Intelligent Design:

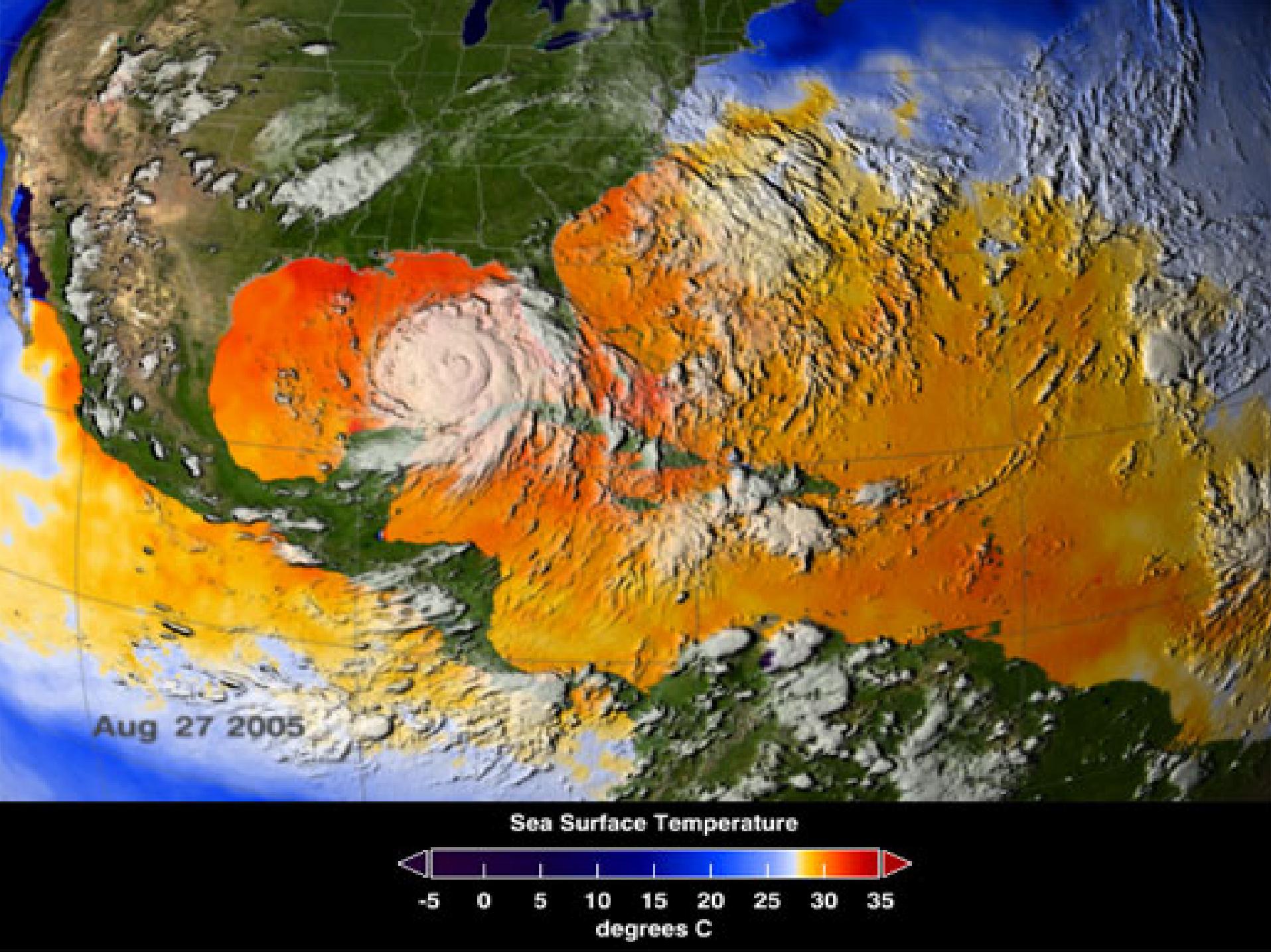
Can a design revolution meet humanity's greatest challenge?

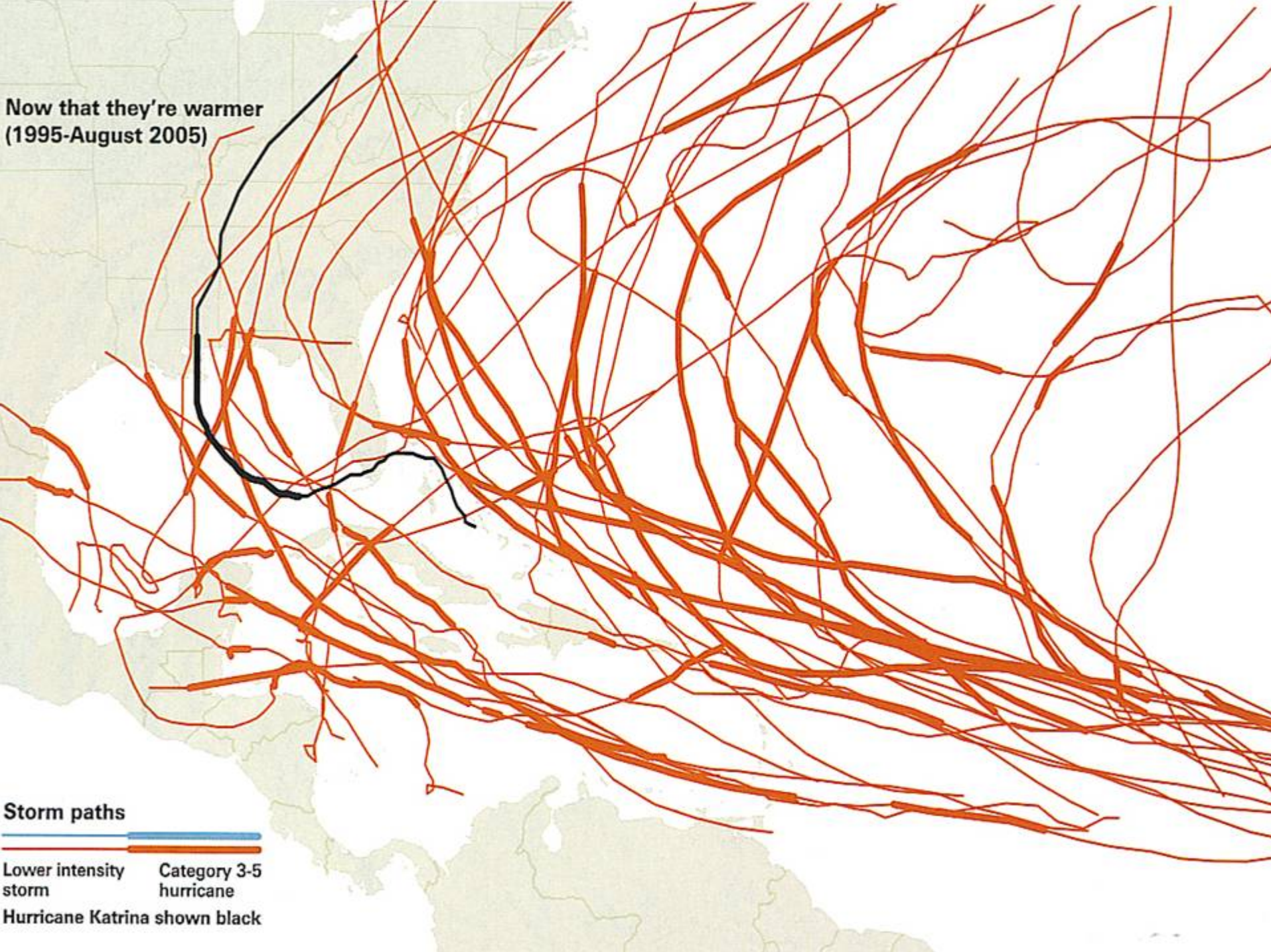
KS State University

6 Jan 06

Bob Berkebile, FAIA


“The best way to predict the future is to design it.”
-Buckminster Fuller


Aug 27 2005
Sea Surface Temperature
-5 0 5 10 15 20 25 30 35
degrees C


Now that they're warmer
(1995-August 2005)
Storm paths
Lower intensity storm
Category 3-5 hurricane
Hurricane Katrina shown black

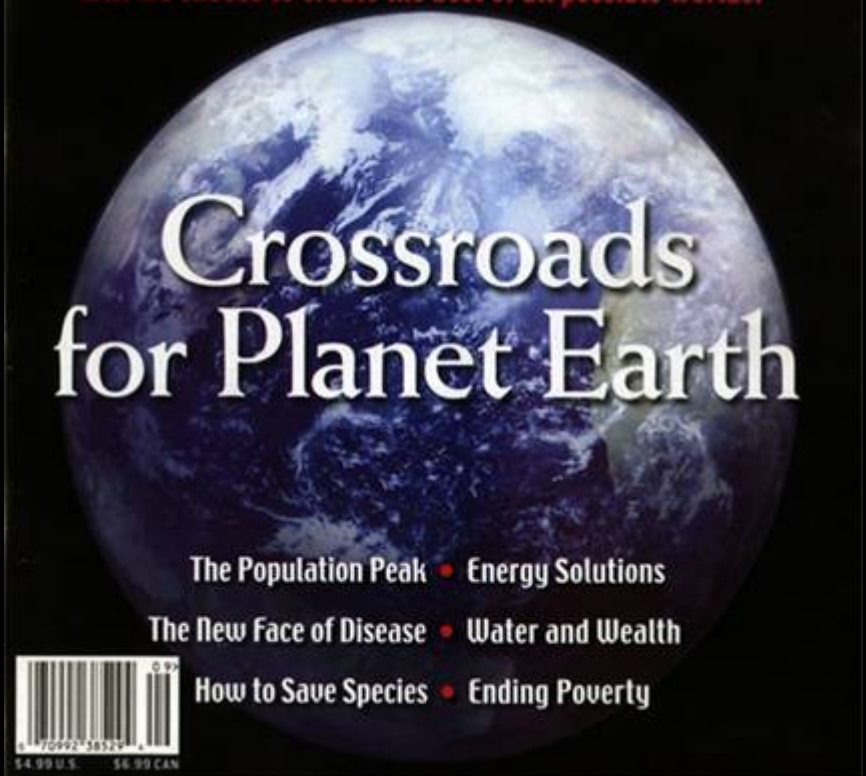
A PLAN FOR A BRIGHT FUTURE BEYOND 2050

SCIENTIFIC AMERICAN

SPECIAL ISSUE

SEPTEMBER 2005
WWW.SCIAM.COM

The human race is at a unique turning point.
Will we choose to create the best of all possible worlds?



Crossroads for Planet Earth

- The Population Peak • Energy Solutions
- The New Face of Disease • Water and Wealth
- How to Save Species • Ending Poverty

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INTRODUCTION

THE CLIMAX OF HUMANITY

BY GEORGE MUSSER

Demographically and economically, our era is unique in human history. Depending on how we manage the next few decades, we could usher in environmental sustainability—or collapse

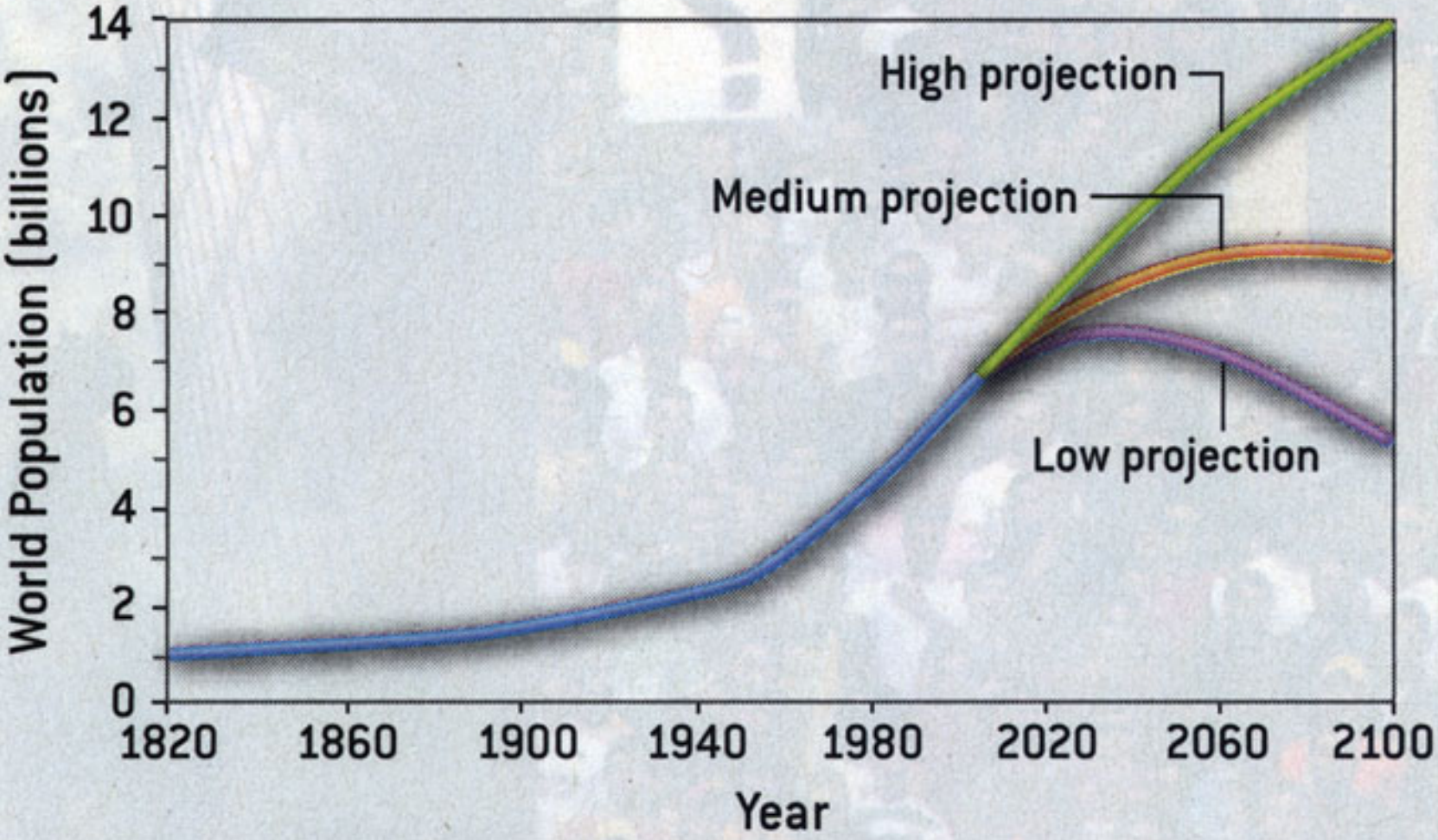
The 21st century feels like a letdown. We were promised flying cars, space colonies and 15-hour workweeks. Robots were supposed to do our chores, except when they were organizing rebellions; children were supposed to learn about disease from history books; portable fusion reactors were supposed to be on sale at the Home Depot. Even dystopian visions of the future predicted leaps of technology and social organization that leave our era in the dust.

dioxide three times as fast as the oceans and land can absorb it; midcentury is when climatologists think global warming will really begin to bite. At the rate things are going, the world's forests and fisheries will be exhausted even sooner.

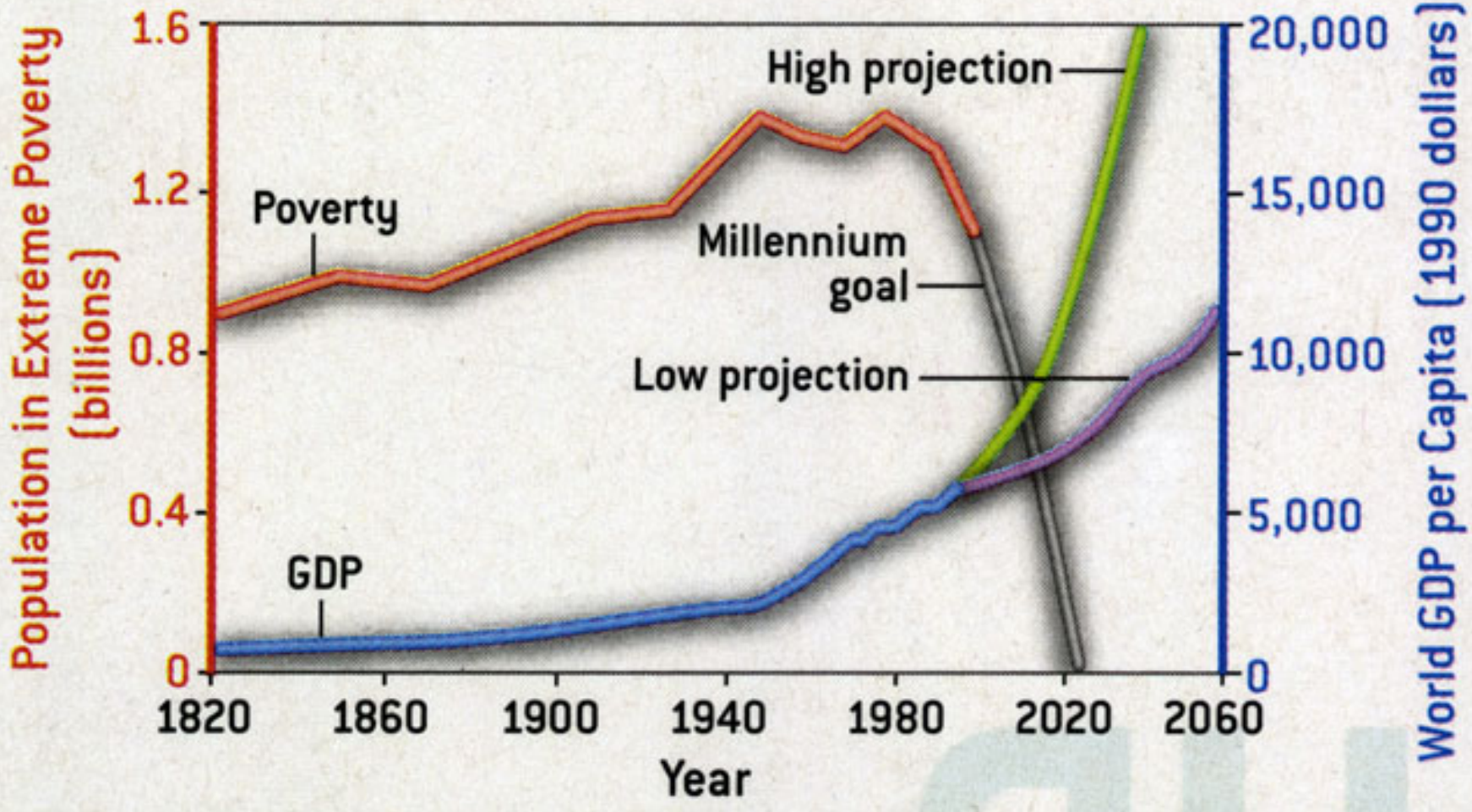
These three concurrent, intertwined transitions—demographic, economic, environmental—are what historians of the future will remember when they look back on our age. They are transforming everything from geopolitics to the struc-

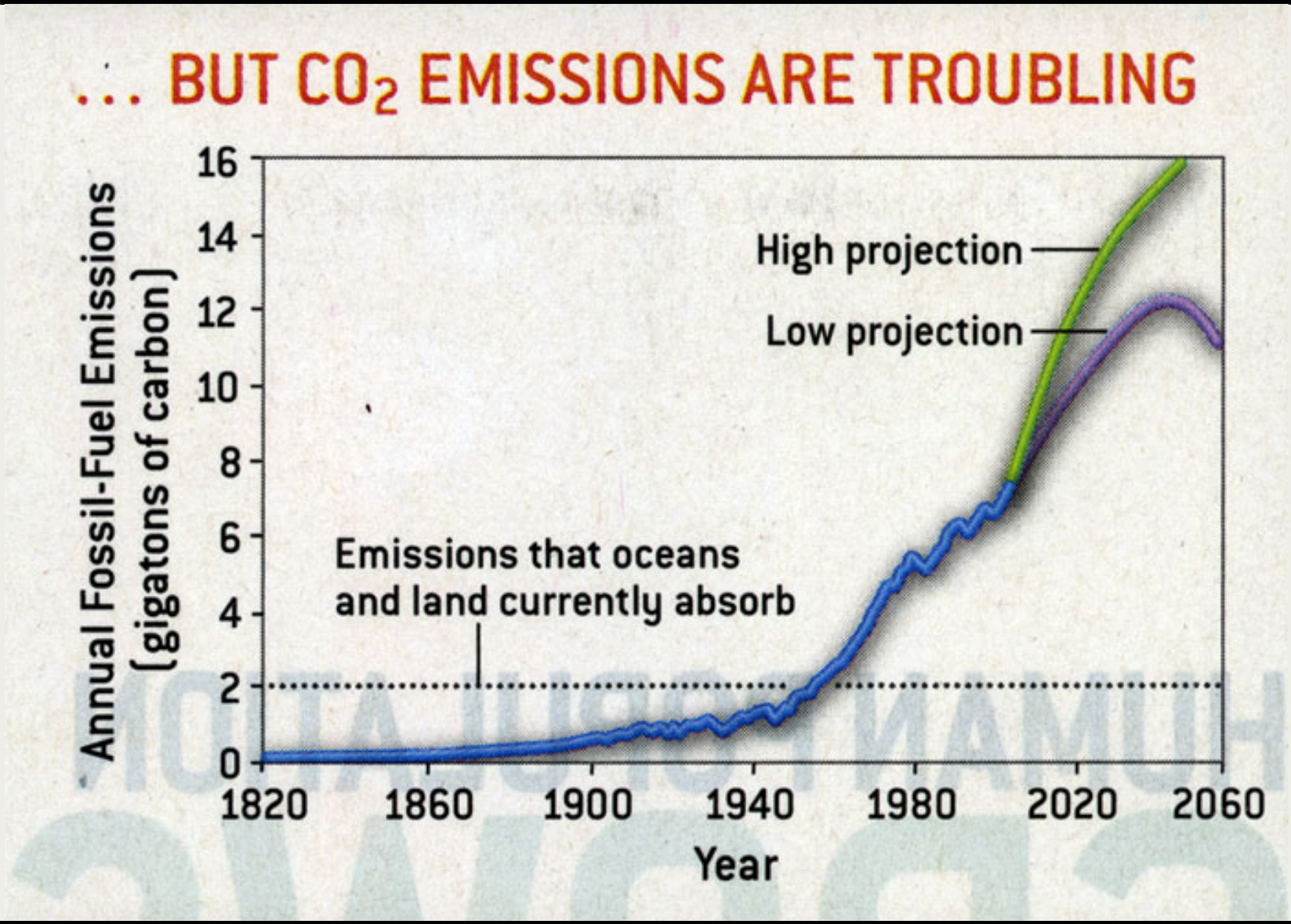
THREE WORLD-CHANGING TRANSITIONS

POPULATION GROWTH IS SLOWING . . .

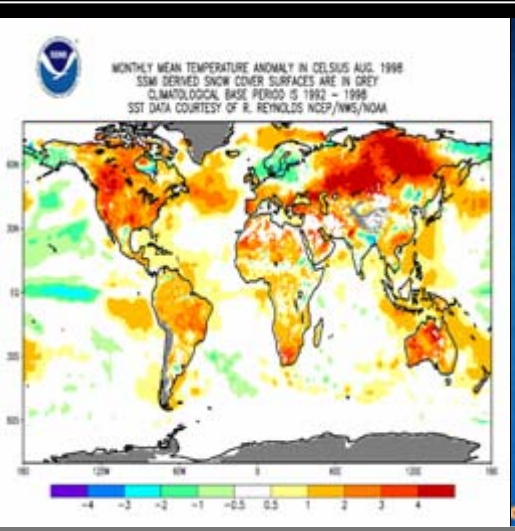


. . . PROSPERITY IS SPREADING . . .

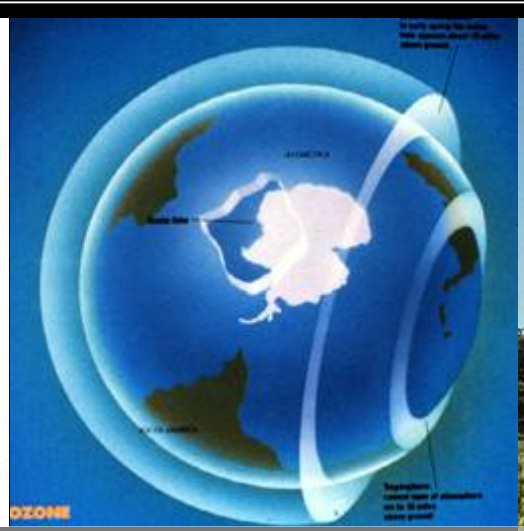



. . . BUT CO_2 EMISSIONS ARE TROUBLING
Annual Fossil-Fuel Emissions (gigatons of carbon)
16
14
12
10
8
6
4
2
0
High projection
Low projection
Emissions that oceans and land currently absorb
1820
1860
1900
1940
1980
2020
2060
Year

Toll on the Environment



Global Warming



Ozone Depletion

Air Pollution

Soil Erosion &
Water Pollution

"*Every living system is in decline and the rate of decline is increasing.*"

-The Union of Concerned Scientists

USGBC

LEED

LEED

Five major categories in which to earn points or credits toward a certification level

Missouri Department of Conservation and Discovery Center

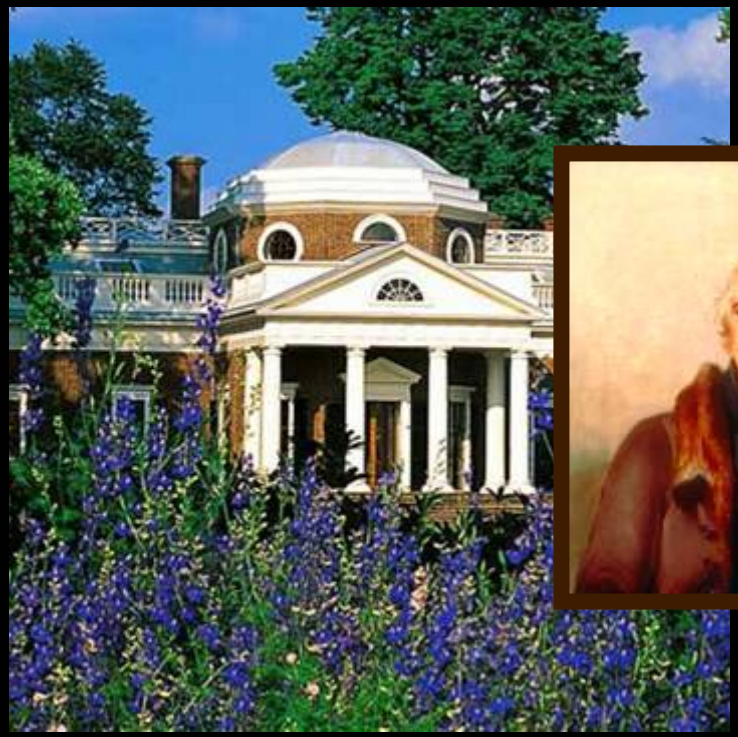
- The outdoor wetland treats stormwater from higher up in the watershed.
- Bioswales filter parking lot runoff back to the water table rather than the city storm system.
- Geothermal heat pump system
- Three basic photovoltaic systems: (1) standard solar panels (2) integrated PV standing seam roof panels, and (3) integrated PV sloped glazing
- “Living Machine,” a solaraquatic wastewater treatment facility, provides on-site treatment of all wastewater for reuse
- Energy efficient light fixtures, motion detection and daylight sensitive sensors are utilized
- Daylighting strategies include solar orientation, clerestory windows, sunshades, light shelves
- Recycled materials include wet and dry countertops, toilet partitions, paint and carpet
- Salvaged materials utilized within the exterior masonry skin and within the main lobby.



Figure III-1. Level of Green Standard and Average Green Cost Premium

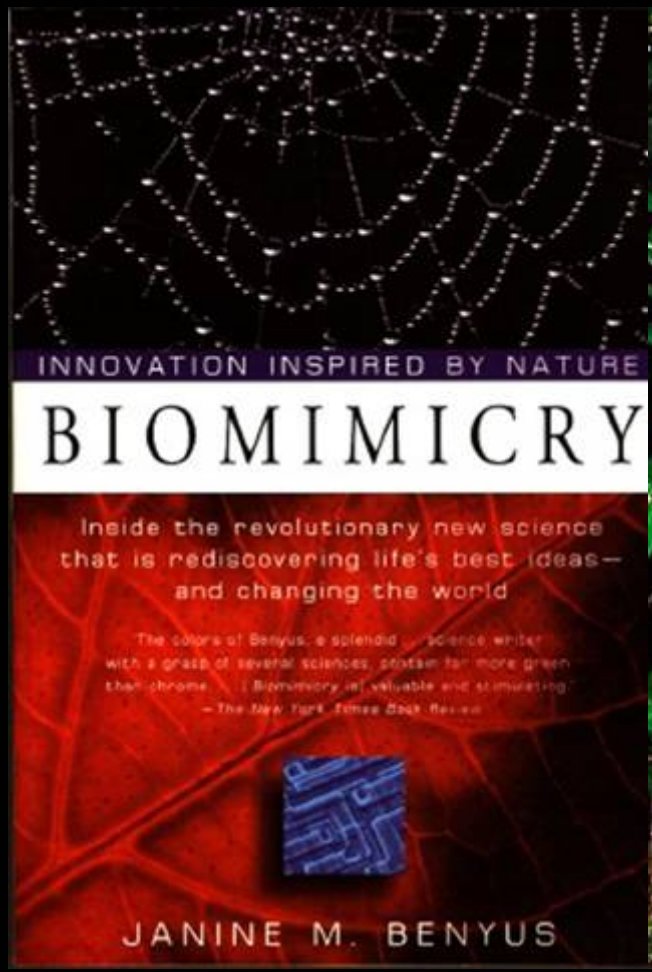
Level of Green Standard	Average Green Cost Premium
Level 1 – Certified	0.66%
Level 2 – Silver	2.11%
Level 3 – Gold	1.82%
Level 4 – Platinum	6.50%
Average of 33 Buildings	1.84%

Source: USGBC, Capital E Analysis

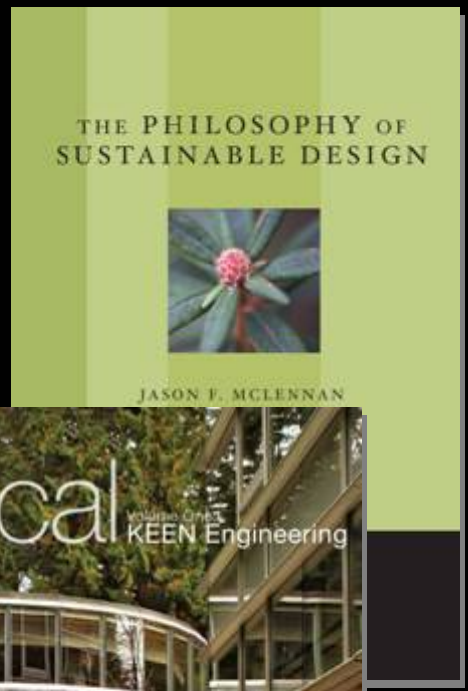


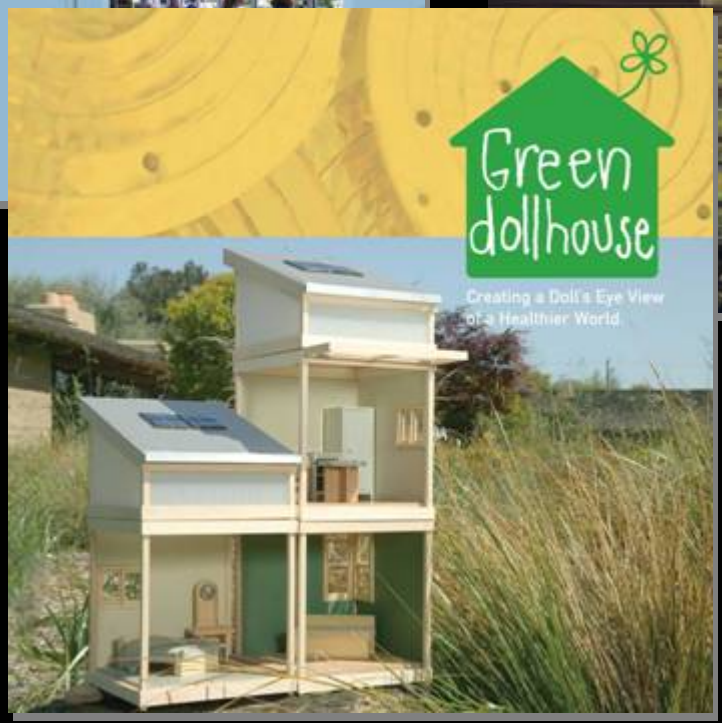
“We do not seek to imitate nature, but rather to find the principles she uses.”

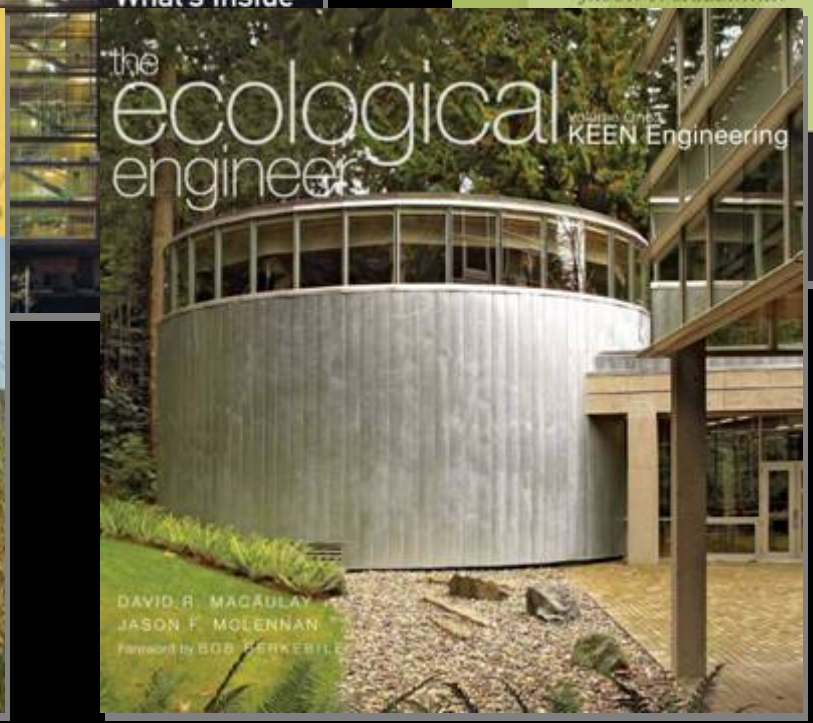
-Buckminster Fuller

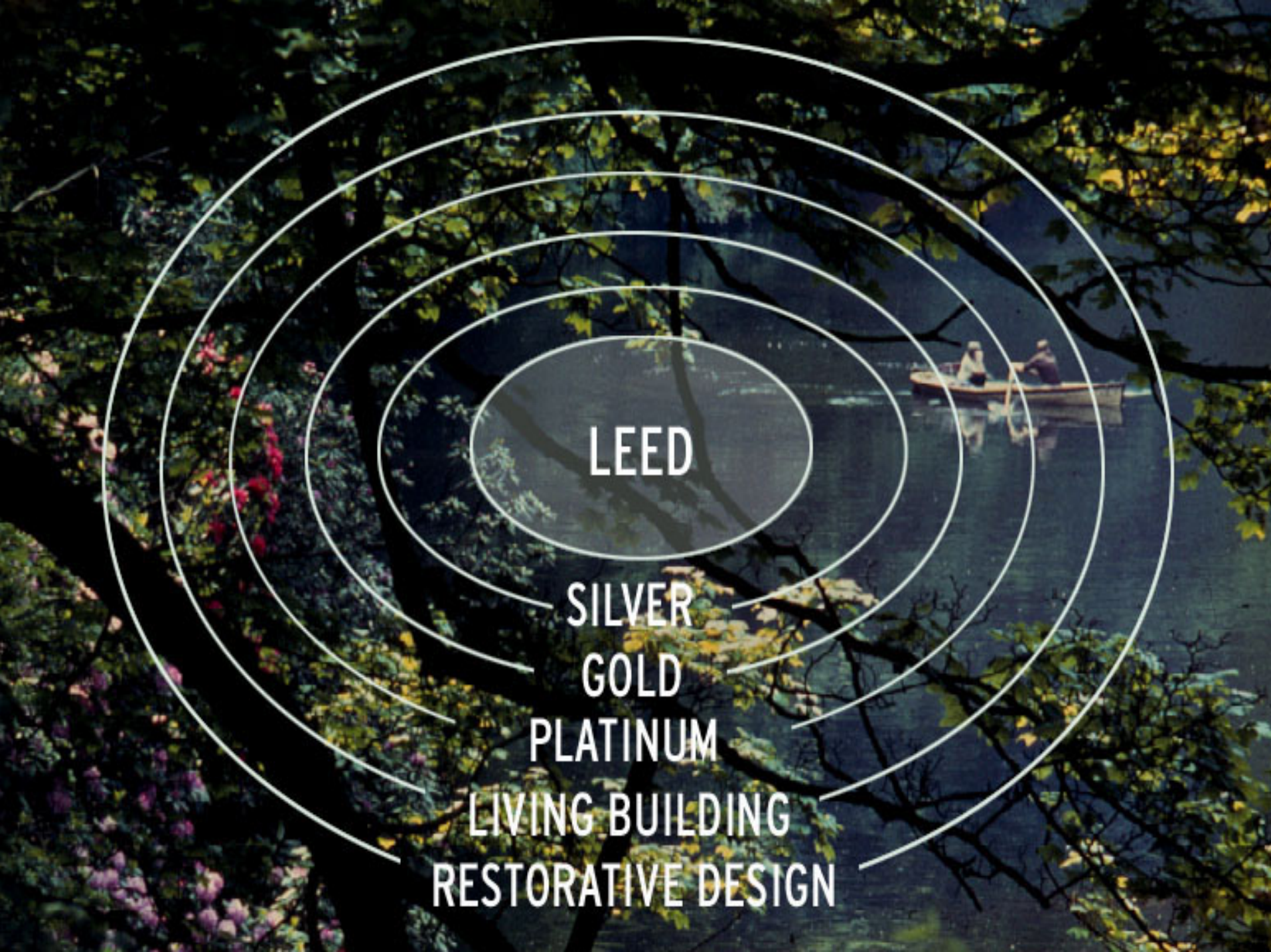

INNOVATION INSPIRED BY NATURE
BIOMIMICRY
Inside the revolutionary new science that is rediscovering life's best ideas—and changing the world
JANINE M. BENYUS

Ecotone Publishing








LEED
SILVER
GOLD
PLATINUM
LIVING BUILDING
RESTORATIVE DESIGN

Building For Sustainability: Sustainability Matrix

Building Form

Energy, Pollution and External Cost to Society

- = 5 Households
- = Energy Consumed by the Building
- = Energy Generated by the Building

Width of Bar = Amount of Energy Required

Height of Bar = % of Energy Obtained from the Grid

- = Carbon Dioxide (tons) - Global Warming
- = Sulfur Dioxide (lbs.) - Acid Rain
- = Nitrogen Dioxide (lbs.) - Smog
- = Particulate Matter < 10 Microns (lbs.) - Air Quality

Schedules

- = Additional Research
- = Design
- = Construction

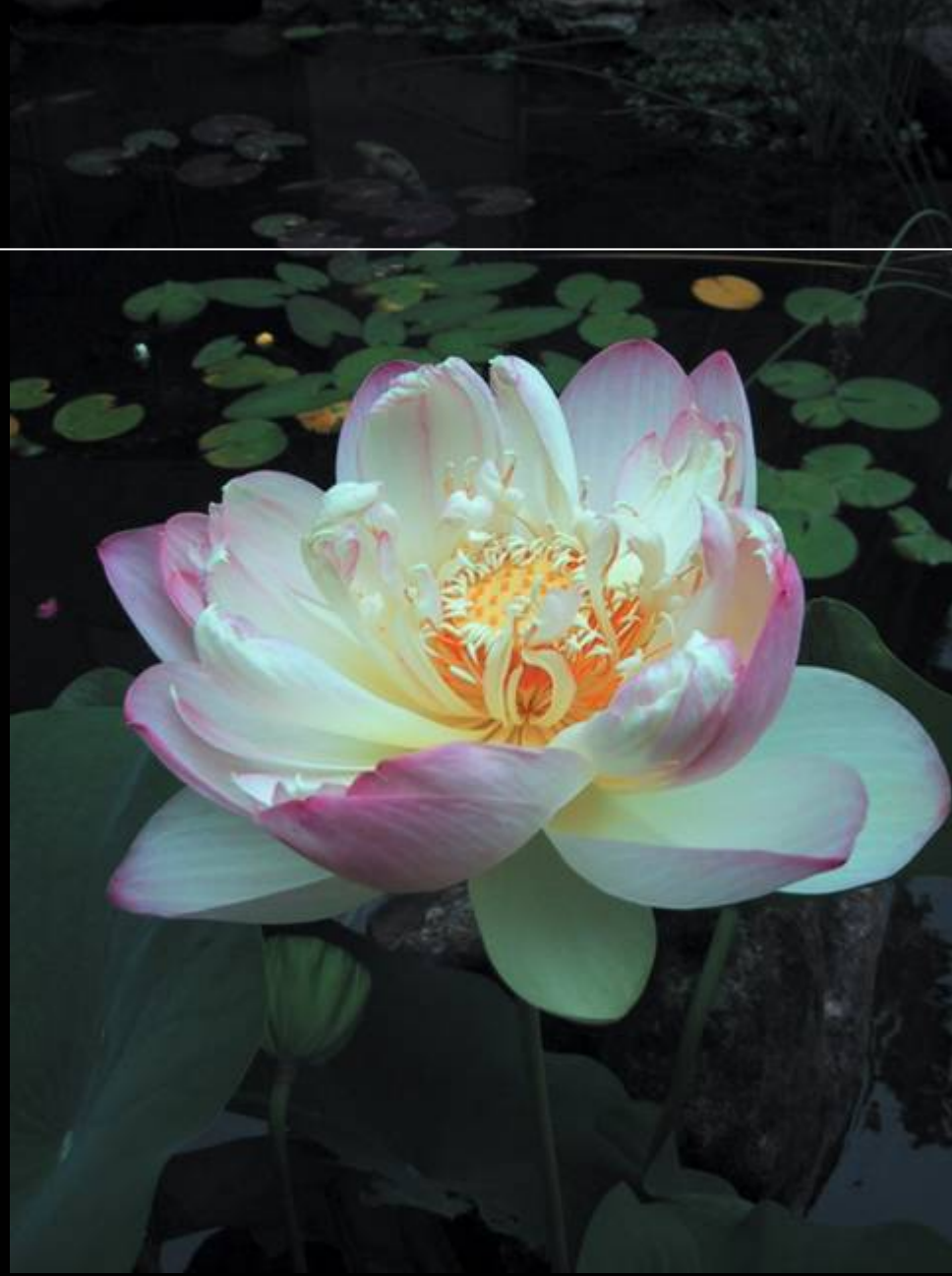
Short and Long Term Costs

All of these figures are based on cost estimates created for each conceptual building model. All costs shown have been adjusted from actual cost estimates to reflect a $10 million Market Building as a baseline. The Net Present Values indicated represent 30-, 60- and 100 year cost models that are based on 5% cost of capital, 1-1/2% inflation rate and 5% annual increase in energy costs.

Living Building	Plan	Wall Section	Energy to Operate Building	Grid Reliance	Pollution from Building Operation (20 yr.)	External Cost to Society (20 yr.)	Schedule	Construction Cost	Furniture, Fixtures and Equipment	Design and Management Fees	Net Present Value	Living Building
LEED™ Platinum			89			$0		$12.9 m	$1.7 m	$2.0 m	$18.7 m (30 Year Model) $19.6 m (60 Year Model) $20.8 m (100 Year Model)	LEED™ Platinum
LEED™ Gold			89			$0.7 m		$12.1 m	$1.6 m	$1.7 m	$18.3 m (30 Year Model) $23.7 m (60 Year Model) $62.2 m (100 Year Model)	LEED™ Gold
LEED™ Silver			150			$1.3 m		$11.5 m	$1.6 m	$1.5 m	$18.5 m (30 Year Model) $27.8 m (60 Year Model) $95.8 m (100 Year Model)	LEED™ Silver
LEED™ Certified			208			$2.0 m		$11.3 m	$1.5 m	$1.5 m	$19.7m (30 Year Model) $36.7 m (60 Year Model) $166.9 m (100 Year Model)	LEED™ Certified
Market			250			$2.5 m		$10.1 m	$1.4 m	$1.3 m	$19.6m (30 Year Model) $45.3 m (60 Year Model) $218.4 m (100 Year Model)	Market
			461			$3.2 m		$10.0 m	$1.3 m	$1.3 m	$22.7 m (30 Year Model) $62.9 m (60 Year Model) $348.9 m (100 Year Model)	

The Living Building

- Harvest all its own energy and water
- Adapted to climate and site
- Operates pollution free
- Promotes health and well-being
- Comprised of Integrated Systems
- Is Beautiful



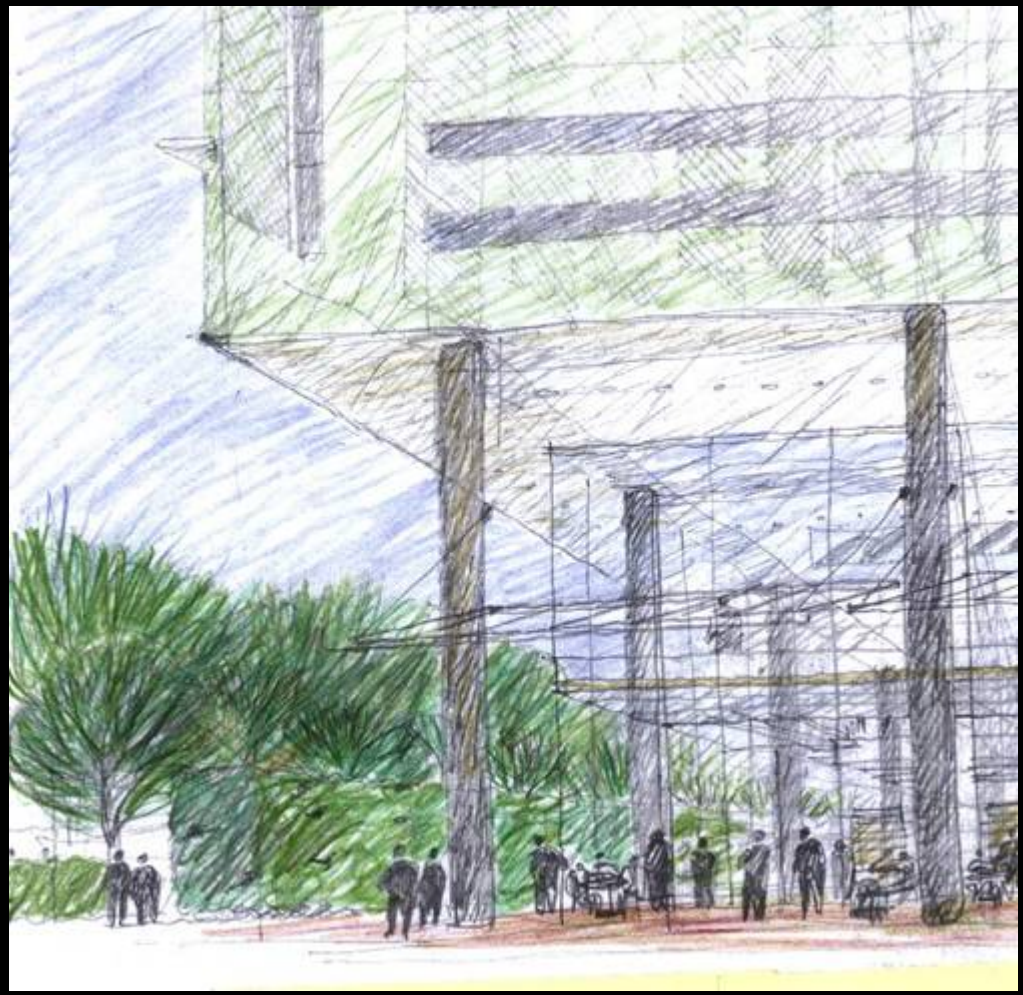
Unlike the Packard Foundation, institutions commonly separate capital funding from operations, which frequently results in increased operating costs and reduced performance (including human health and productivity, flexibility, and durability).

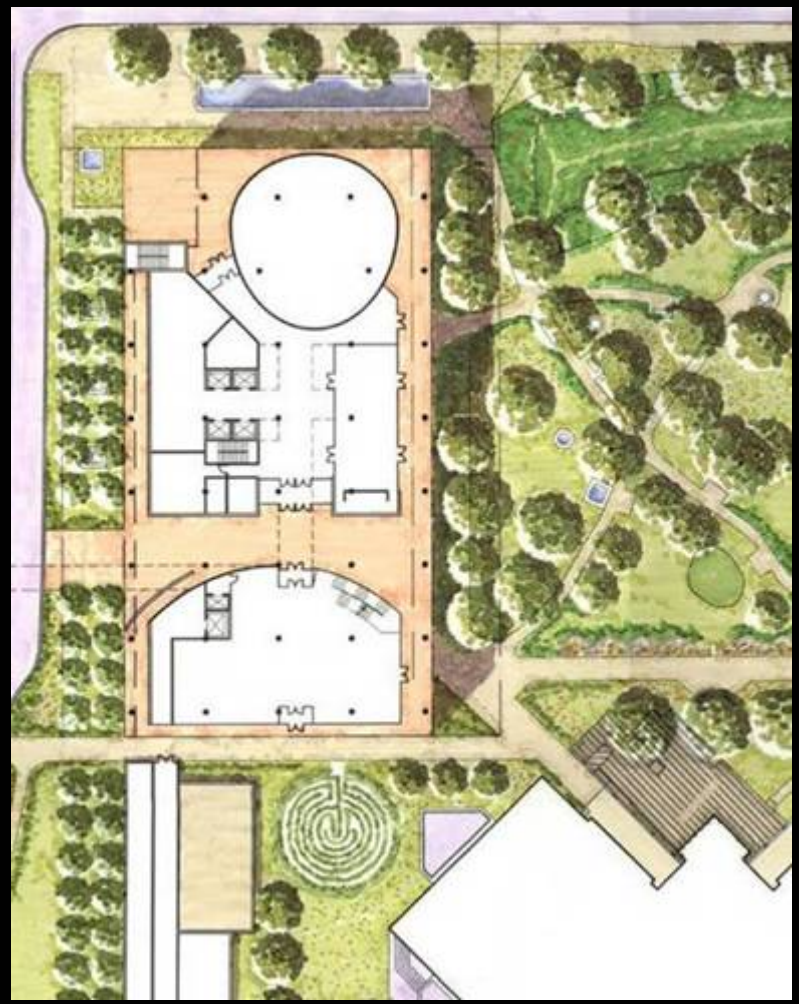
Daylighting and Student Performance

Daylighting, Windows, Skylights

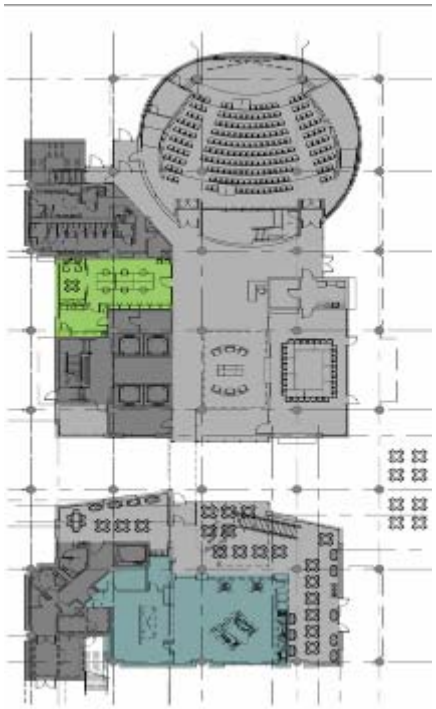
- 15-25% faster progress on math and reading tests
- 7-18% higher test scores

Ref:
Heschong Mahone Group, "Daylighting in Schools: An Investigation into the Relationship Between Daylight and Human Performance," 1999. Available at: http://www.h-m-g.com; Follow u
p studies verified the rigor of analysis and subsequent research continues to show positive correlation between daylighting and student performance.





breezeway: park connection

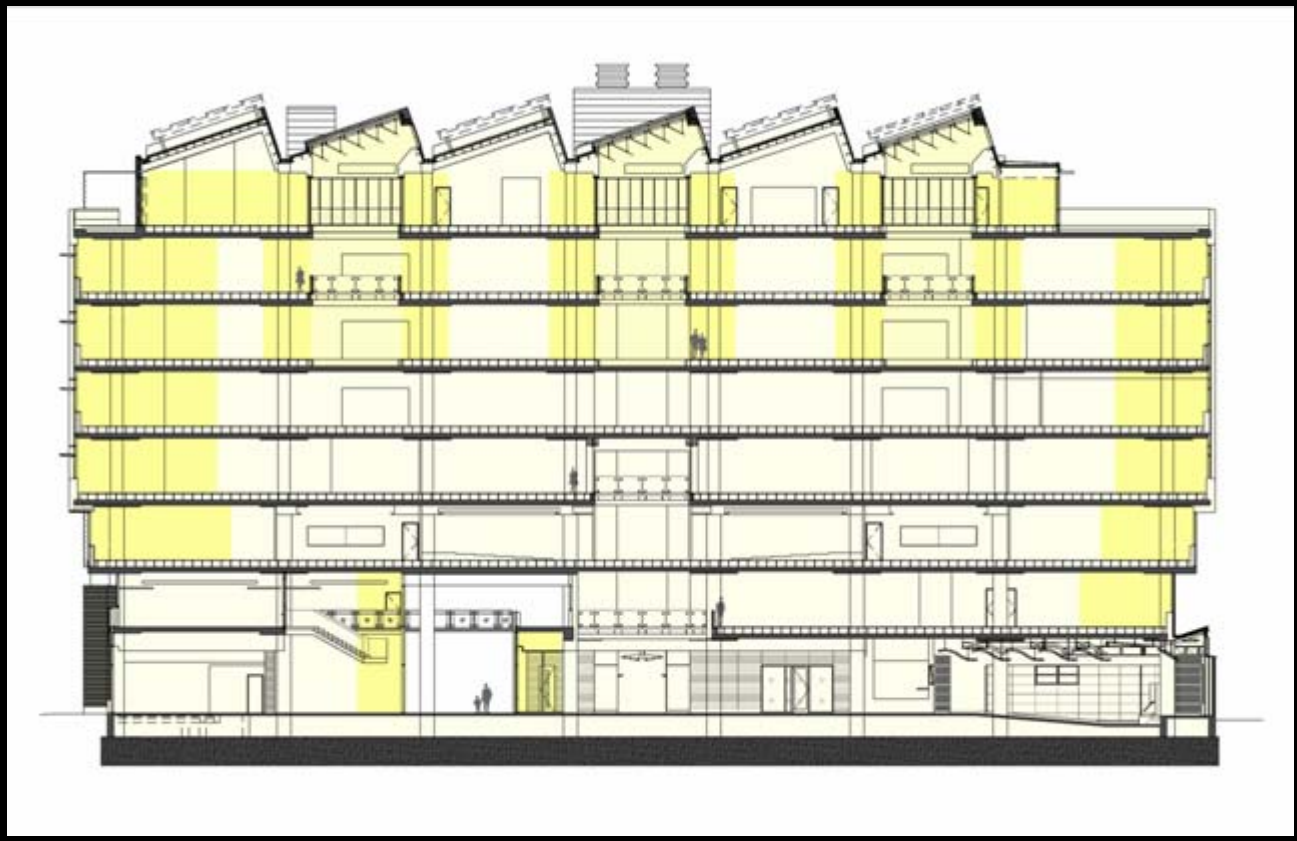


First Floor

Second Floor

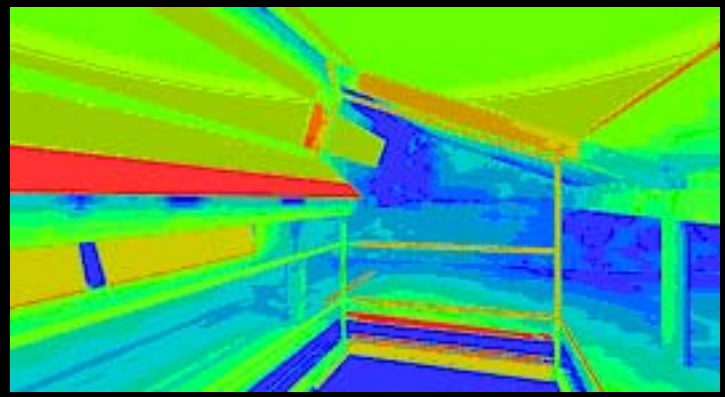
Third Floor

Plan



section from east showing daylit areas

Shading Control



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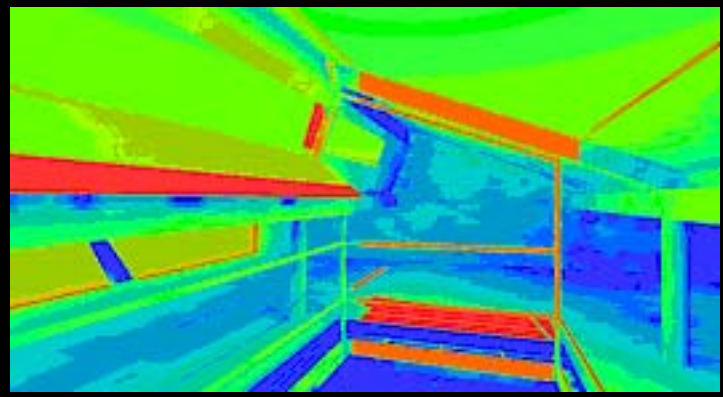

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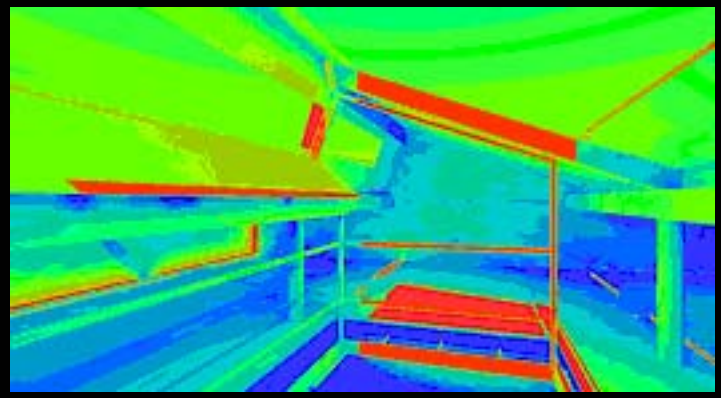

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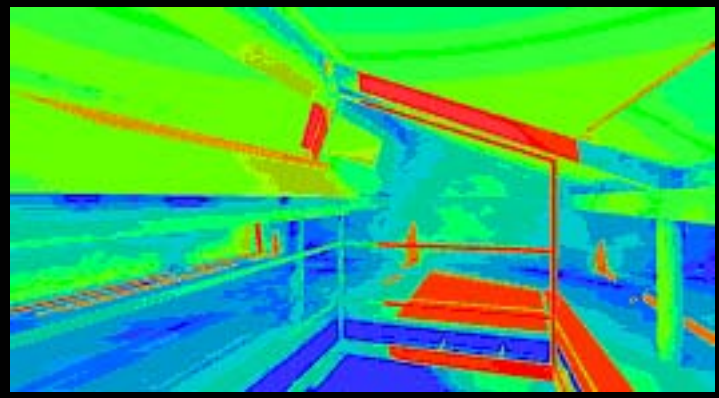
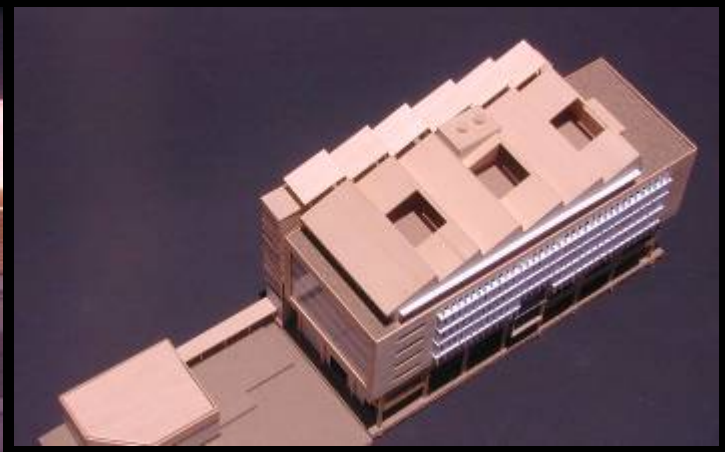
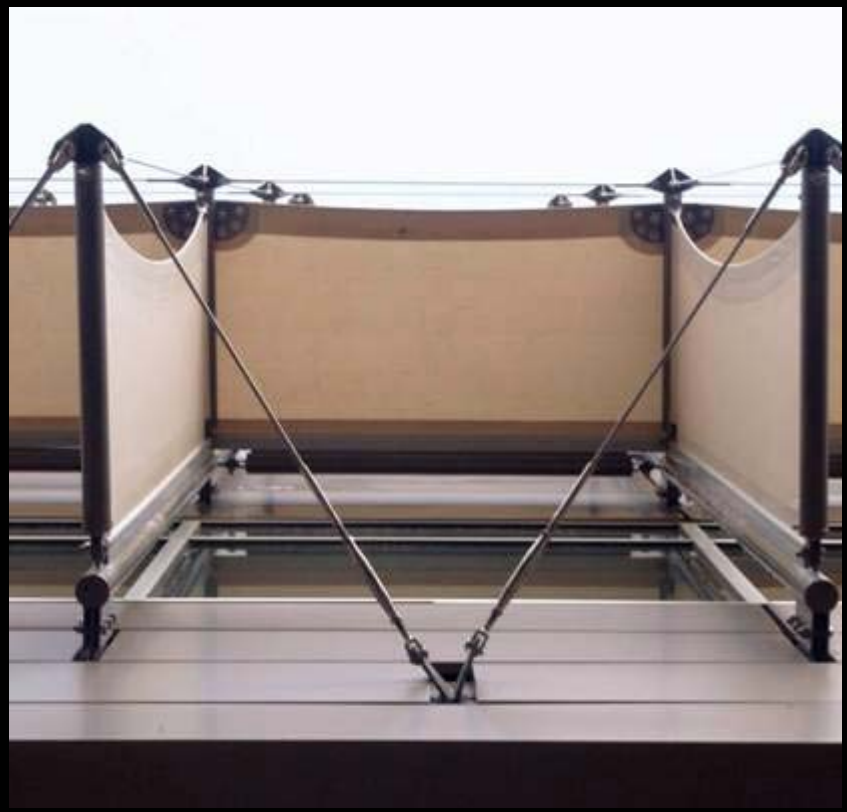


4 PM

Sun-patch dynamics; Houston, Summer – clear sky

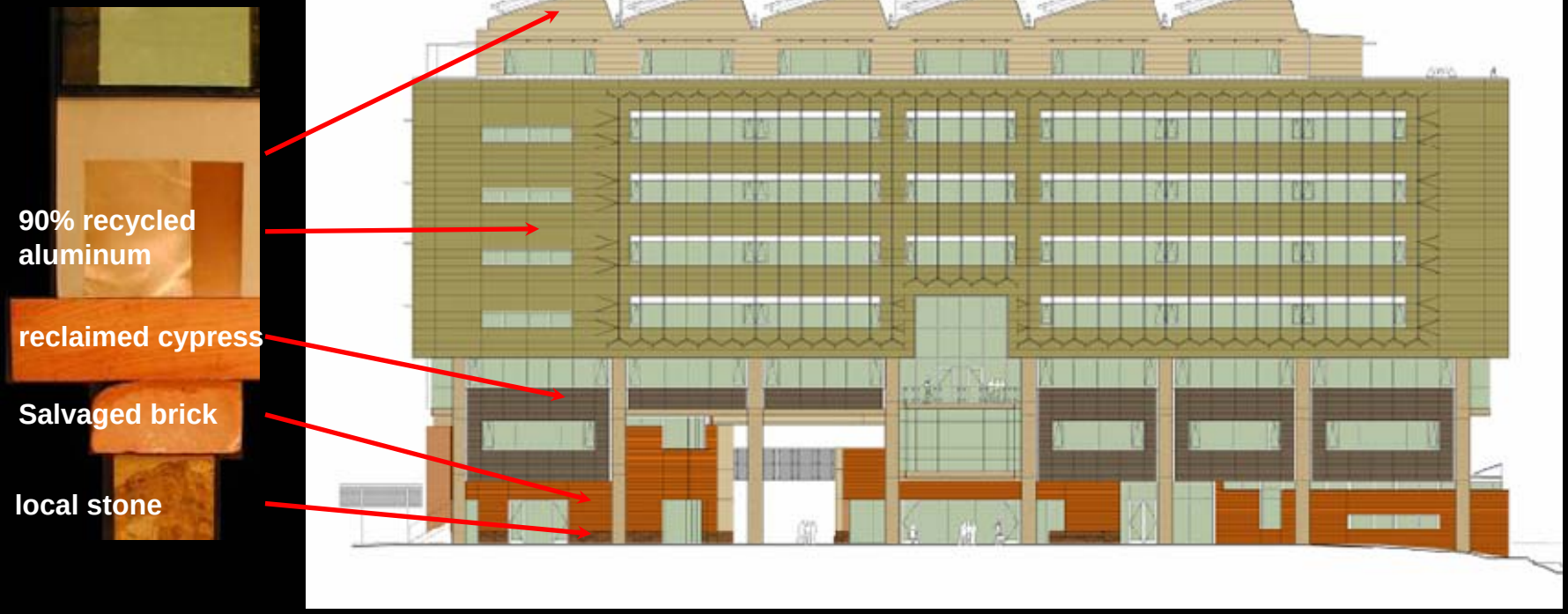





SCHOOL OF

- Improved thermal performance
- Reduction in sound transmission
- Extended life of roof membrane
- Fire resistance
- Low maintenance needs, often with little or no irrigation requirements

- Attractive visual features
- May provide additional outdoor usable space
- Improved rainwater management
- Improvement of air quality
- Reduction of the 'urban heat island effect
- Creation of habitat



east elevation

Economic Impact

SCHOOL OF NURSING AND STUDENT COMMUNITY CENTER

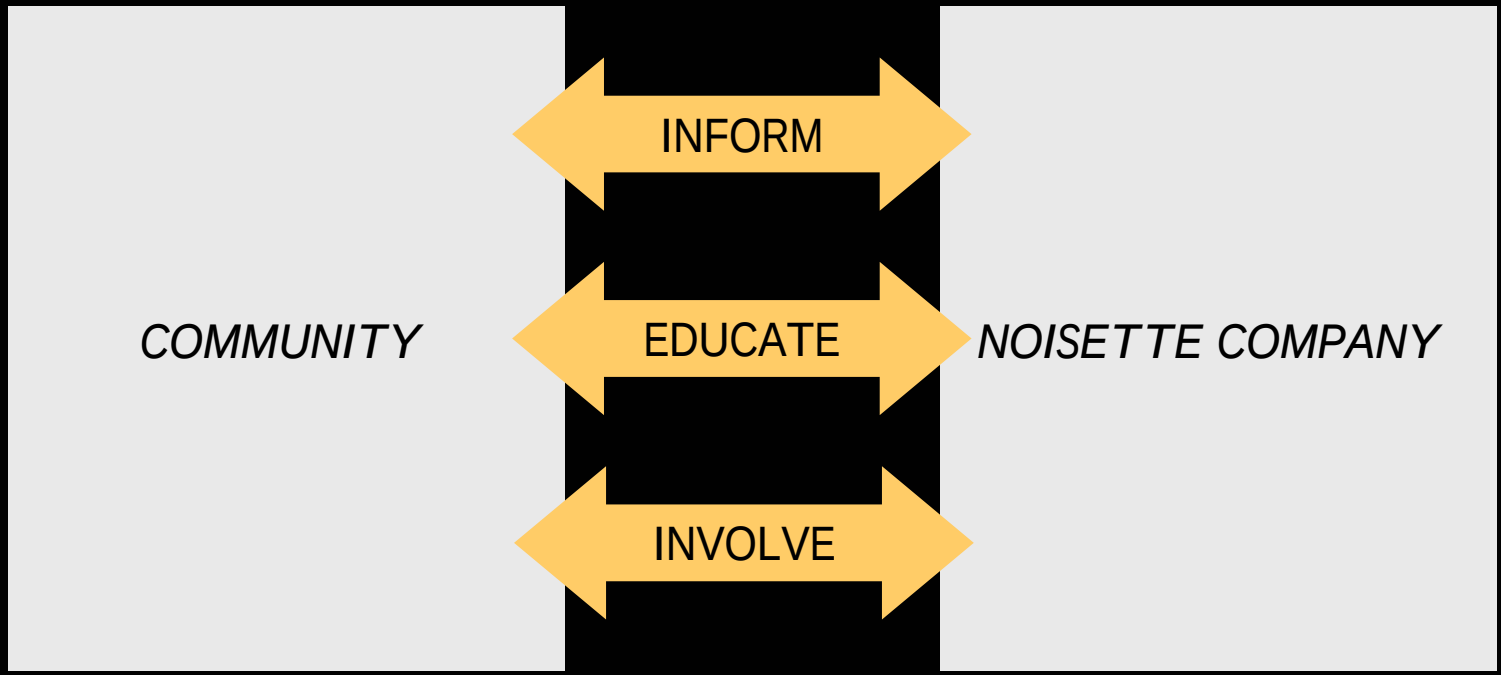
		HARRIS COUNTY	TEXAS	UNITED STATES OF AMERICA
BASELINE	OUTPUT TOTAL VALUE OF PRODUCTS SHIPPED	20.1 M	3.6 M	9.1 M
	JOBS FULL TIME EQUIVALENT	196.07 JOBS	44.48	67.1
	INCOME	6.8 M	.87 M	3.04 M
FINAL DESIGN	OUTPUT TOTAL VALUE OF PRODUCTS SHIPPED	25.39 M	1.16 M	11.4 M
	JOBS FULL TIME EQUIVALENT	212.67 JOBS	26.59	77.81
	INCOME	7.96 M	.4 M	3.82 M

NORTH CHARLESTON REDEVELOPMENT | BNIM + BHKR


people
prosperity
planet

Community Involvement

PURPOSE: Partner the wisdom of the community with the expertise of the development team to emerge the best solutions.



Noisette Briefings
Treasures Process

Neighborhood Meetings
Crayons in the Hands

Community-Based Planning Process

Create a socially durable community by informing, educating, and involving the citizens.

Four Step Process:

-Get to know

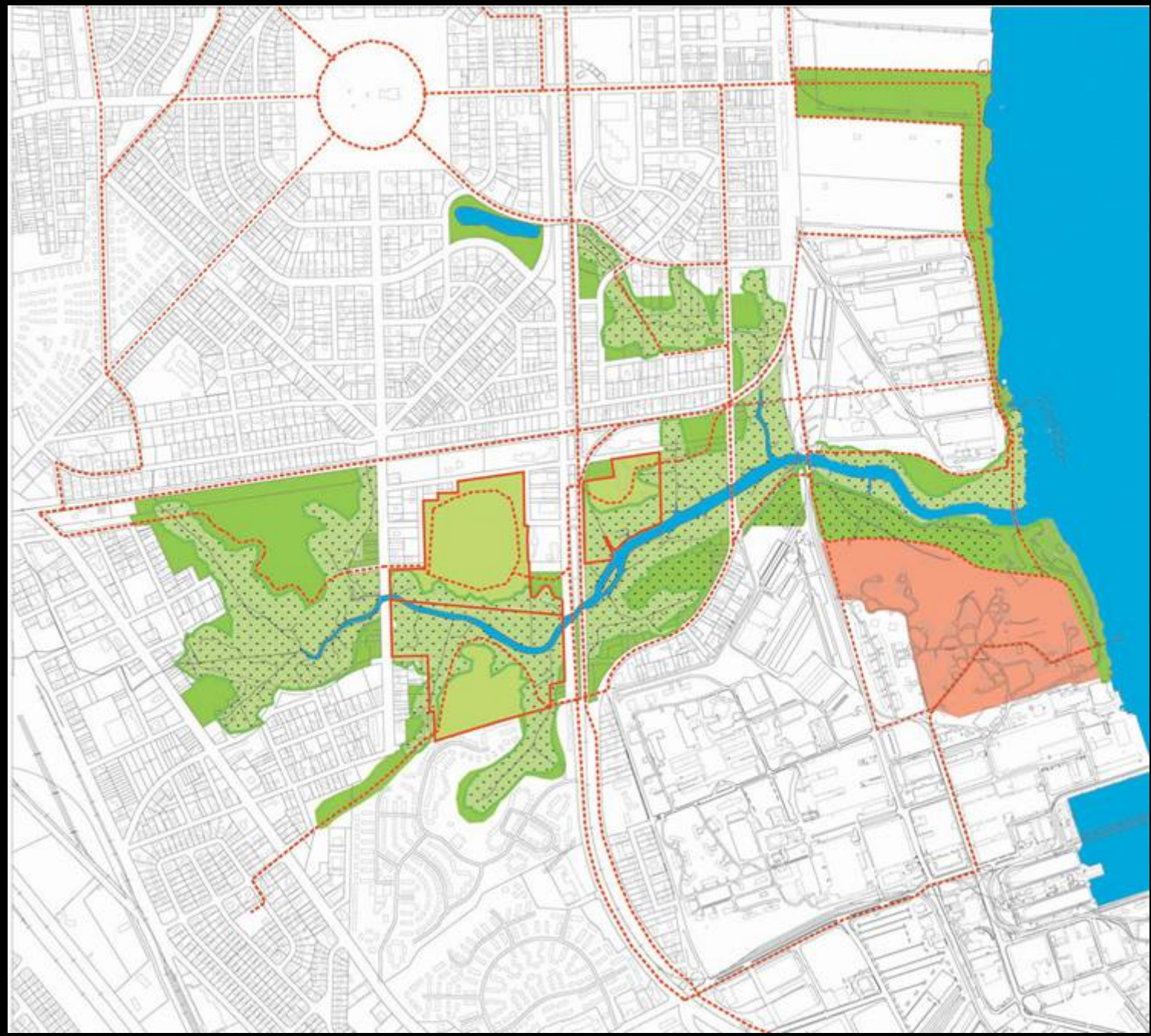
-Eat and Greet

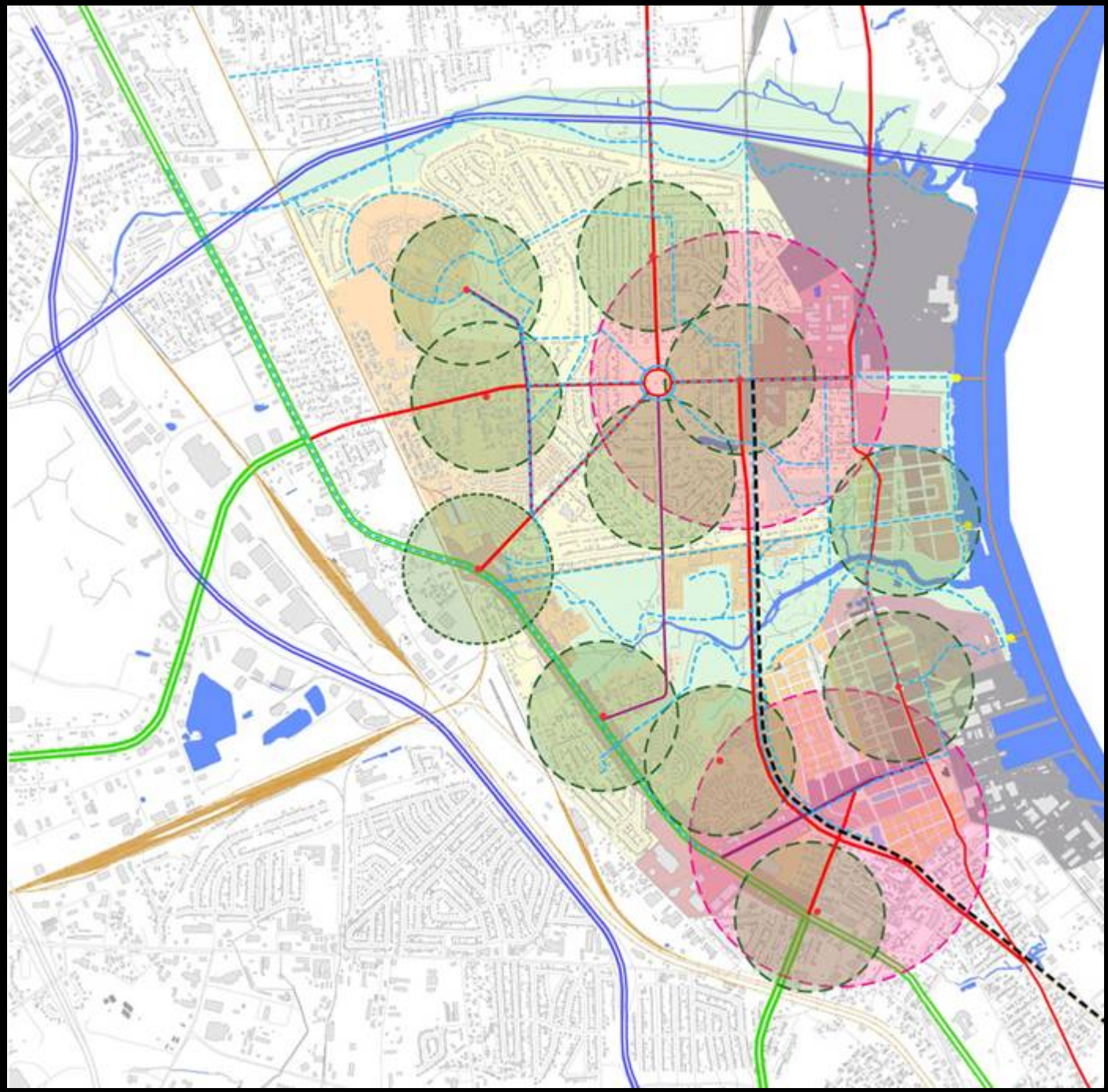
-Treasures

-Crayons in the hand

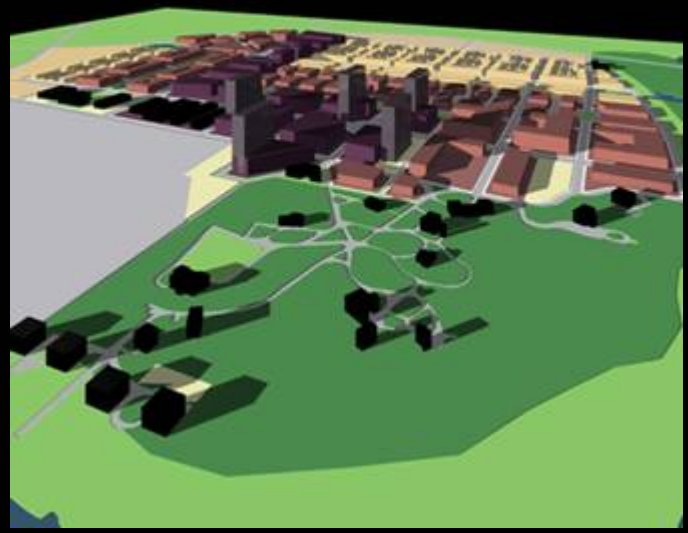
Master Plan Process

- A vision, not a plan – developer as integrator
- Creating the Noisette brand
- Role of developer as planner/zoning/community organizer/ economic development/ educator
- Establishing the self-worth of the community





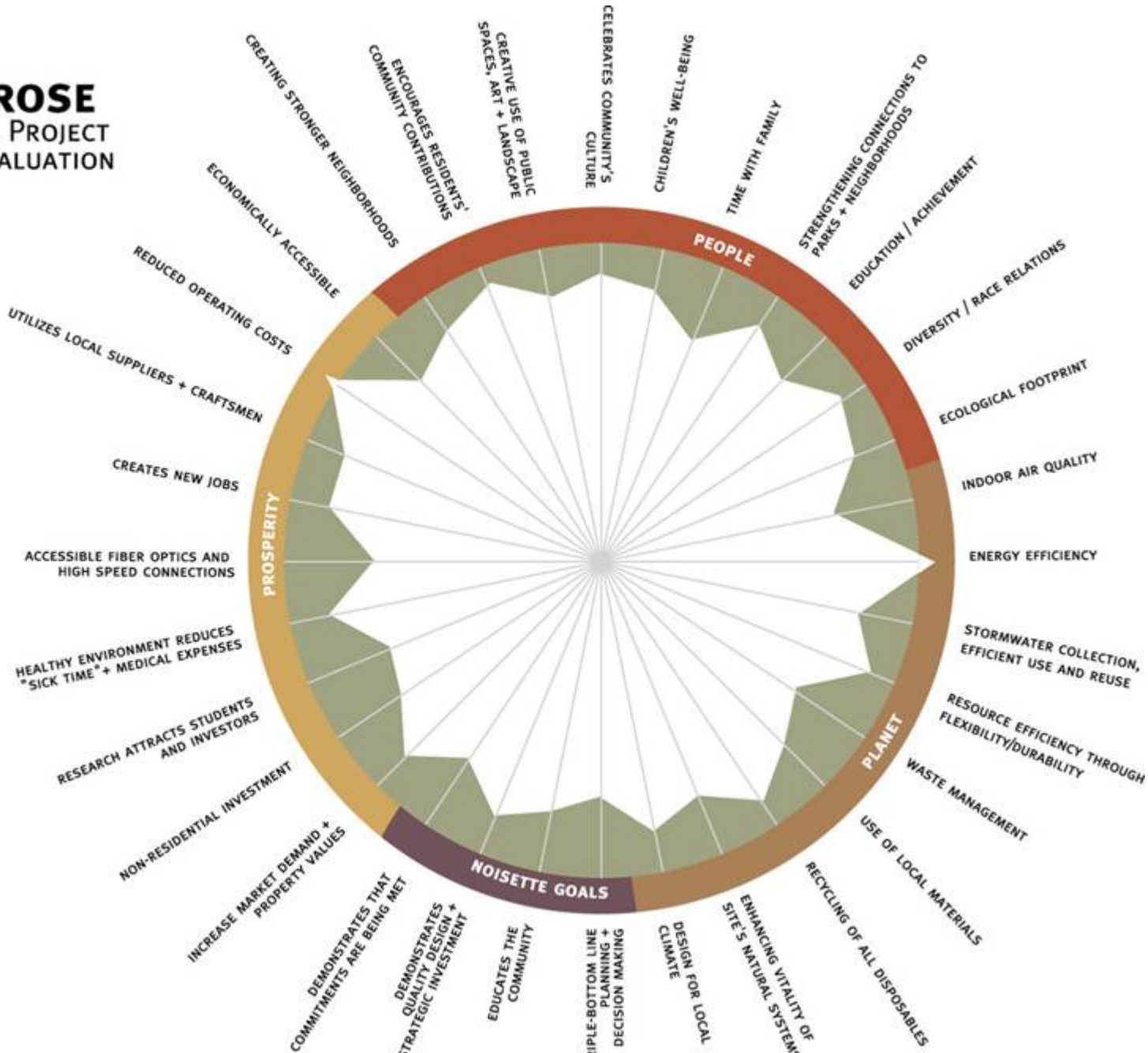

T1
C5
SOO
C5



Noisette Offices

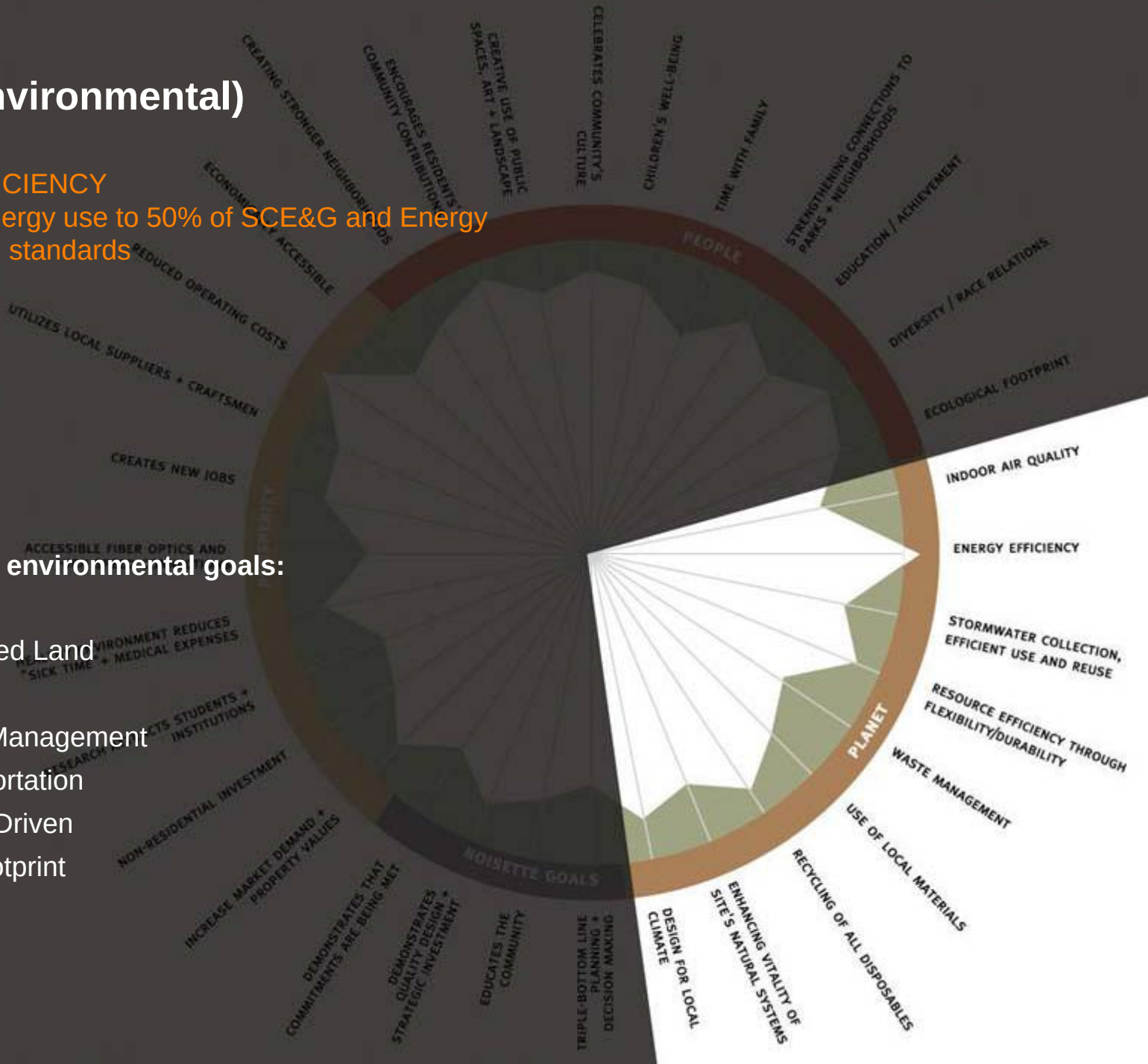
NOISETTE ROSE

EXAMPLE SCHOOL PROJECT
HYPOTHETICAL EVALUATION



Planet (environmental)

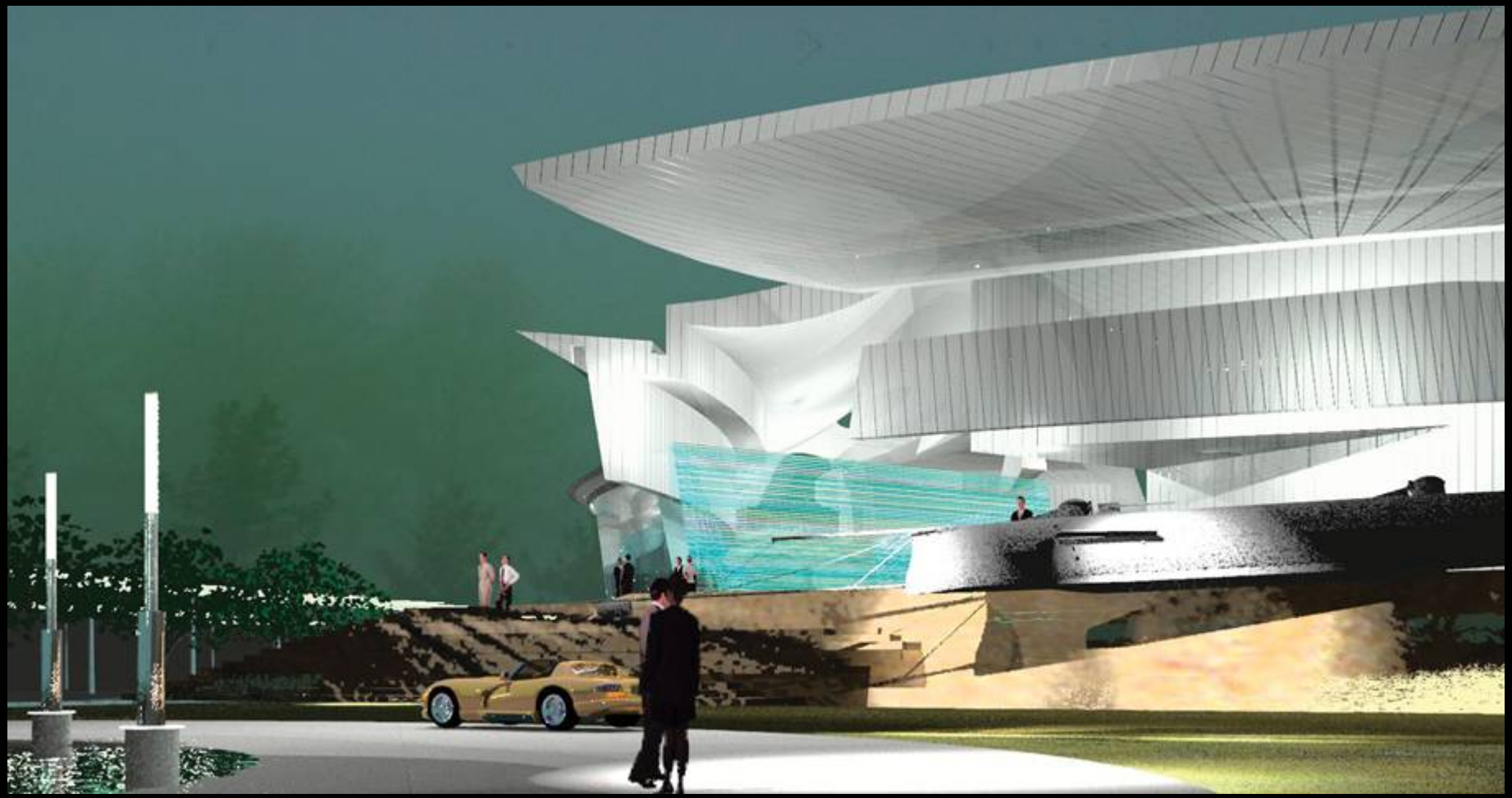
ENERGY EFFICIENCY
Goal to limit energy use to 50% of SCE&G and Energy Star residential standards

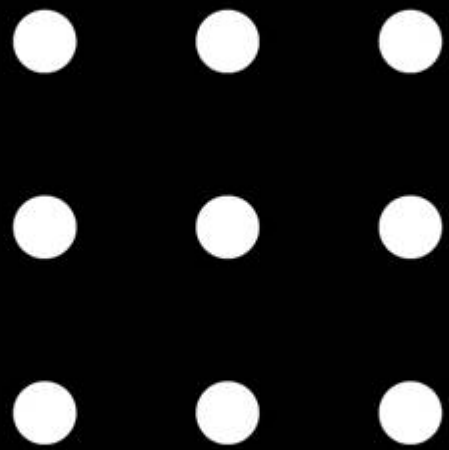


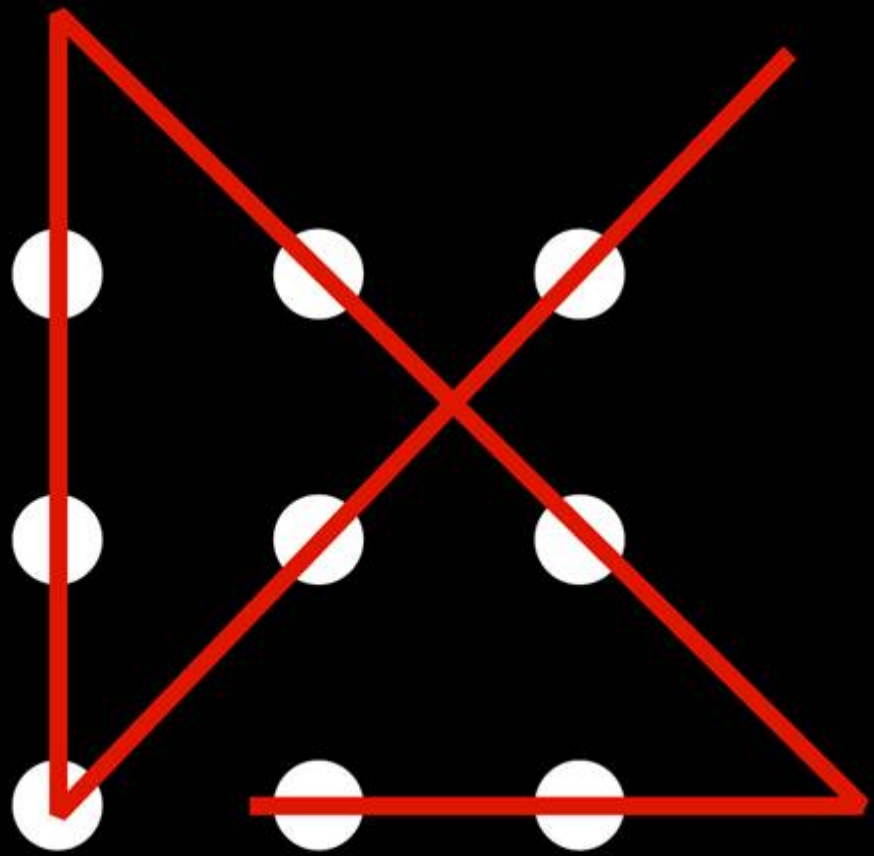
Other possible environmental goals:

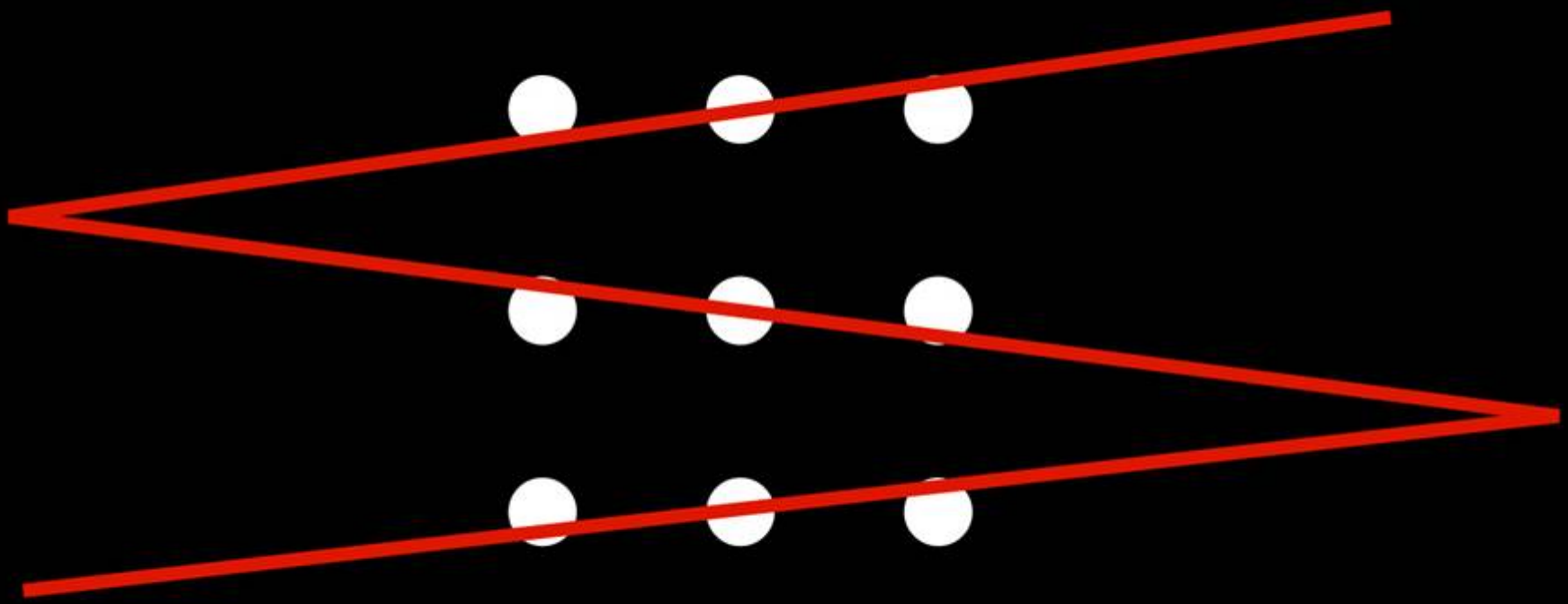
- Air Quality
- Underdeveloped Land
- Water Quality
- Storm Water Management
- Public Transportation
- Vehicle Miles Driven
- Ecological Footprint

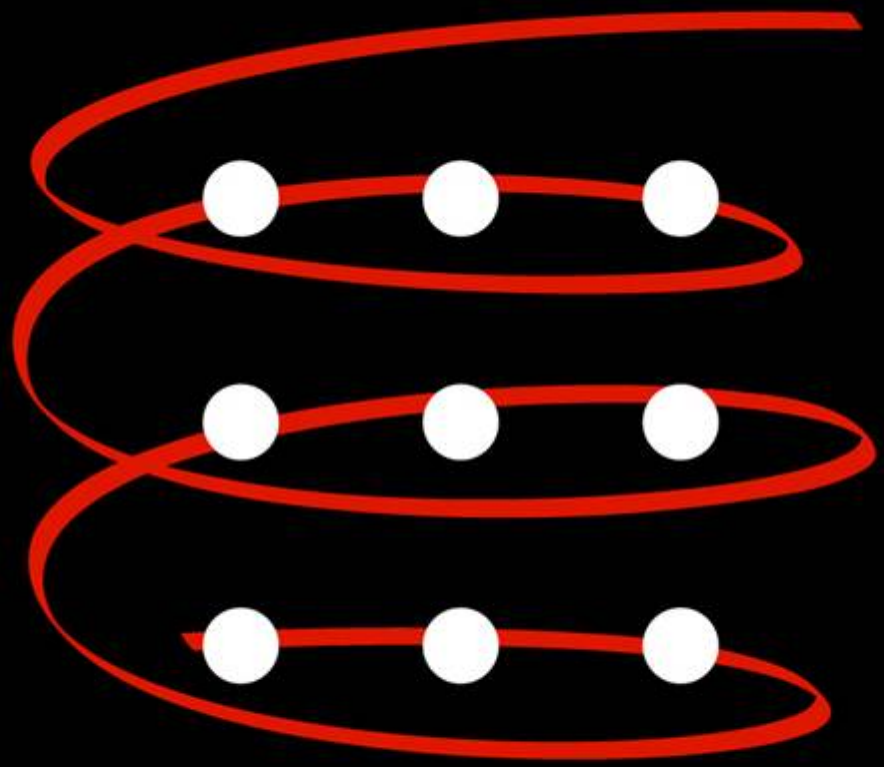
North Charleston Point Pavilion

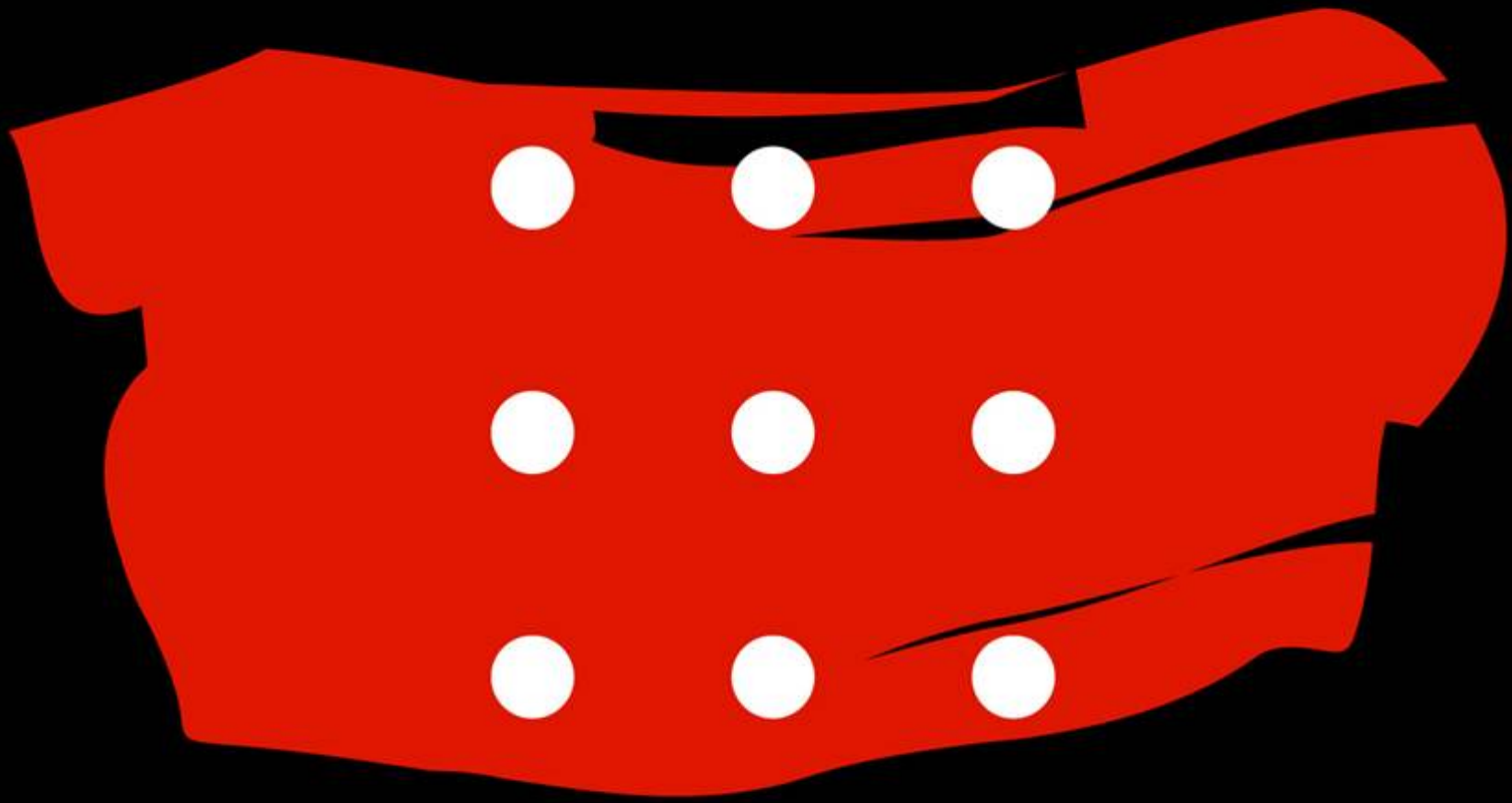










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