



Designing the Fifth Facade

Colin Rohlfing, Sustainable Design Leader



Atlanta
Chicago
Dallas
Beijing
Calgary
Denver
Dubai
Hong Kong
Houston
London
Los Angeles
Miami
Mumbai
New York
Ottawa
San Francisco
Shanghai
Singapore
St. Louis
Tampa
Toronto
Vancouver
Washington, D.C.



THE FIFTH FACADE

Urban roof conditions

Heat Island, Air Quality, Biodiversity, Insulation, Cultural interaction

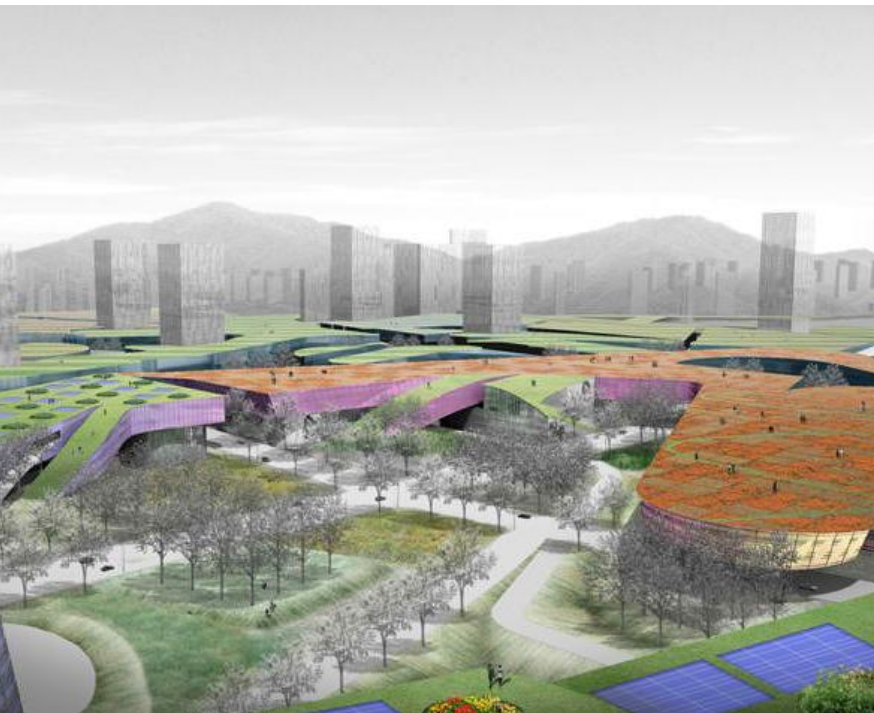




THE FIFTH FACADE

Diana Balmori - Fluid interface between landscape and structure in the development of urban public spaces

Epidermis of the city: Architecture, Urbanism, Landscape, Infrastructure, the Inhabitants and their Behavior



Administrative Town: Sejong, South Korea

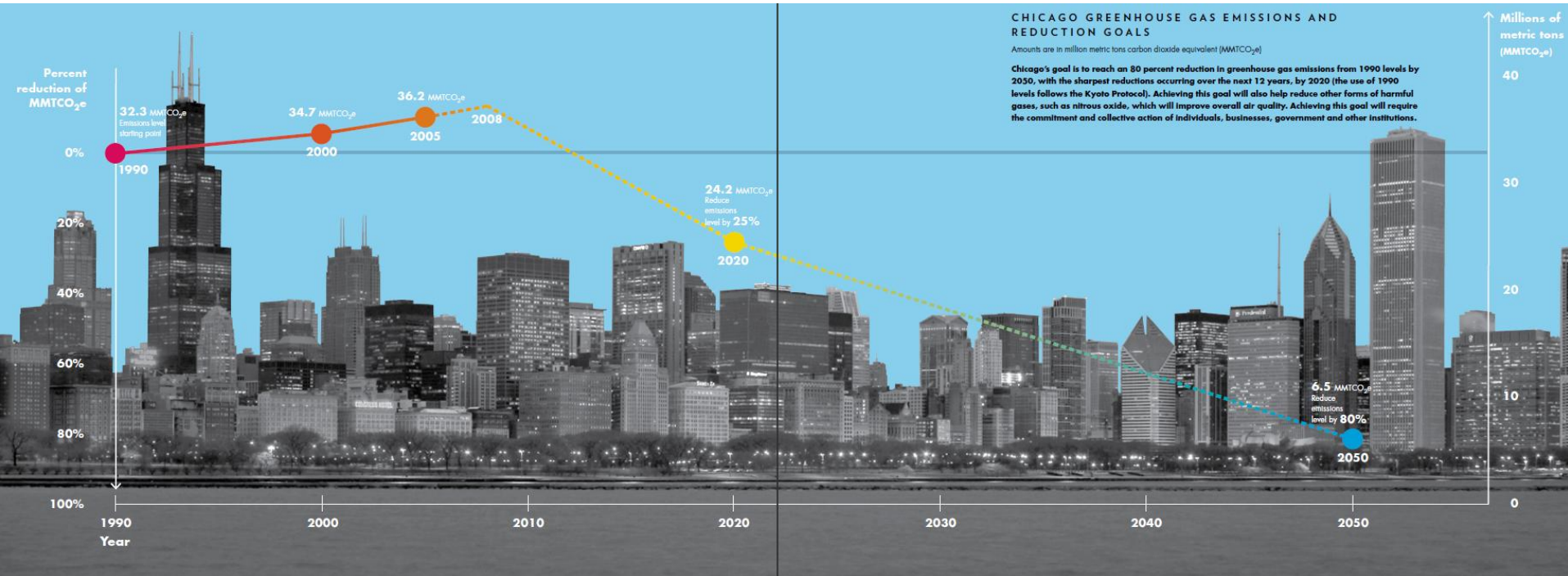


Campo de los Igleles: Bilbao, Spain



THE ENERGY OF THE METROPOLIS

Efficiency of Existing Conditions



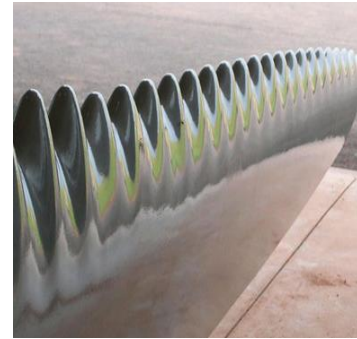
CHICAGO CLIMATE
ACTION PLAN



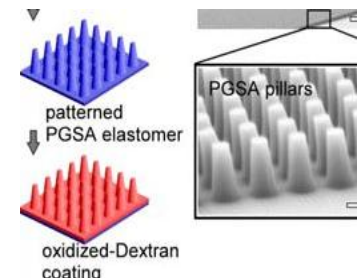


BIOMIMICRY – LIFE'S PRINCIPLES

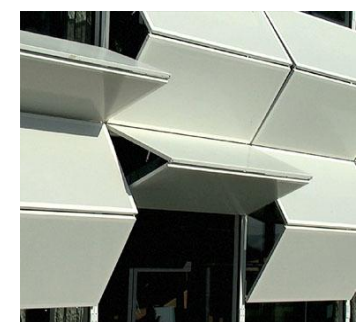
optimizes rather
than maximizes



uses life-friendly
chemistry



Be locally attuned
and responsive



Biomimicry is a new way of viewing and valuing nature, based not on what we can *extract* from the natural world, but on what we can *learn* from it and apply as *principles*.

~ Janine Benyus



ENVIRONMENTAL PERFORMANCE INDICATORS



water collection and
storage
gallons/storm



solar gain and
reflectance
% albedo



carbon sequestration
tons/acre



water filtration
% pollutants
captured



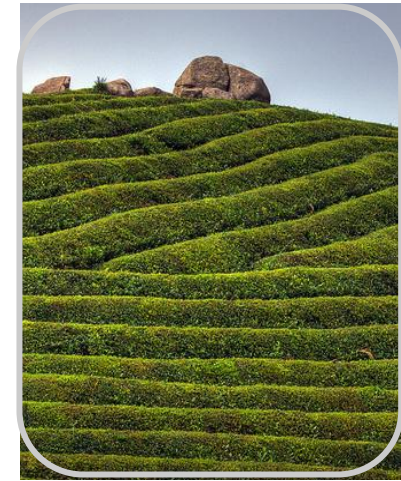
evapo-transpiration
% rainfall returned



nitrogen and
phosphorous cycling
tons/acre



biodiversity
% diversity of native
species



soil building
mm of soil created

ENVIRONMENTAL

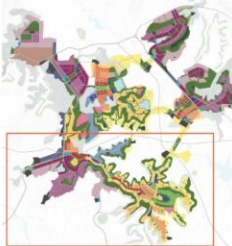
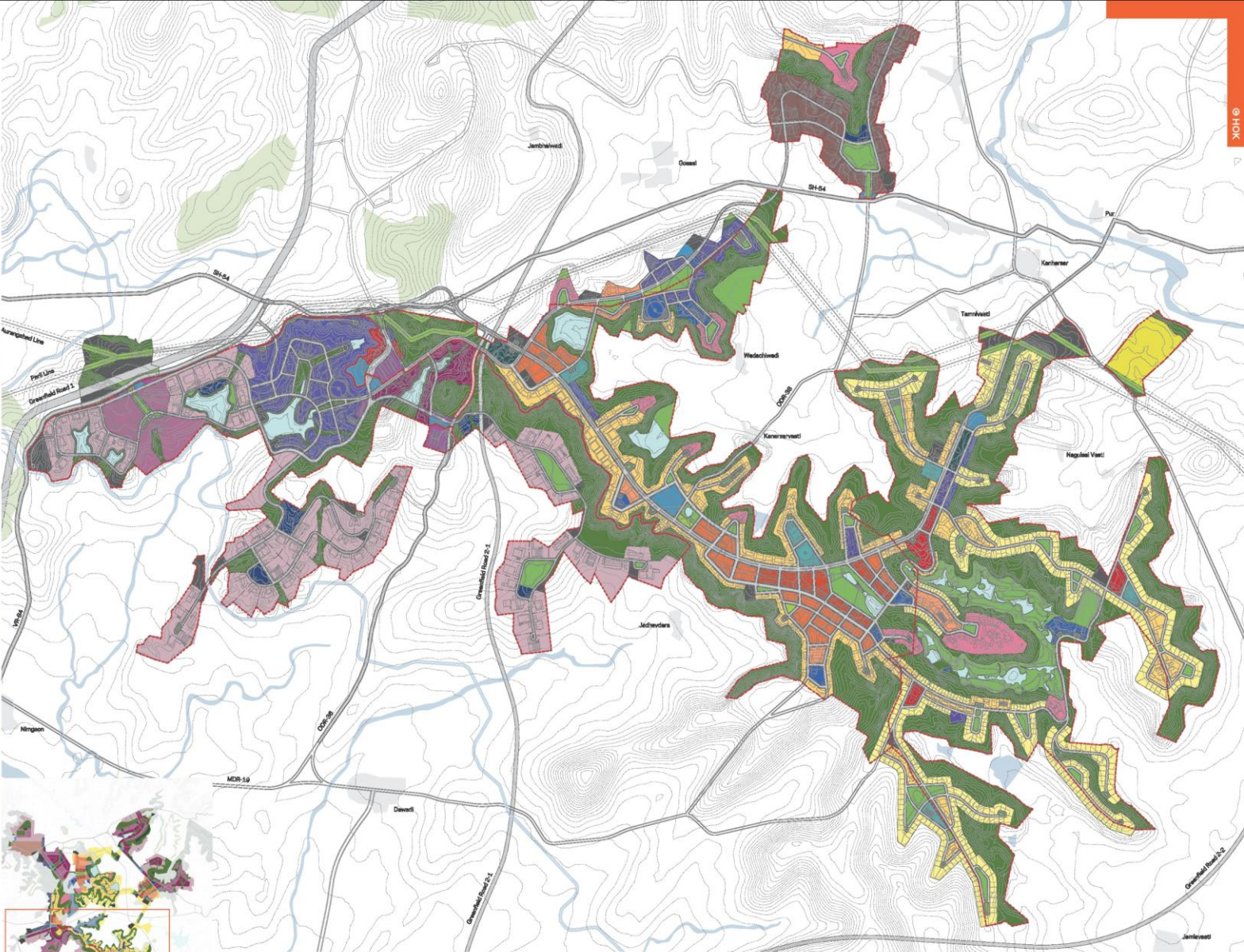
- 1 ECOSYSTEM
- 2 WATER
- 3 ATMOSPHERE
- 4 MATERIALS
- 5 ENERGY
- 6 FOOD

SOCIAL

- 7 COMMUNITY
- 8 CULTURE
- 9 HEALTH
- 10 EDUCATION
- 11 GOVERNANCE
- 12 TRANSPORT
- 13 SHELTER

ECONOMIC

- 14 COMMERCE
- 15 VALUE



Phase - 1

legend:

- | | | | |
|----------------------------|----------------------------|-----------------------|------------------------|
| Commercial | Hospital | R&R Housing | Road |
| Community | Hospitality | Reservoir & Waterbody | School |
| Culture | Infrastructure | Residential - T2 | SEZ - Heavy Industrial |
| DTA Industrial | Logistics | Residential - T3 | SEZ - IT Park |
| Food Markets | Open Space | Residential - T4 | SEZ - Light Industrial |
| Governance | Police/Fire/Post Office | Residential - T5 | Transit Hub |
| High Tension Line Corridor | Preserved Slopes and Nalas | Residential - T6 | University |





THE EPIDERMIS OF THE METROPOLIS

Preservation of Topography, Habitat, Biodiversity,
Streams, Riparian Corridors

1

ECOSYSTEM

maintains and fosters the health and
integrity of the native physical and
ecological landscapes

2

WATER

protects and enhances water
quantity and quality

3

4

5

6

7

8

9

10

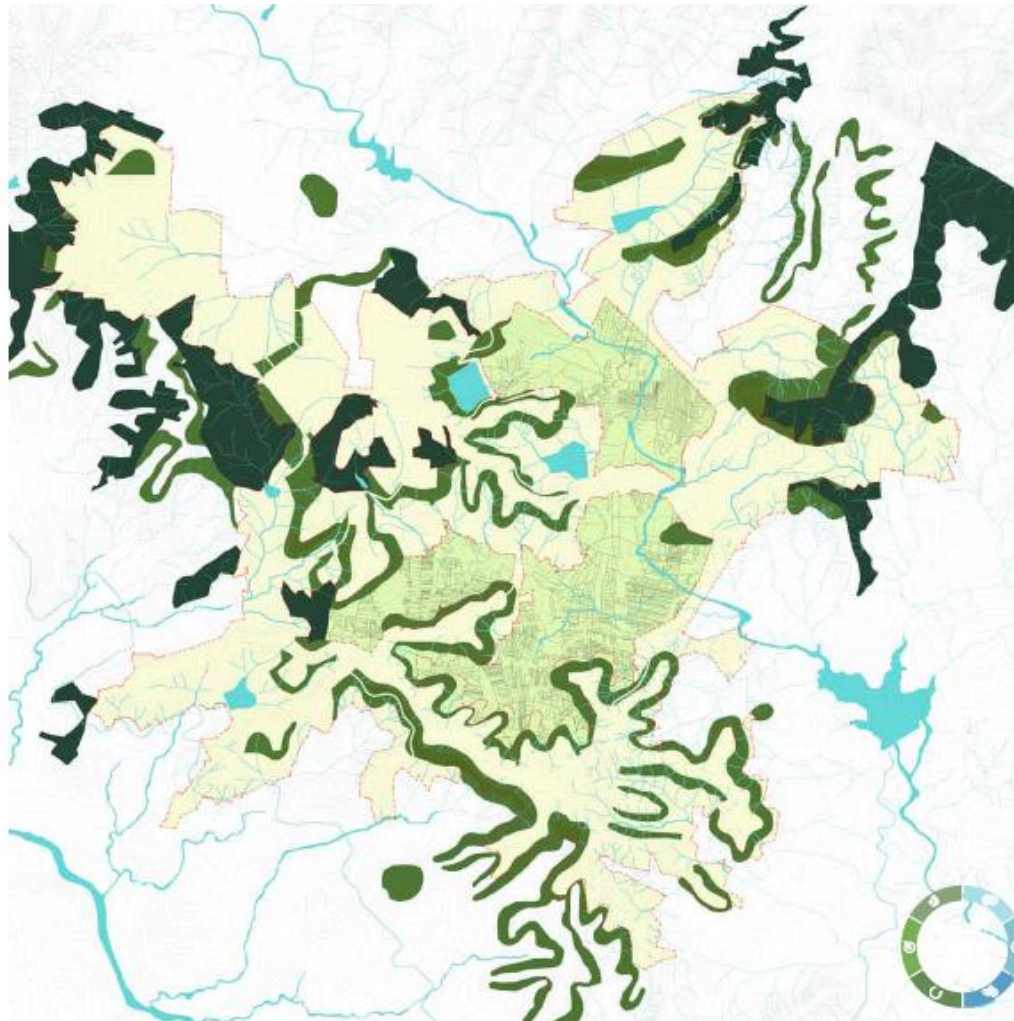
11

12

13

14

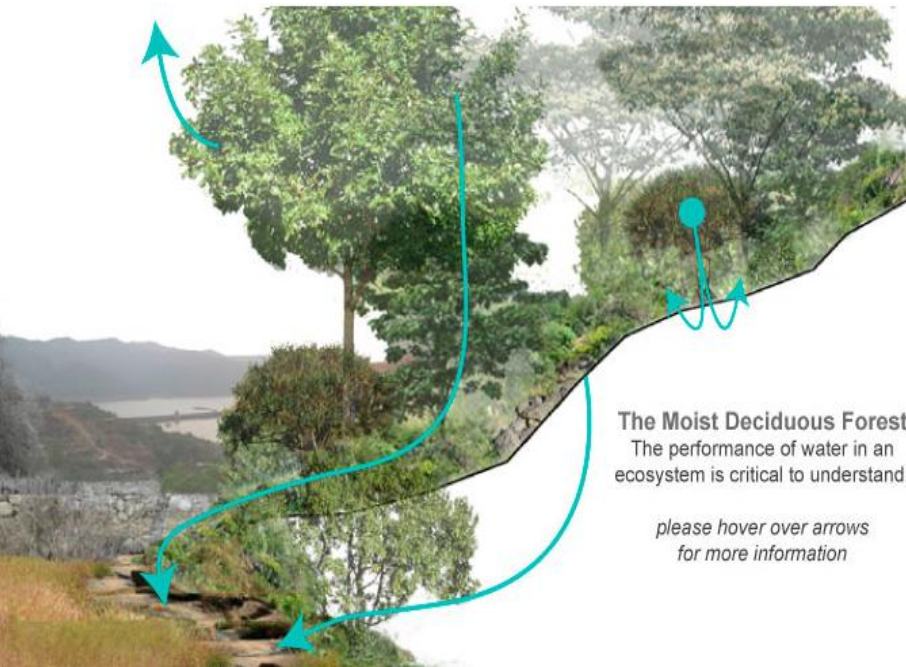
15





THE EPIDERMIS OF THE METROPOLIS

MANIKARA Transport water vertically, Beavers dam

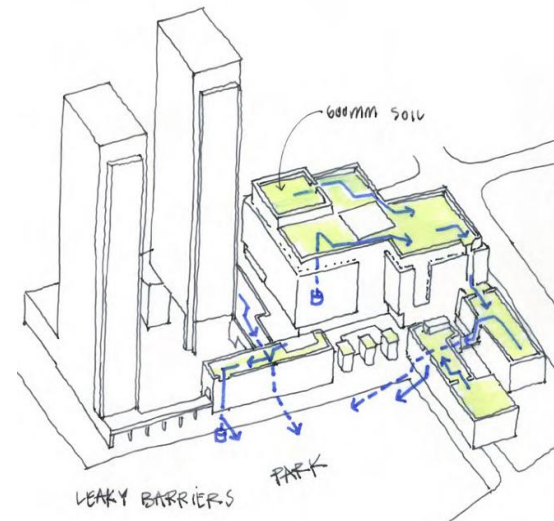
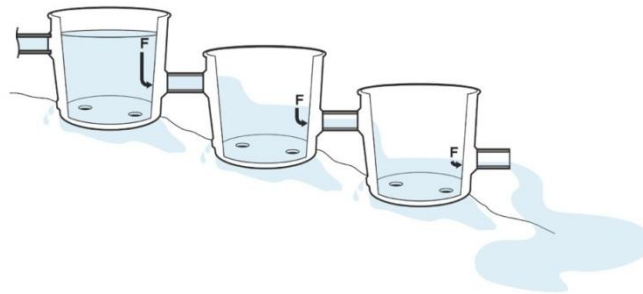
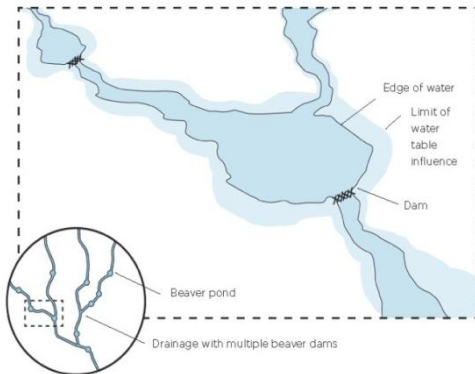
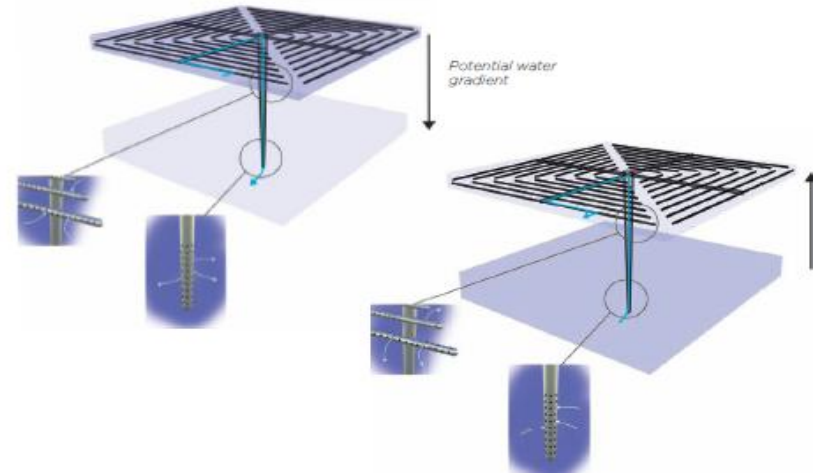


The Moist Deciduous Forest
The performance of water in an ecosystem is critical to understand.

*please hover over arrows
for more information*

mechanism

Lateral roots absorb excess moisture from surface layer soil and the tap root sends the collected moisture downward to recharge groundwater. During the dry season, the reverse happens.



nature's design
series of upstream barriers slow water

design principle
series of upstream barriers slow water



THE EPIDERMIS OF THE METROPOLIS

Distributed and gravitational water cycle

1 ECOSTRUCTURE

2 ATMOSPHERE

3 WATER

4 FOOD

5 MATERIALS

6 SHELTER

7 ENERGY

8 TRANSPORT

9 COMMUNITY

10 CULTURE

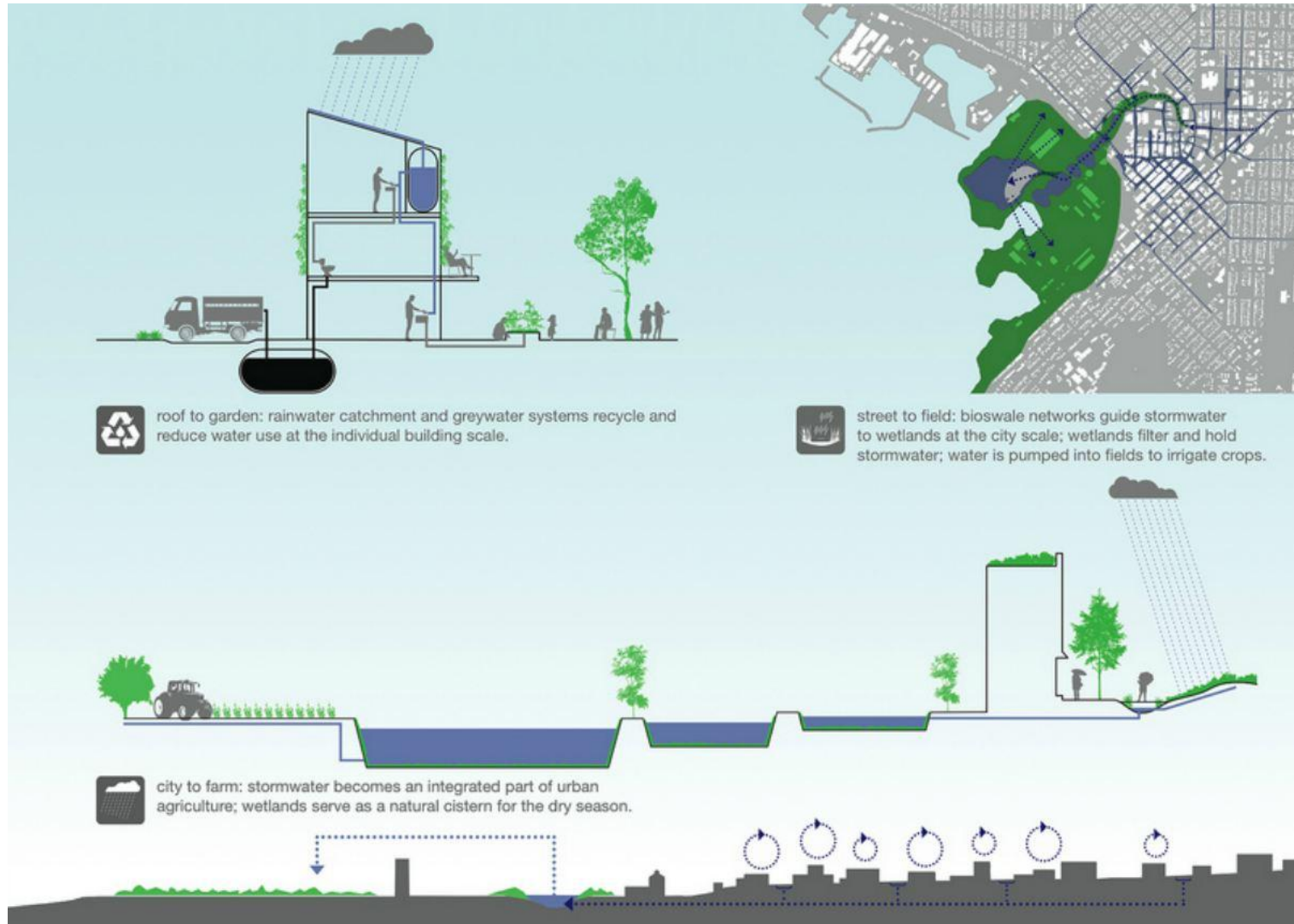
11 HEALTH

12 EDUCATION

13 GOVERNANCE

14 COMMERCE

15 VALUE



Living Building Neighborhood competition entry

THE ENERGY OF THE METROPOLIS

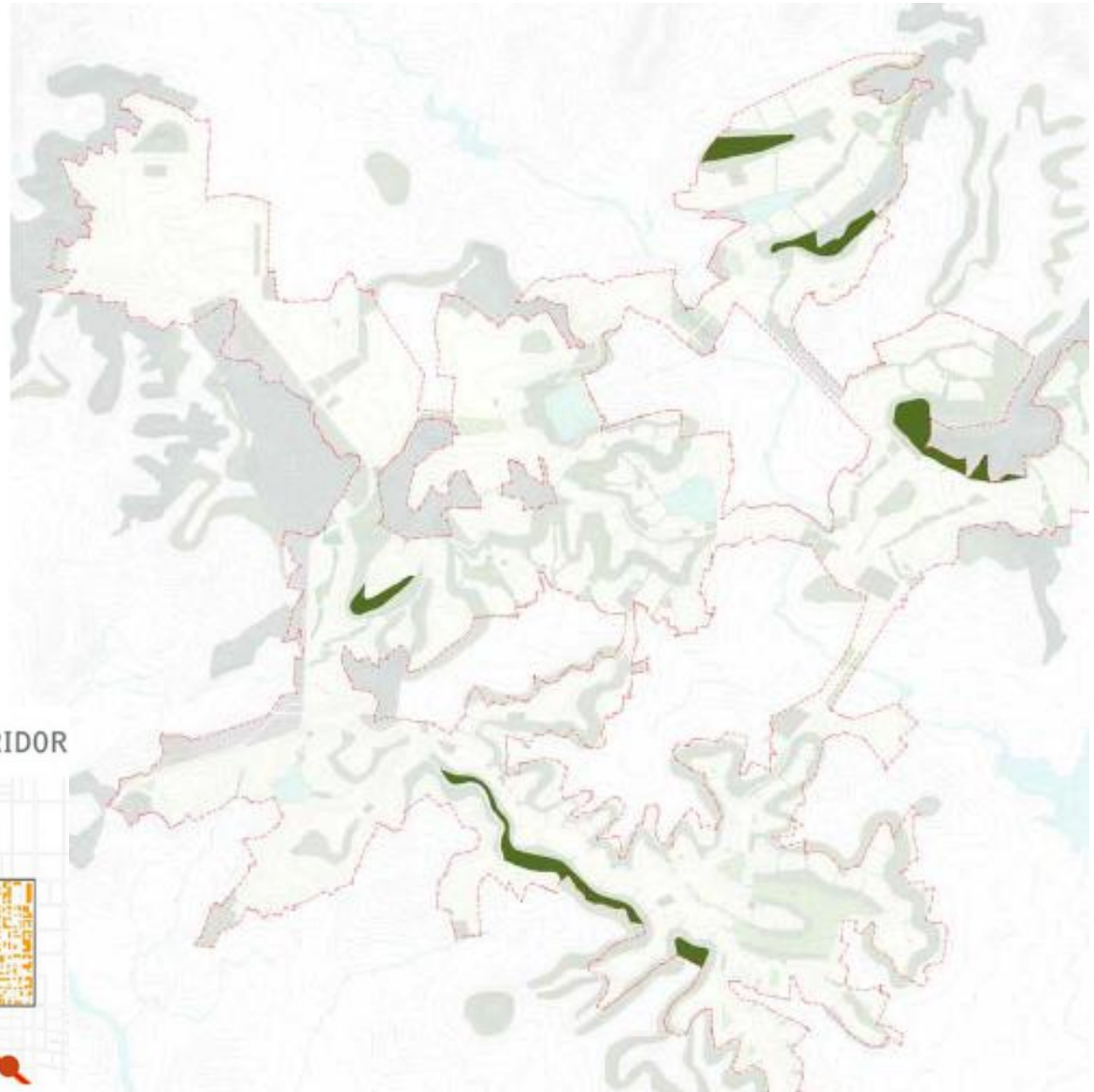
Location of Solar and Wind Corridors

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15

ENERGY

provides safe, clean, abundant, reliable, consistent, free energy for all inhabitants in perpetuity

SOLAR ROOFS AND ENERGY CORRIDOR

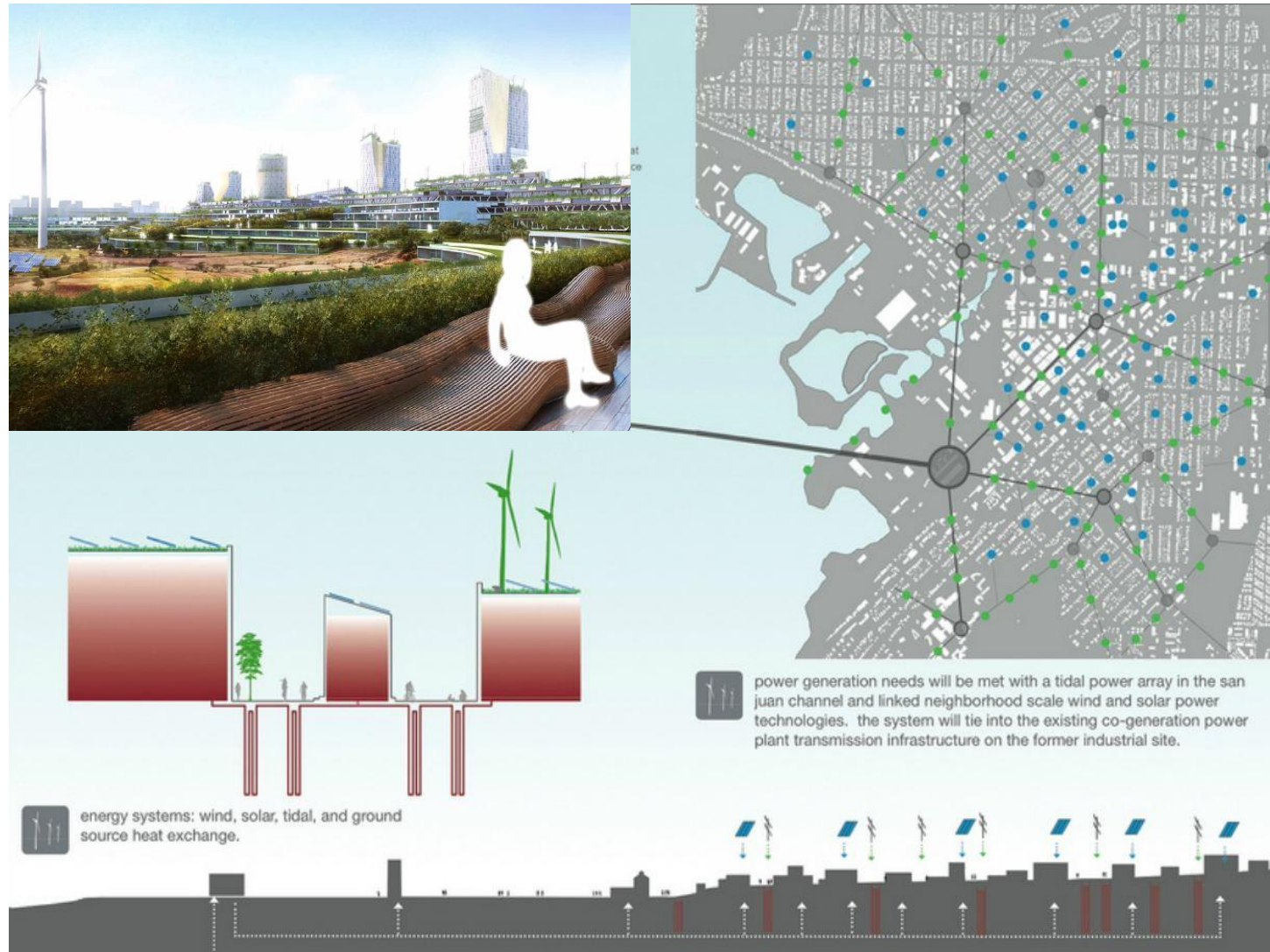




THE ENERGY OF THE METROPOLIS

Location of Solar and Wind Corridors

1	ECOSTRUCTURE
2	ATMOSPHERE
3	WATER
4	FOOD
5	MATERIALS
6	SHELTER
7	ENERGY
8	TRANSPORT
9	COMMUNITY
10	CULTURE
11	HEALTH
12	EDUCATION
13	GOVERNANCE
14	COMMERCE
15	VALUE

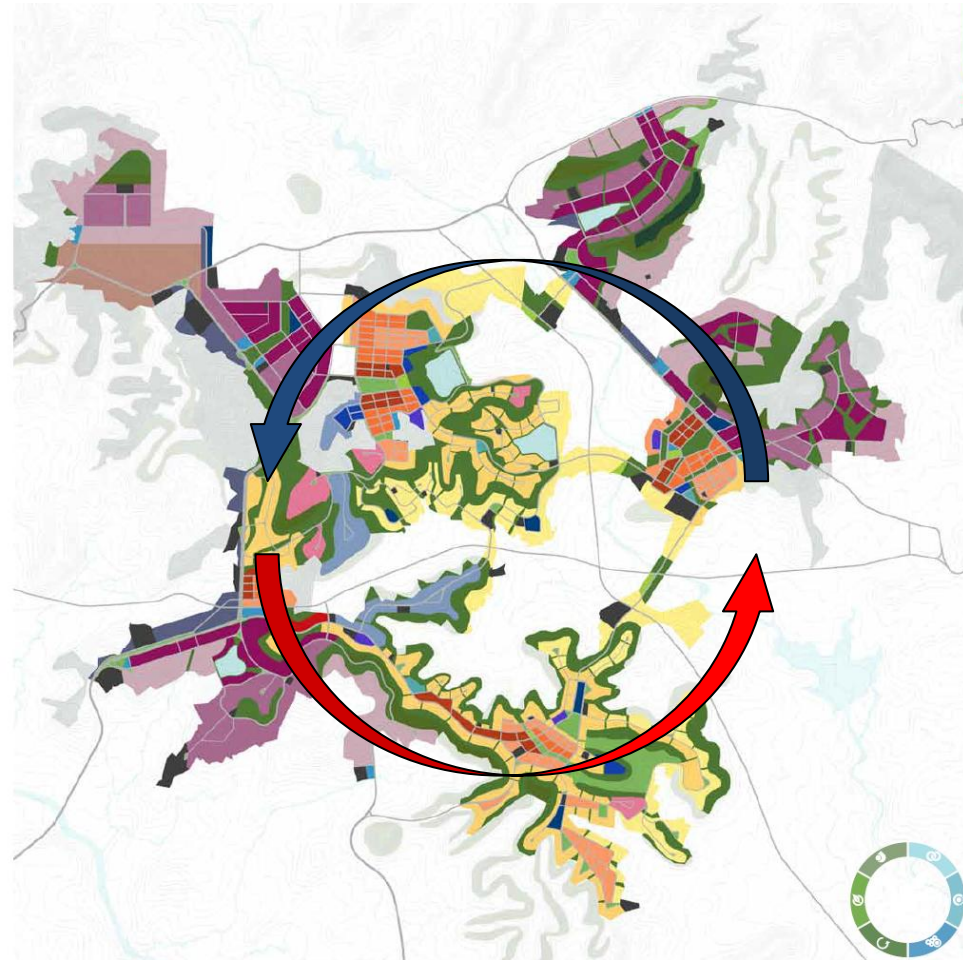
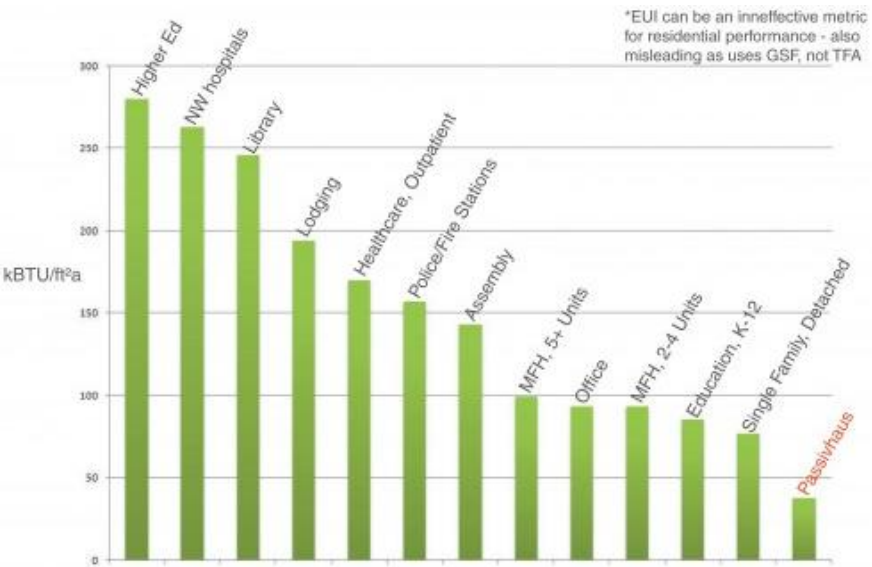
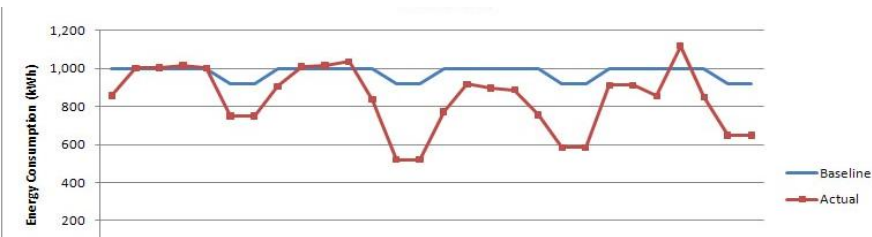


Living Building Neighborhood competition entry



THE ENERGY OF THE METROPOLIS

Production, Consumption, Dissipation, Exchange



THE ENERGY OF THE METROPOLIS

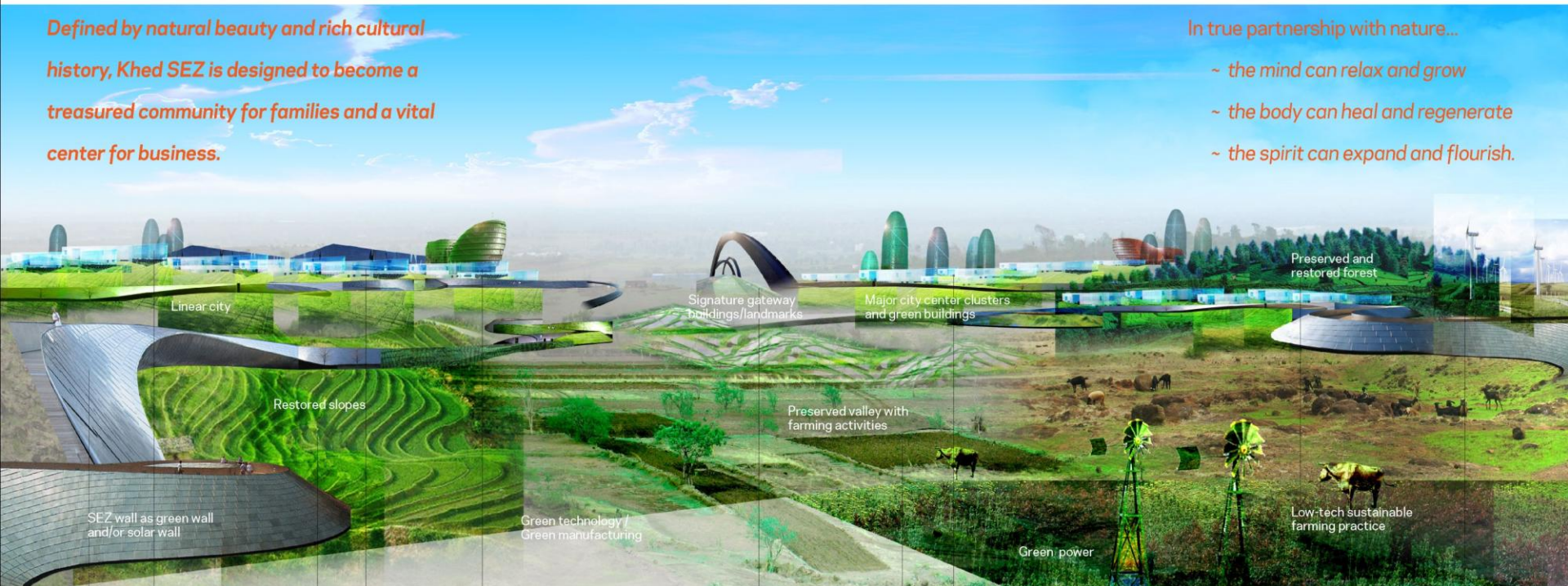
“Where Energy Meets Form”



Defined by natural beauty and rich cultural history, Khed SEZ is designed to become a treasured community for families and a vital center for business.

In true partnership with nature...

- ~ the mind can relax and grow
- ~ the body can heal and regenerate
- ~ the spirit can expand and flourish.

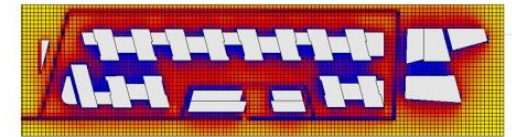
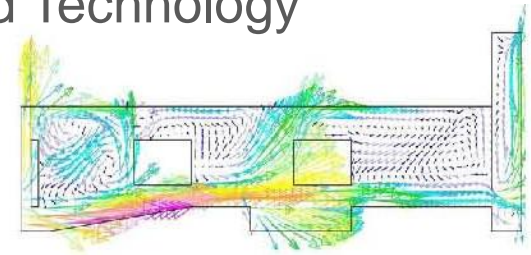
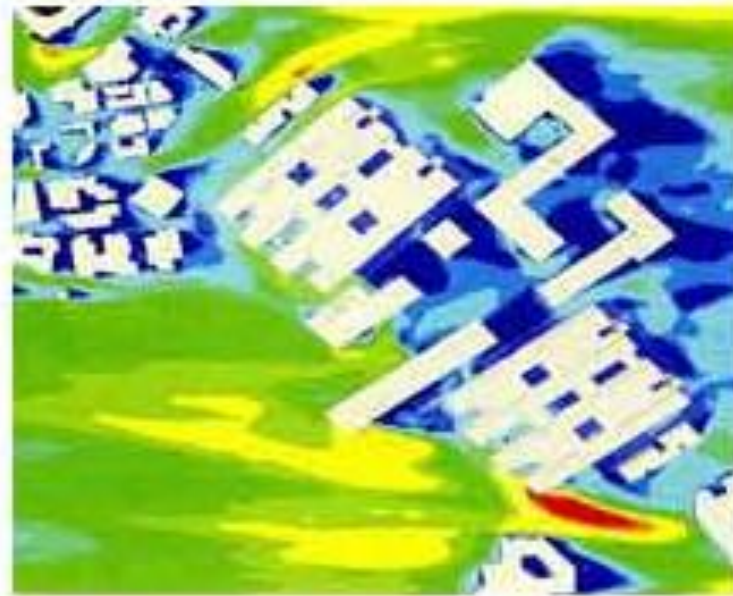




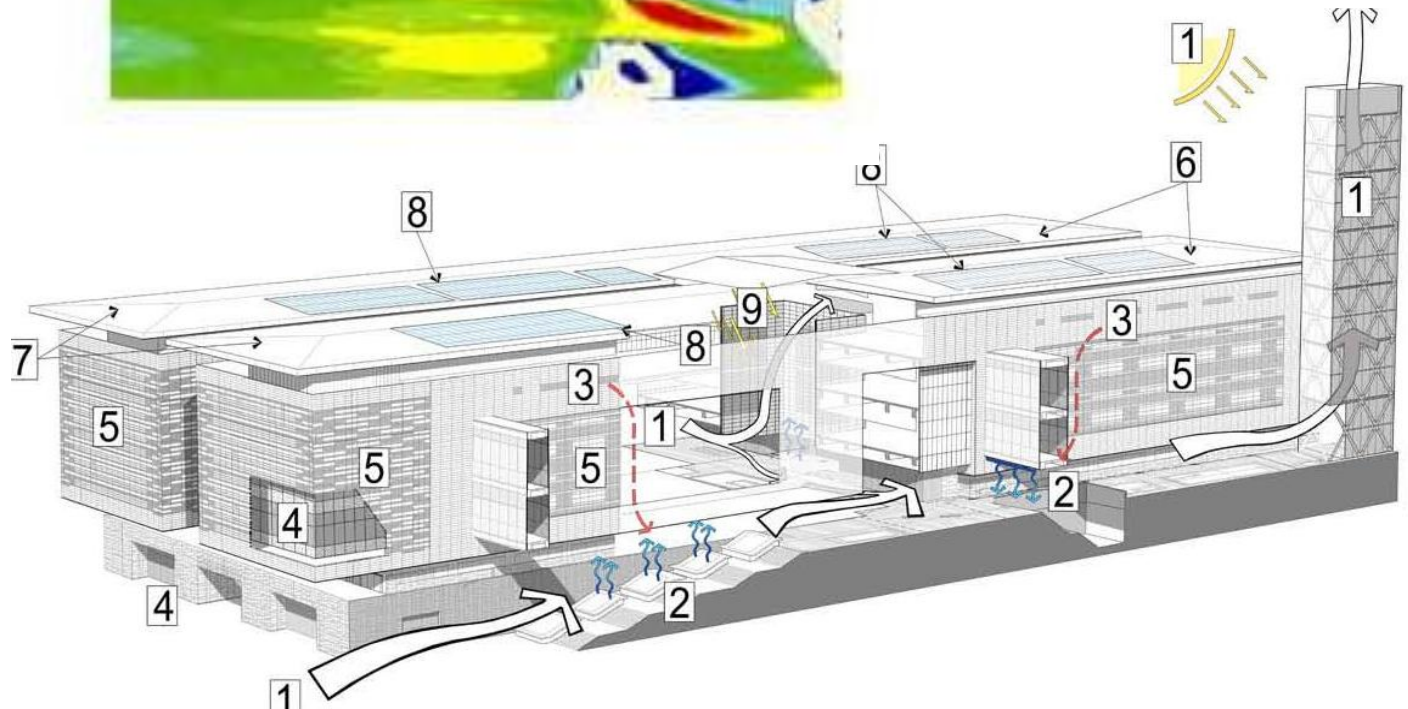
DISTRICT ORIENTATION FOR OPTIMIZATION

King Abdullah University of Science and Technology

1	ECOSTRUCTURE
2	ATMOSPHERE
3	WATER
4	FOOD
5	MATERIALS
6	SHELTER
7	ENERGY
8	TRANSPORT
9	COMMUNITY
10	CULTURE
11	HEALTH
12	EDUCATION
13	GOVERNANCE
14	COMMERCE
15	VALUE



OVER 1 YEAR

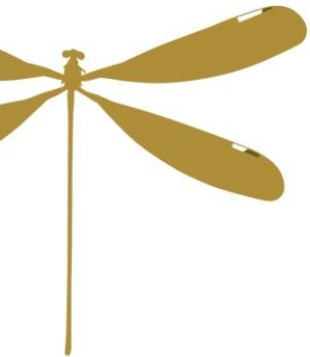


ENERGY MEETS FORM – GENIUS OF THE PLACE

Nature as Mentor: What would nature do here?

Let the landscape direct **WHERE** to build

Let the Genius of Place and architecture patterns direct **HOW** to build
Life's Principles and Ecological Performance Standards describe **WHY** it matters

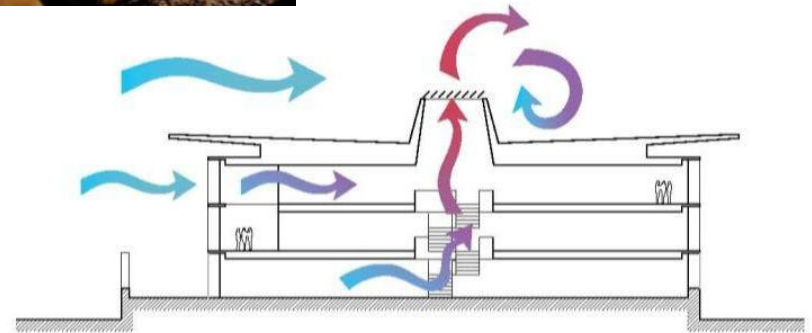


Genius of Place

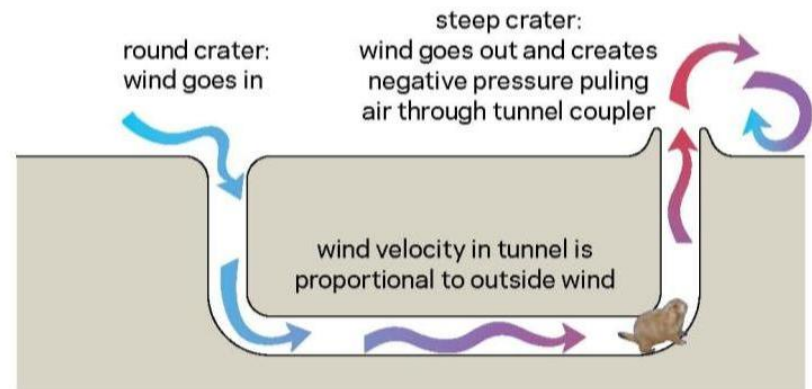
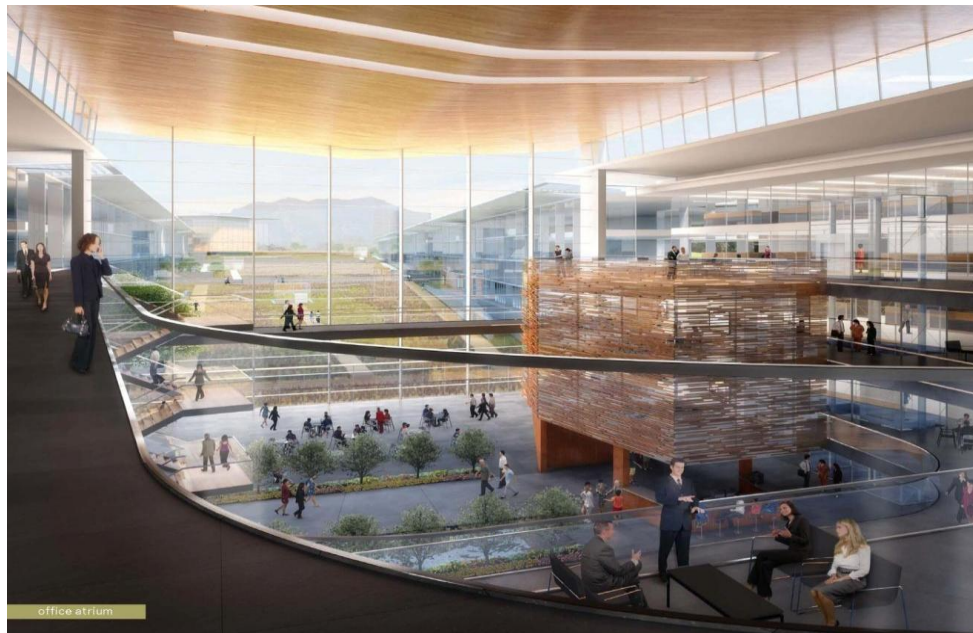
The primary factors driving the face of the landscape on the Conoco-Phillips site can be grouped by their presence:

- *Plenty:* Wind and Sun
- *Precious:* Water
- *Predictable:* Temperature Extremes and Fire

As a result of brutal wind and sun, scarce water, and predictable fire occurrences and temperature extremes, all the organisms that live in that habitat have adopted various strategies to accommodate those environmental pressures with grace. The congruence of these survival strategies across taxa suggests their mandatory inclusion in any design implemented in this area. The major strategies, with their design implications, are below:



1/4"=1'-0"

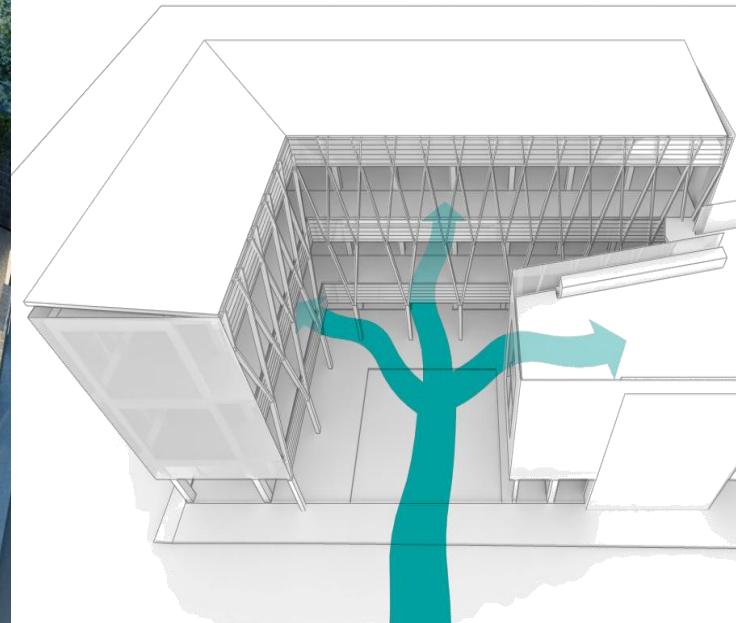




ENERGY MEETS FORM – GENIUS OF THE PLACE



PROJECT
HATI
ORPHANAGE & CHILDREN'S CENTER





THE ENERGY OF THE METROPOLIS

Advanced Building Physics of the 5th facade

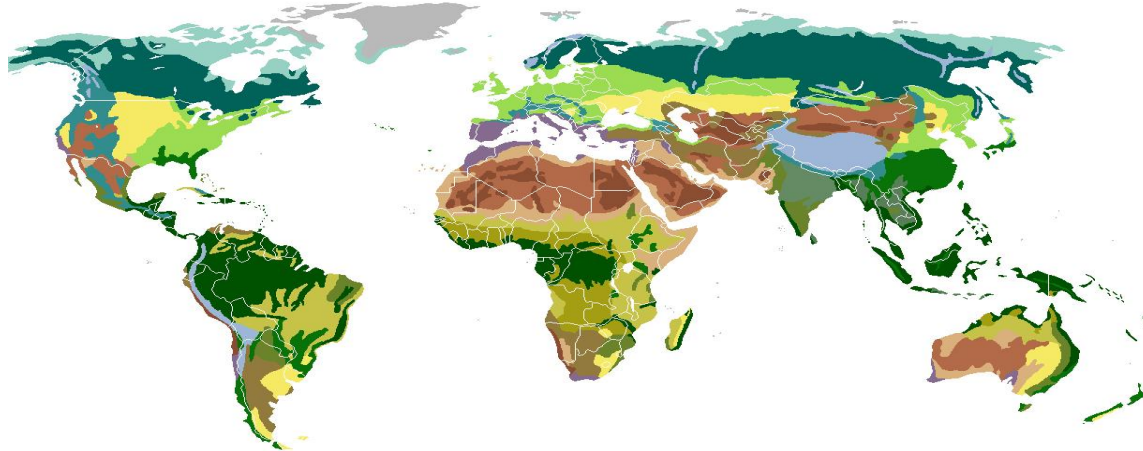
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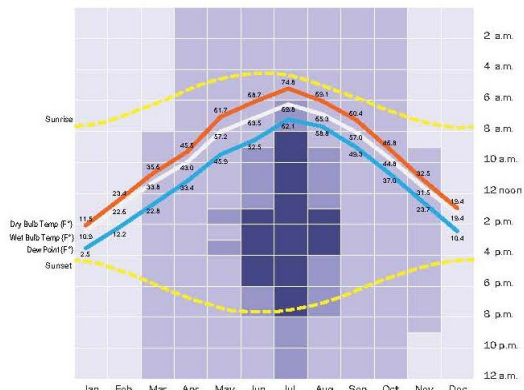


THE ENERGY OF THE METROPOLIS

Advanced Building Physics creates the Design

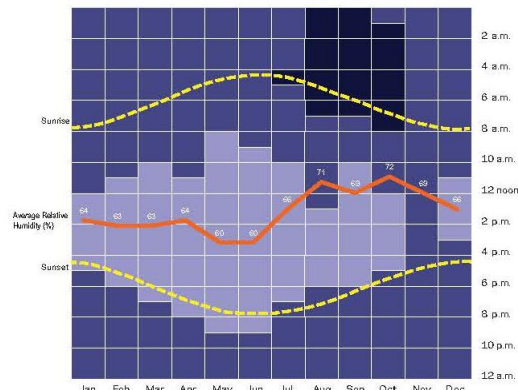


Temperature



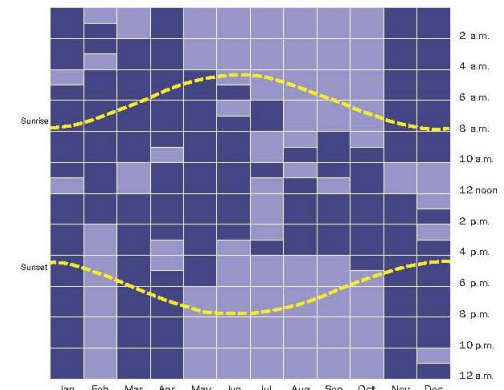
With the exception of summer daytime, the temperature is below a comfortable level; the temperature reaches 70-75° F during 15% of operational hours. Consider an optimized orientation which will absorb max thermal energy in under-heated periods and less in overheated periods. Due to the extreme temperature, huge conductive loss is expected; consider thermal mass, well insulated walls, roofs, an optimized window to wall ratio (min. heat loss in winter, max sunlight), and low U glass. Saving by insulation is expected to be much higher than using an optimized floor aspect ratio and orientation due to the extreme temperatures.

Humidity



With the exception of summer daytime, the humidity throughout the year is well above comfortable levels. There is the possibility to use evaporative cooling during warmer months (June and July) due to the 5°-7° difference between the dry and wet bulb temperatures; 58% of operational hours have an optimal amount of relative humidity during this period. Active desiccant cooling is suggested to control humidity as well. If there are possible strategies to decrease wind speed, summer passive ventilation should be seriously considered since during this season humidity is less than 60% and the wind velocity is high.

Sky Cover

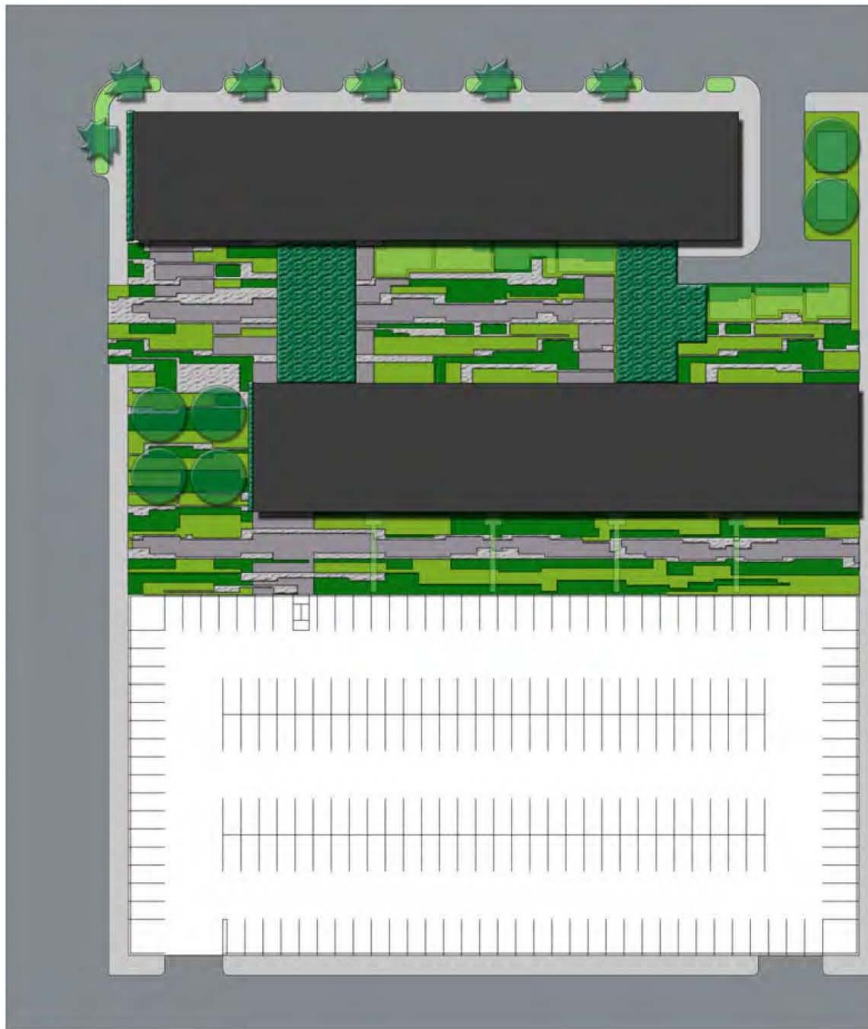


Sky conditions are cloudy about 65% of daytime, especially in spring and summer during occupied hours. Daylighting control strategies can be considered year round, as the cloud cover may actually yield more consistent, diffused light.

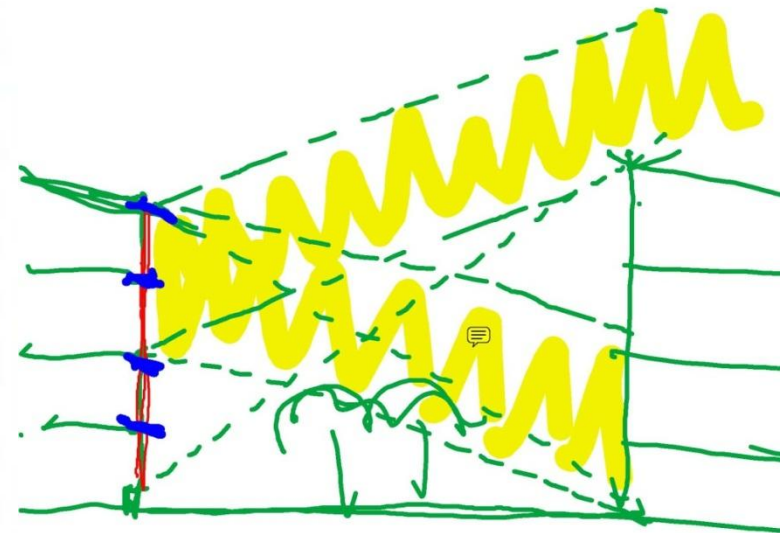


THE ENERGY OF THE METROPOLIS

Advanced Building Physics of the 5th facade



On-site Food Source



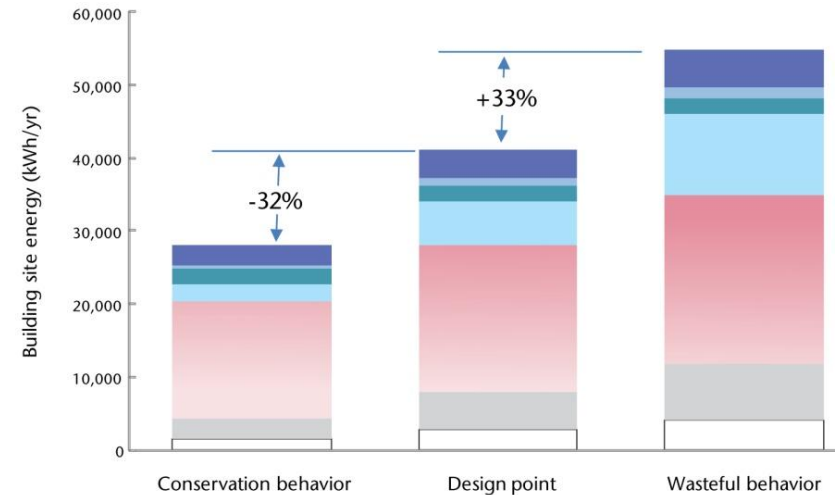
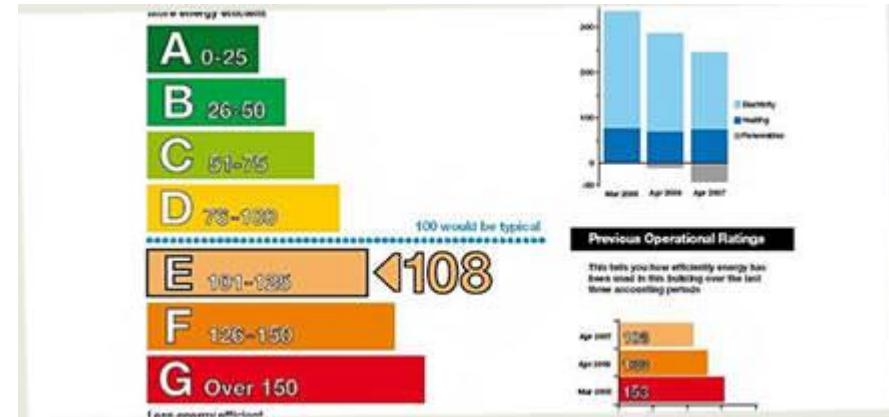
South

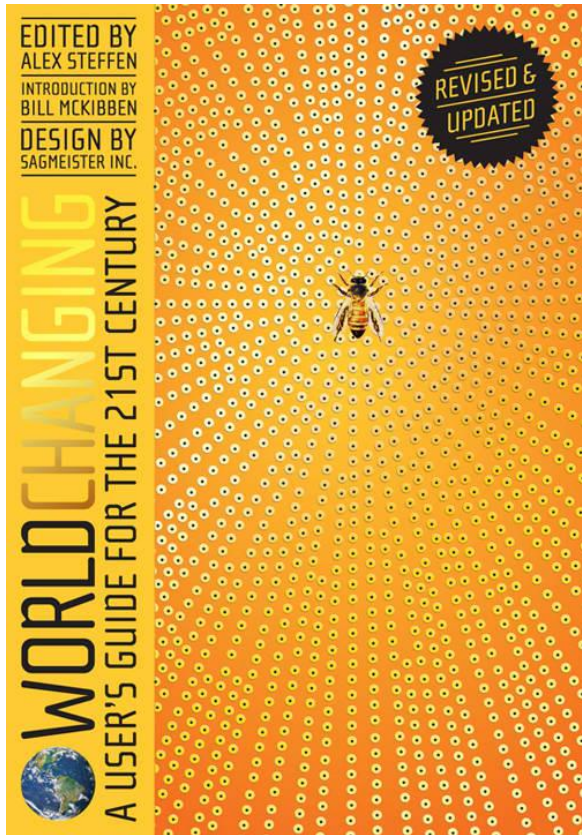
	South Facade	North Facade	East Facade	West Facade
WWR 40%				
WWR 30%				



USER PERCEPTION AND BEHAVIOR

Data collection and display to drive behavior in the 5th facade





“Readiness to act will allow cities and communities to invest boldly in growing resilience and building up the local capacity for innovation, adaptation and rapid cultural change.

There comes a point where lack of action means further incremental change can no longer keep up with exponential problems.

Personally, I’d rather live in a city that’s moving fast to meet the future, than one that started father ahead, but is stuck and complacent, or simply unwilling to go beyond mere incremental change.”

Alex Steffen
Futurist and Design Optimist