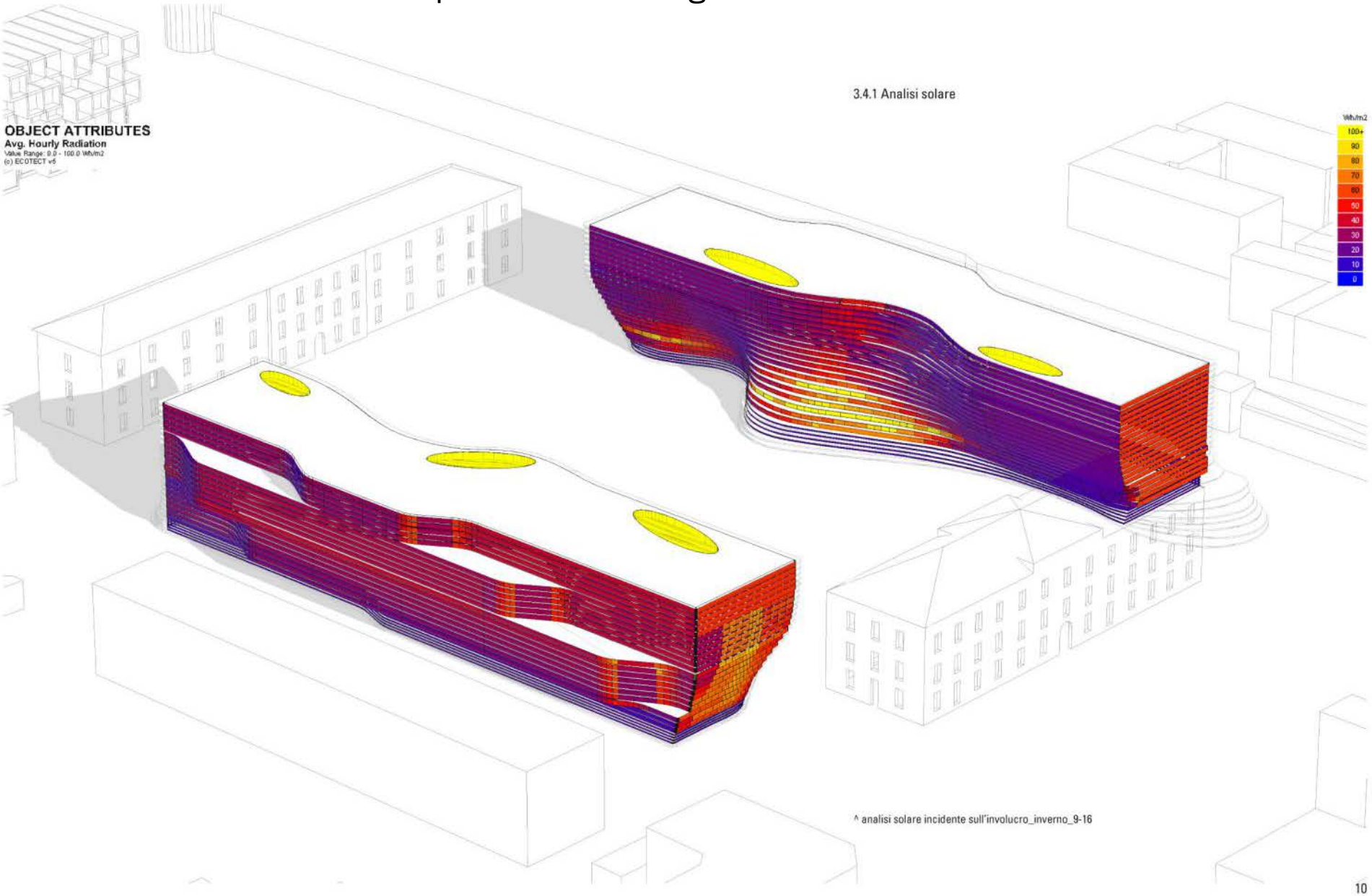
0 kgCO2-eq/m² year

-100%

~~30 kgCO2-eq/m² year~~

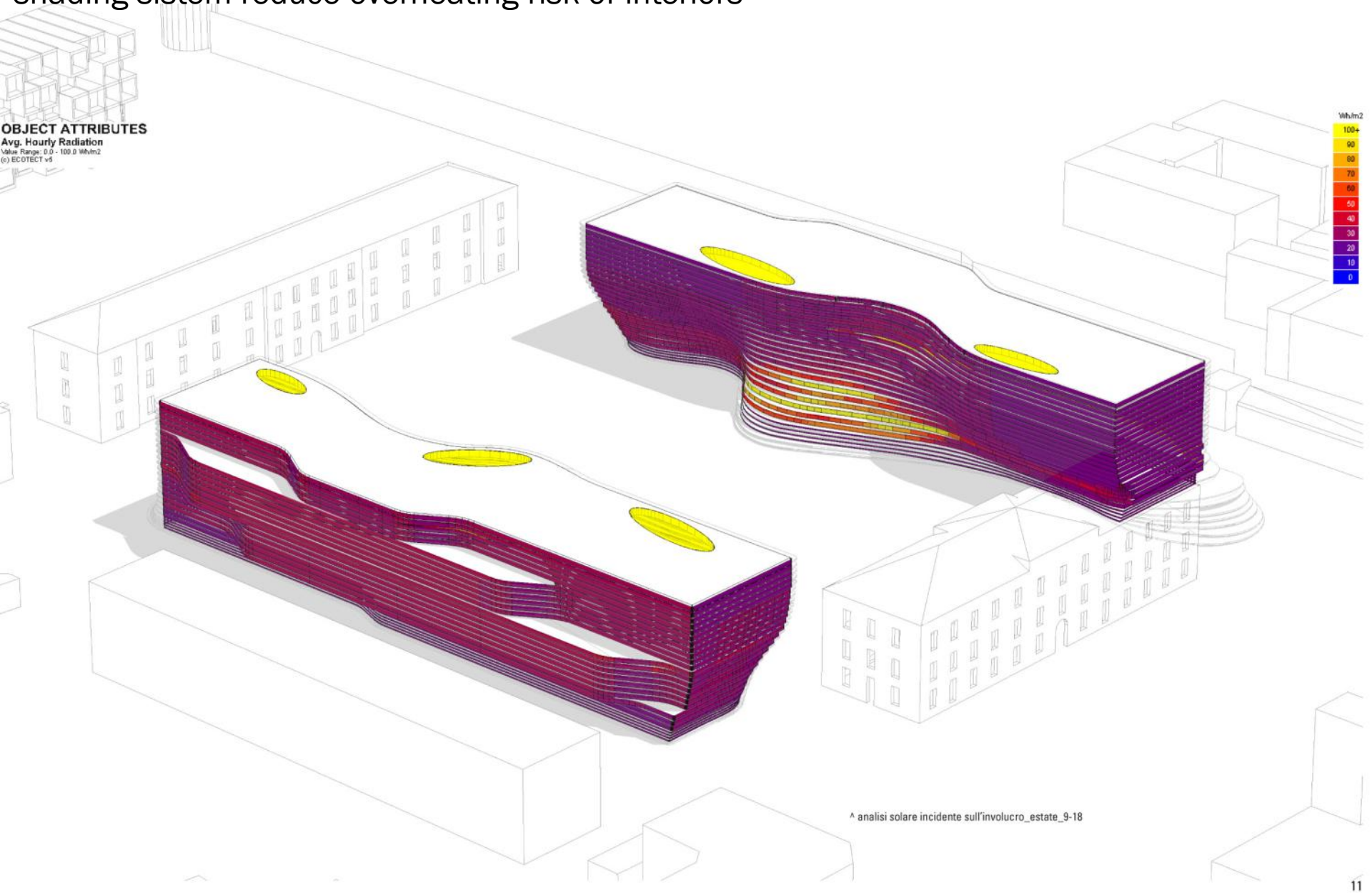
solar analysis_winter

horizontal louvers allow solar penetration during wintertime



solar analysis_summer

shading sistem reduce overheating risk of interiors

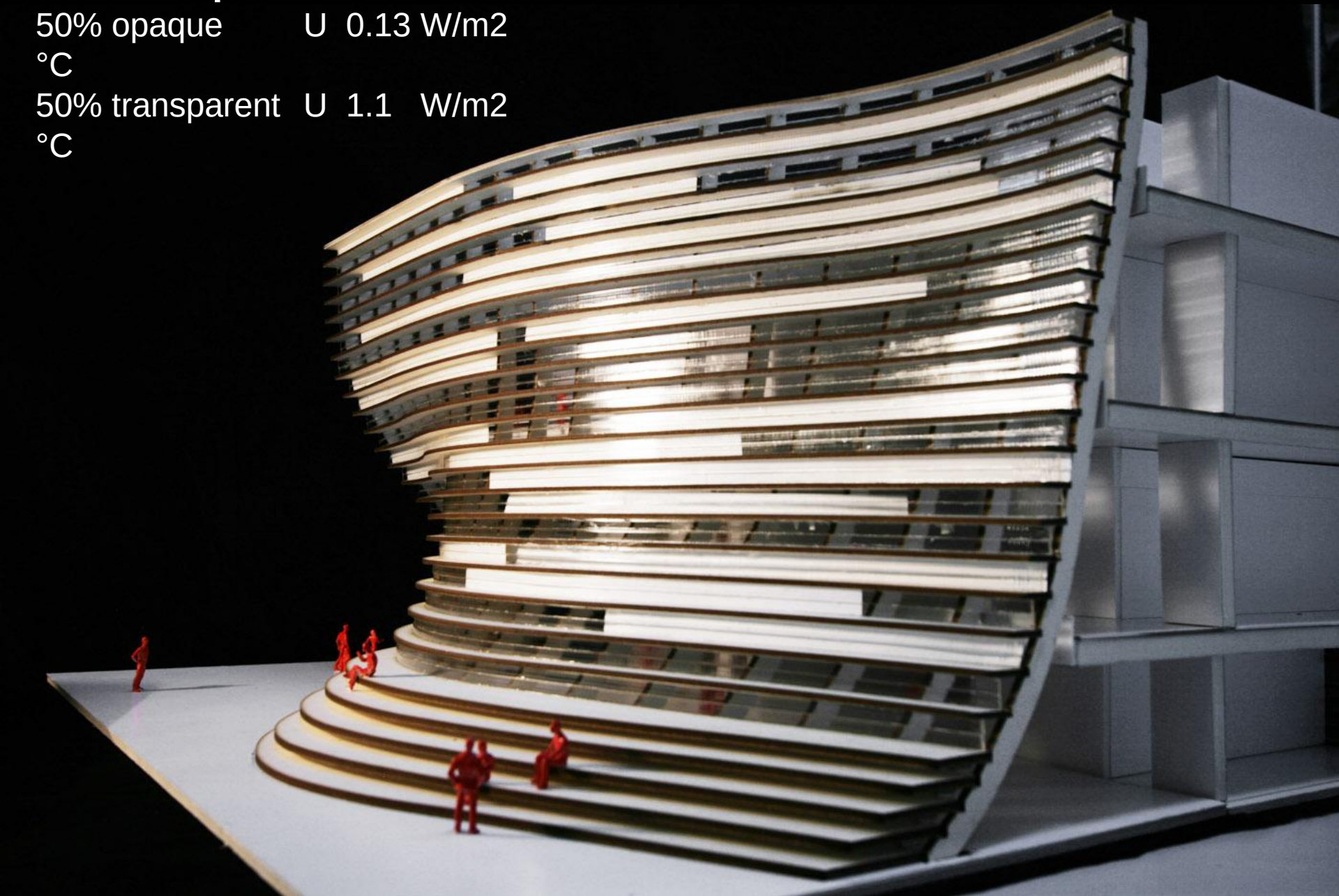


^ analisi solare incidente sull'involucro_estate_9-18

envelope

50% opaque U 0.13 W/m2 °C

50% transparent U 1.1 W/m2 °C



Building green Futures

Architecture for sustainable development

Nasce “Building Green Futures”:

un’organizzazione non profit dove cultura e tecnologia si fondono per ricreare spazi, edifici e quartieri come sintesi/sinonimo di dignita’, qualita’ e performance nel rispetto dell’ambiente

Integriamo architettura sostenibile e energie rinnovabili per migliorare le condizioni di vita, l’accesso ad acqua ed elettricita’ di comunita’ in paesi in via di sviluppo

Building green futures

La nostra visione

Reinventare l’ambiente costruito perche’ questo diventi soluzione (e non ostacolo) ai problemi energetici e di gestione delle risorse naturali

vogliamo produrre una nuova genetica dell’architettura per un ambiente costruito che non consumi risorse, ma ne permetta la moltiplicazione nel rispetto dell’ambiente

Dignità qualità performance

Questi sono i principi che ispirano la nostra missione: vogliamo dare dignita’ allo spazio costruito e alle persone che ci vivono attraverso la qualita’ dell’architettura e la performance in termini di condizioni di vita e di accesso sostenibile a servizi essenziali

La prima partnership

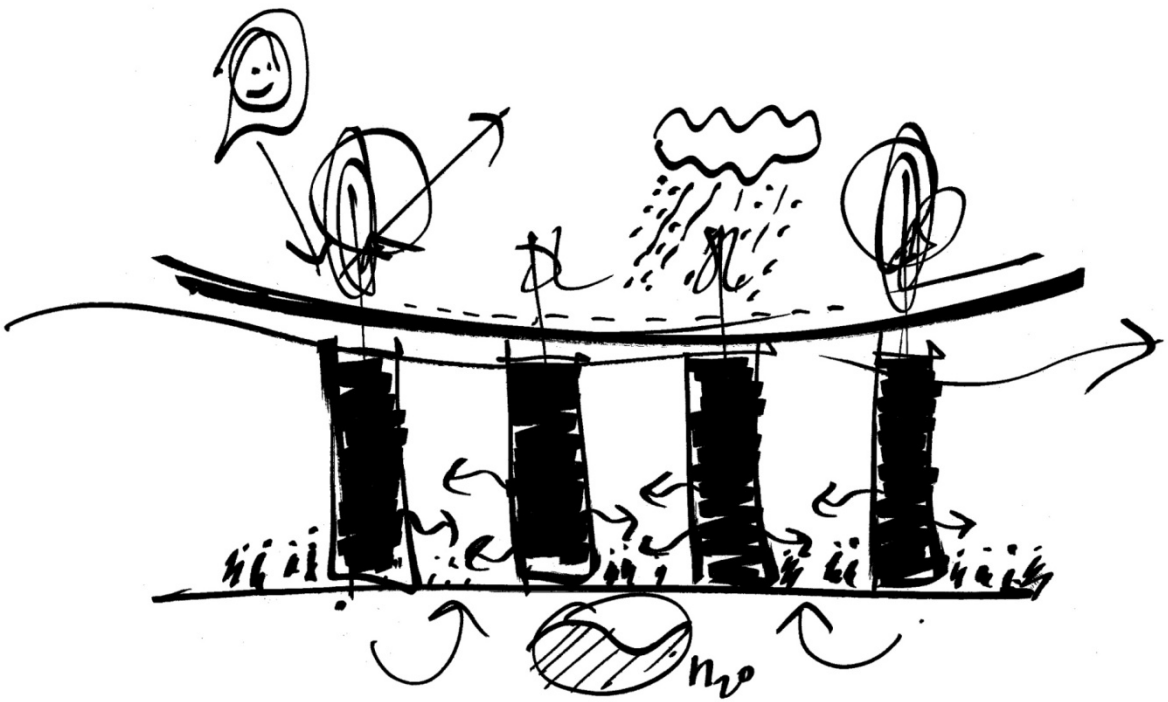
building green futures

UNRWA

mario cucinella architects

MC A

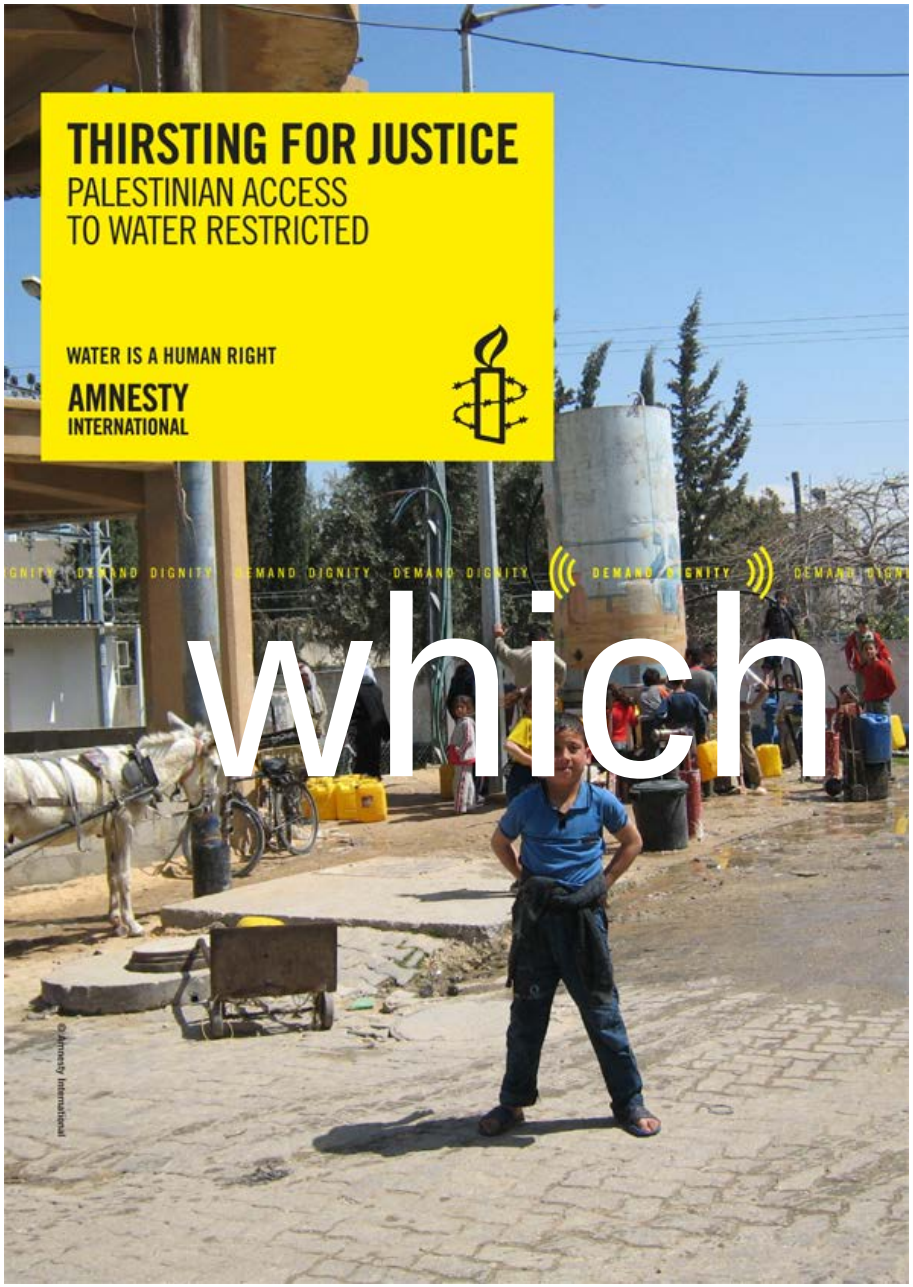
UNRWA



a climate neutral school

0 CO2, -70% water demand, 0 oil, km 0 food


the future



which future?

World Energy Monthly Review

Oil, Peace and Palestine: Energy Key to Holy Land's Past, Future

by Robert Bryce

Few people consider Ramallah a key locale when it comes to the future of the energy business in the Middle East. The home of the Palestinian Authority and the de facto capital of the still-nonexistent independent state of Palestine, Ramallah is a cramped, somewhat disheveled city of 60,000 or so. The city, which traces its roots back to the 16th century, lies about 10 miles north of Jerusalem. Like other towns on the West Bank, it has plenty of poverty and plenty of dashed dreams, yet plenty of hope that someday, somehow, Palestine will become an independent country. If statehood does occur – and even if it doesn't – energy will continue to be the key driver of Palestine's economy. It may also be the flashpoint that leads to more conflict between the Israelis and the Palestinians.

Ever since the Six-Day War in 1967, the fitful peace negotiations between the Israelis and the Palestinians have focused on land, water, Jewish settlements in the occupied territories and, more recently, on the "separation wall" Israel is building, much of it on land claimed by the Palestinians.

All of those issues are [illegible]lly important, and alas, largely u[illegible]olved. Bu[illegible] m[illegible] equ[illegible] energy su[illegible]es at re[illegible]nable pric[illegible] also [illegible]y, yet o[illegible] overlook[illegible] elemen[illegible] th[illegible]eace equat[illegible]. [illegible]e Palestin[illegible] have [illegible] of the [illegible]st-growin[illegible]pulat[illegible] o[illegible]rth. The [illegible]li po[illegible]tion is [illegible]ing more [illegible]dy. B[illegible] city's [illegible]omy, d[illegible] the [illegible]ng vi[illegible] in th[illegible] occu[illegible] territories, is grow[illegible] about [illegible] percent per year. The combination of these factors means demand for all types of energy is booming in both Palestine and Israel. As with everything in the Holy Land, the politics of energy are complicated. This article will focus on three points: the current state of energy politics in the region, the ties between energy and water and, finally, the problems posed by the separation wall.

This power plant in Gaza, operational since March 2004, has the capacity to produce 140 megawatts of electricity. However, it produces only about half that amount due to lack of transportation infrastructure.

Booming Demand in Israel and Palestine

Over the next 15 years, the Palestinian Authority's Ministry of Energy and Natural Resources expects electricity demand in the West Bank and Gaza Strip to quadruple. Motor fuel and liquefied petroleum gas (LPG) demand, which has been flat for several years largely due to the Israeli occupation, is also expected to rise. In Israel, natural gas demand is expected to increase 14-fold over the next two decades. Electricity demand will increase by 25 percent by 2010.

These energy demands mean that the Arabs and the Jews must live together (however unhappily) in order to keep the lights burning. Currently, Israeli companies supply all of Palestine's energy: motor fuel, LPG and electricity. But the Palestinians are eager to break their dependence on Israel. And given the right conditions, that could happen: The Palestinians are, in aggregate, energy rich. For the past six years, the Palestinian Authority has been sitting on a major gas field that contains at least [illegible]ic feet (Tcf) of gas.

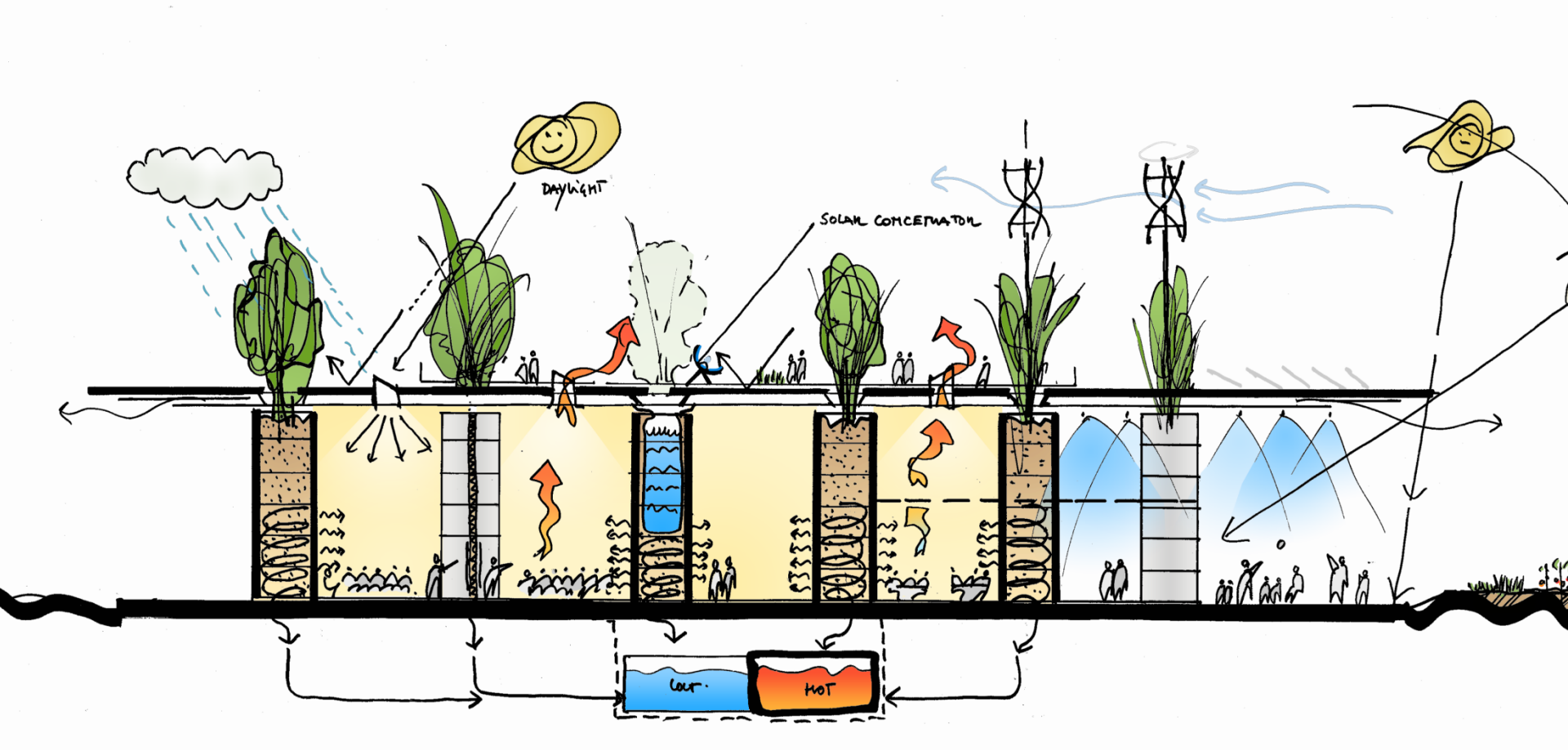
In 1999, BG Group, in p[illegible]ship with [illegible] Palestinians, [illegible]illed t[illegible]aza Marine-1 off the c[illegible] of the Gaza Strip [illegible]re they [illegible]vered the Gaza ga[illegible]. And sometime this [illegible]mer, BG [illegible]ill another w[illegible] Palestinian terri[illegible] waters in an effort to fin[illegible]re gas. Determining who [illegible] the Palestinian gas, and at what price, will be a key to the [illegible]e of P[illegible]ne. But righ[illegible]w, the gas might as well be fictiona[illegible] their land and their water. The gas is worth $4 billion," says Amit Mor, an Israeli energy consultant. "It's the only natural resource they have. They can't sell it. They can't develop it for their own needs because their own needs are too small to allow economic development of the field. So they are very frustrated."

The Israelis are the cause of that frustration. In 2003, Israeli Prime Minister Ariel Sharon blocked a proposal that would have allowed the Palestinians to sell their Gaza gas to electric power plants in Israel. BG had proposed a pipeline to carry the Gaza gas ashore, where most of it would be used by the Israelis. The pipe would also have carried gas to the Palestinians and meant $50 million per year in revenue to the Palestinian Authority.

Dr. Omar Kittaneh, deputy minister of energy and natural resources for the Palestinian Energy Authority, told me that "like any country, we want to have energy independence." But the Palestinians will never have energy independence without statehood.

Adding to the frustration in the West Bank and Gaza is the disparity in the levels of energy consumption between Israel and Palestine. According to Nationmaster.com, which publishes statistics on countries around the world, the Israelis are the most imported-oil-dependent people in the world (the Japanese rank second). They are also among the most energy intensive, ranking number eight among the world's

0 CO2



construction

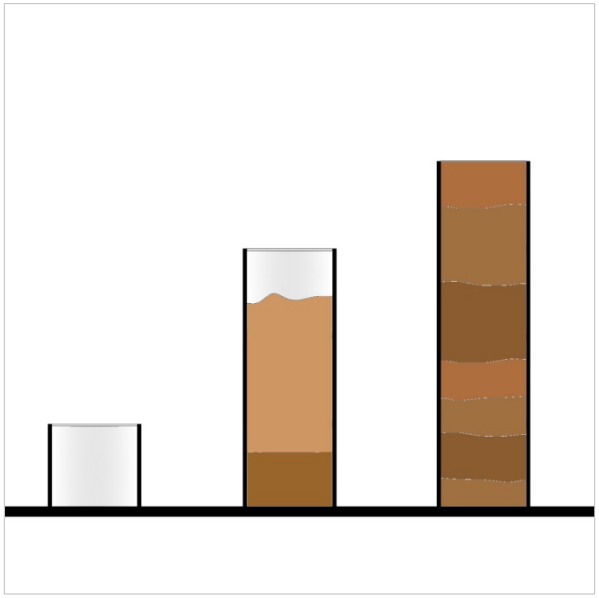
1

excavation ground

2

precast concrete ducts

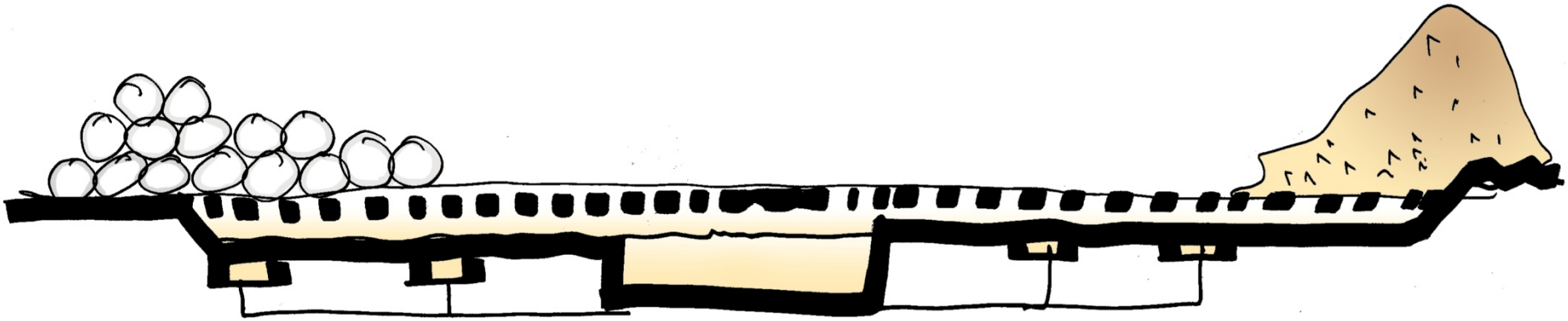
3



self build pillars

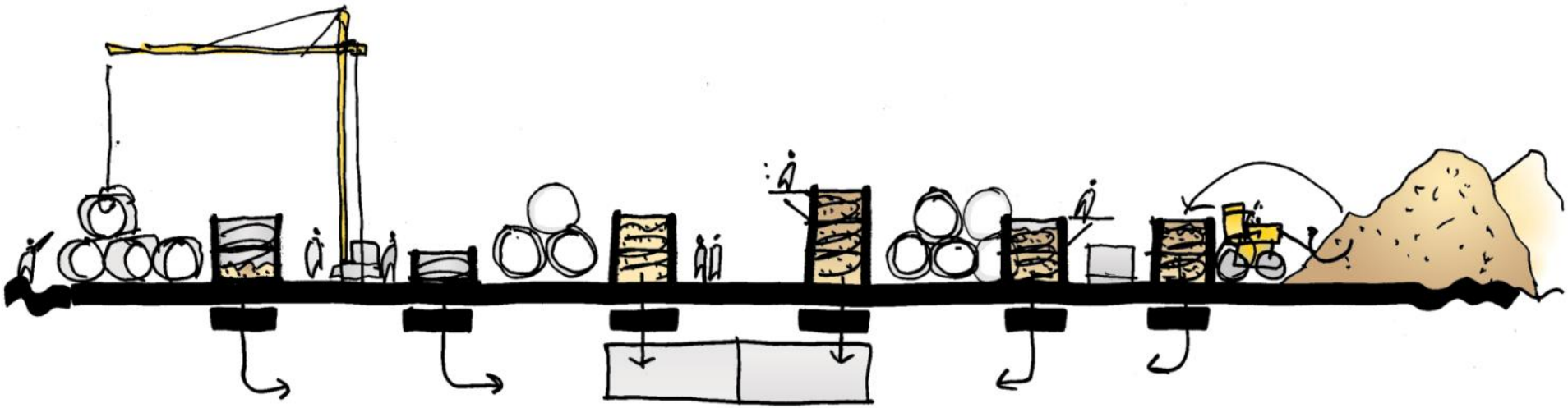
step by step process

1



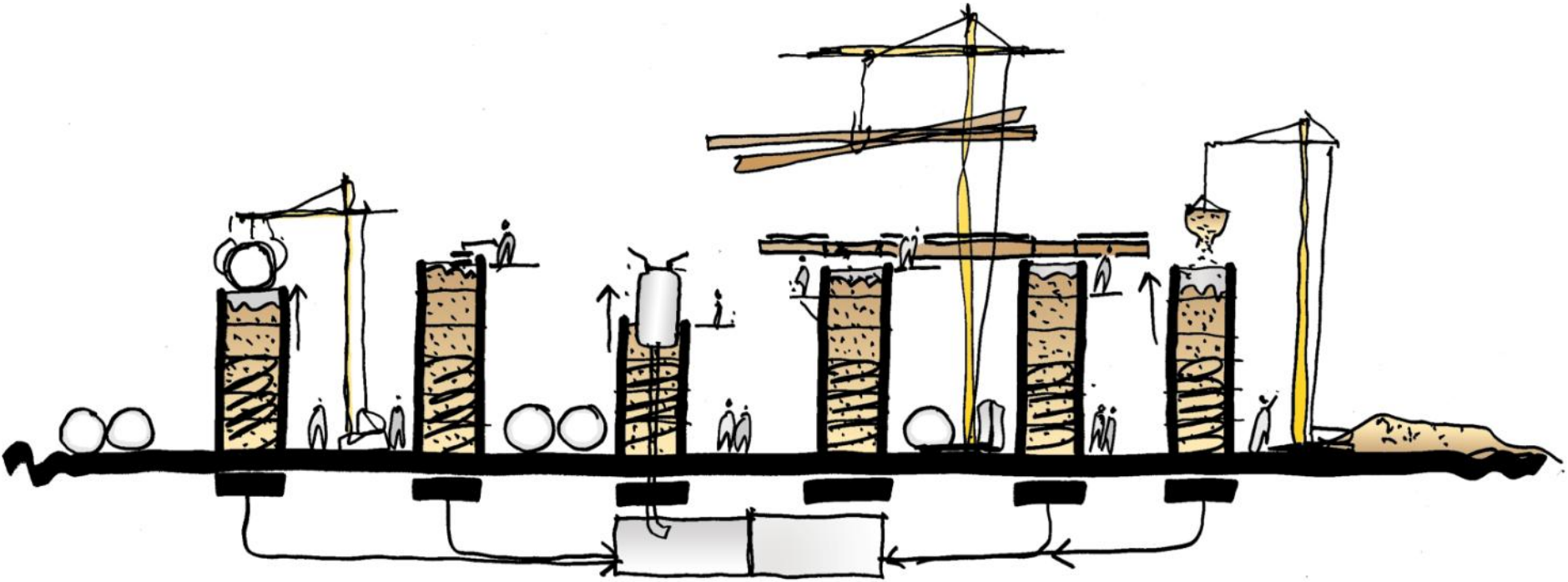
excavations for foundations, water tanks and heat storages

pillars
the school structure



step by step process

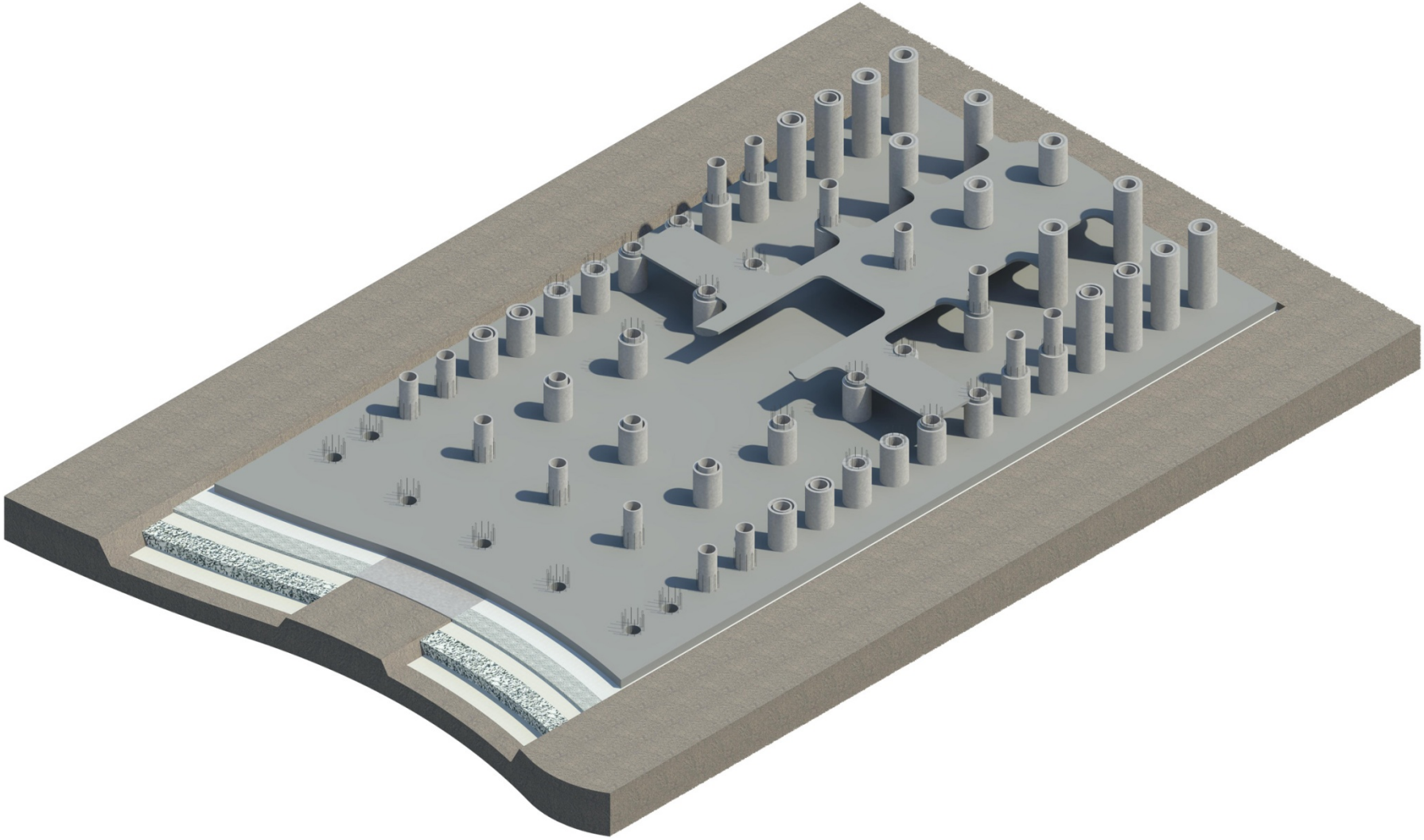
3



construction step by step

4

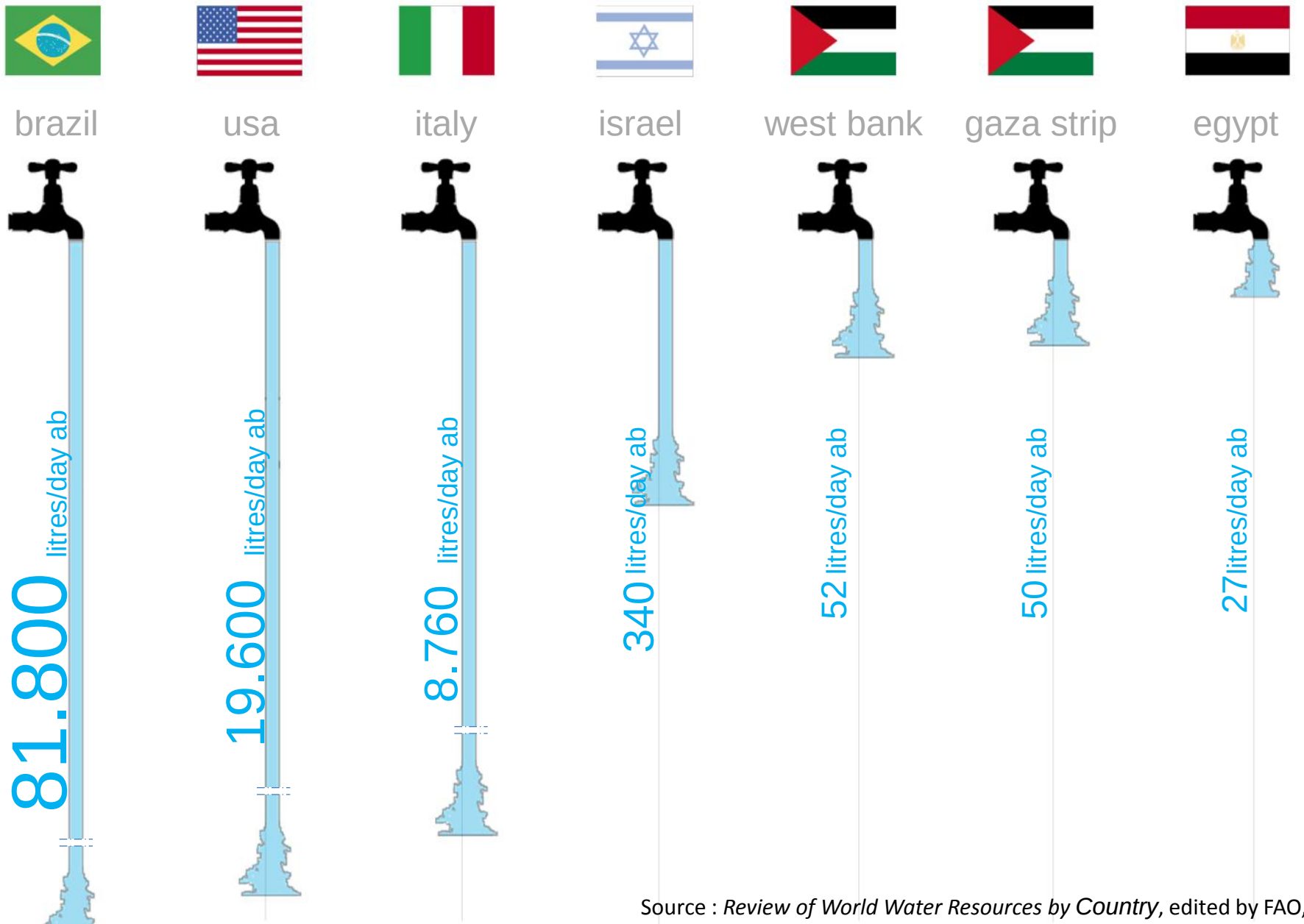
construction system



0 water

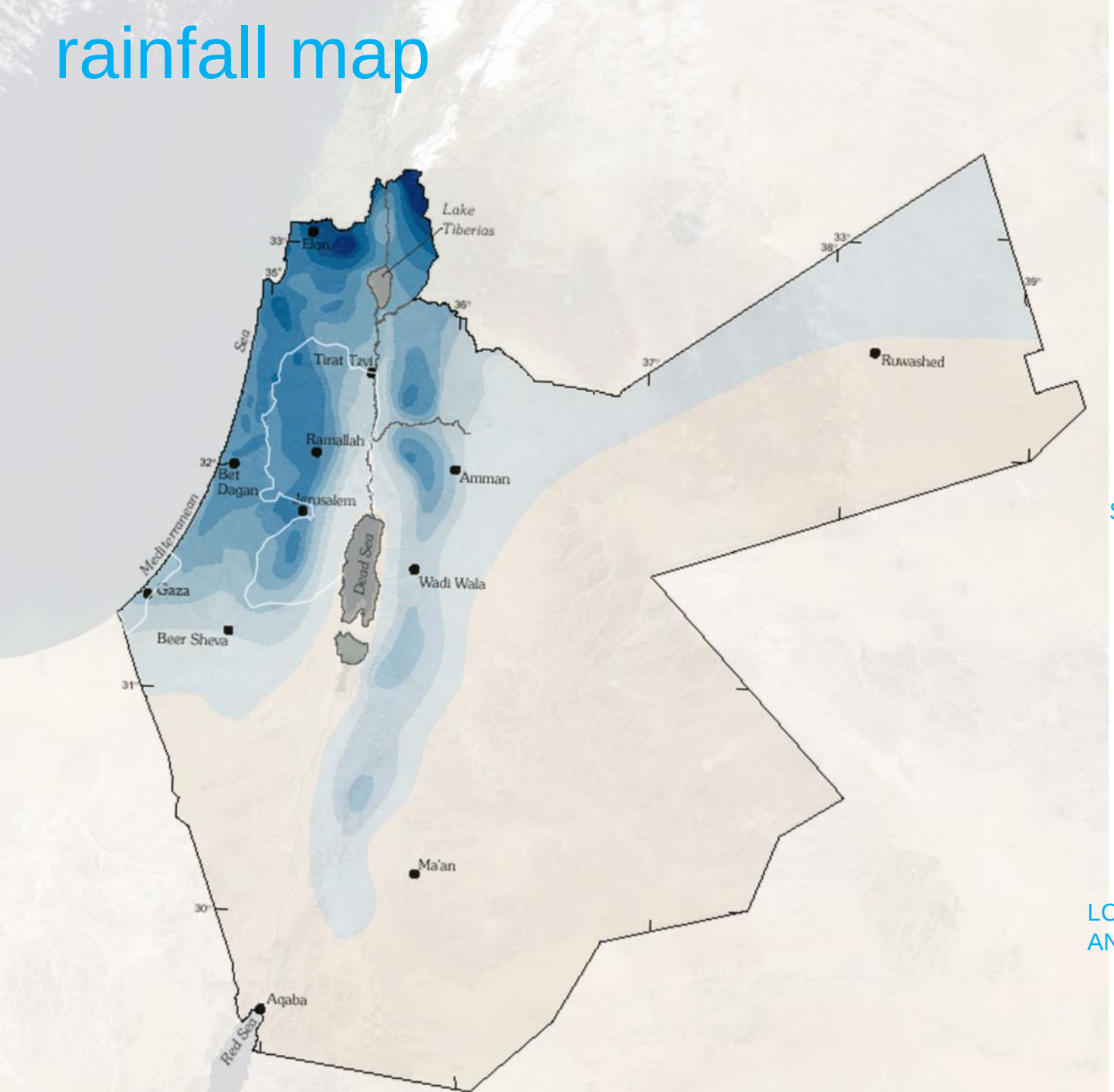
from waterworks

internal renewable water resources



Source : *Review of World Water Resources by Country*, edited by FAO, 2003

rainfall map



SAN PAOLO 1000 mm/year

ROME

RAMALLAH
690 mm/year

PARIS
LONDON

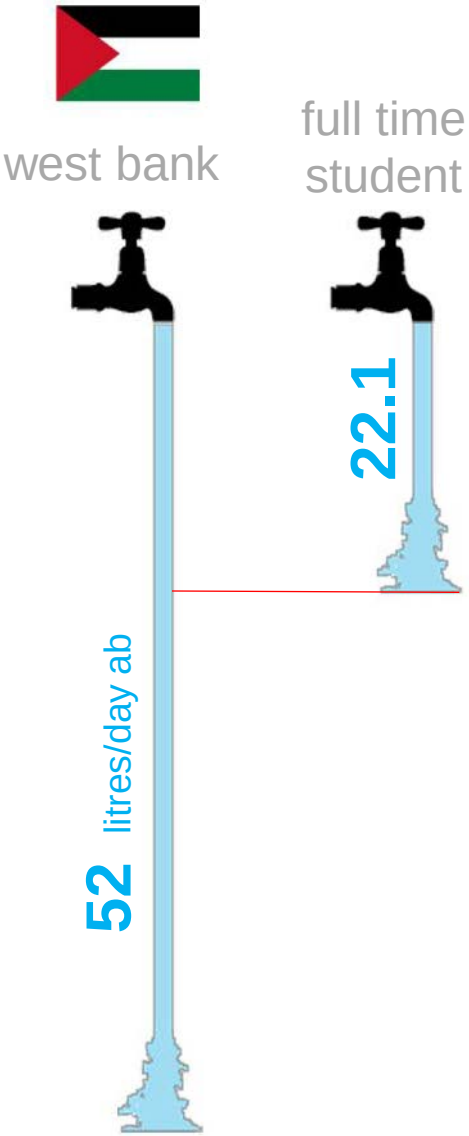
GAZA
400 mm/year

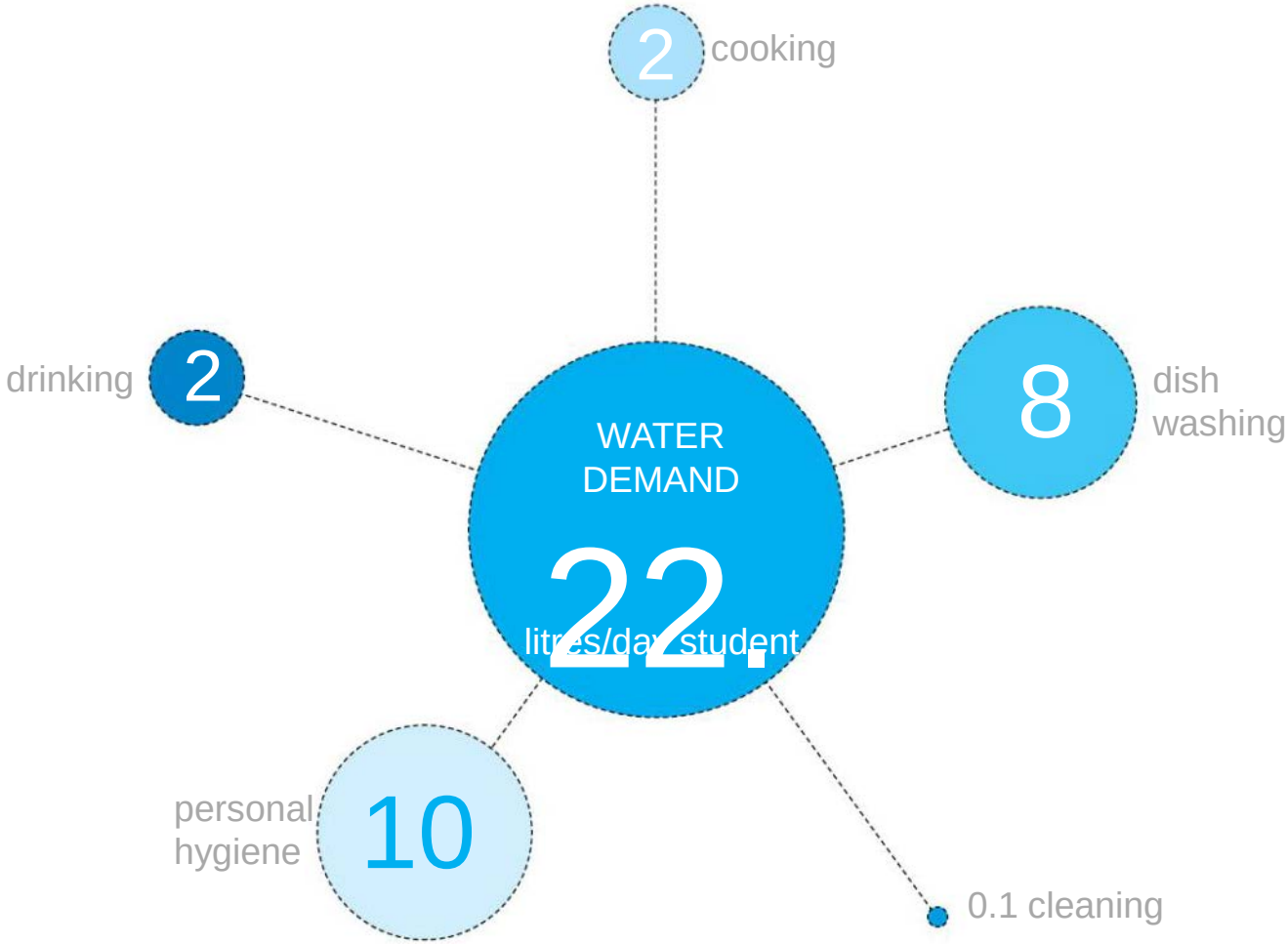
LOS ANGELES

LAS VEGAS

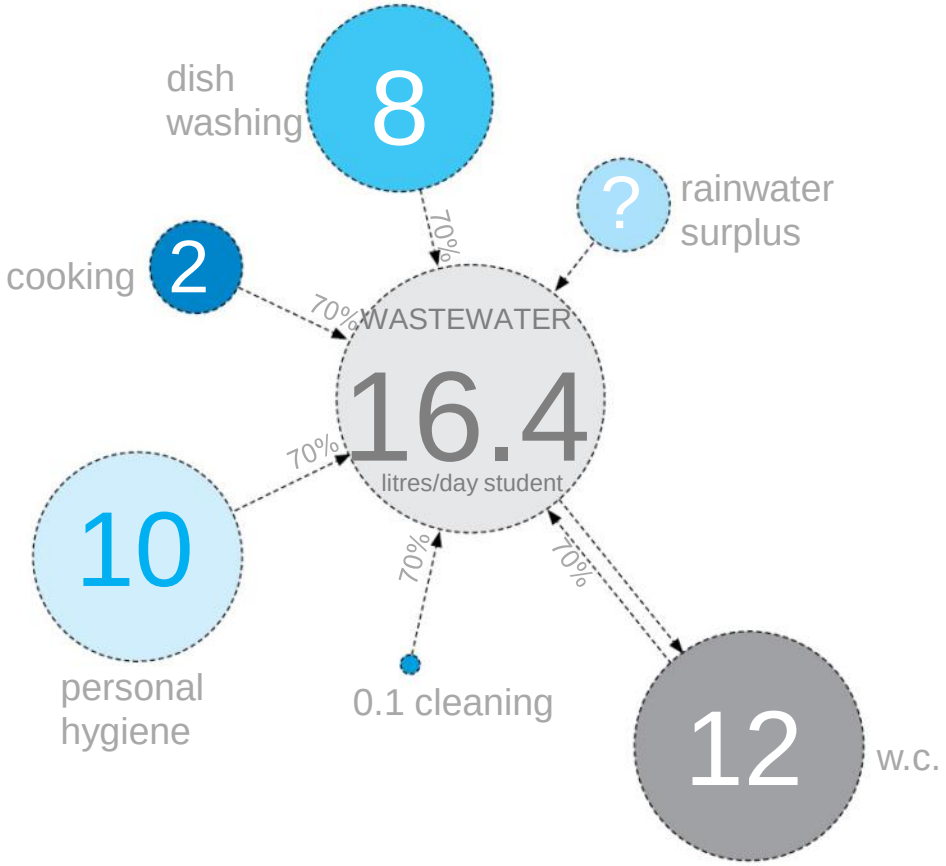
0 mm/year

water demand





reusing wastewater



vegetable garden

328 students → 830 m3 wastewater available for irrigation → 300 m2 vegetable garden → 0 km food for the school canteen + open air classroom

0 energy

from oil

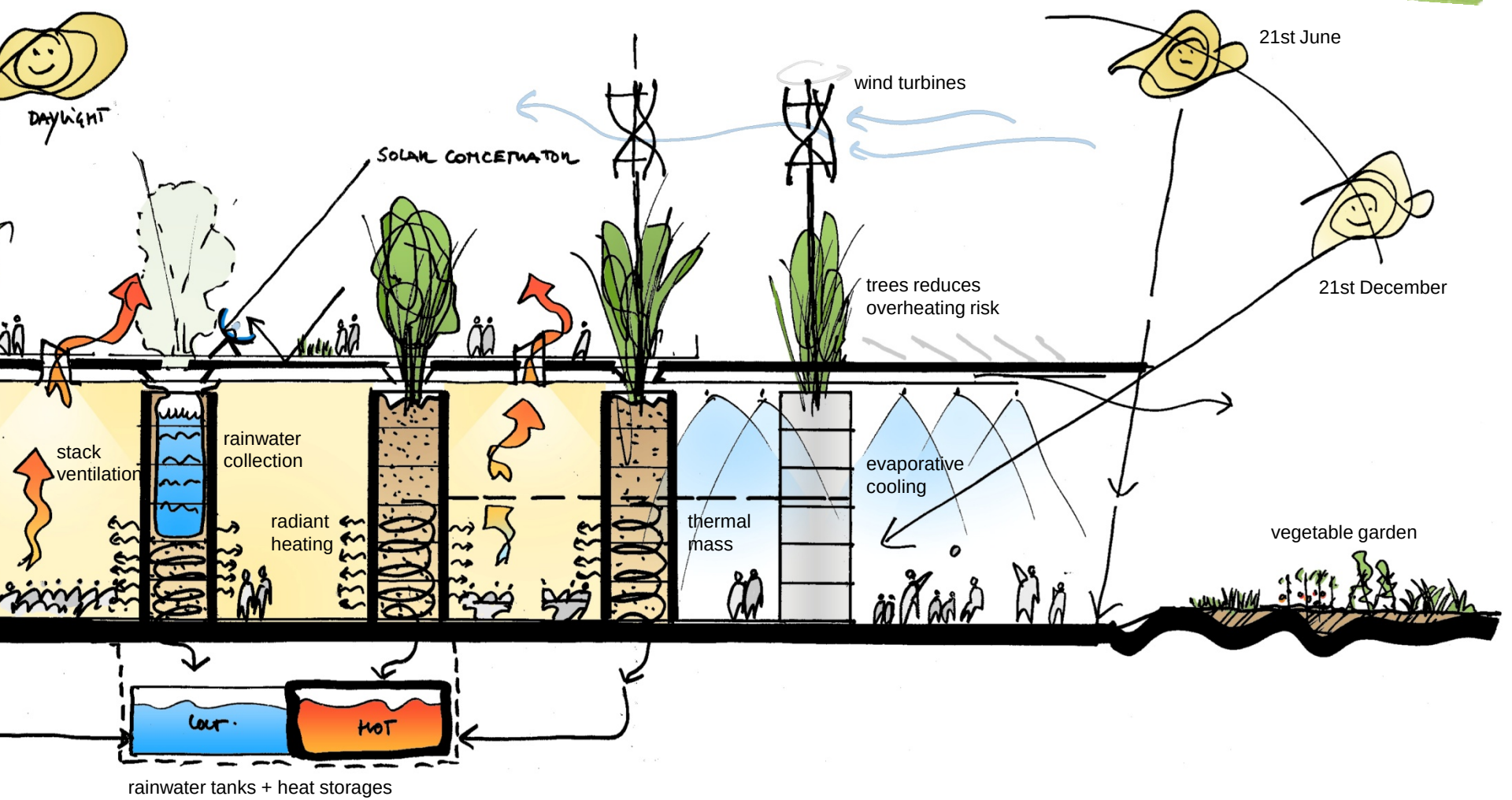
passive design

A SCHOOL FOR A GREEN FUT

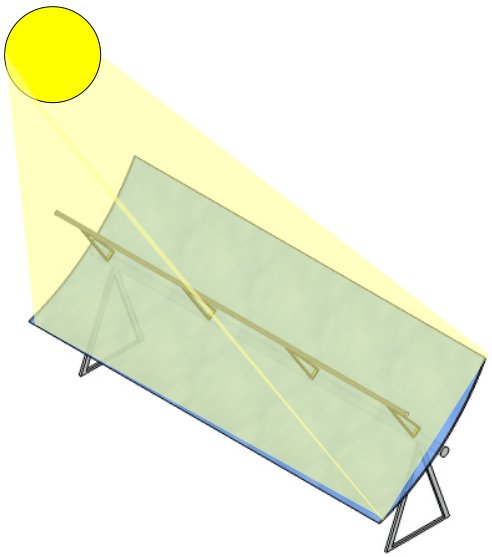
11 kWht/m2 year
heating

NO COOLING REQUIRED
cooling

12 kWhel/m2 year
lighting

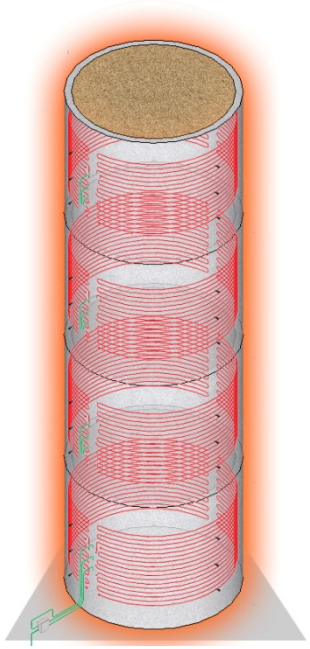


seasonal storage + solar heating

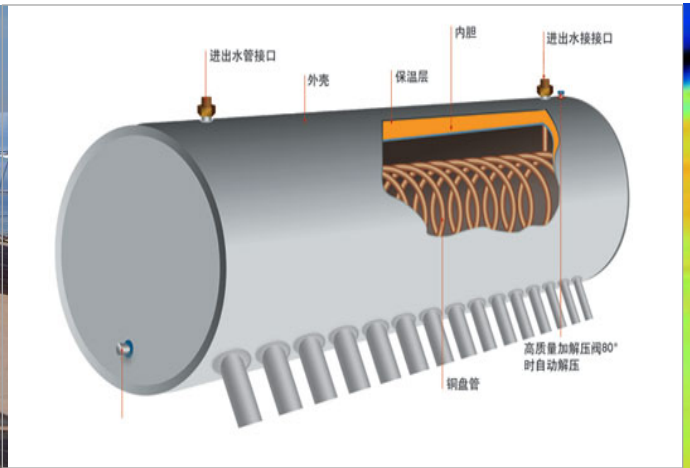


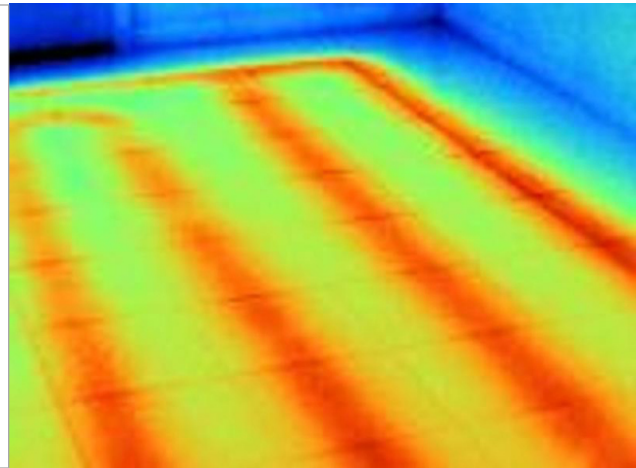
summer sun +
30 m^2 solar
concentrator

seasonal
heat storage

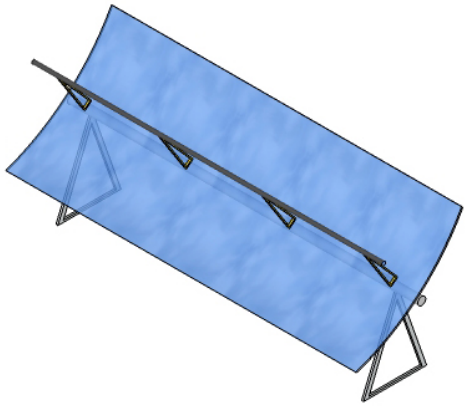


thermal mass activation
during winter





solar kitchen

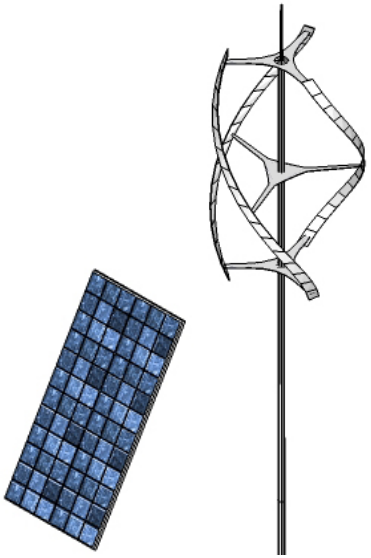


11 m^2 solar concetrator
9.8 MW_{ht} /y solar energy

heat storage

528 meals/day

electric equipment



no. 4 5 kW wind turbines or
275 m^2 photovoltaic cells

grid exchange or energy storage

lighting + electric appliances
51 Mw_{hel}/y

aim: zero CO2 emission

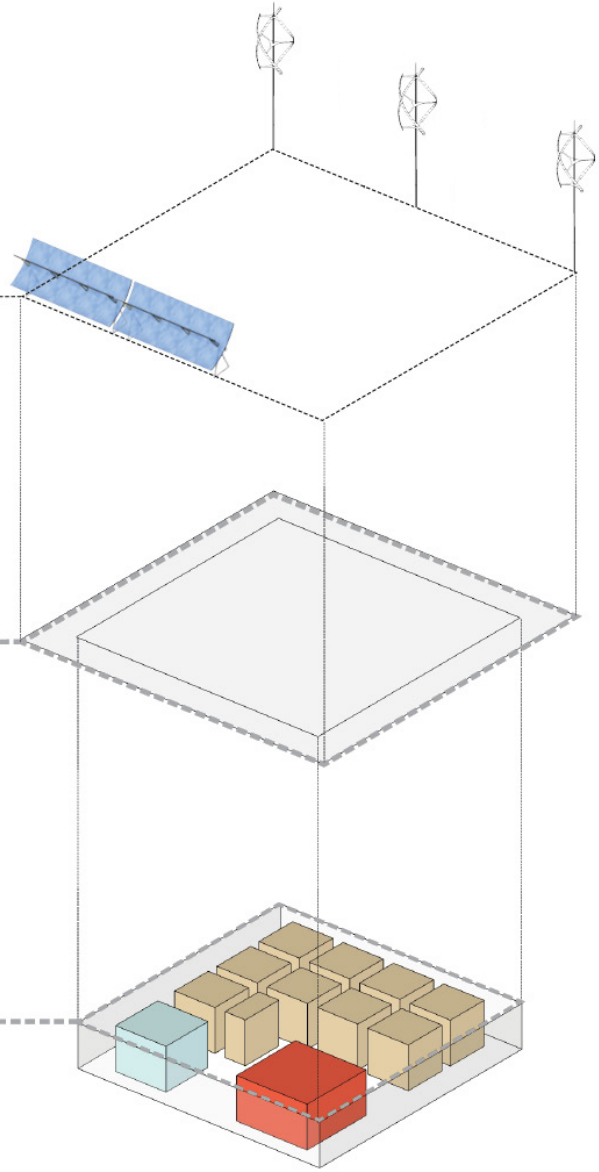
3x 5 kW wind turbine
2x 30 m2 solar concentrator

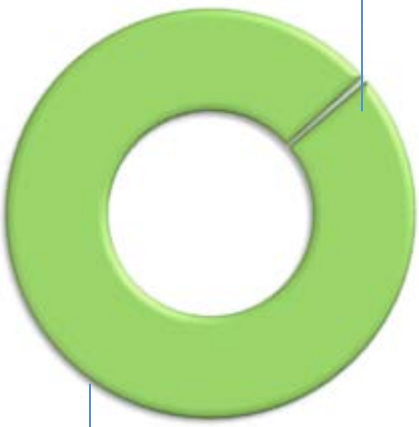
Gaza
sun 2055 kWh/m2 year
wind 5.6 m/sec

328x students

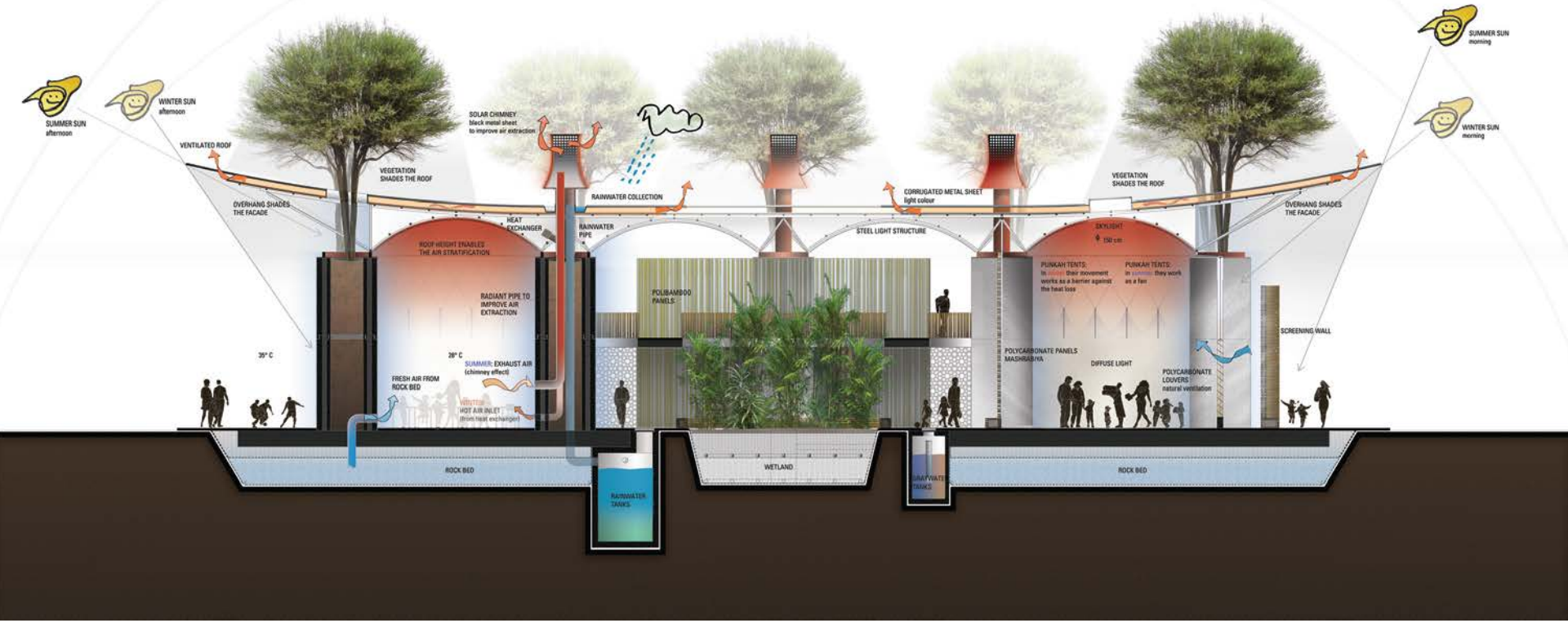
53 MWh/year thermal demand

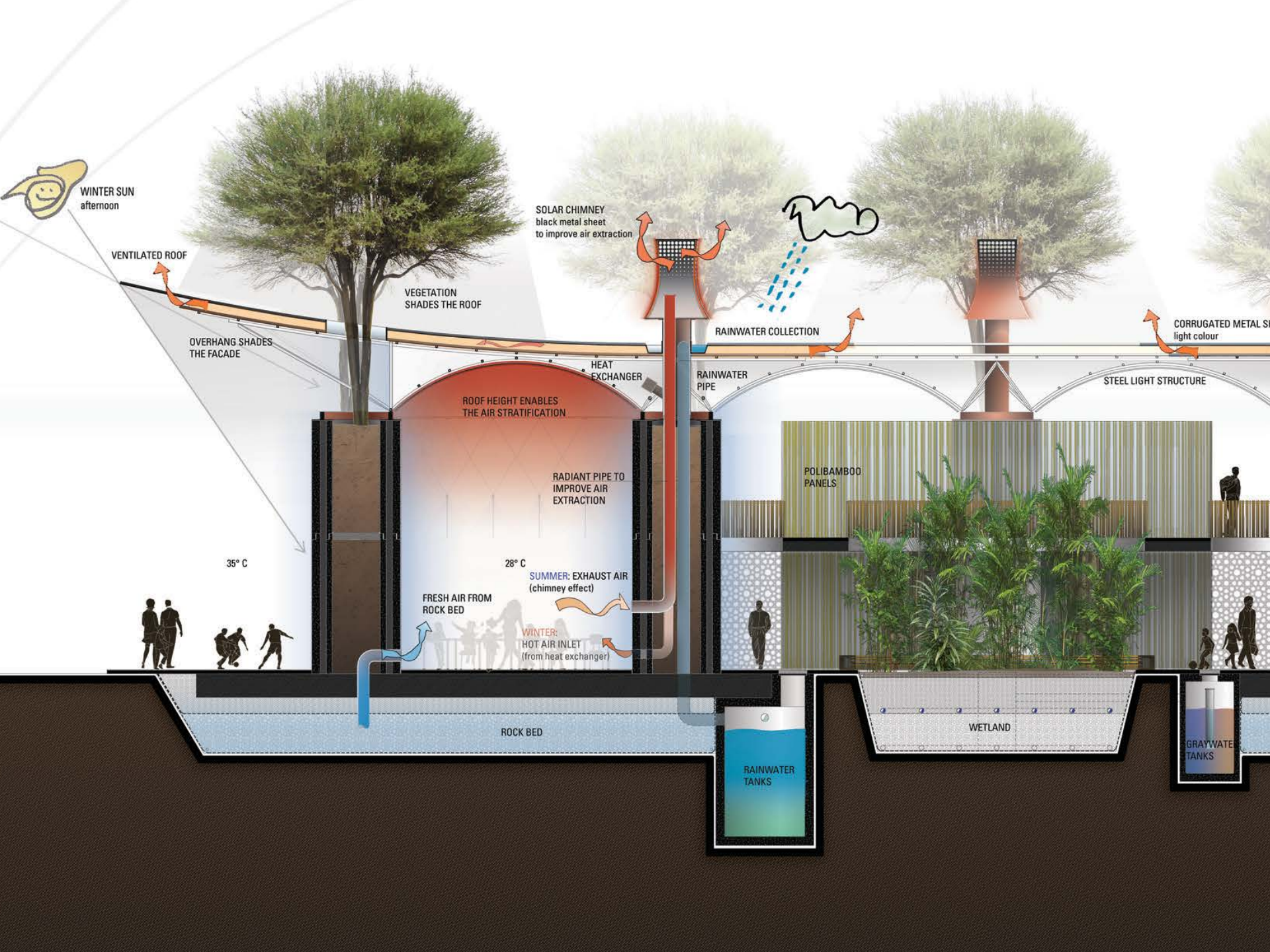
50 MWh/year electric demand





zero carbon


SUMMER SUN afternoon
WINTER SUN afternoon
VENTILATED ROOF
VEGETATION SHADES THE ROOF
OVERHANG SHADES THE FACADE
SOLAR CHIMNEY black metal sheet to improve air extraction
RAINWATER COLLECTION
HEAT EXCHANGER
RAINWATER PIPE
ROOF HEIGHT ENABLES THE AIR STRATIFICATION
RADIANT PIPE TO IMPROVE AIR EXTRACTION
35° C
28° C
SUMMER: EXHAUST AIR (chimney effect)
FRESH AIR FROM ROCK BED
WINTER HOT AIR INLET (from heat exchanger)
POLIBAMBOO PANELS
STEEL LIGHT STRUCTURE
CORRUGATED METAL SHEET light colour
VEGETATION SHADES THE ROOF
SKYLIGHT
150 cm
PUNKAH TENTS: in winter their movement works as a barrier against the heat loss
PUNKAH TENTS: in summer they work as a fan
POLYCARBONATE PANELS MASHRABIYA
DIFFUSE LIGHT
POLYCARBONATE LOUVERS natural ventilation
SCREENING WALL
SUMMER SUN morning
WINTER SUN morning
ROCK BED
RAINWATER TANKS
WETLAND
RAINWATER TANKS
ROCK BED


WINTER SUN
afternoon
VENTILATED ROOF
VEGETATION
SHADES THE ROOF
OVERHANG SHADES
THE FACADE
SOLAR CHIMNEY
black metal sheet
to improve air extraction
RAINWATER COLLECTION
CORRUGATED METAL S
light colour
HEAT
EXCHANGER
RAINWATER
PIPE
STEEL LIGHT STRUCTURE
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(from heat exchanger)
ROCK BED
RAINWATER
TANKS
WETLAND
GRAYWATE
TANKS

le nostre prime iniziative

Il Workshop Permanente a Bologna e gli Hubs locali in medio oriente, west africa e america

La Green School a Gaza e la partnership con UNRWA (Agenzia ONU per i rifugiati palestinesi)

La campagna RIO+20 – “UNA SCUOLA PER TUTTI”: le linee guida per il design e la costruzione di una green school nel contesto di programmi di ricostruzione/sviluppo