

JBC

25TH
ANNIVERSARY

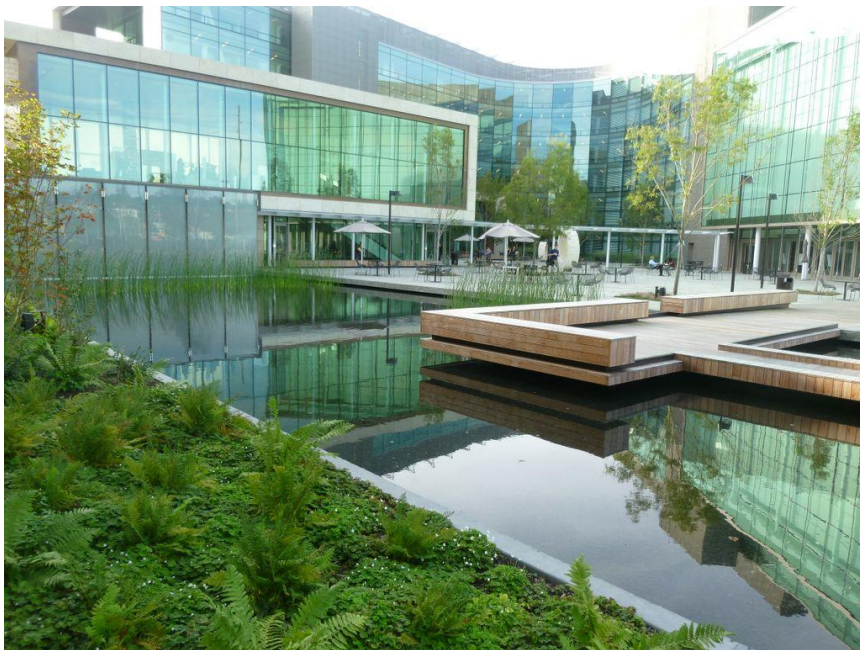
LANDSCAPE ARCHITECTURE
CAMPUS PLANNING
URBAN DESIGN

Introduction to Green Roofs



What is a Green Roof?

A green roof is a green space created by adding layers of growing medium and plants on top of a traditional roofing system.



Hanging Towers of Babylon (450 BC)



Green Roofs are as old as America



1981 Green Roof



Urban Landscape

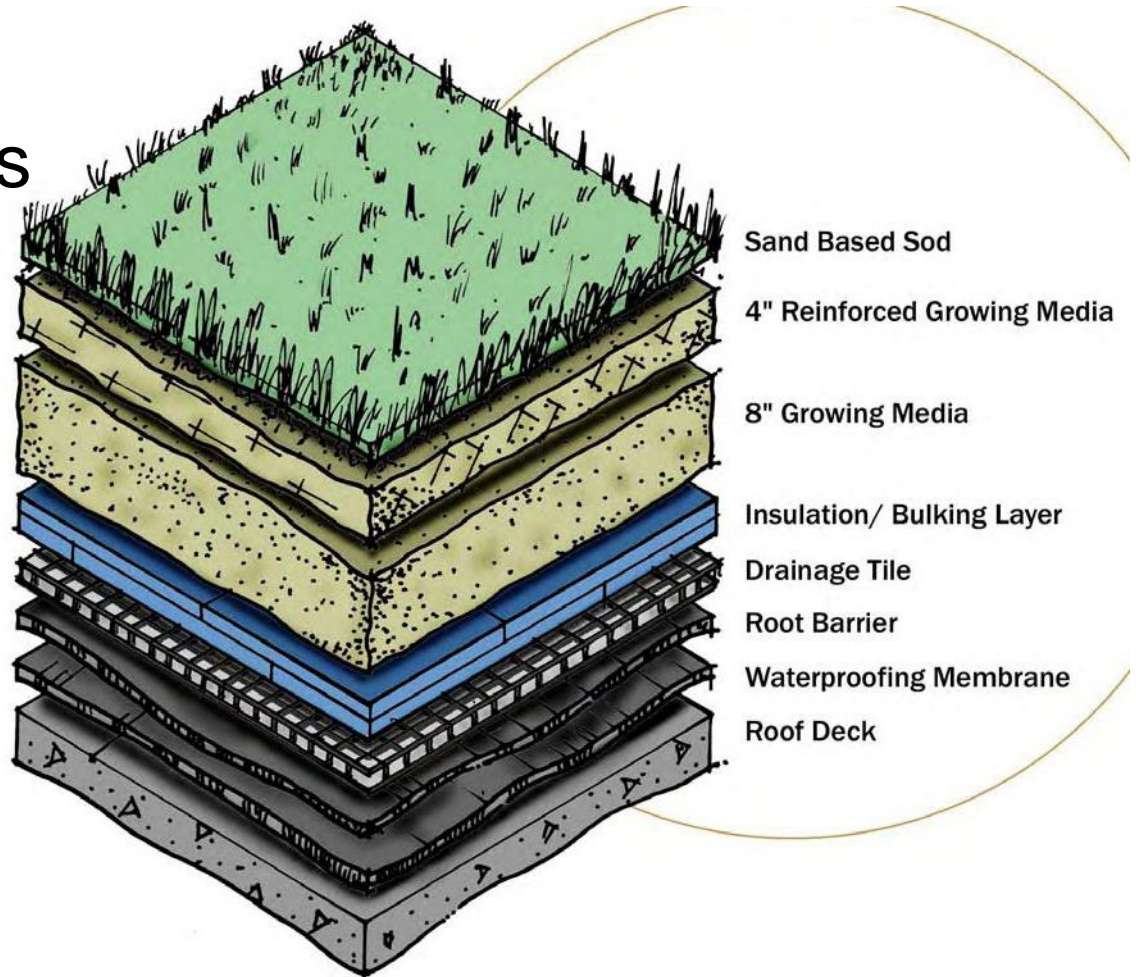
EPA estimates 30% of the total land area in urban areas are roofs.



Intensive vs. Extensive Green Roof

The two basic types differentiated by

- Cost
- Depth of growing medium
- Choice of plants



Extensive Green Roofs

- Extensive green roofs are often not accessible and are characterized by:
 - 2"- 6" Growing medium
 - Low weight
 - Low capital cost
 - Low plant diversity
 - Minimal maintenance



Boulevard Brewery, Kansas City, MO

Extensive Green Roofs

Advantages of Extensive Roofs

- Lightweight
- Suitable for large areas
- Suitable for roofs with 0 – 30° (slope)
- Low maintenance
- Often no need for irrigation
- Often suitable for retrofit projects
- Relatively inexpensive



TWA Building, Kansas City, MO

Extensive Green Roofs

Disadvantages of Extensive Roofs

- Less energy efficiency and stormwater retention benefits
- More limited choice of plants
- Usually no access for recreation or other uses
- Unattractive to some especially in winter



Nelson Atkins Museum, Kansas City, MO

Intensive Green Roofs



909 Walnut, Kansas City, MO

Intensive green roofs are often not accessible and are characterized by:

- 8 – 30 inches growing medium
- Greater weight
- Higher capital costs
- Increased plant diversity
- More maintenance

Intensive Green Roofs

Advantages of Intensive Roofs

- Greater diversity of plants and habitats
- Good insulation properties
- Can simulate a garden on the ground
- Often accessible, with more diverse utilization of the roof
- More energy efficiency and storm water retention capability



Gates Foundation, Seattle, WA

Intensive Green Roofs

Disadvantages of Intensive Roofs

- Greater weight loading on roof
- Need for irrigation and drainage systems requiring energy, water, materials
- Higher capital & maintenance costs
- More complex systems and expertise



Millennium Park - Laurie Garden, Chicago, IL

Different Construction Approaches

Modular systems combine two or more essential components of an assembly into one product.



Loose laid or built-up systems involve the separate installation of various essential components of an assembly, with products supplied by one or more firms.



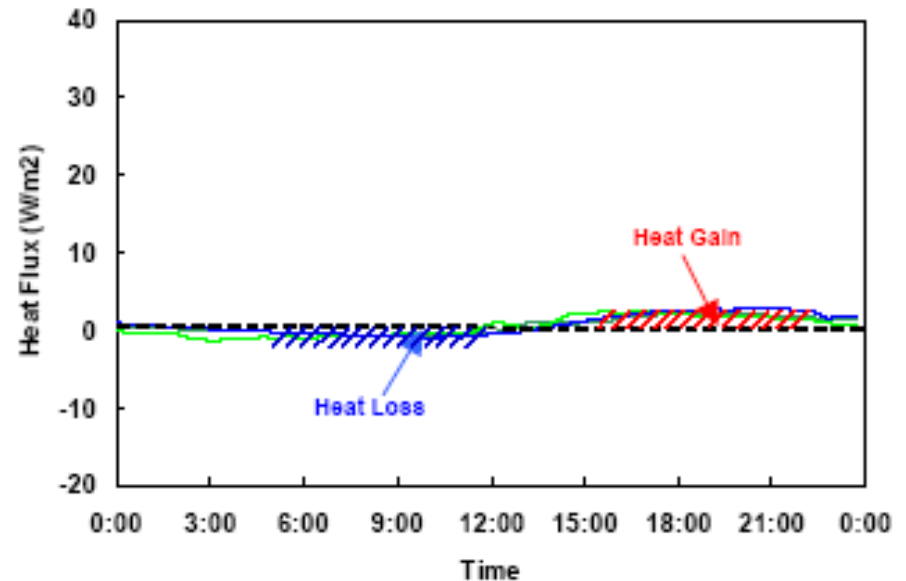
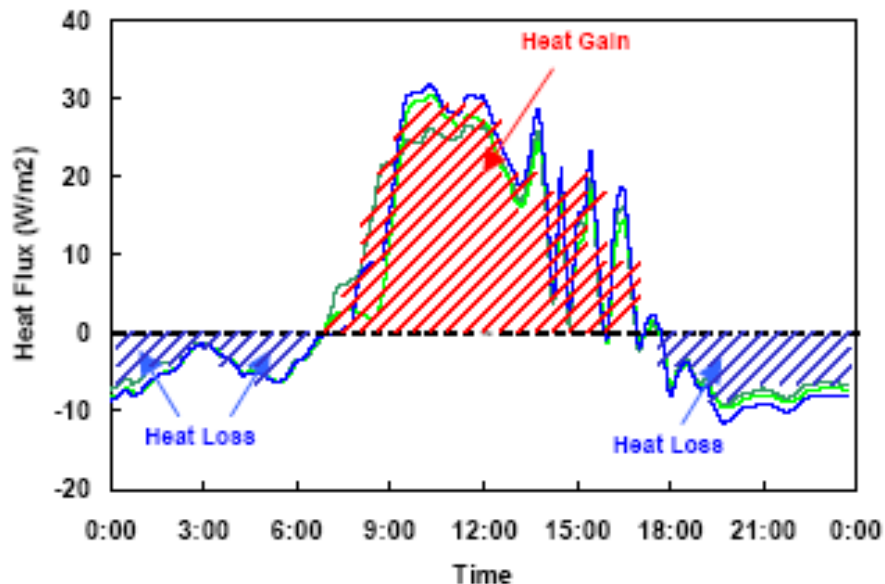
Owner Benefit - Membrane Life



Owner Benefit - Energy Savings

A 8" layer of soil and plants has a combined insulative value of R20.

A 2" layer air trapped above the roof by 6" of plants can increase the R value by 30%

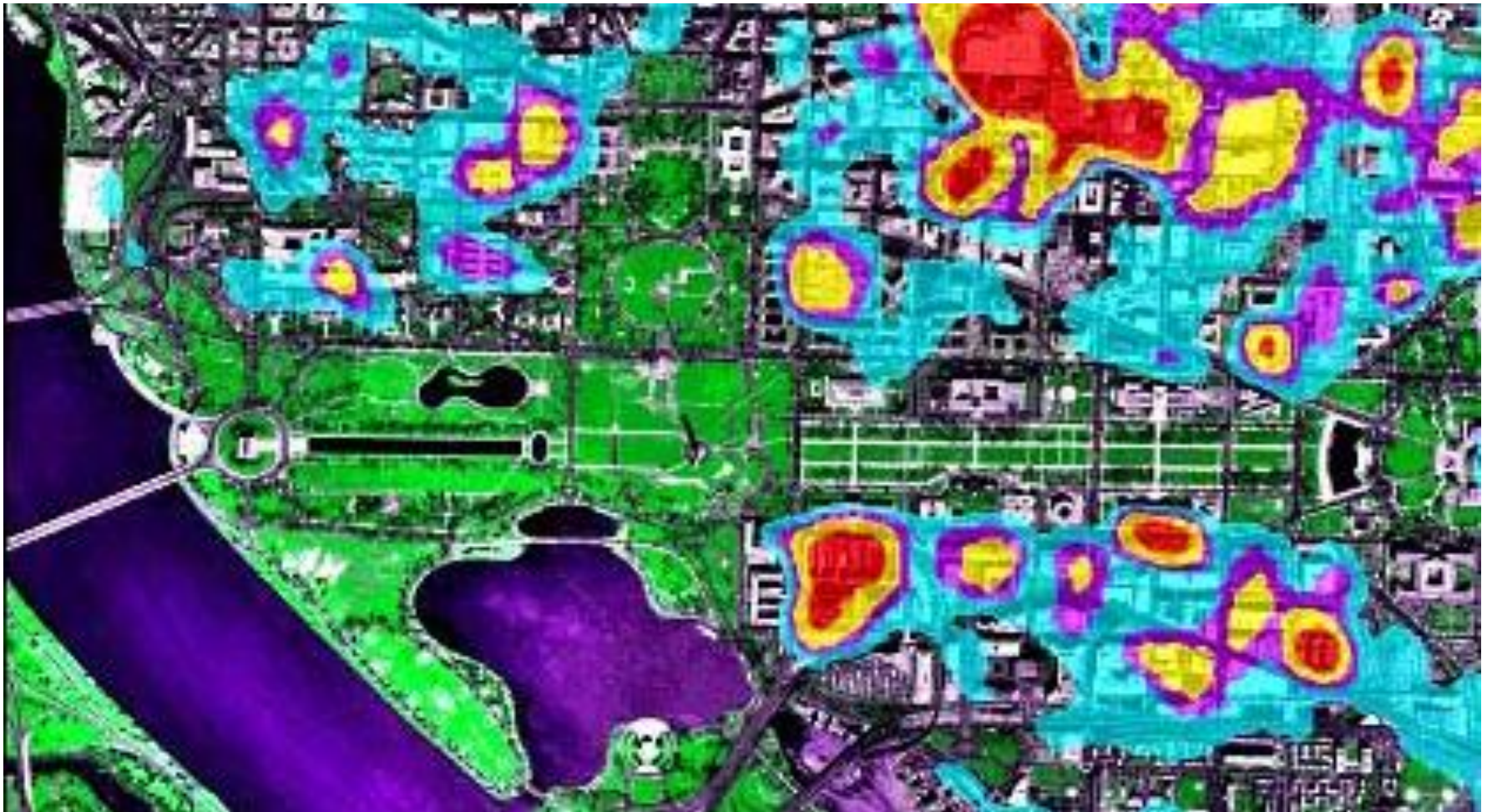


Owner Benefit – Amenity Space

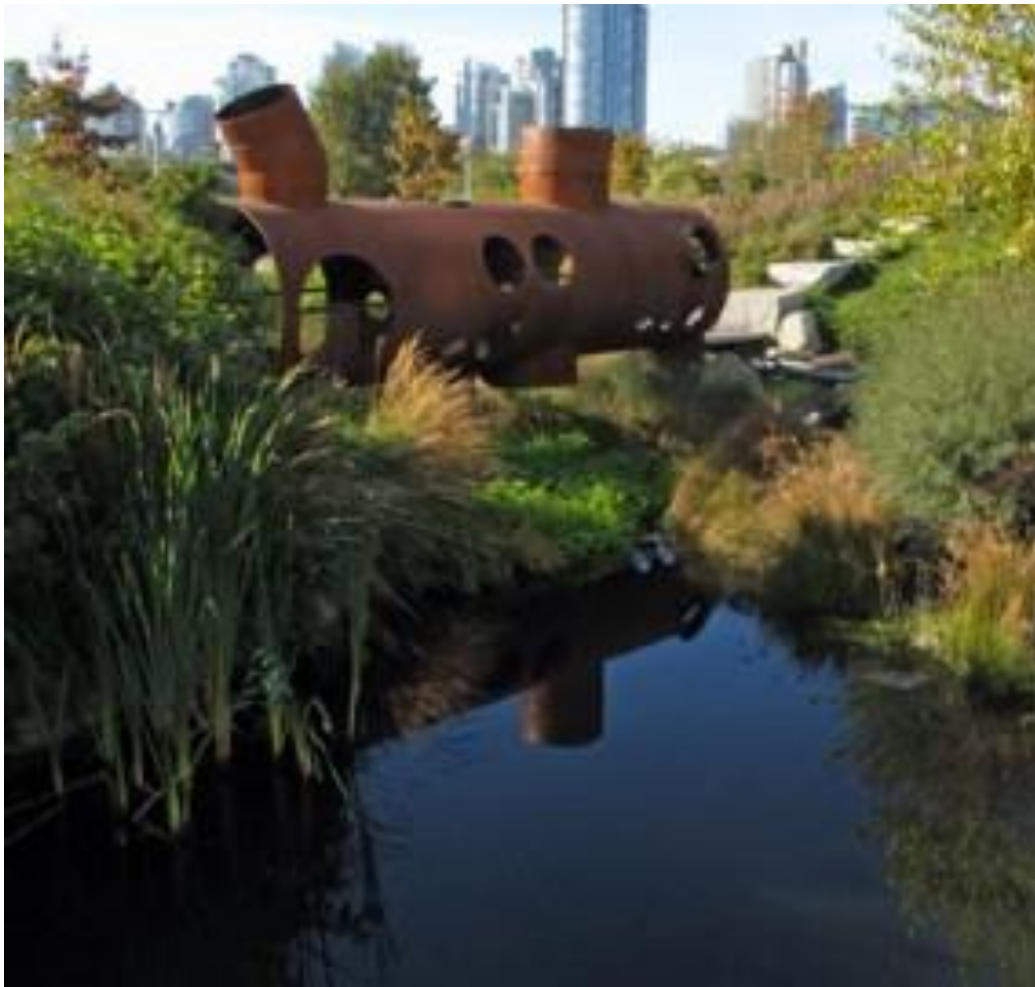


Green Roof Intro BEC St. Louis

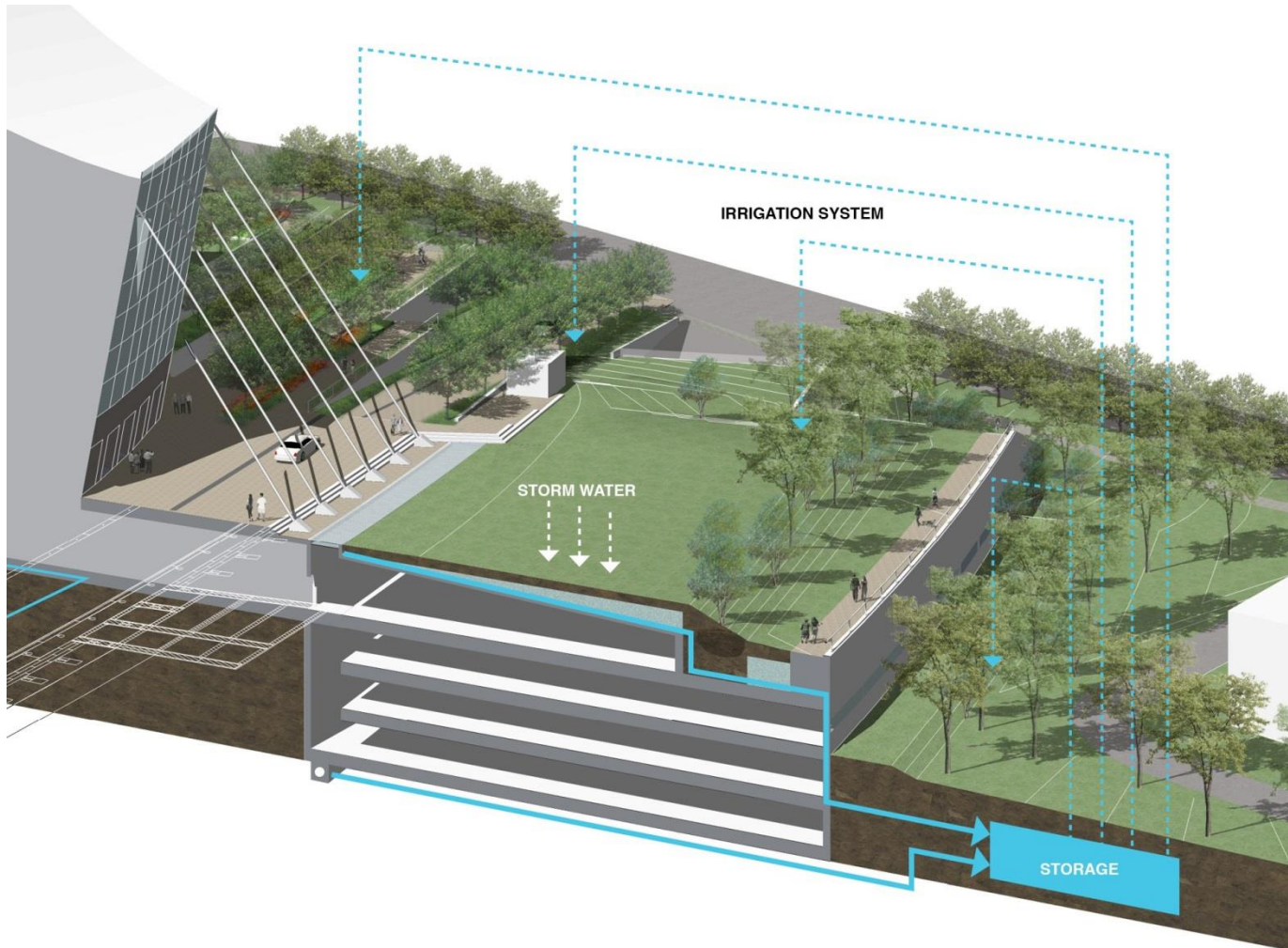
Public Benefit - Urban Heat Island



Public Benefit – Water Quality



Public Benefit – Storm Water



Public Benefit – Air Cleaning



Public Benefit – Habitat Creation

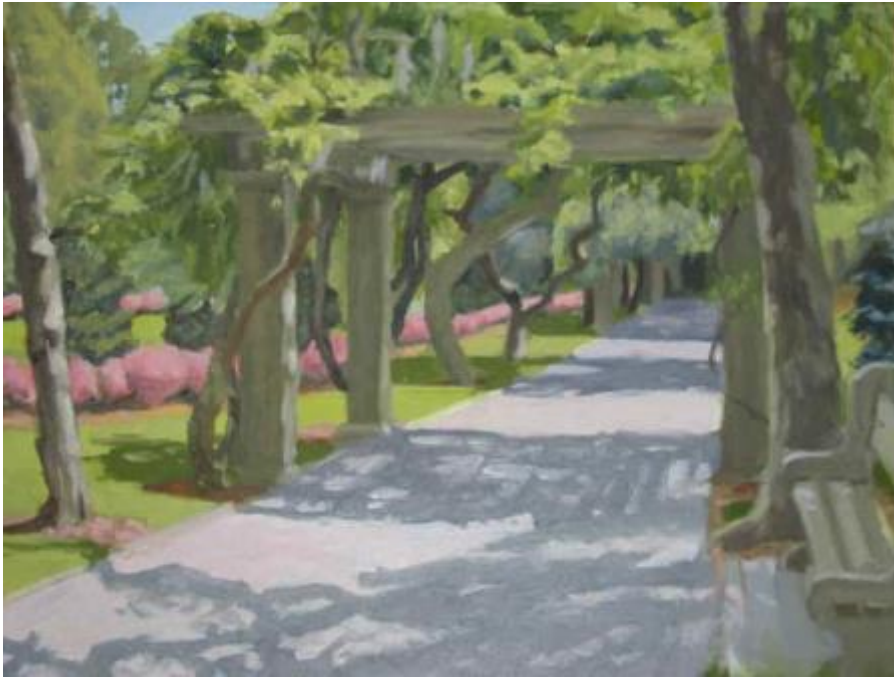


Public Benefit – Sound Insulation



Green Roof Intro BEC St. Louis

Aesthetic vs. Function



Horticulture

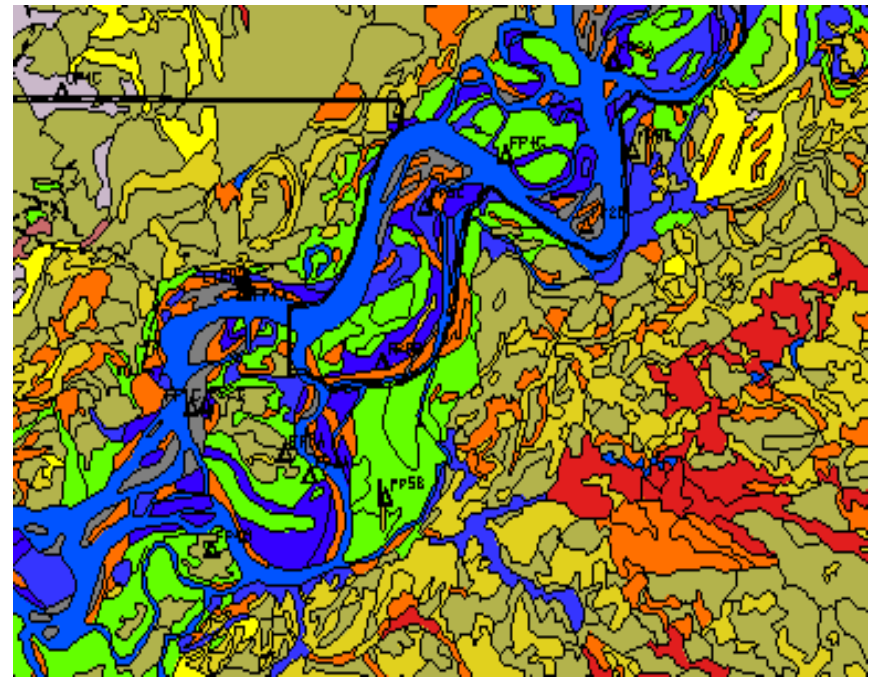


Ecology

Consumptive vs. Restorative

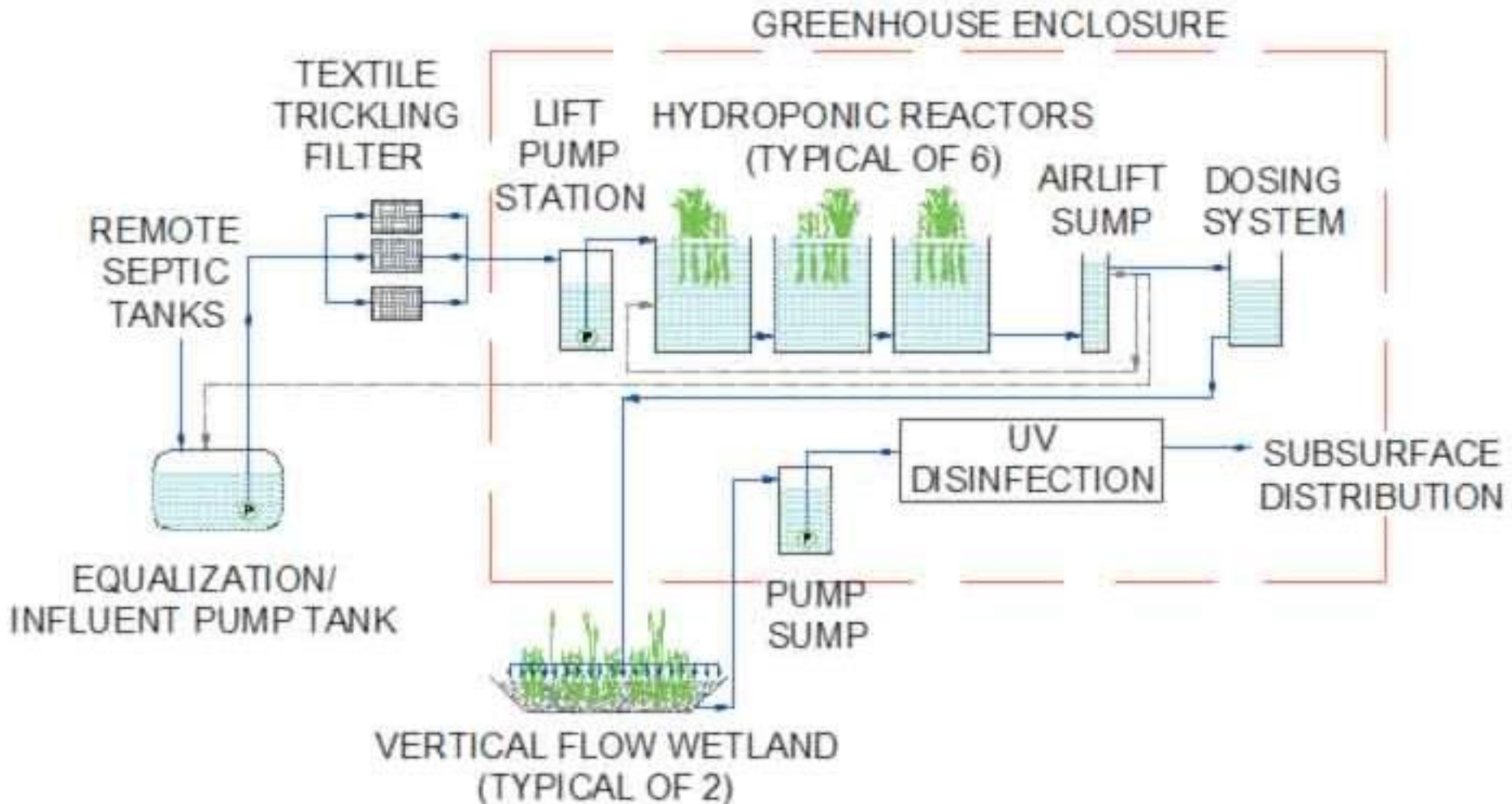


Horticulture



Ecology

Landscapes as Living Machines



Water as Fuel

We can't build greener cities simply by wasting less energy and water. The idea of net zero water is that we can actually **harness the power of nature** to restore our rainwater, air, and ground water.



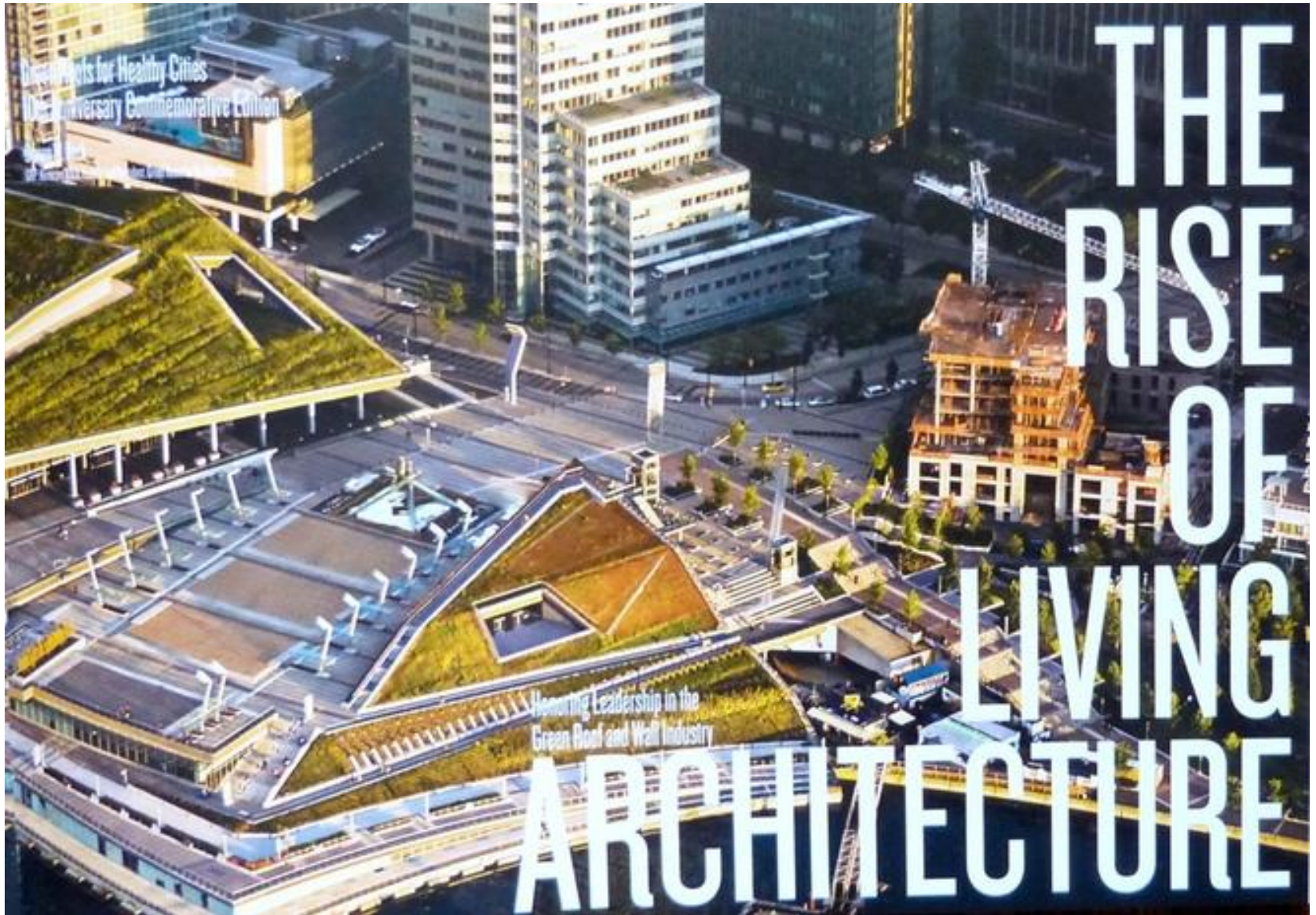
If We Were To Dream?



If We Were To Dream?



Green Roof Intro BEC St. Louis



Endless Possibilities

Green Roof Intro St. Louis

Green Roofs



RCCL Solstice Lawn Club

Rooftop Urban Agriculture



Brooklyn Grange, New York City

Green Walls



Musée du quai Branly, Paris

Bio-Lungs



Siam Paragon Center, Bangkok Thailand

Urban Forests



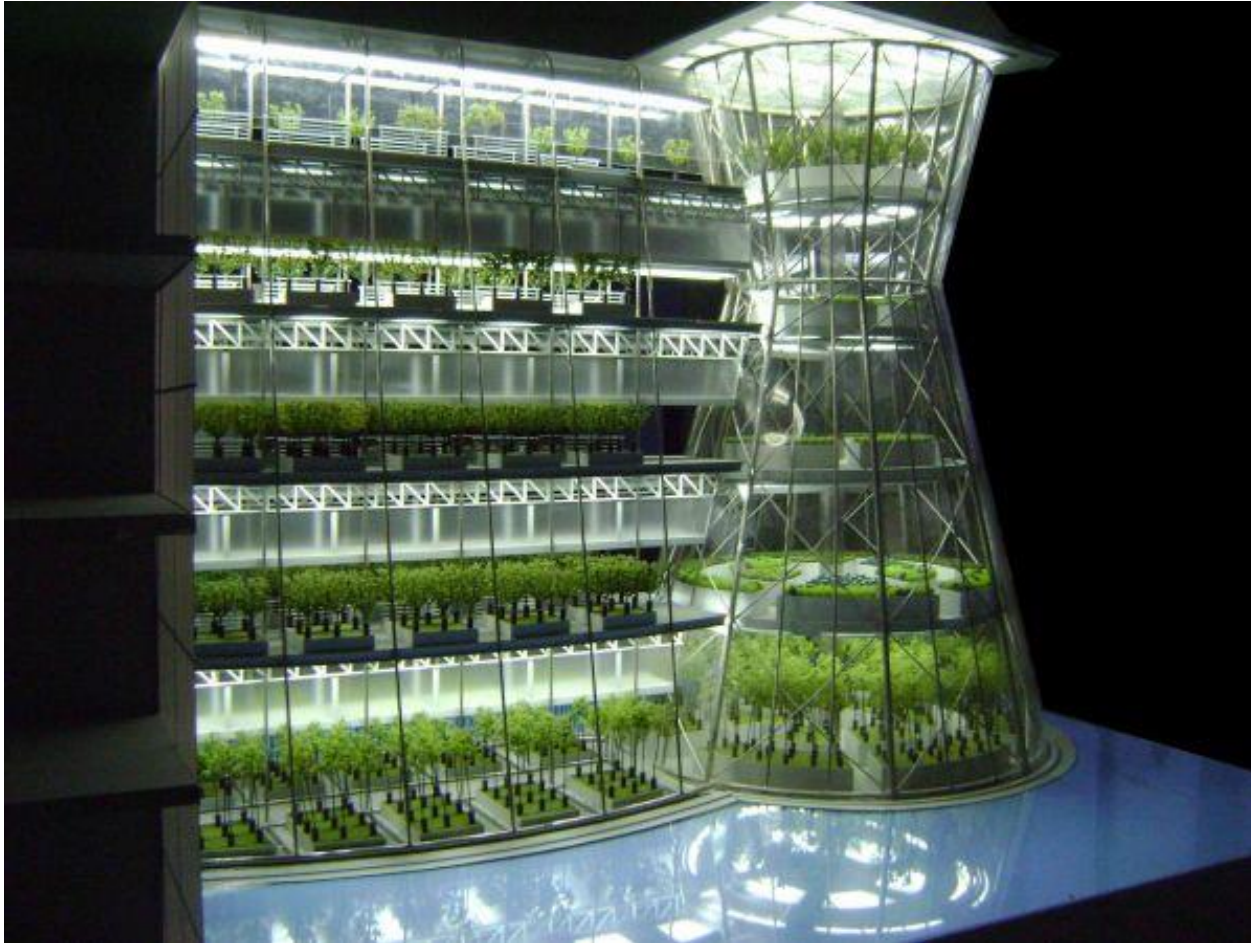
Chongqing, China

Vertical Greenhouses



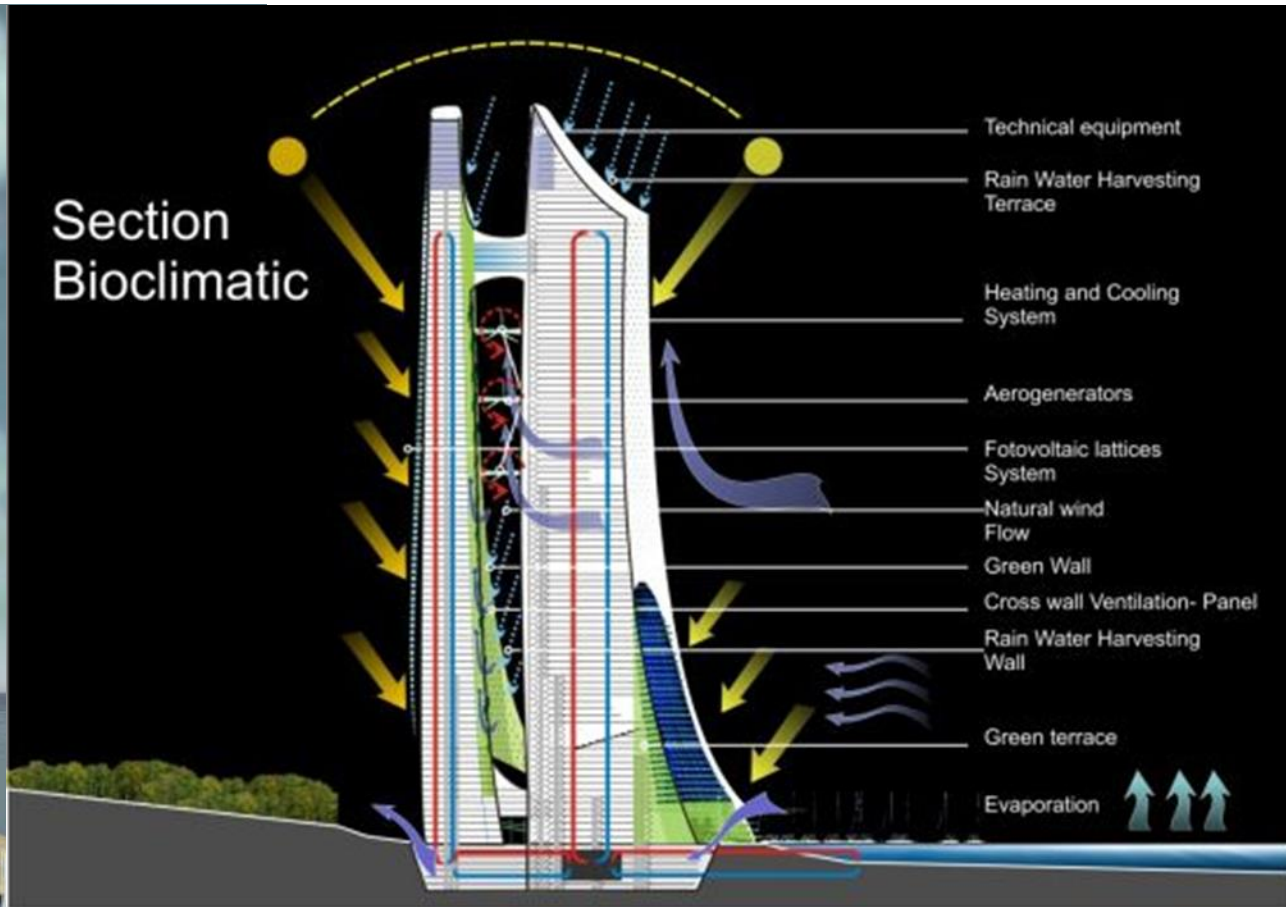
EDDIT Tower Singapore

Vertical Farming



Roosevelt Island, New York City

Bio-Climatic Buildings

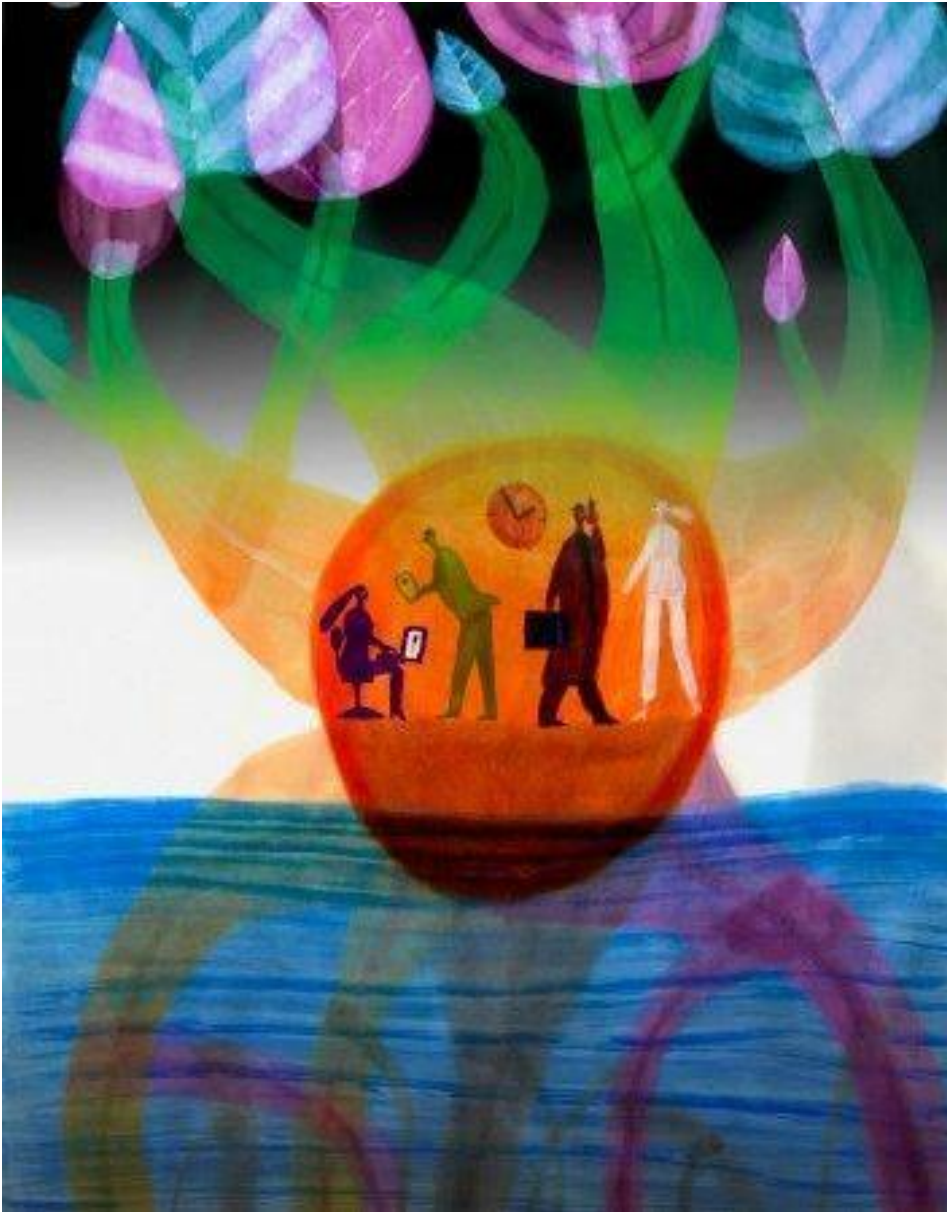


Eco-Cybernetic City

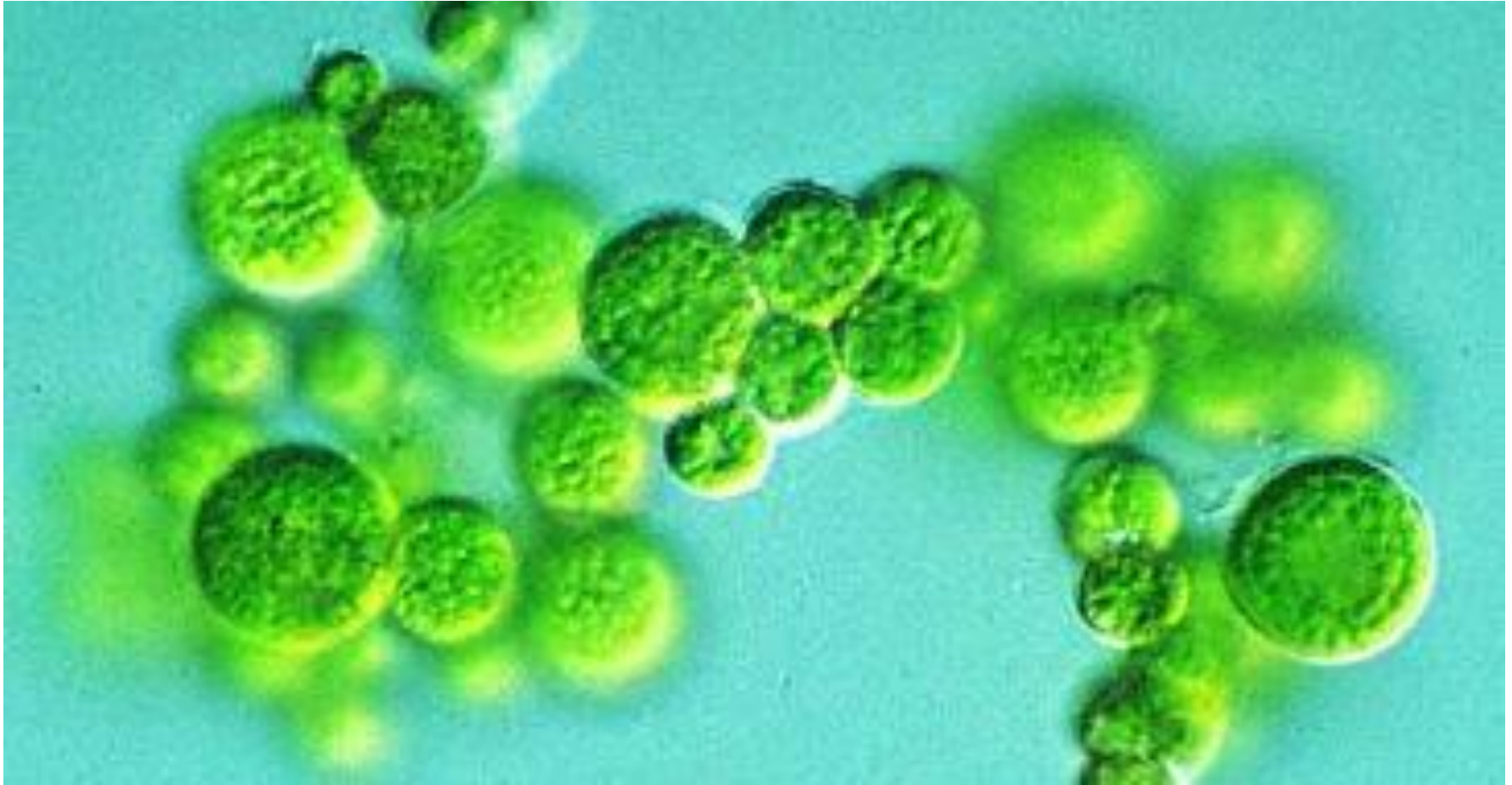
Bio-Climatic Buildings

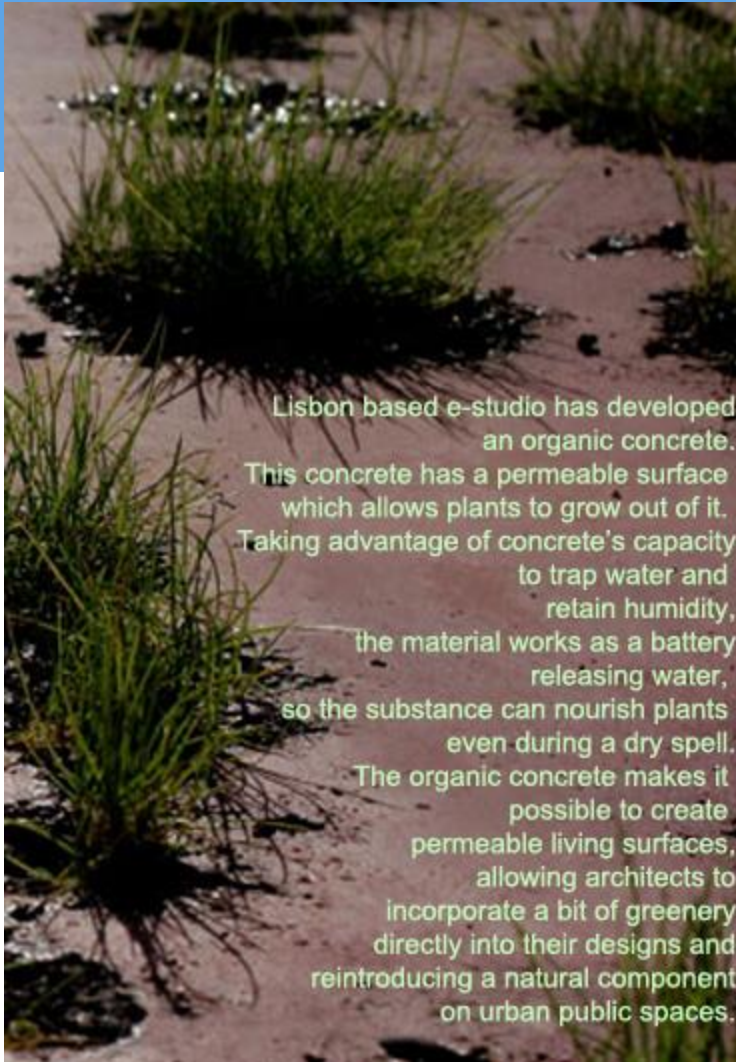


Convergence of Technologies



Self Healing Materials





Organic Concrete

bonds both vegetal and inorganic in one element



Biological Concrete



Water Harvesting & Treatment Facades



Will bioluminescent trees replace streetlights?



Robotic Bees to Pollinate Monsanto Crops



Digital Data Successfully Merged With Biological DNA

Algae Bioreactor



El Paso, Texas



Cities of the Future: Built By Drones and Bacteria



What's Next

Green Roof Intro BEC St. Louis

Restorative Urban Environments





The Living Bridges of Cherrapunji



“The battle for life on earth will be won or lost in cities.”

United Nations 2008

A New Paradigm Shift



Green Roof Intro St. Louis

A New Paradigm Shift



Green Roof Intro St. Louis

**“Design is
the most
under-utilized
resource for
solving
environmental
problems.”**

