

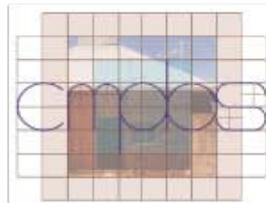
# GREEN BUILDING FUTURE OR PAST

PLINY FISK III

CO-DIRECTOR

CENTER FOR MAXIMUM POTENTIAL BUILDING SYSTEMS

AUSTIN TEXAS



## DESIGN

Flexible Open Building Systems  
Incorporating Life Cycle Design

Internationally recognized green architecture  
Greenhouse gas-balanced design  
Prototype building systems  
Healthy building design and specifications



Blueprint  
Demonstration Farm  
Laredo, TX



Advanced Green  
Builder Demonstration  
Austin, TX



2007 Solar Decathlon  
Texas A&M University



GroJoint™  
CMPBS Farmstand  
Austin, TX

## MASTER PLANNING

Ecologically-Balanced Land Use  
Master Planning

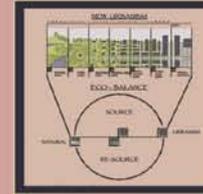
Nature centers & camps  
Community-supported architecture  
Educational facilities  
Integrated landscape/infrastructure systems



School for Field Studies  
Baja Del Sur, Mexico



CMPBS 30th Year  
Master Plan  
Austin, TX



Verano Development  
San Antonio, TX



Community Supported  
Architecture  
Mississippi

## POLICY & EDUCATION

Sustainable Guidelines, Training  
& Policy Initiatives

Intern program  
Green building programs and guidelines  
Life cycle planning procedures  
Professional development training seminars  
Environmentally preferred materials and methods  
Green health care initiatives



Green Guide for  
Health Care



Green Building Guidelines;  
Mueller Green Resources Guide  
Austin, TX



Professional Training,  
Conference Seminars,  
and Workshops  
Image copyright Bill Ravanesi



Guidebooks, Manuals,  
Publications

## TOOLS

Environmental/Economic Impact  
Baselining and Benchmarking  
Life Cycle Evaluation

BaselineGreen™  
GreenBalance™  
Materials library and assessment  
LEED® and sustainability consulting



Block 21  
Austin, TX



LEED® Consulting  
Image: Dell Children's Medical Center of  
Central Texas, courtesy of Kartsberger Companies



Materials and Building  
Systems Library



EcoBalance™ Game

# BUILDING FOR THE FUTURE

( A BEYOND LEED PROPOSITION )

PLINY FISK III  
CMPBS AUSTIN TEXAS

- Need to understand the how the future is near
- Need for buildings to become part of owners economic reality
- Need to move from linear checklists to balanced cycles
- Need to retrofit existing cites at a meta level by leveraging possibilities



## Declared Disasters by Year or State

By Year:

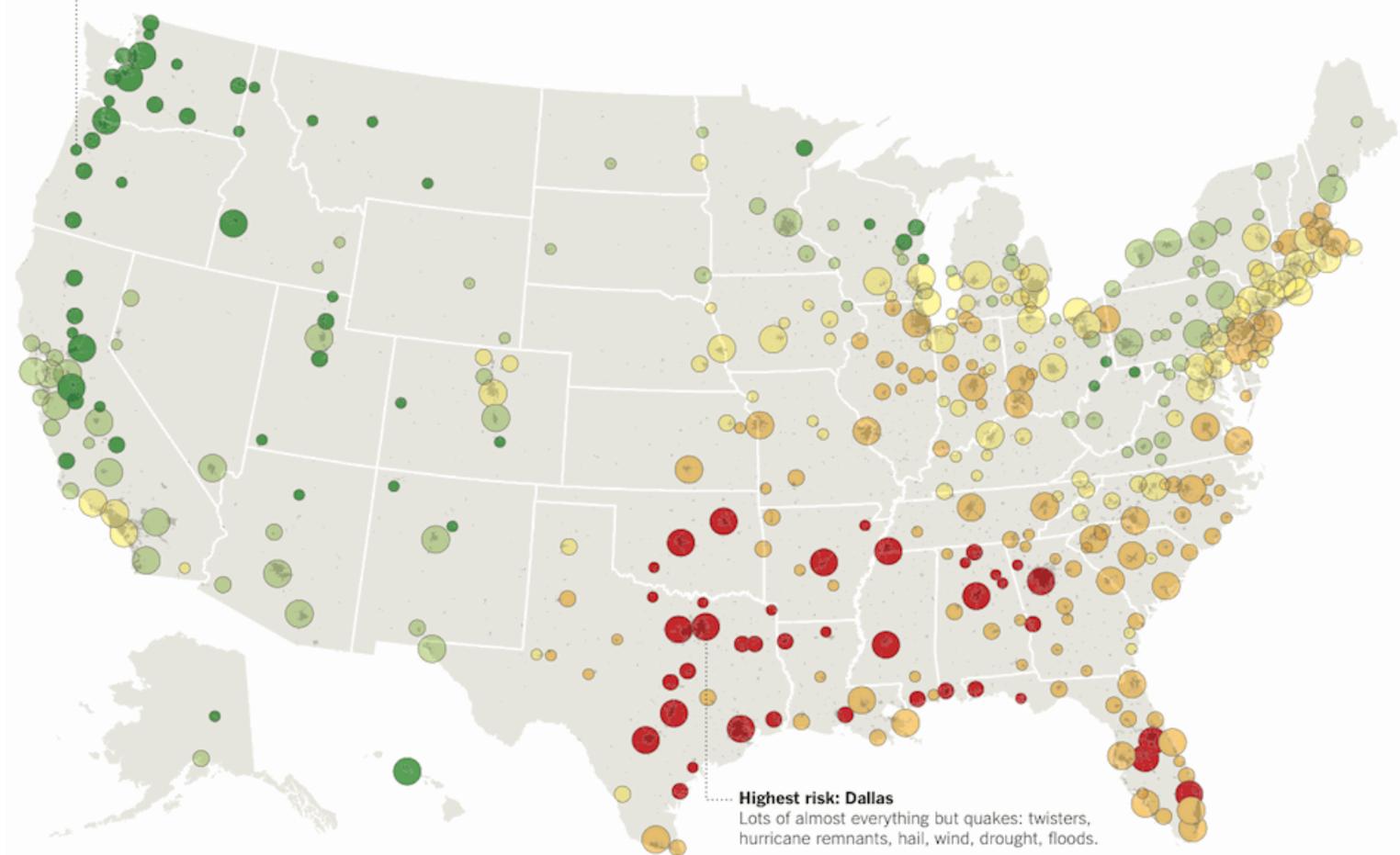
YEAR	NUMBER OF DISASTER DECLARATIONS
<a href="#">2011</a>	93
<a href="#">2010</a>	81
<a href="#">2009</a>	59
<a href="#">2008</a>	75
<a href="#">2007</a>	63
<a href="#">2006</a>	52
<a href="#">2005</a>	48
<a href="#">2004</a>	69
<a href="#">2003</a>	56
<a href="#">2002</a>	49

By State:

	STATE	NUMBER OF DISASTER DECLARED
1	<a href="#">Texas</a>	86
2	<a href="#">California</a>	78
3	<a href="#">Oklahoma</a>	70
4	<a href="#">New York</a>	65
5	<a href="#">Florida</a>	63
6	<a href="#">Louisiana</a>	58
7	<a href="#">Kentucky</a>	55
8	<a href="#">Alabama</a>	55
9	<a href="#">Missouri</a>	53
10	<a href="#">Arkansas</a>	53

Natural hazards included in this analysis are hurricane, tornado, earthquake, flooding, drought, hail and other extreme weather.

**Lowest risk: Corvallis, Ore.** Small quake and drought risk; little extreme weather.



**Highest risk: Dallas**  
Lots of almost everything but quakes: twisters, hurricane remnants, hail, wind, drought, floods.

**Metro area population**  
○ Less than 175,000  
○ 175,000 to 500,000  
○ More than 500,000

**Scale of hazards**  
Lower → Higher  
● ● ● ● ●

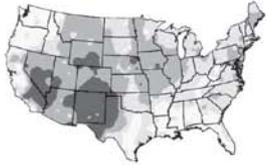
- Metro areas with lowest risk:**
1. Corvallis, Ore.
  2. Mt. Vernon-Anacortes, Wash.
  3. Bellingham, Wash.
  4. Wenatchee, Wash.
  5. Grand Junction, Colo.
  6. Spokane, Wash.
  7. Salem, Ore.
  8. Seattle

- Highest risk:**
1. Dallas-Plano-Irving, Tex.
  2. Jonesboro, Ark.
  3. Corpus Christi, Tex.
  4. Houston
  5. Beaumont-Port Arthur, Tex.
  6. Shreveport, La.
  7. Austin, Tex.
  8. Birmingham, Ala.

**T  
E  
X  
A  
S**

# HAZARD MAPS

FIRE RISK



HURRICANE RISK



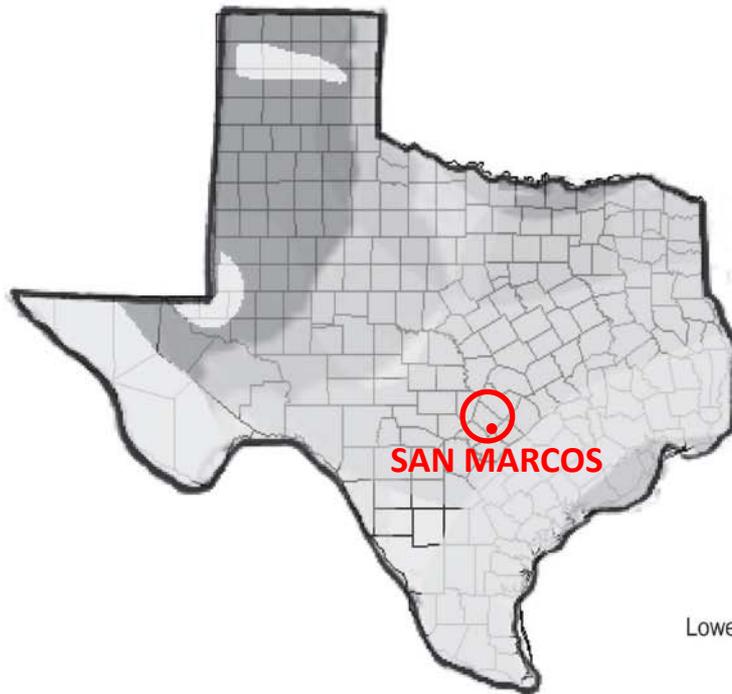
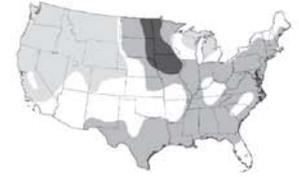
EARTHQUAKE RISK



TORNADO RISK



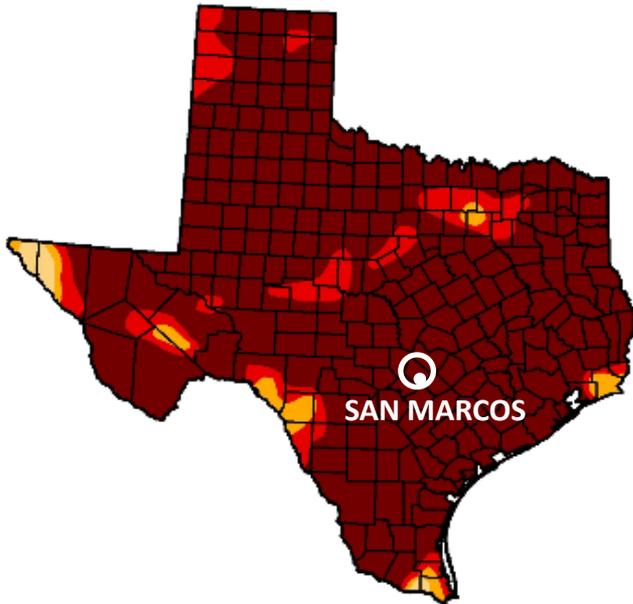
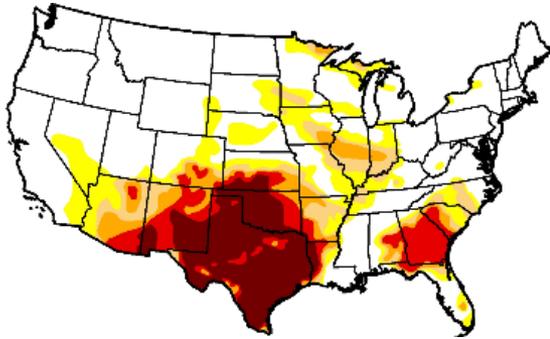
FLOOD RISK



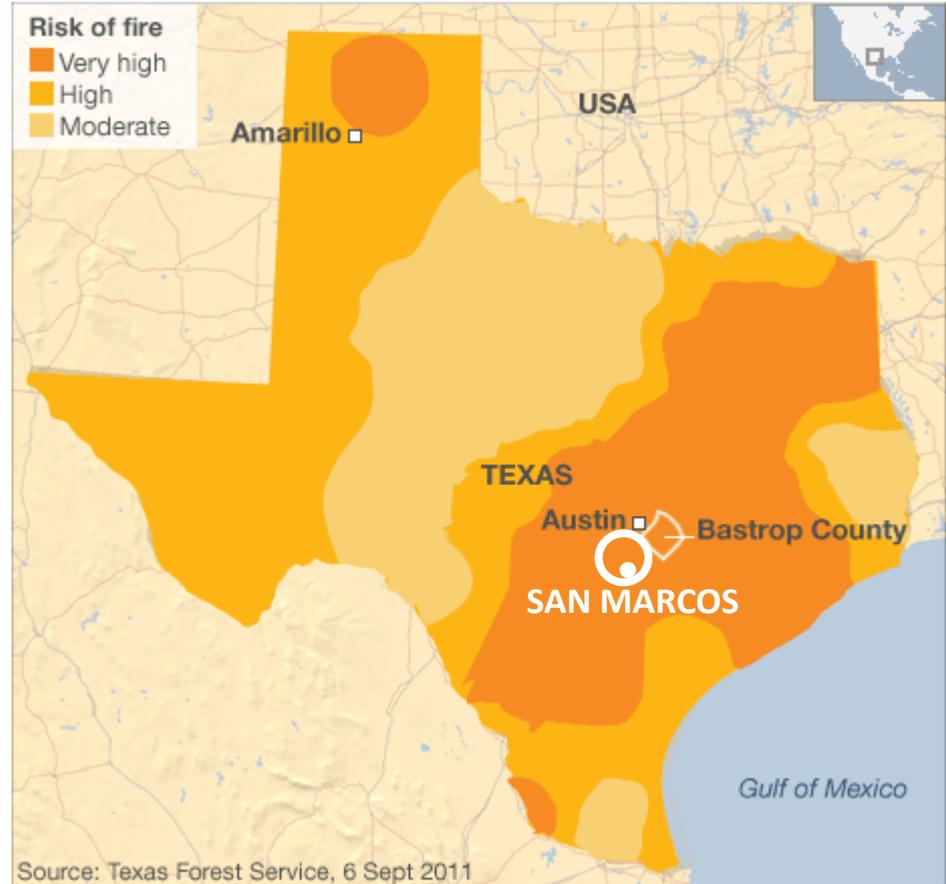
**SAN MARCOS**

Lower  Higher

# Drought Severity and Forecast Fire Danger Map- September 2011



## Forecast of areas at risk of fire

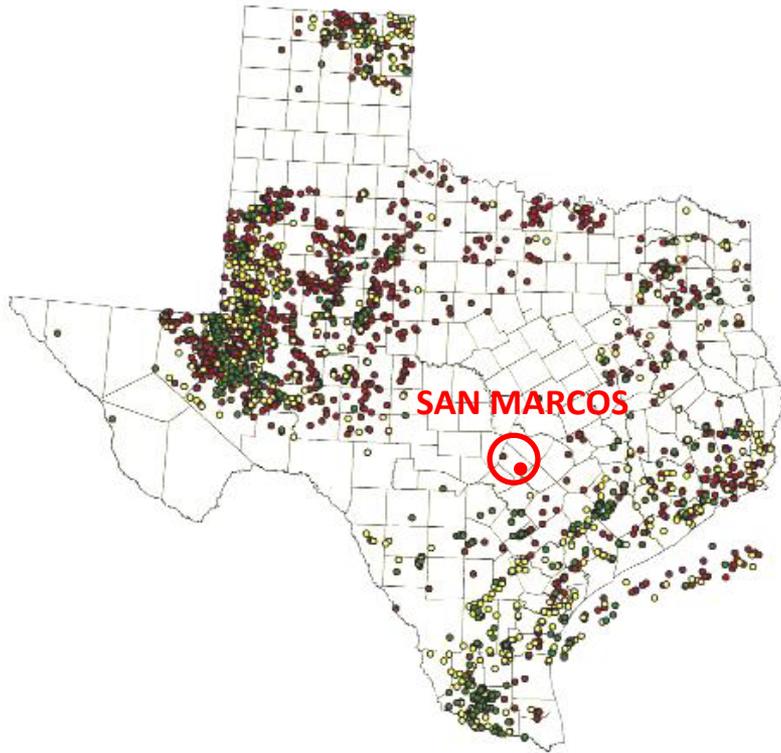


## Drought Severity



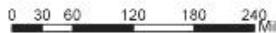
# ECOLOGICAL RESTORATION MAP

## Brine Water

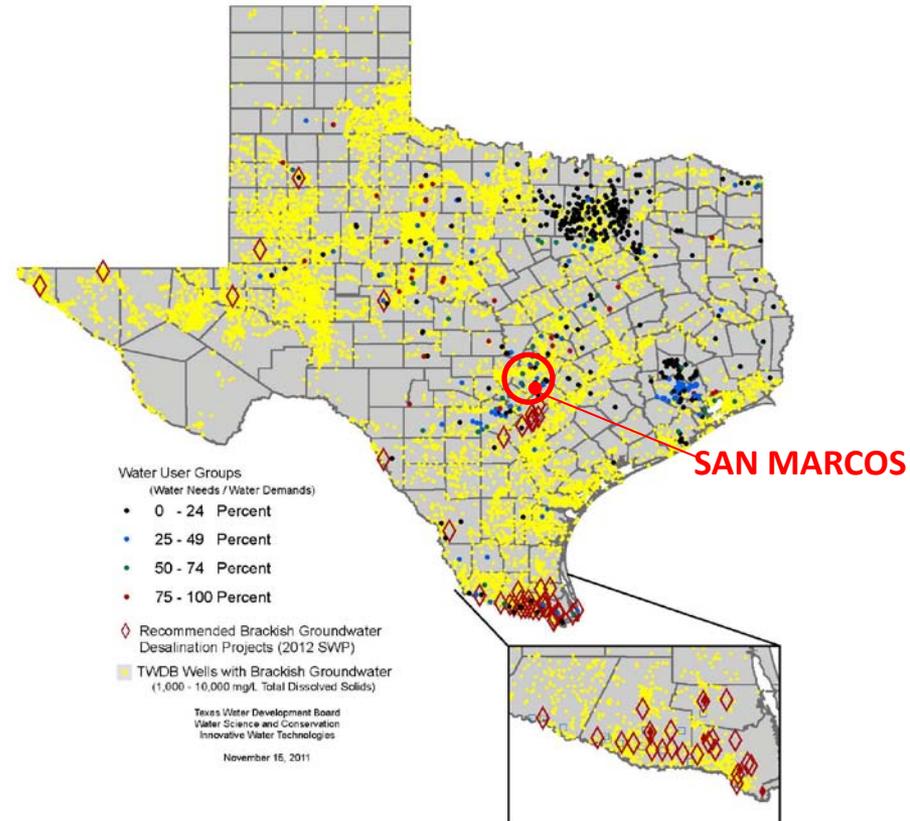


### Legend

- Total Dissolved Solids < 10,000 ppm
- Total Dissolved Solids between 10,000 and 50,000 ppm
- Total Dissolved Solids > 50,000 ppm



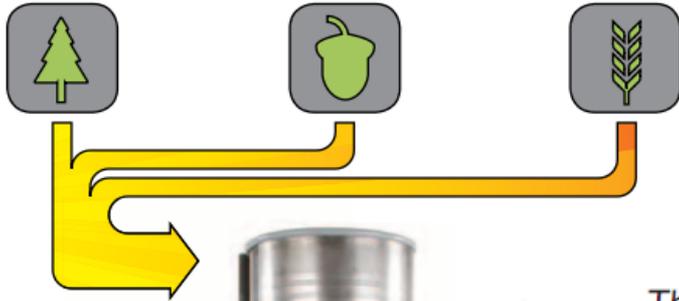
## Brackish Ground Water Sources



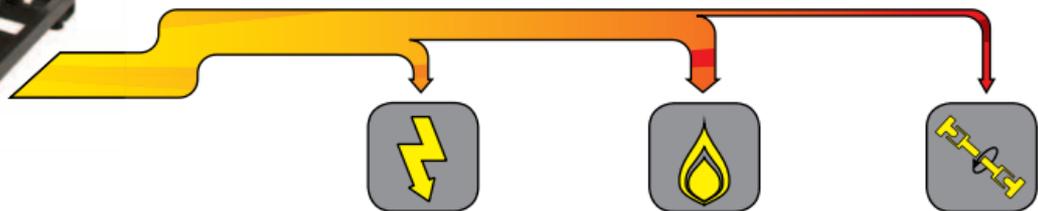
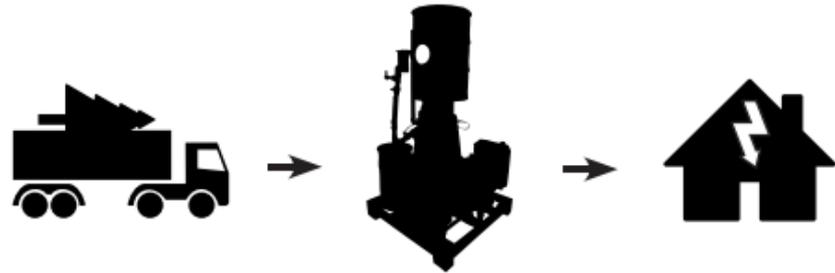


**ALL POWER LABS**  
PERSONAL SCALE POWER

Woody Biomass

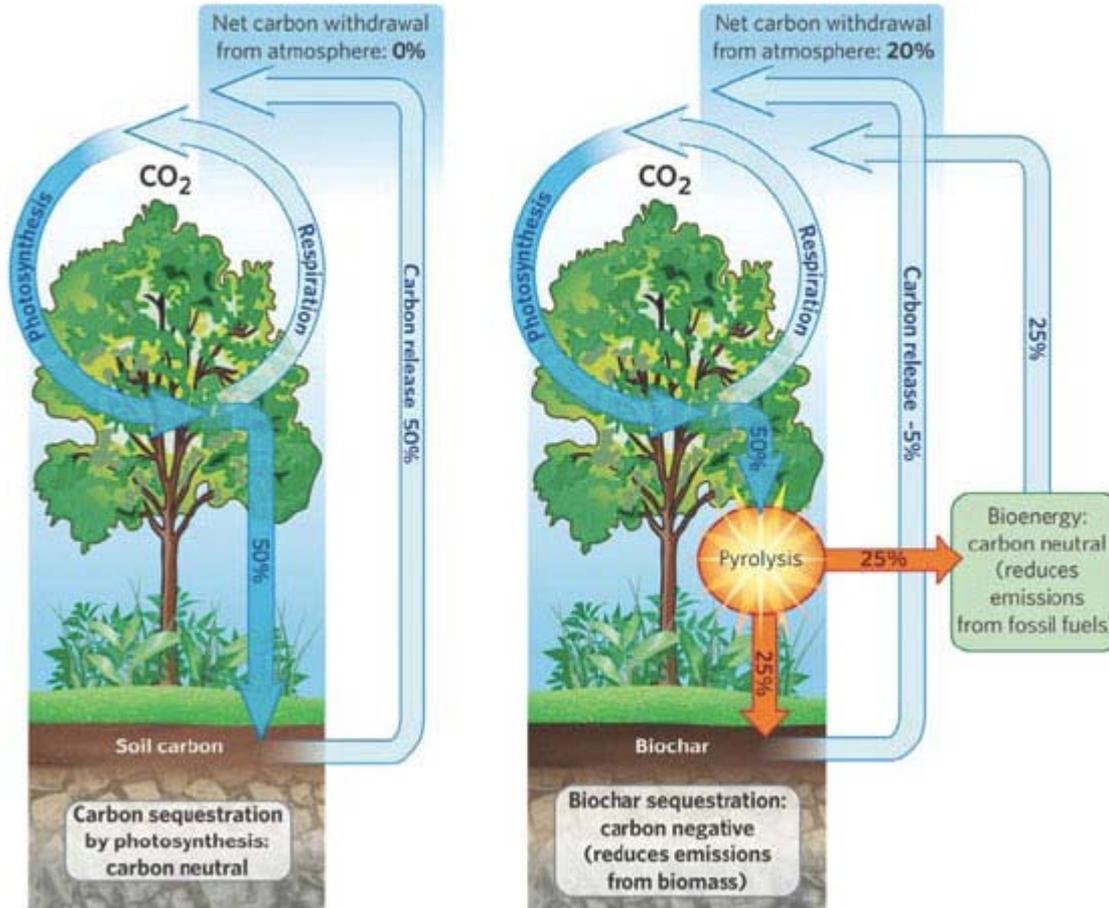


The *GEK Power Pallet* provides reliable, low-cost electricity anywhere biomass is available.

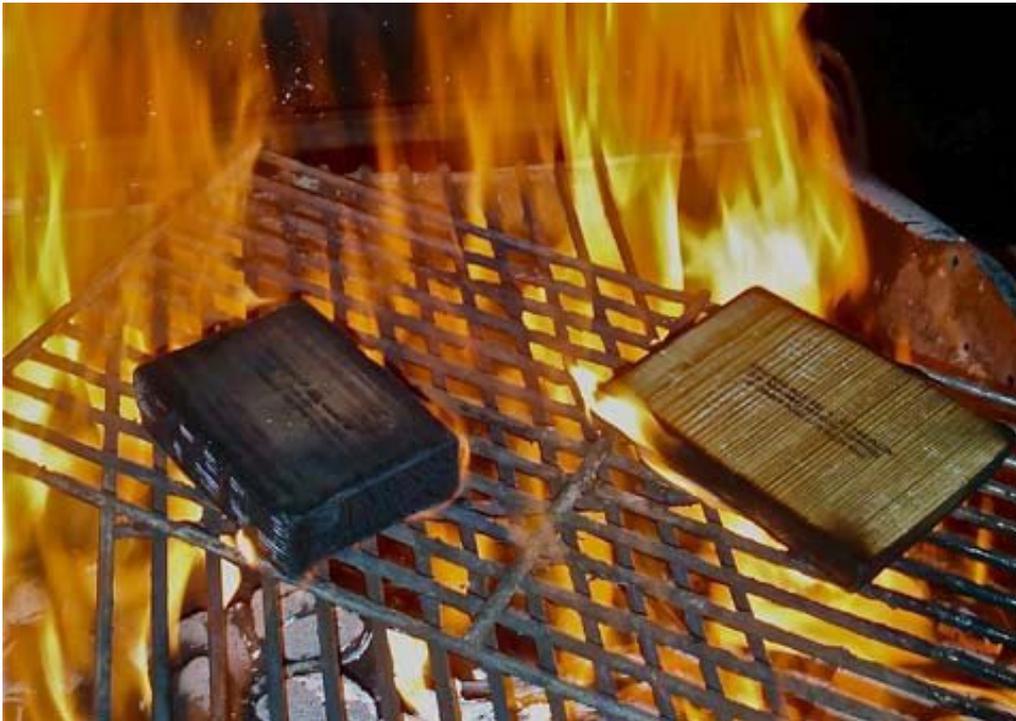


Electricity, Heat and PTO shaft power

## Biochar Can Be Carbon-Negative

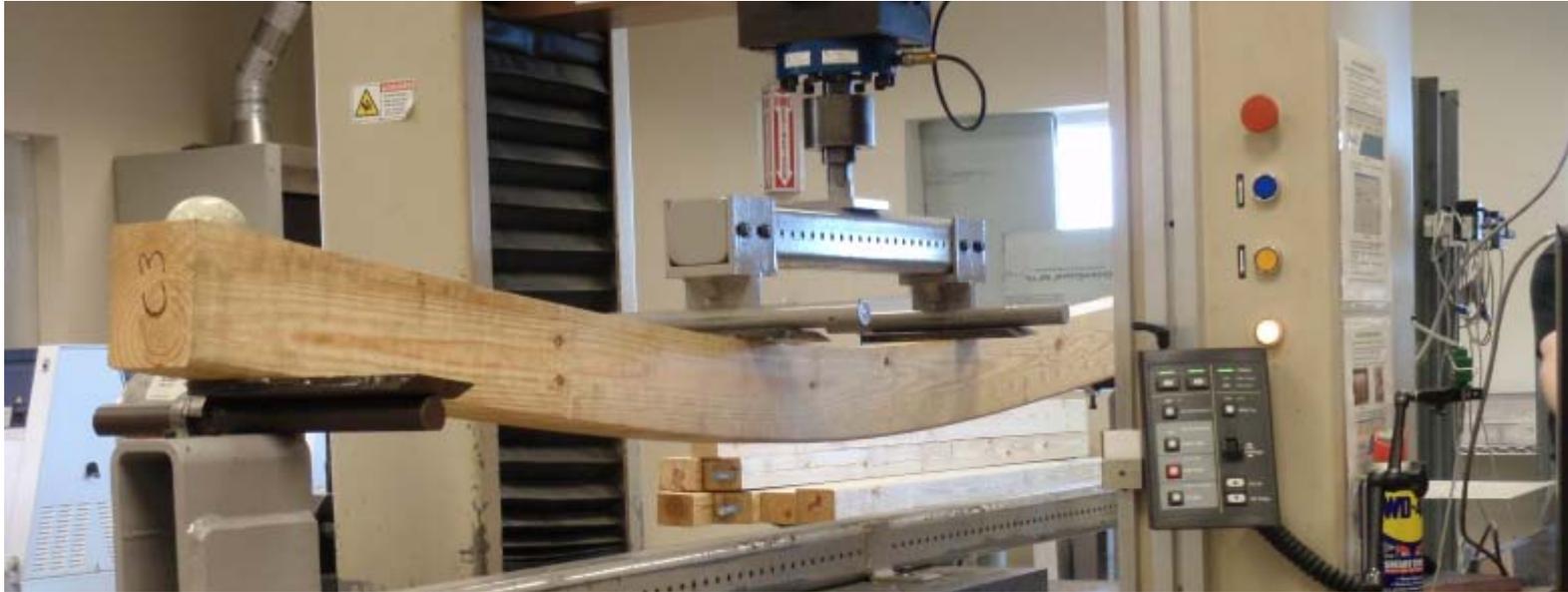


# Fire Resistant “Wood”





# How TimberSIL<sup>®</sup> Strength Compares to Selected Wood Species



Properties	TimberSIL <sup>®</sup> Glass Wood Fusion	Beech	Oak	Douglas Fir	Radiata Pine	SPF (stud)
Strength (rupture) MOR (psi)	16,000	14,900	14,300	11,900	11,700	10,200
F <sub>b</sub> (psi) (Grade 1, 2x4)	2,700	1,810	1,425	1,600	1480	690
Strength (elasticity) MOE (psi)	1,900,000	1,720,000	1,820,000	1,490,000	1,480,000	1,000,000
Compression parallel to grain (psi)	7,100	7,300	6,090	6,230	6,080	5,600
Compression perpendicular to grain (psi)	2,124	1,000	870	740	610	580
Tension parallel to grain (psi)	15,000	9,529	8,700	11,000	11000	4,600
Shear parallel to grain (psi)	1,600	2,000	1,390	1,510	1,600	1,150
Hardness (lb)	1,012	500	1,060	510	750	510

# The Gaia Engineering Process

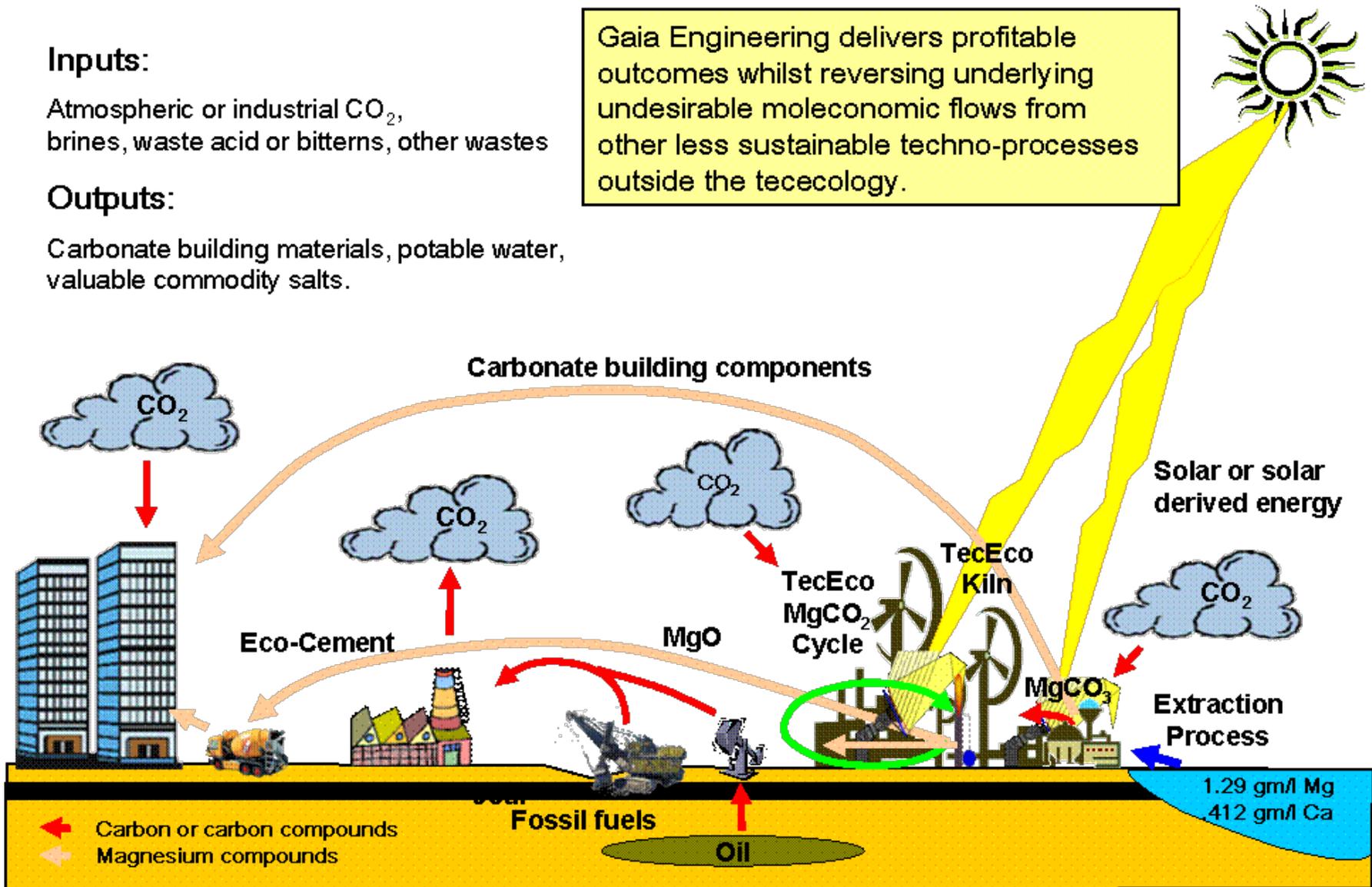
## Inputs:

Atmospheric or industrial  $\text{CO}_2$ ,  
brines, waste acid or bitters, other wastes

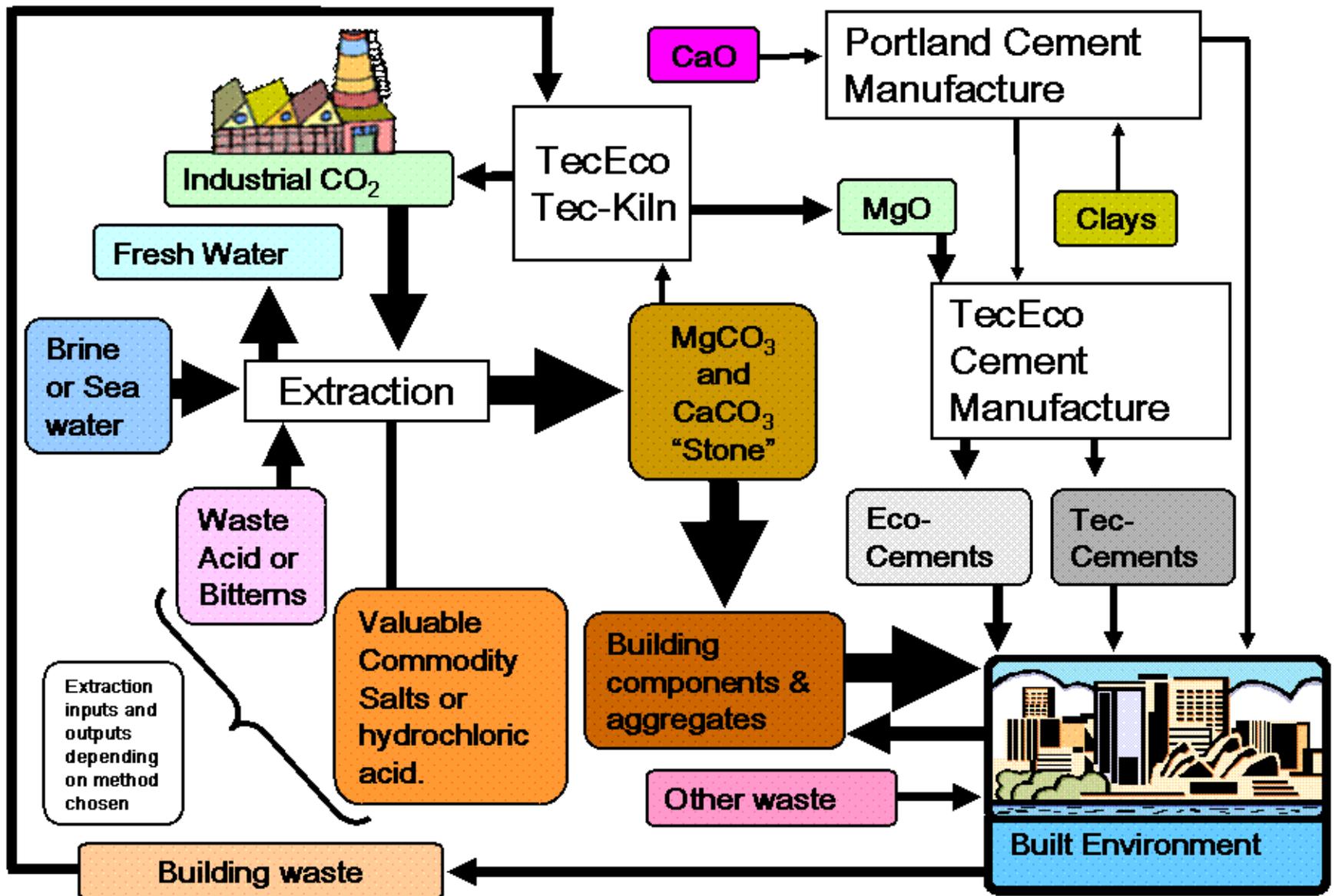
## Outputs:

Carbonate building materials, potable water,  
valuable commodity salts.

Gaia Engineering delivers profitable outcomes whilst reversing underlying undesirable moleconomic flows from other less sustainable techno-processes outside the tececoology.

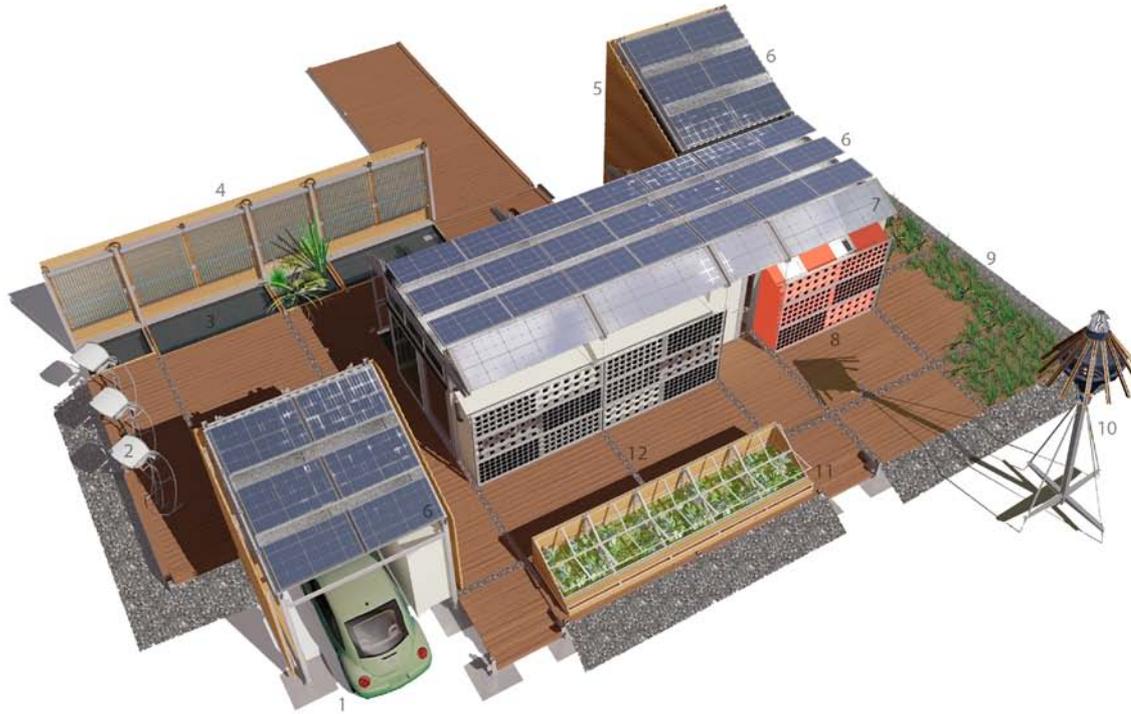


# Gaia Engineering Flowchart



# Texas A&M Solar Decathlon

■ Shelter ■ Energy ■ Health ■ Visualization ■ Marketing

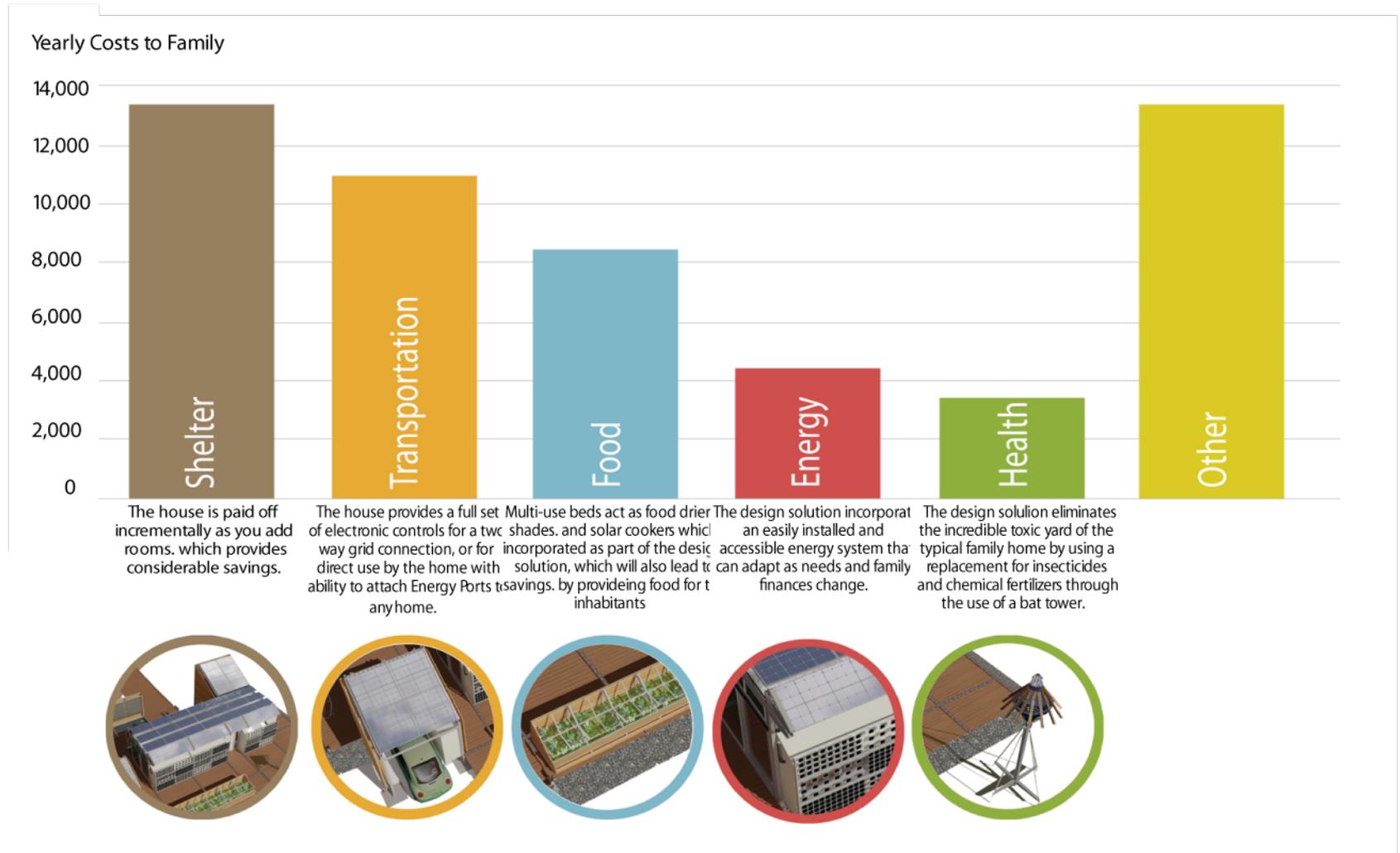


- 1 Solar Carport
- 2 Building Integrated Wind System
- 3 Reflecting Pond
- 4 Solar Thermal Fence
- 5 Studio
- 6 High Efficiency BIPV
- 7 Light Reflecting BIPV
- 8 Light-Thru BIPV
- 9 Grassland Biome Simulation
- 10 Bat Tower
- 11 Food Garden

■ Shelter ■ Energy ■ Health ■ Visualization ■ Marketing

In partnership with the Center for Maximum Potential Building Systems





- Need for buildings to become part of owners economic reality

# Building Costs Compared by Method of Construction

	Manufactured Mobile Home	Traditional Site Built	Incremental Site Built	Monthly Savings	Total Term Savings
Structure cost	\$48,000	\$4,000	\$22,000*		
Lot cost	\$16,000	\$16,000	\$16,000		
<b>Total cost</b>	<b>\$64,000</b>	<b>\$100,000</b>	<b>\$38,000</b>		
Mortgaged amount	\$61,800	\$95,000	\$36,100		
<b>15 Year Mortgage monthly payment (6.5%)</b>	<b>\$494</b>	<b>\$880</b>	<b>\$314</b>	<b>\$566</b>	
Out of pocket & mortgage payment	<b>\$145,812</b>	<b>\$226,164</b>	<b>\$104,232</b>		
Out of pocket incremental improvements	\$0	\$0	<b>-\$44,000</b>		
Appreciation of 5%	\$133,051	\$207,895	\$170,472		
<b>Net gain</b>	<b>-\$12,761</b>	<b>-\$18,271</b>	<b>\$22,240</b>		<b>\$77,090</b>
<b>20 Year Mortgage monthly payment (6.5%)</b>	<b>\$453</b>	<b>\$708</b>	<b>\$269</b>	<b>\$439</b>	
Out of pocket & mortgage payment	<b>\$172,775</b>	<b>\$272,752</b>	<b>\$134,044</b>		
Out of pocket incremental improvements	\$0	\$0	<b>-\$44,000</b>		
Appreciation of 5%	\$169,811	\$265,330	\$217,870		
<b>Net gain</b>	<b>-\$2,964</b>	<b>-\$7,422</b>	<b>\$39,526</b>		<b>\$106,500</b>
<b>30 Year Mortgage monthly payment (6.5%)</b>	<b>\$384</b>	<b>\$569</b>	<b>\$228</b>	<b>\$341</b>	
Out of pocket & mortgage payment	<b>\$233,422</b>	<b>-\$380,711</b>	<b>-\$196,589</b>		
Out of pocket incremental improvements	\$0	\$0	<b>-\$44,000</b>		
Appreciation of 5%	\$276,604	\$427,194	\$354,400		
<b>Net gain</b>	<b>\$43,184</b>	<b>\$51,483</b>	<b>\$113,811</b>		<b>\$188,646</b>

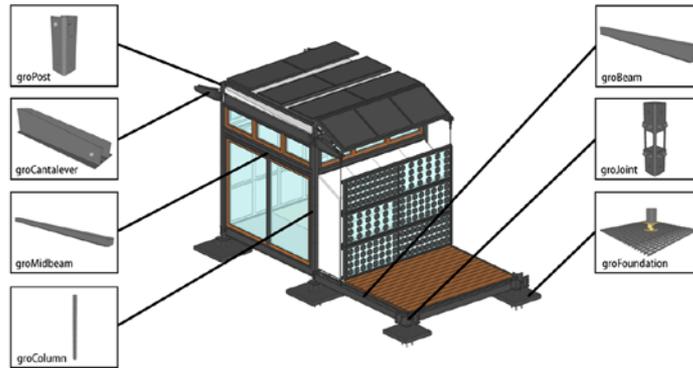
\* It is assumed that only the first increment is built and financed initially and the monthly savings will afford the owner to save and pay cash for two (2) future increments each costing \$22,000.

Additional assumptions include: 2.5% property tax, 2.0% closing costs, 5.0% down payment, 1.0% annual maintenance, 5-year mortgage insurance, 6.5% mortgage interest, 5.0% property appreciation. The traditional site built home is used to calculate the monthly and term

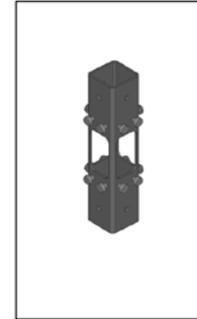
# Shelter

the groSystem of Componentes

the groComponents



the groJoint



the groWalls



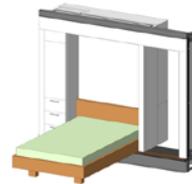
Kitchen groWall



Entertainment groWall



Bathroom groWall



Bedroom groWall



Mechanical groWall



Energy groWall

the groSpaces



Garage



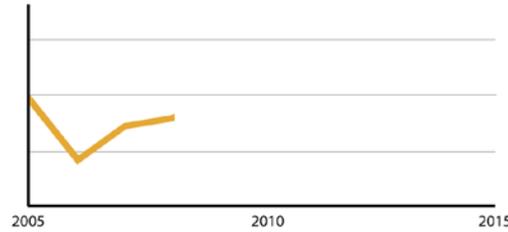
Studio

# Marketing

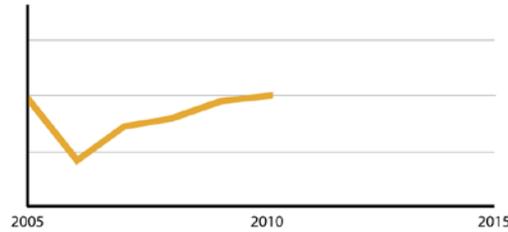
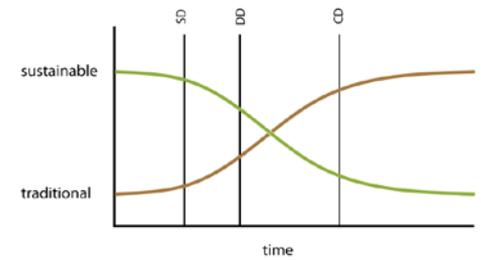
## Pay-As-You-Grow



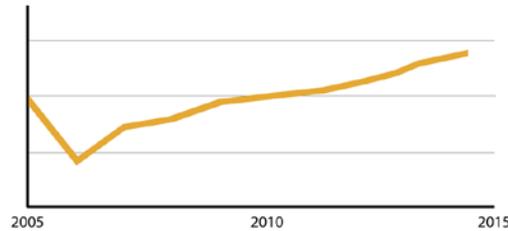
Financial Stability



## Design Cost Comparison



## Open Source System



**Pay-As-You-Grow:** Because you only purchase what you can afford, adding more components as you need, there is no need for a large mortgage, reducing the amount of money paid for the groHome. The amount of equity on this example of disaster relief for post-Hurricane Katrina housing in Mississippi only increases after the initial purchase and construction of the groHome. As the number of occupants grows, so does the amount of space in the house.





























# Texas A&M Solar Decathlon

■ Sustainability ■ Open Source ■ Growth ■ Relief ■ D.I.Y.

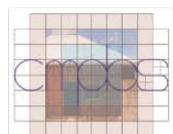


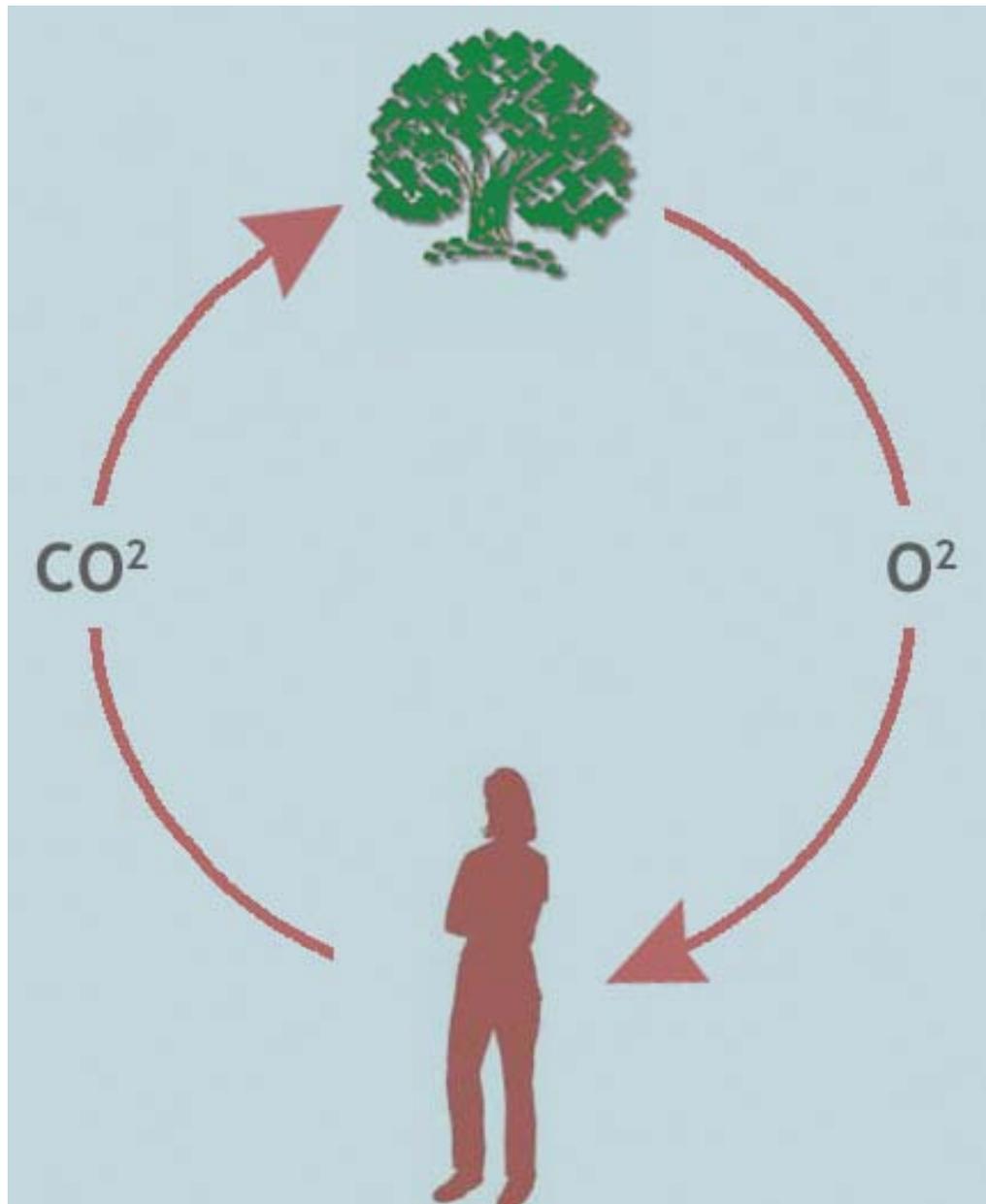
The Texas A & M Solar Decathlon won the following awards:

- 1) AIA Cote/ AIAS 1st place Mall award
- 2) EPA design for disassembly DfD 1st<sup>t</sup> Place national award
- 3) Decathlon Appliance award 1st place
- 4) NAHB - 3<sup>rd</sup> place curb appeal award
- 5) Sundance Documentary chosen out of the 20 entries ( shown April 1 2008)

<b>ALLIED PROFESSIONALS</b>	<b>POTENTIAL OR EXISTING BALANCE CONDITIONS</b>
Accountant	Balances Credit and Debit
Mathematician	Balances Algebraic Equations
Chemical Engineer	Balances Chemical Equations
Mechanical Engineer	Balances Heat Gain to Heat Loss
Civil Engineer	Balances Retention to Release of Stormwater
Structural Engineer	Balances Gravitational Force to Structural Capacity
Ecologist	Balances Producers and Consumers
Climatologist	Balances Carbon Release to Carbon Sink
Hydrologist	Balances Water Quality to Water Availability
Life Cycle Analyst	Analyzes Data for Upstream and Downstream
Industrial Ecologist	Balances Inputs & Outputs in Industrial Ecosystems
Urban Planner	Balances Public Sector to Private Sector Needs
Neurobiologist	Balances the Brain to Metabolic Functionality
Psychologist	Balances Society with the Individual

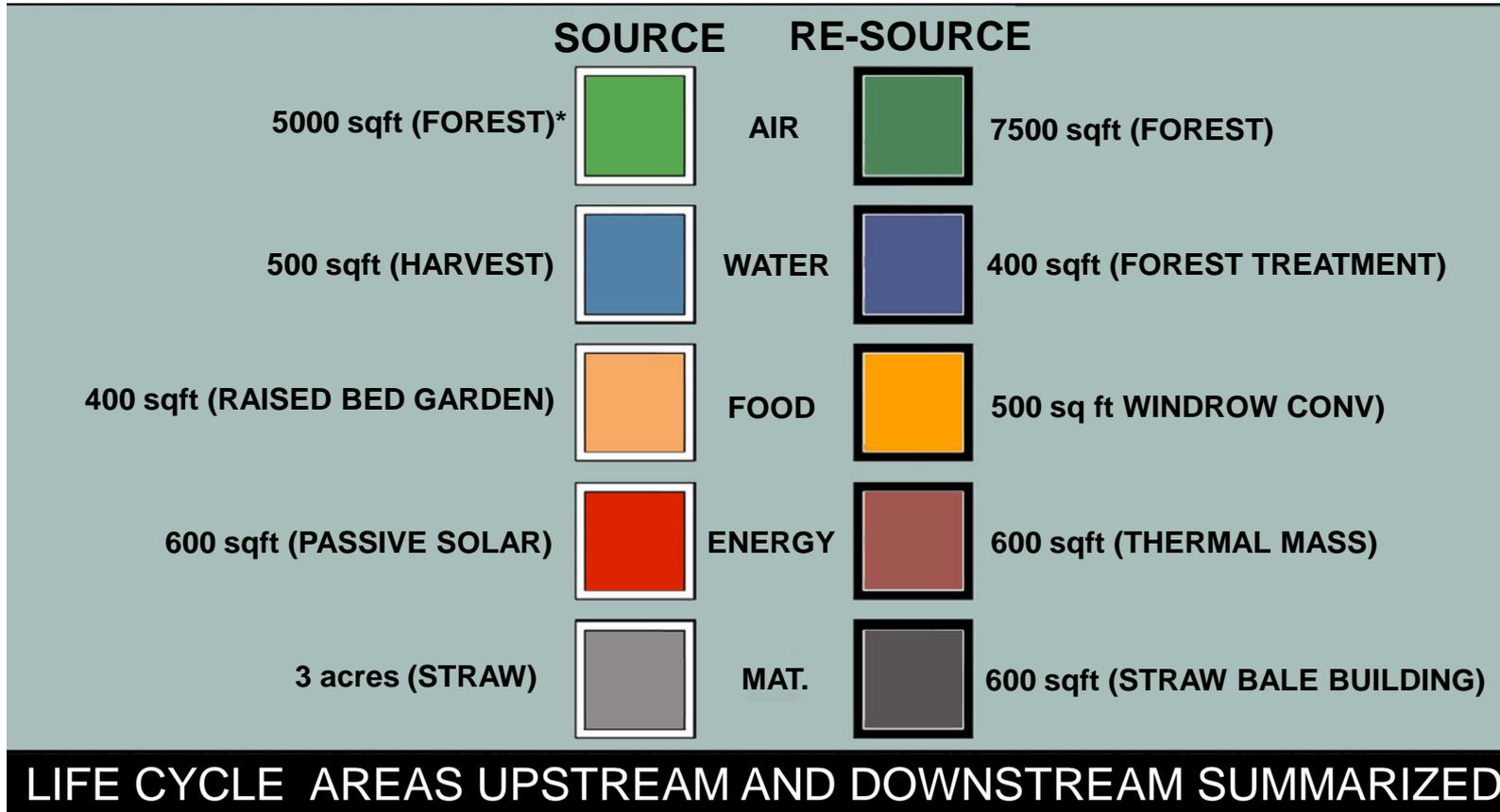
## DISCIPLINES OF BALANCE





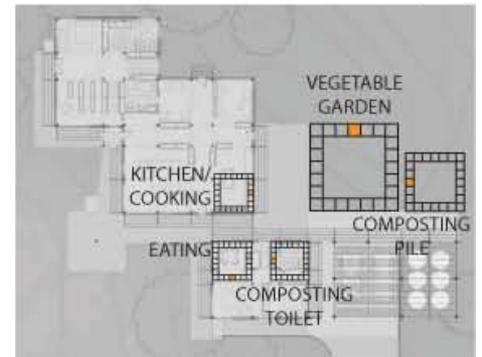
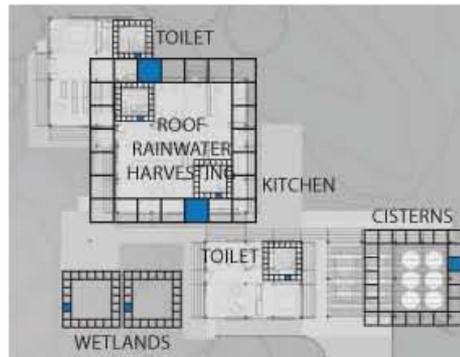
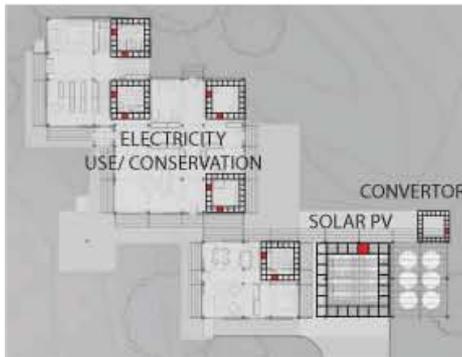
**A SIMPLE AIR LIFE CYCLE FOR BREATHING  
BETWEEN HUMANS AND PLANTS**

THE CENTER FOR MAXIMUM POTENTIAL BUILDING SYSTEMS

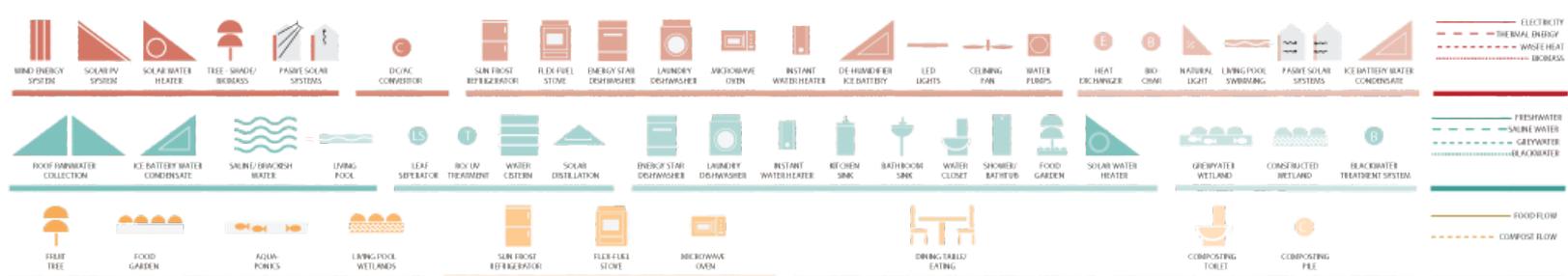
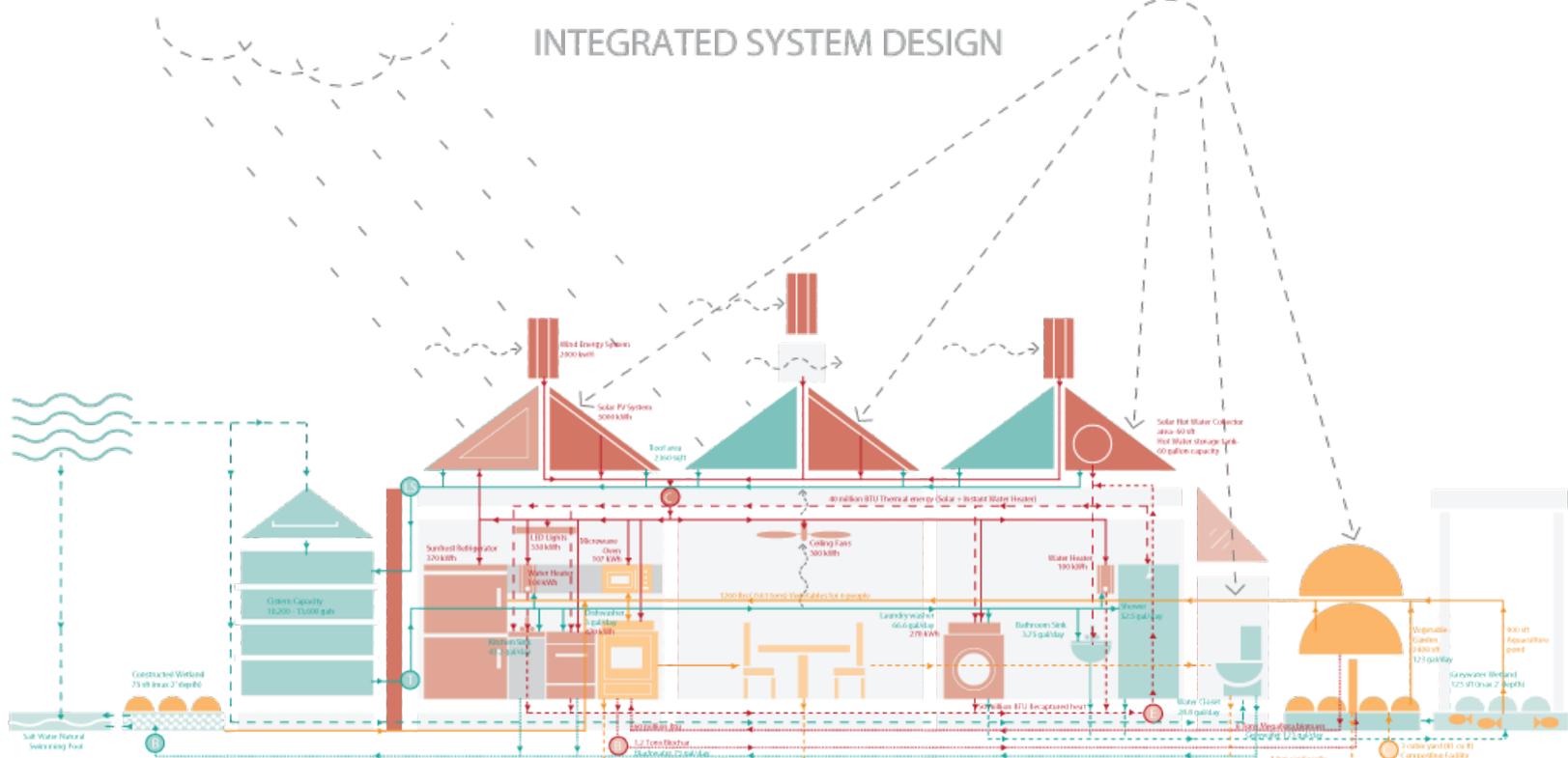


• AREA NEEDED PER PERSON  
SOURCES UPON REQUEST

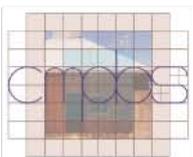




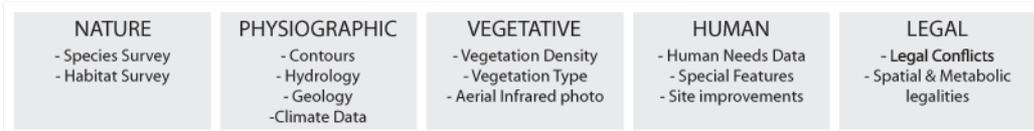
# INTEGRATED SYSTEM DESIGN



## INTEGRATED HOMNE SCENARIO – PEACABLE KINGDOM



### BASE/ INVENTORY MAPS



### SUITABILITY MAPS



### COMPOSITE MAPS

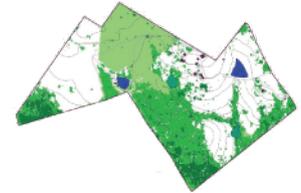


### SYNTHESIS MAPS

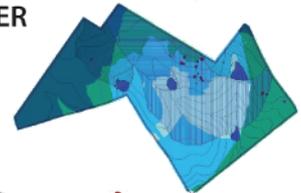


### ECOBALANCED MASTERPLAN

AIR



WATER



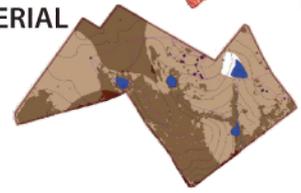
FOOD



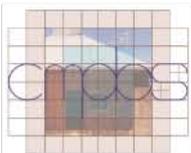
ENERGY

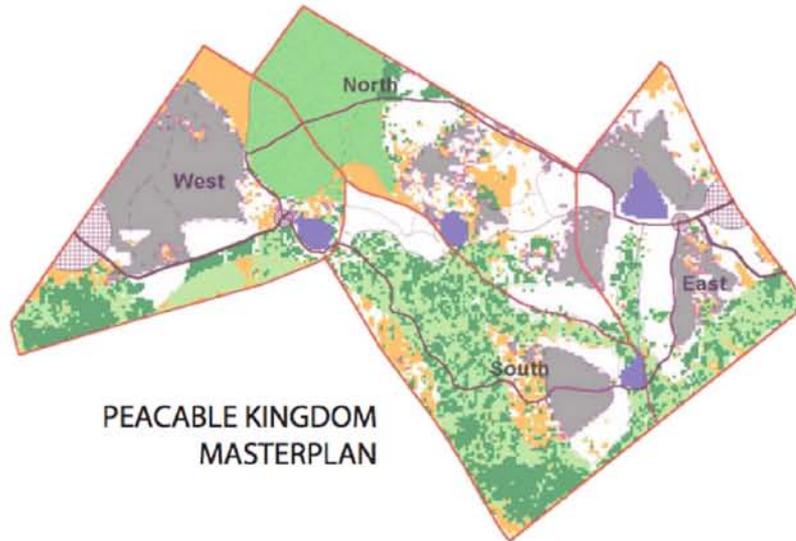
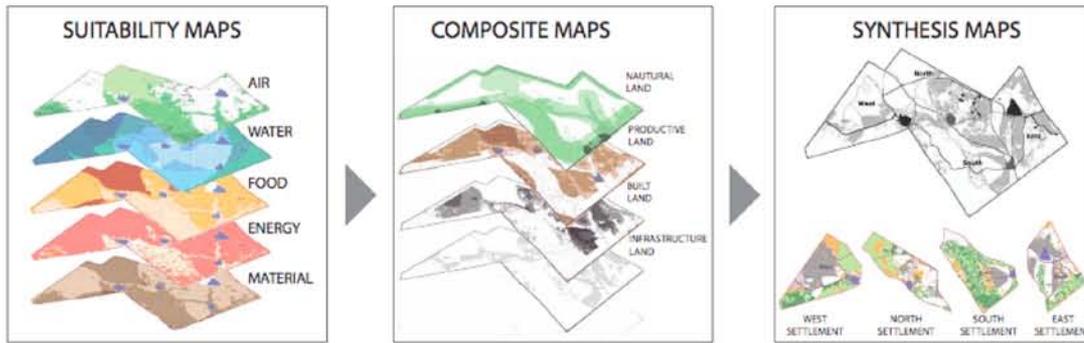


MATERIAL



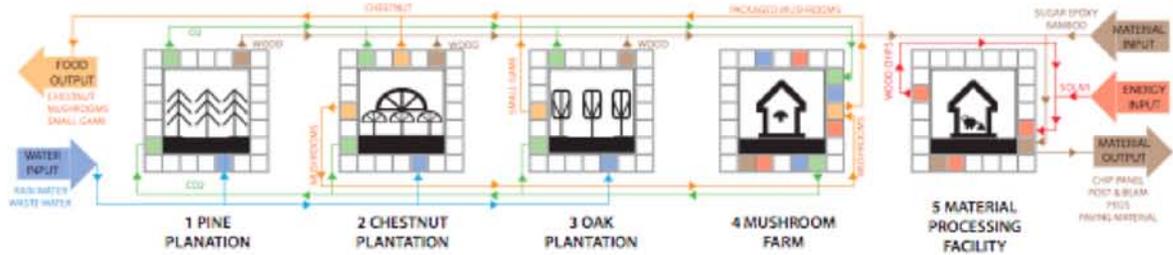
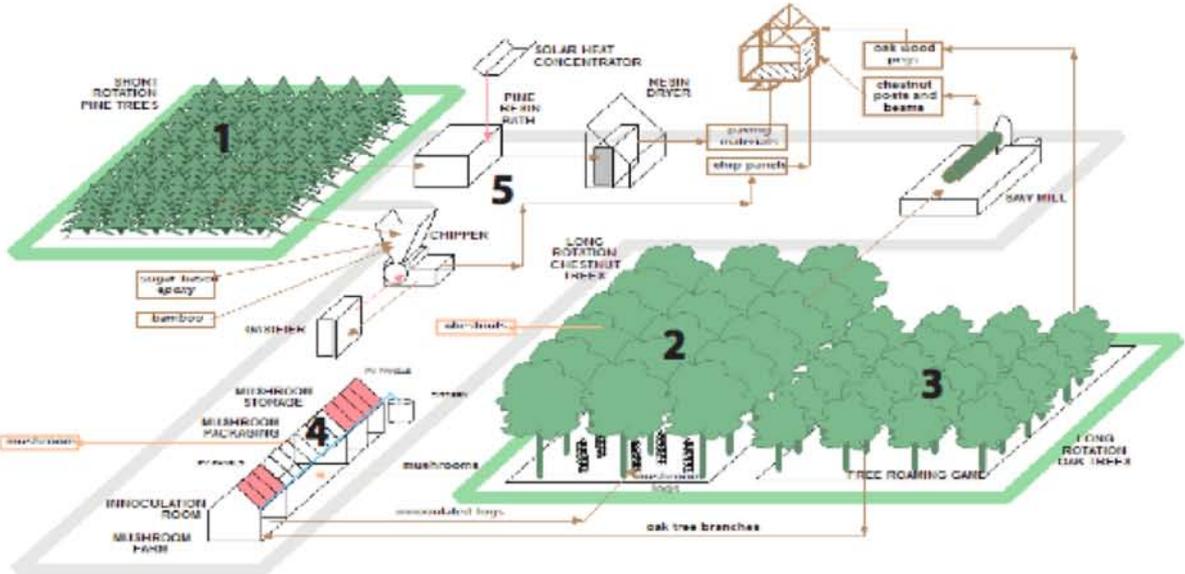
## LAND PLANNING PROCESS – EAST TEXAS







# SOUTH SETTLEMENT





Ecobalance basic home

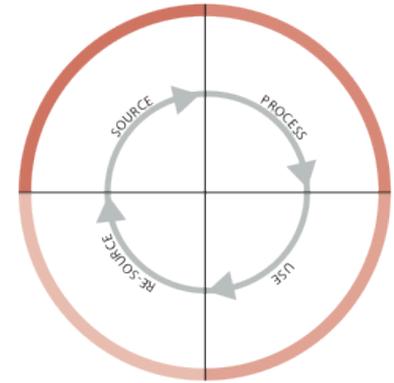


ecoBalanced Fredricksburg Style Home



ecoBalance dog trot as green house home

# ENERGY LIFE CYCLE



## SOURCE

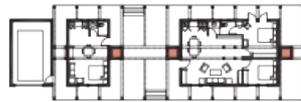
## PROCESS

## USE

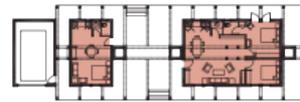
## RE-SOURCE



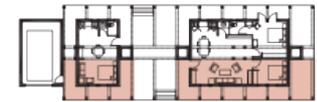
S1 Integrated PV and Solar Thermal



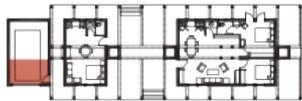
P1 Load Sharing Converters



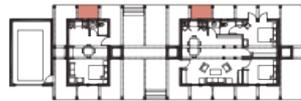
U1 Space Conditioning using PTAC Heating/Cooling



R1- Excess PV Heat used for Thermal



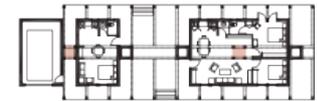
S2 Solar Thermal



P2 Hot Water Storage



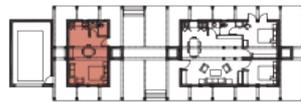
U2 Hot Water



R2- Solar Thermal Chimnies Exhaust Waste Heat and Reduce Electricity Load



S3 Dye Sensitized colored PV



P3 Wet Sand Heat Sink



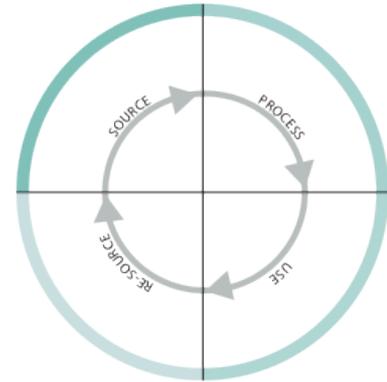
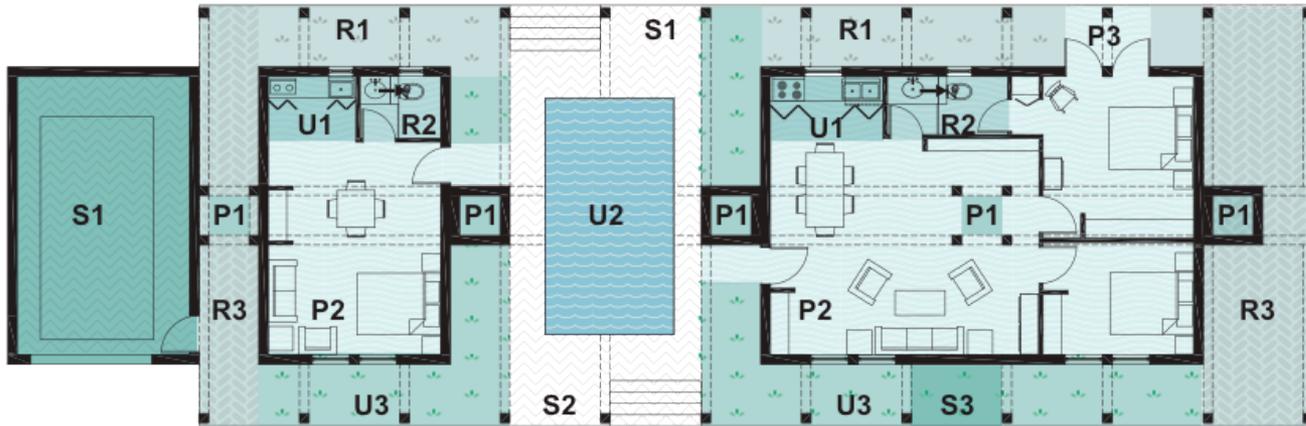
U3- Energy Efficient Appliances



R3- Dye sensitized PV help in plant growth



# WATER LIFE CYCLE

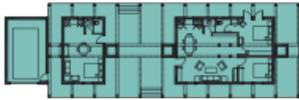


## SOURCE

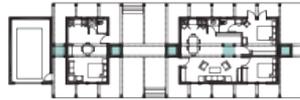
## PROCESS

## USE

## RE- SOURCE



S1 Rainwater Roof Collection



P1 Water Storage in Tower Cisterns



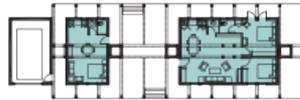
U1 Water conserving Kitchen/Bathroom Fixtures



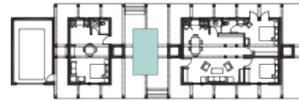
R1- Kitchen Greywater Wetland and Garden



S2 Integrated Rainwater Collection from PV Panels



P2 Water Storage in Floor Cisterns



U2- Wading Pool for recreation and passive cooling



R2- Bathroom Greywater Reused for Flushing



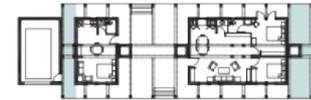
S3 Dew Collection



P3 Water Storage in Pod cisterns



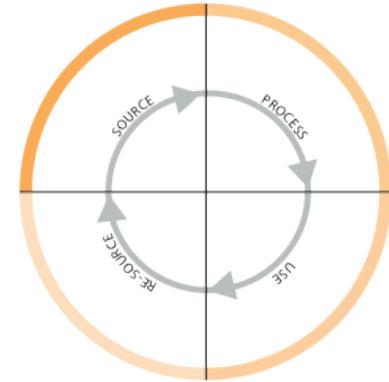
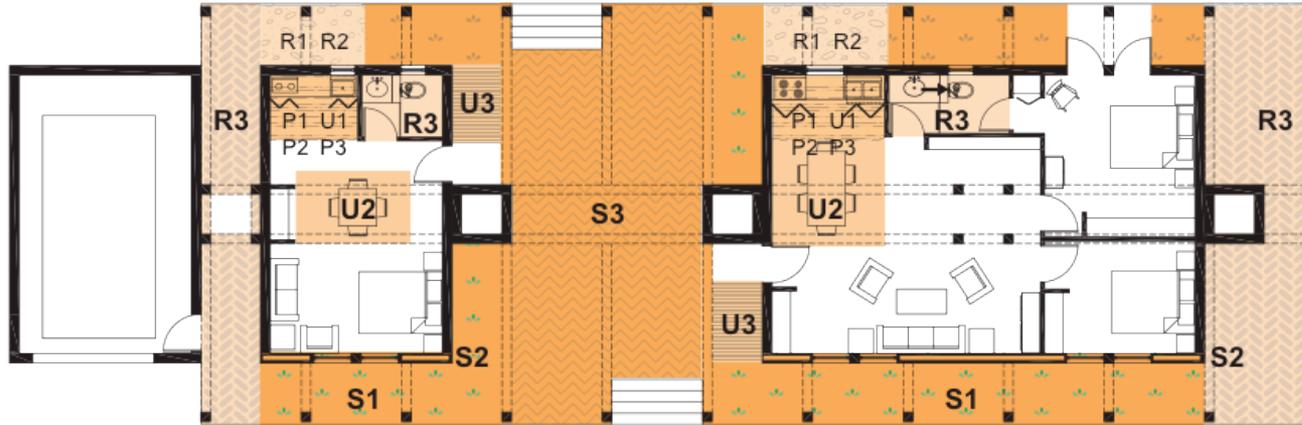
U3- Vegetable/Herb Garden Irrigation



R3- Blackwater Treatment Wetland



# FOOD LIFE CYCLE

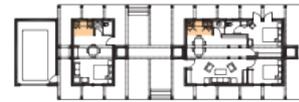
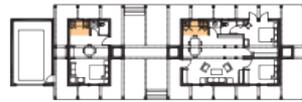
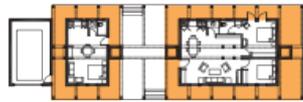


## SOURCE

## PROCESS

## USE

## RE- SOURCE

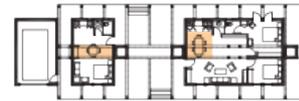
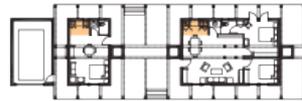


S1 Vegetable/Herb garden in pods

P1 Washing/Preparation

U1 Kitchen

R1- Composting Kitchen waste

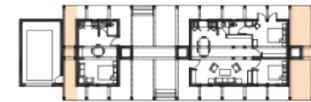
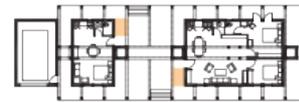


S2 Vegetable/Herb growing Green Walls

P2 Low Energy Cooking

U2 Dining Area

R2- Vermiculture



S3 Edible Landscaping in Breezeway

P3 Low Energy Refrigeration

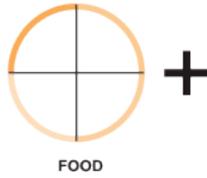
U3- Barbecue Station Outside

R3- Blackwater Treatment Wetland

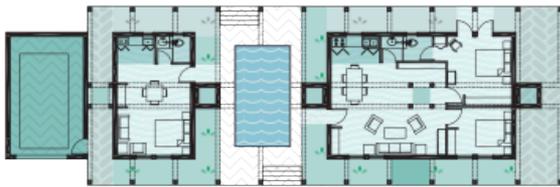
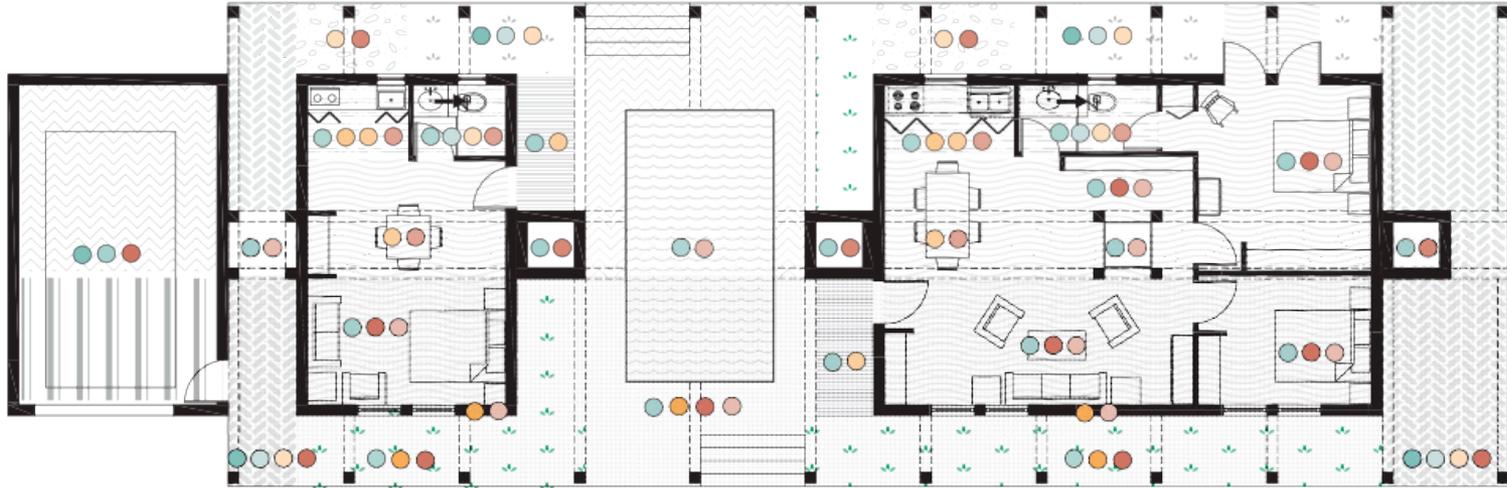
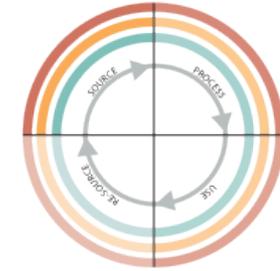


# INTEGRATED LIFE CYCLE LIVING

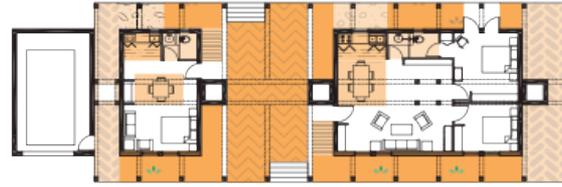
	WATER	FOOD	ENERGY
SOURCE			
PROCESS			
USE			
RE-SOURCE			



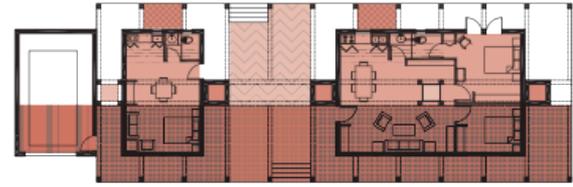
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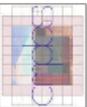
WATER



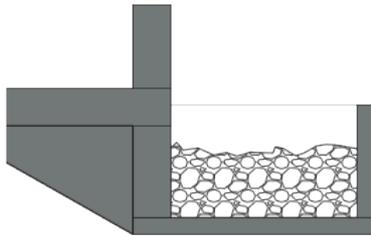
FOOD



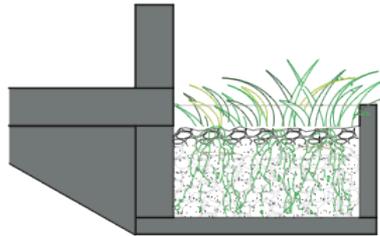
ENERGY



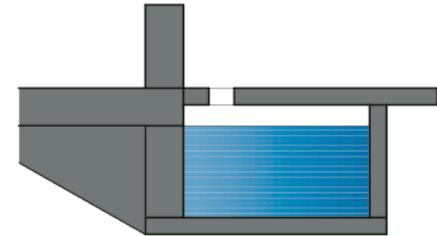
## VARIOUS FUNCTIONS OF PORCH CELL COMPONENT



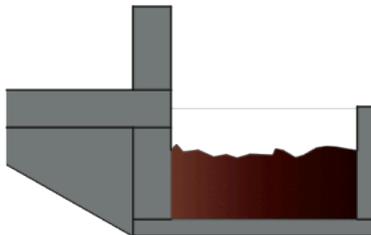
WETLAND



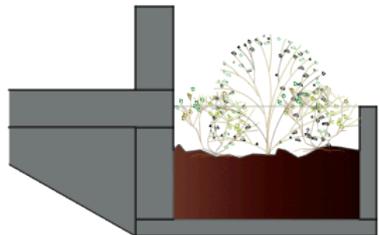
WETLAND WITH PLANTS



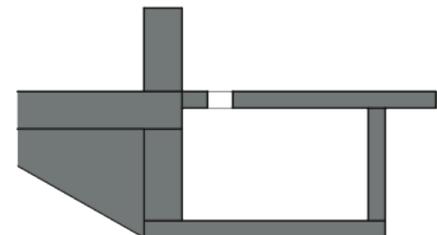
WATER CISTERN



DIRT AS ANCHORING WEIGHT



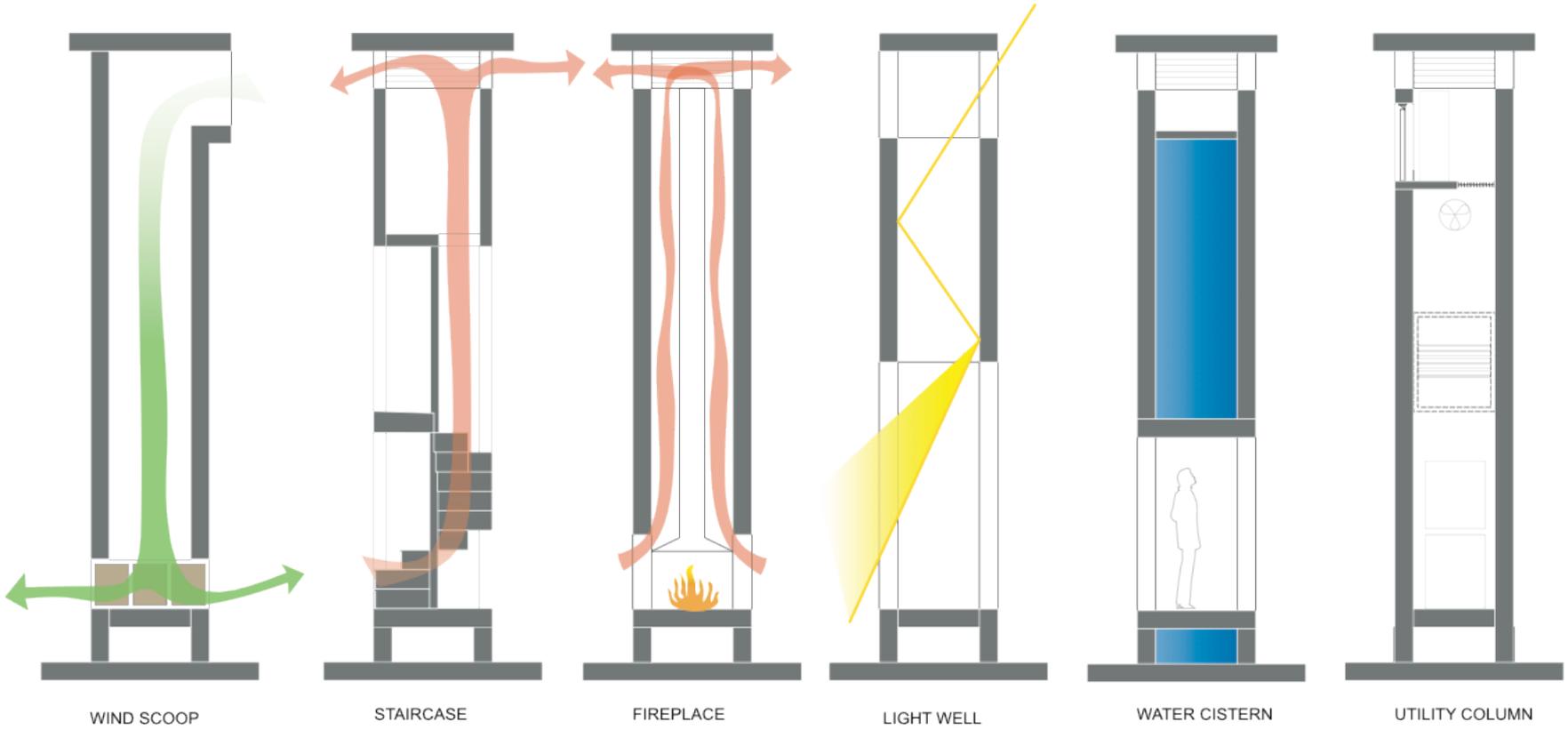
GARDEN



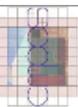
PORCH

The adaptable porch for varying ecoBalance™ needs

# TOWER ALTERNATIVES



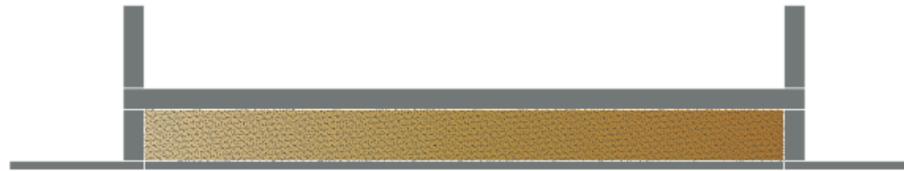
The adaptable vertical shaft/ column for varying ecoBalance™ needs



# FLOOR ALTERNATIVES



WATER CISTERN

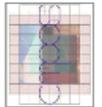


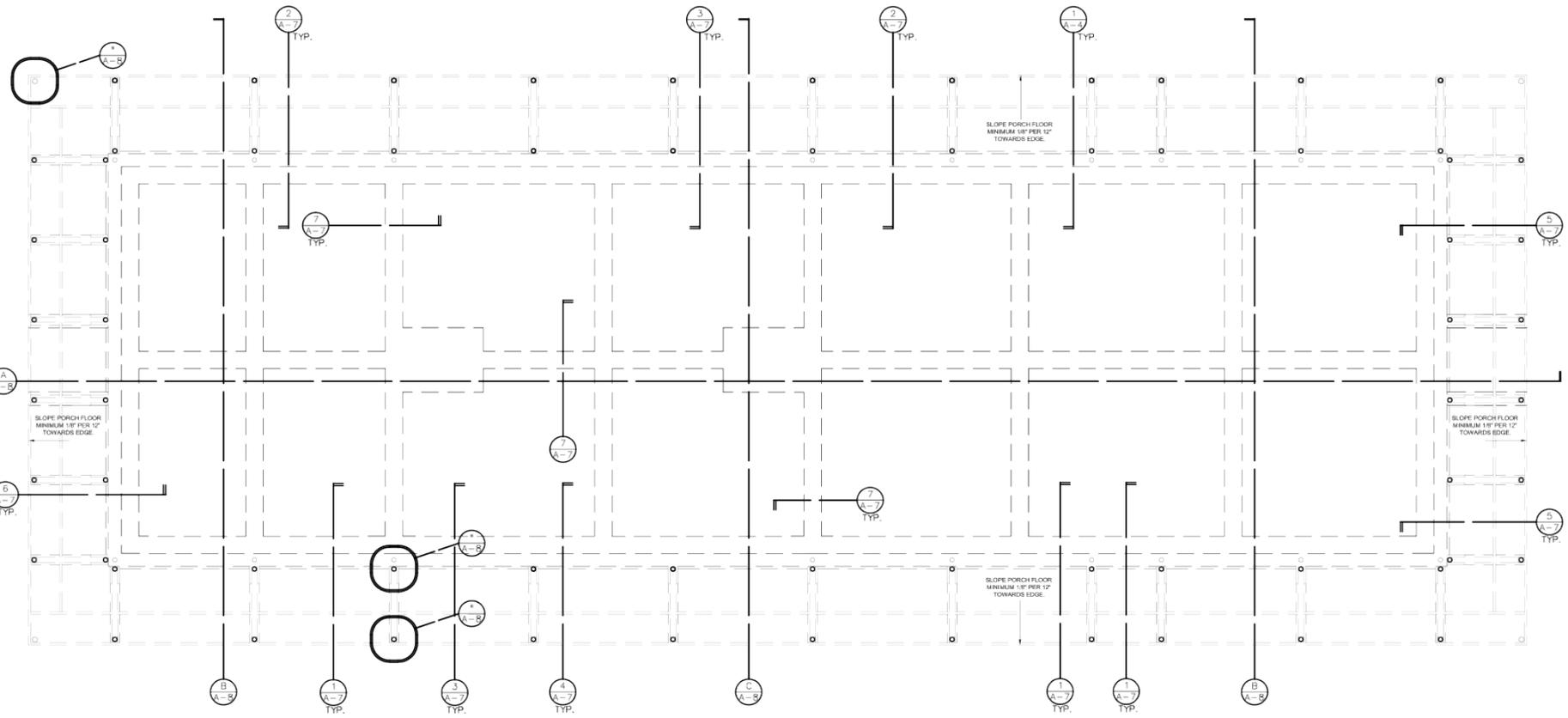
WET SAND HEAT SINK



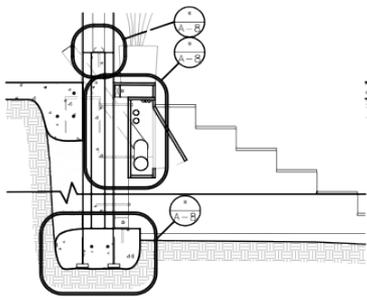
VACANT SPACE

The foundation for varying ecoBalance™ needs

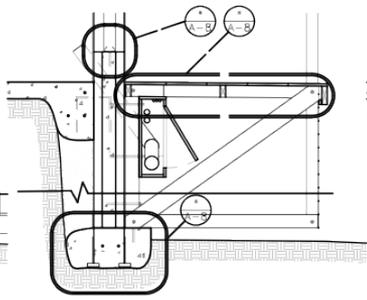




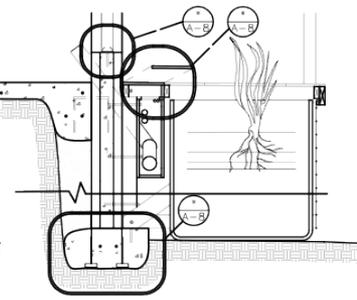
**Foundation Plan**  
 SCALE: 1/4" = 1'-0"



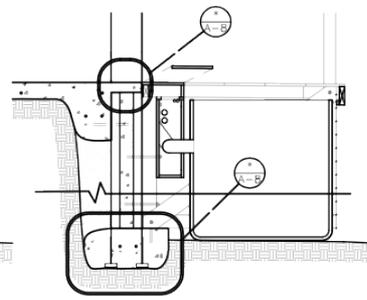
**1 Opt. For Stem Wall**  
 A-7 SCALE: 1/2" = 1'-0"



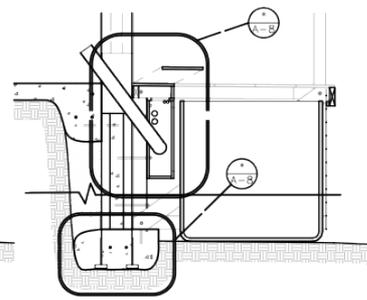
**1.2 Opt. For Stem Wall/ Porch**  
 A-7 SCALE: 1/2" = 1'-0"



**3 Opt. For Stem Wall/ Wetland**  
 A-7 SCALE: 1/2" = 1'-0"

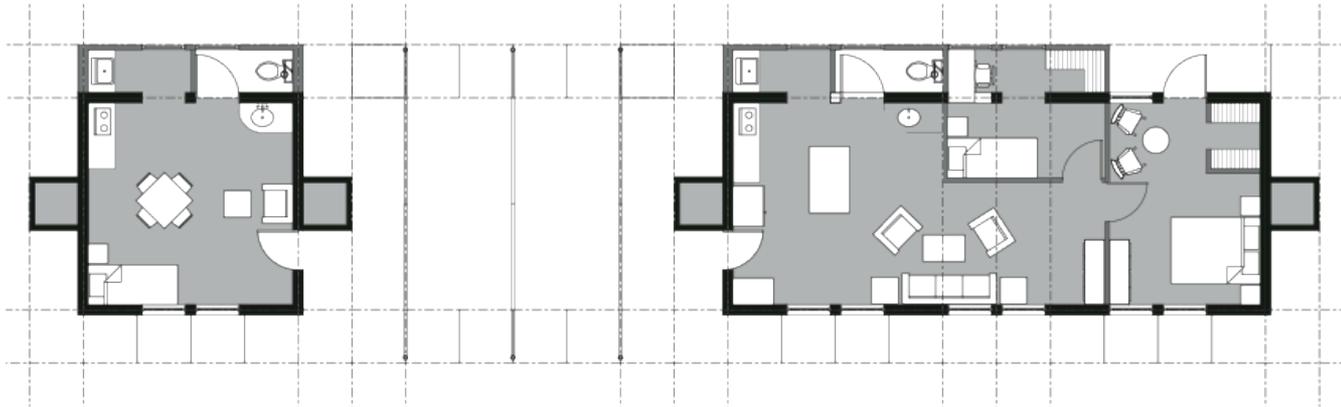


**1.2 Opt. Stem Wall at Doors**  
 A-7 SCALE: 1/2" = 1'-0"

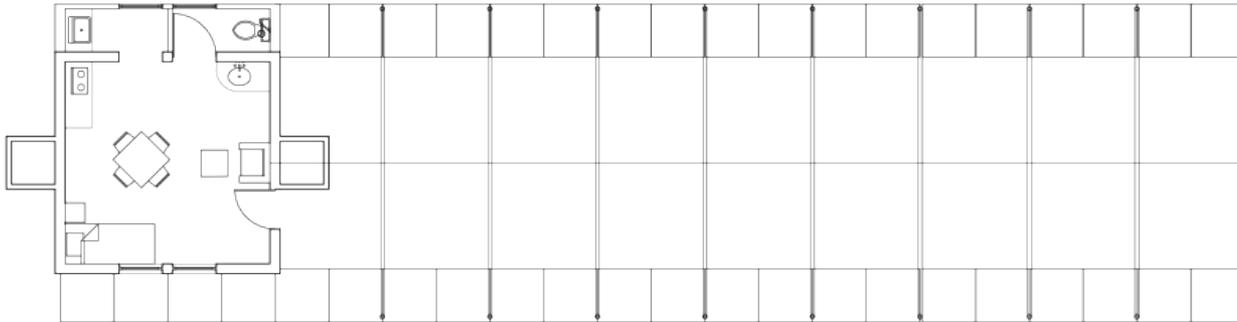


**7 Opt. Stem Wall at Wall Opening**  
 A-7 SCALE: 1/2" = 1'-0"

**PRELIMINARY**  
 THIS DRAWING IS UNCHECKED  
 NOT FOR CONSTRUCTION



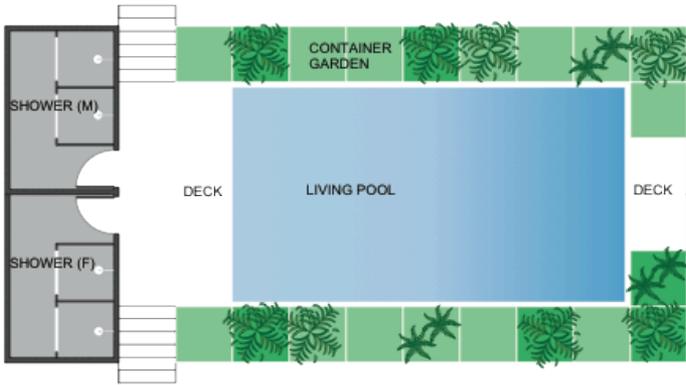
COTTAGE AND HOUSE WITH BREEZEWAY



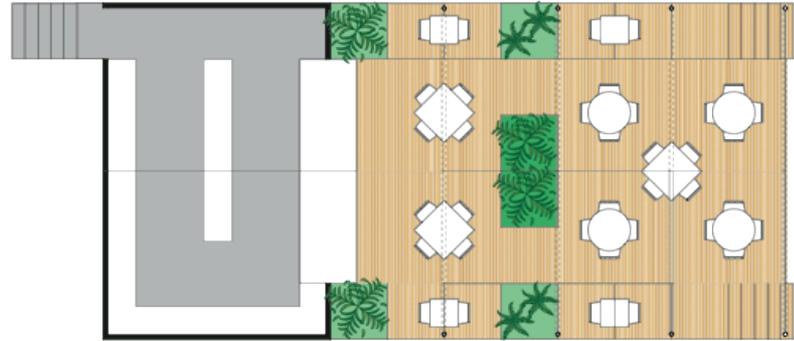
COTTAGE WITH GREENHOUSE

Spatial adaption for varying ecoBalance™ and user needs

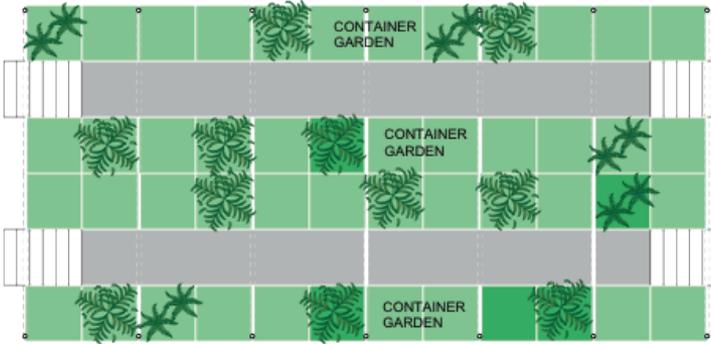




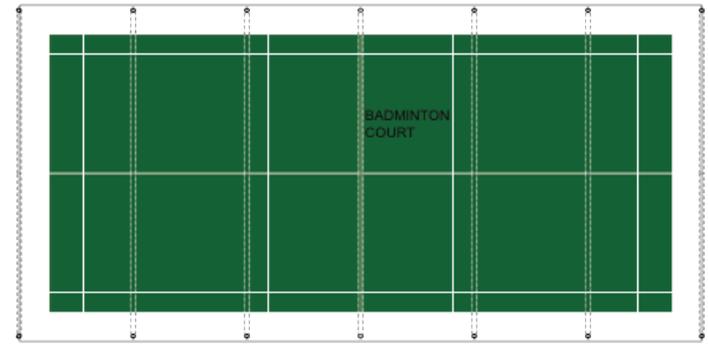
LIVING POOL



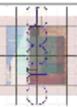
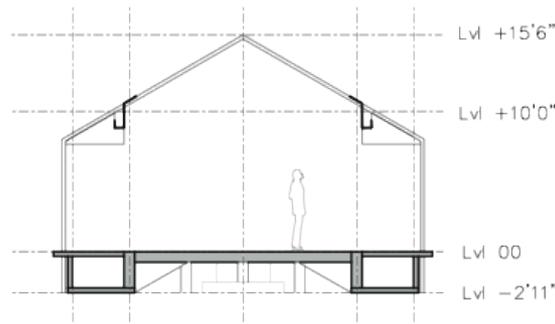
COMMUNITY RESTAURANT



CONTAINER GARDENS UNDER GREENHOUSE

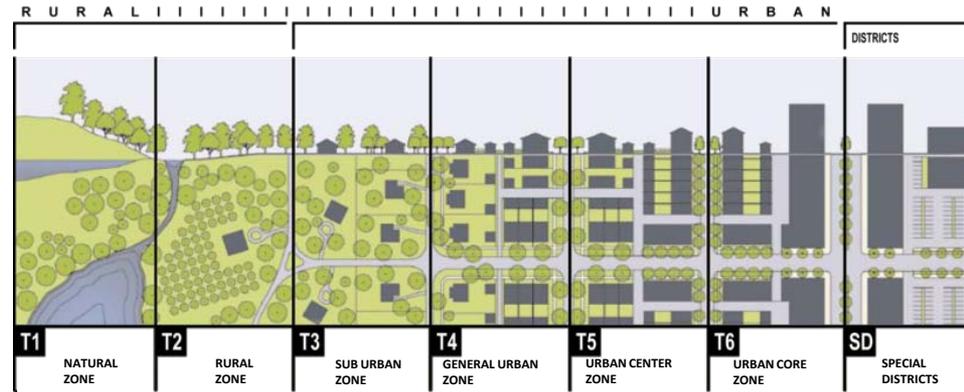


COURT GAMES UNDER TRELLIS

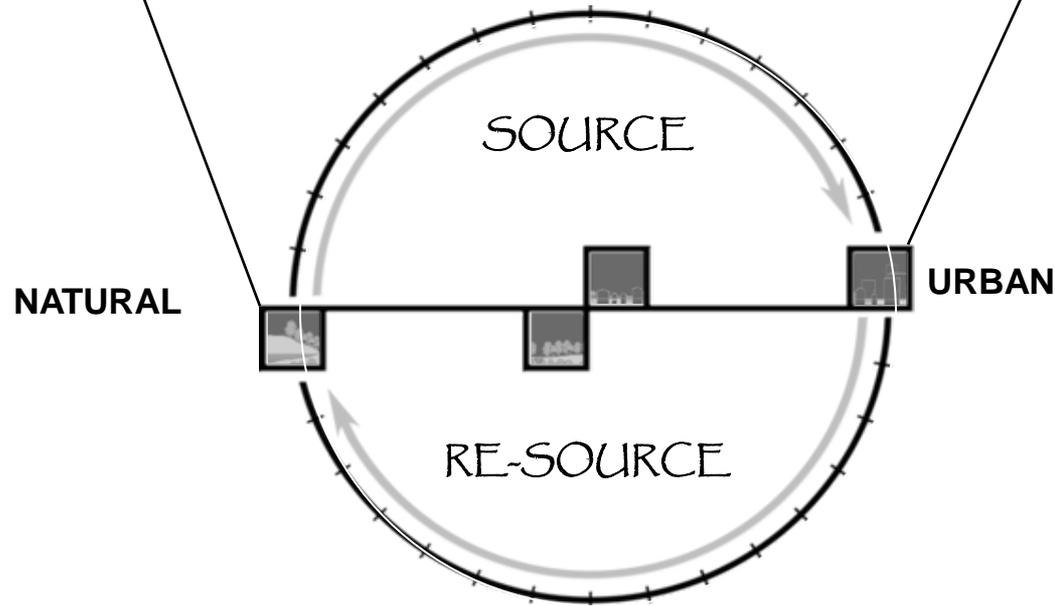


# NEW URBANISM AND ECOBALANCE - COMPLETING CYCLES AT THE SECTOR LEVEL

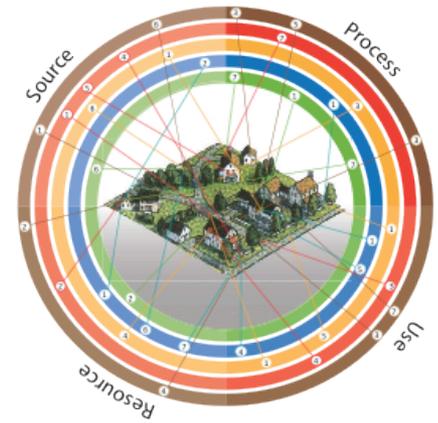
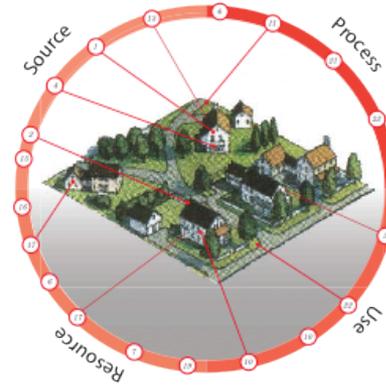
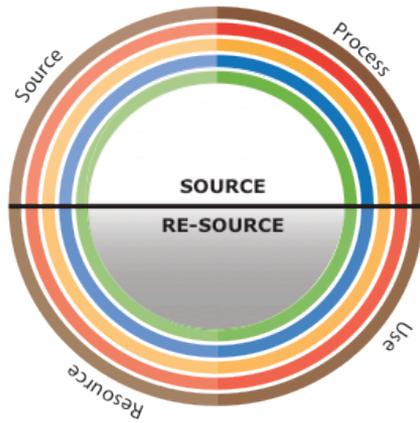
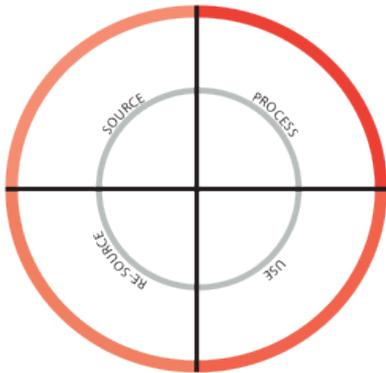
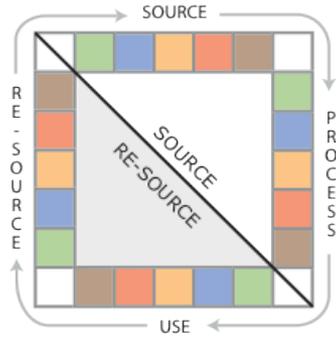
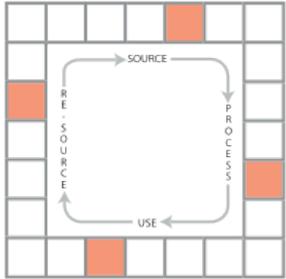
## NEW URBANISM



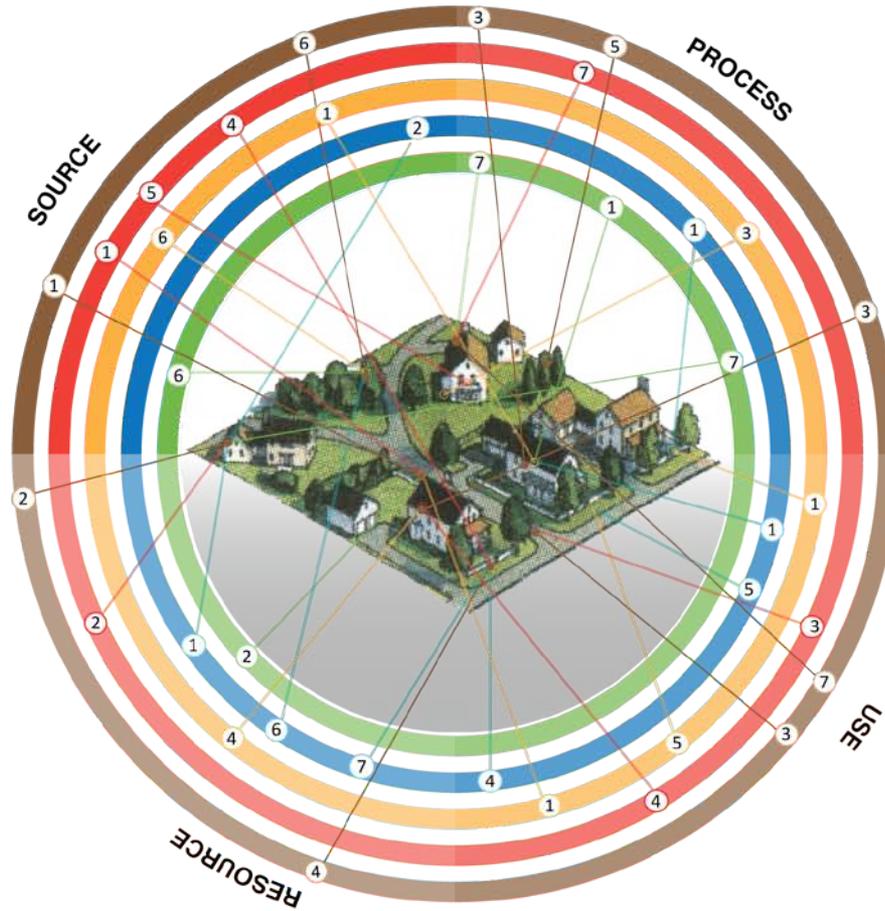
## ECO-BALANCE



# LIFECYCLE ECOBALANCING

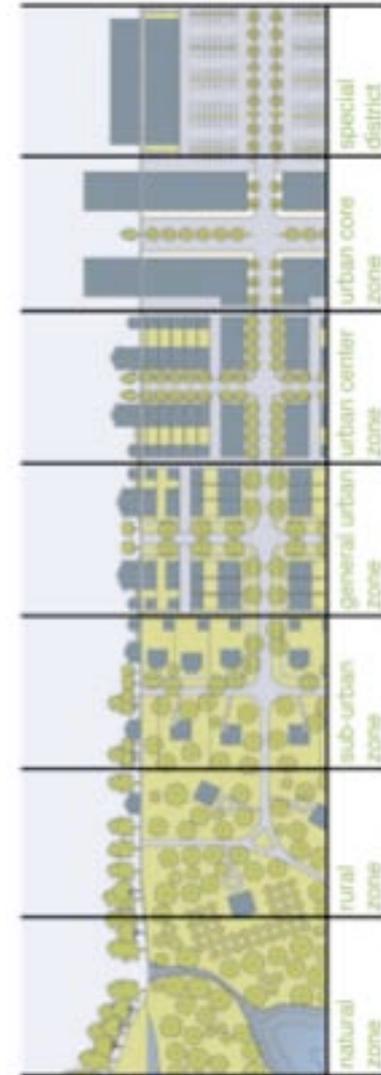


- Need to move from linear checklists to cycles



ECOBALANCE

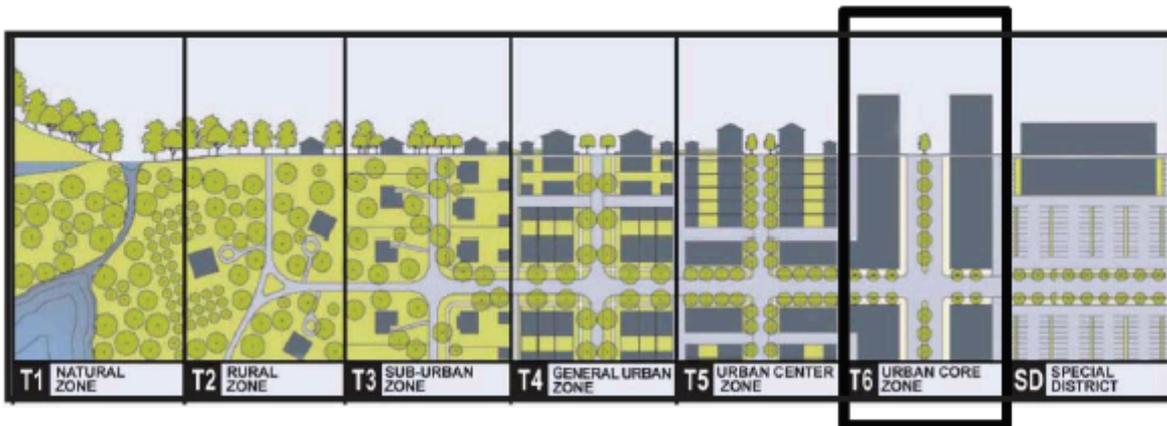
Verano



- Need to move from a conservation to integration



SOURCE	RE-SOURCE
<b>O2 Footprint</b> For 1 person 5000sft For 3718 ppl <b>450acre</b>	<b>CO2 Footprint</b> For 1 person 7500sft For 3718 ppl <b>648 acre</b>
<b>Water Harvest Footprint</b> For 1 person 400sft For 3718 ppl <b>32acre</b>	<b>Water Treatment Footprint</b> For 1 person 400sft For 3718 ppl <b>32acre</b>
<b>Food Harvest Footprint</b> For 1 person 4000sft For 3718 ppl <b>338acre</b>	<b>Food Compost Footprint</b> For 1 person 2000sft For 3718 ppl <b>162acre</b>
<b>PV Footprint</b> For 1 person 1000sft for 1 vehicle 250sft For 1 Unit 2250sft For 1487 Units <b>98acre</b>	<b>Solar Thermal Footprint</b> For 1 person 80ft For 3718 ppl <b>8 acres</b> For 1 Unit surplus



## SOURCE

## RE-SOURCE

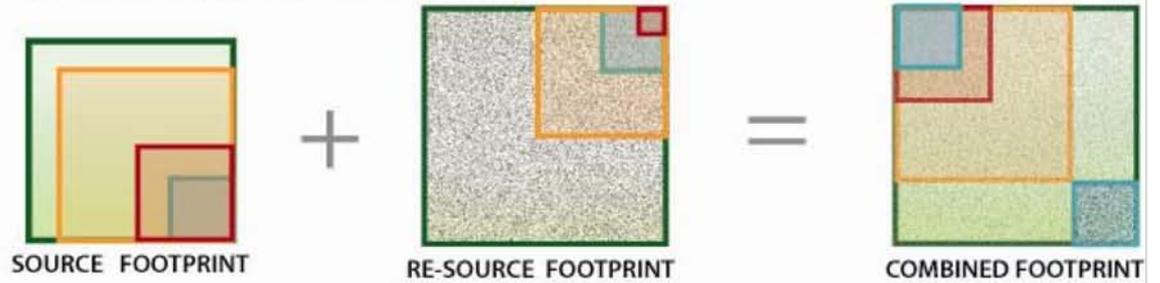
<p><b>O2 Footprint</b>            For 1 person 5000sft            For 4230 ppl <b>512 acres</b></p>	<p><b>CO2 Footprint</b>            For 1 person 7500sft            For 4230 ppl <b>800 acres</b></p>
<p><b>Water Harvest Footprint</b>            For 1 person 400sft            For 4230 ppl <b>50 acres</b></p>	<p><b>Water Treatment Footprint</b>            For 1 person 400sft            For 4230 ppl <b>50acres</b></p>
<p><b>Food Harvest Footprint</b>            For 1 person 4000sft            For 4230 ppl <b>392 acres</b></p>	<p><b>Food Compost Footprint</b>            For 1 person 2000sft            For 4230 ppl <b>200 acres</b></p>
<p><b>PV Footprint</b>            For 1 person 1000sft            for 1 vehicle 250sft            For 1 Unit 2875sft            For 1692 Units <b>128 acres</b></p>	<p><b>Solar Thermal Footprint</b>            For 1 person 80ft            For 4230 ppl <b>8 acres</b>            For 1 Unit surplus</p>

# AIR+WATER+FOOD+ENERGY

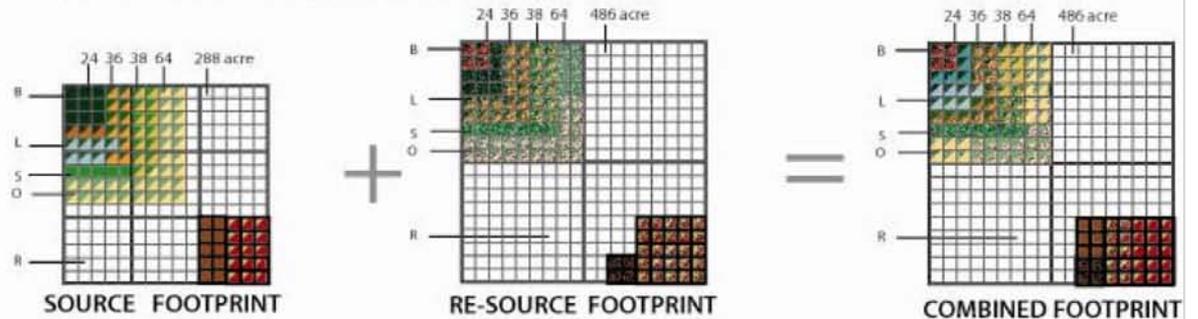
## COMBINED FOOTPRINT AREA FOR T-3



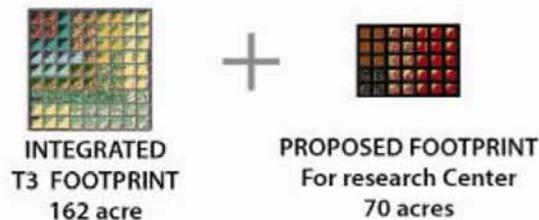
### UNINTEGRATED FOOTPRINT AREA :



### INTEGRATED FOOTPRINT AREA :



### ACTUAL FOOTPRINT REQUIRED TO BALANCE T3:

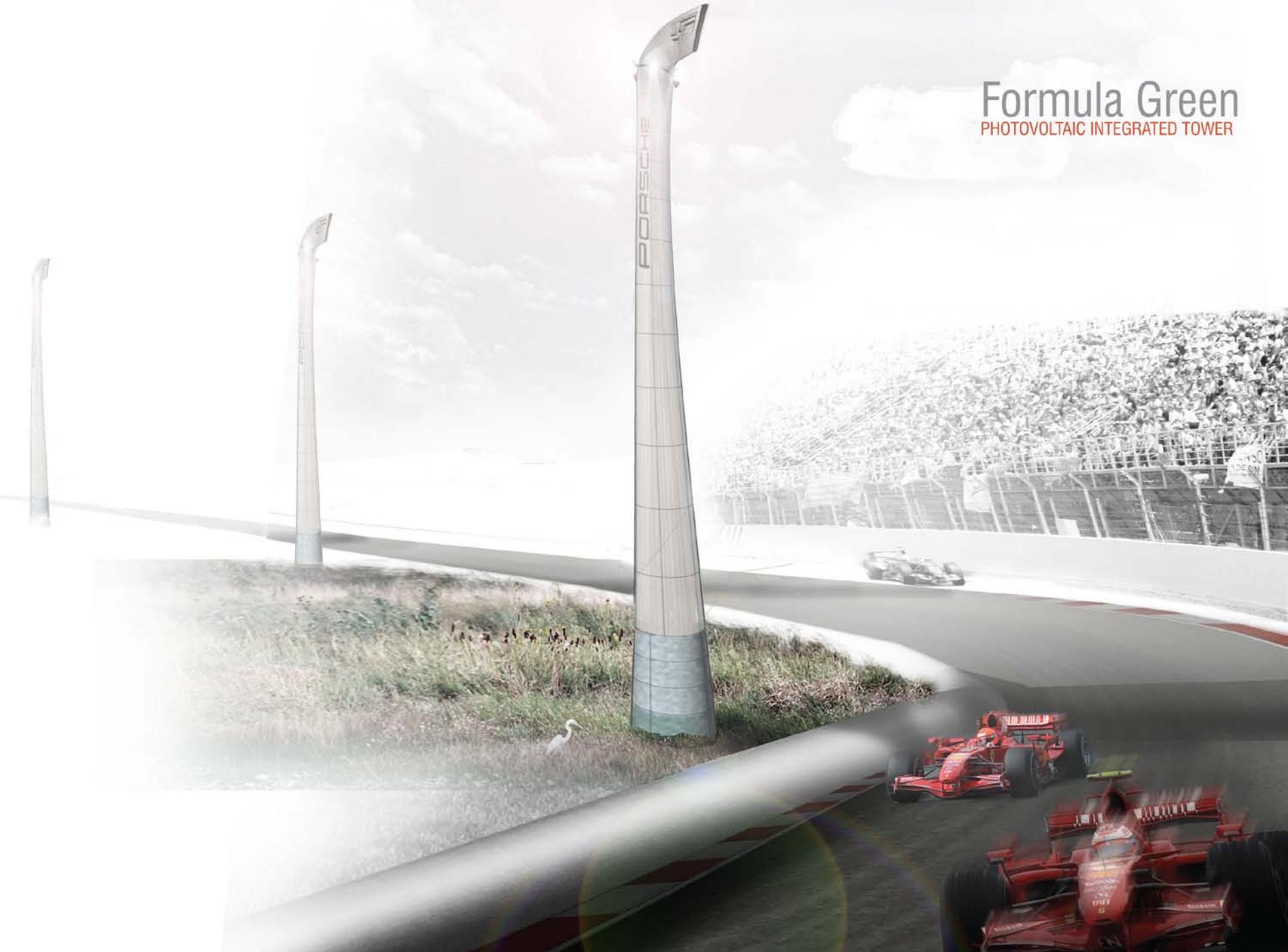


**RESEARCH CENTER USAGE**

- Megaflora plantation 50acres
- O2 supply/Carbon sink
- Waste water treatment
- BiomassFuel / Biochar
- Intensive Farming 20acres

# Formula Green

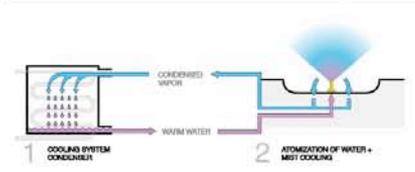
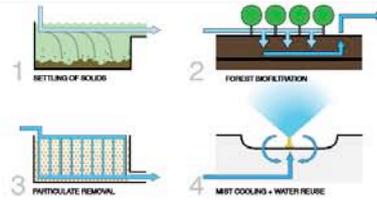
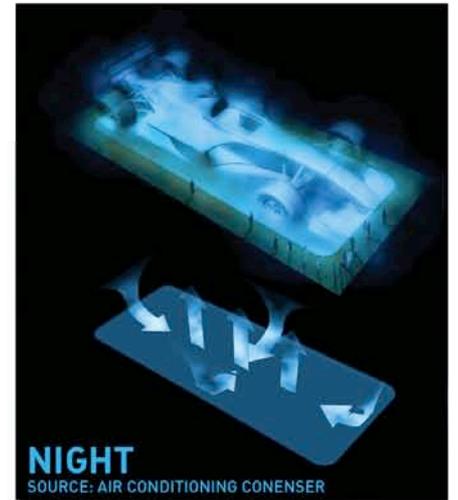
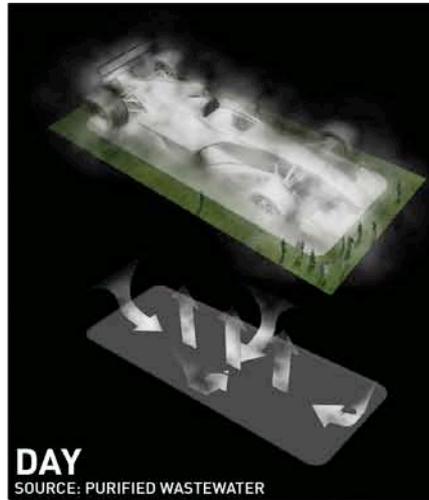
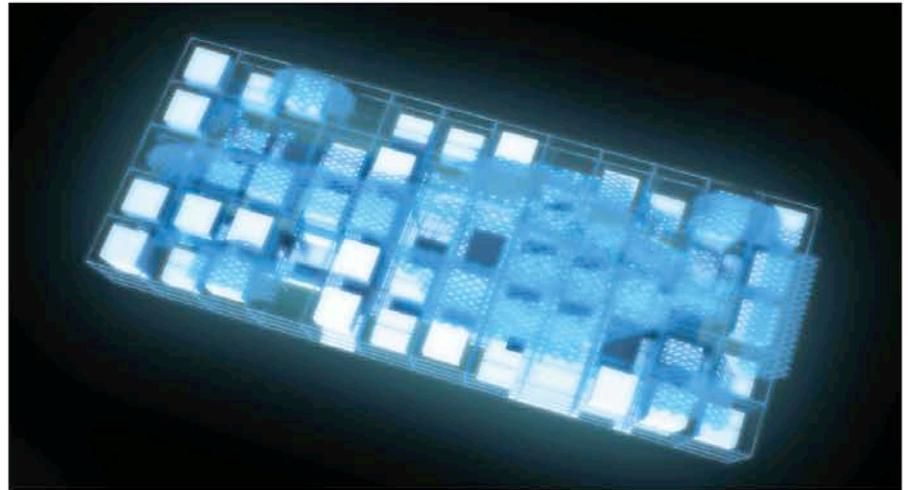
PHOTOVOLTAIC INTEGRATED TOWER



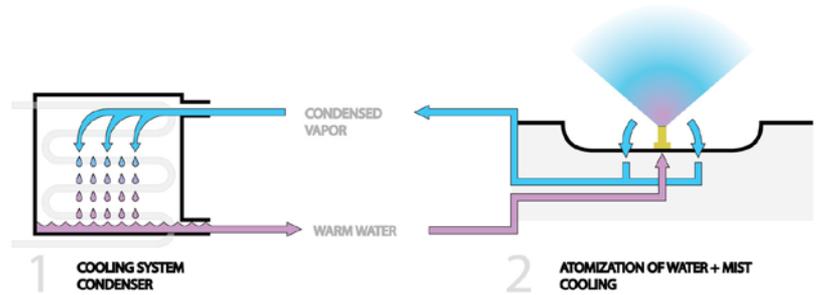
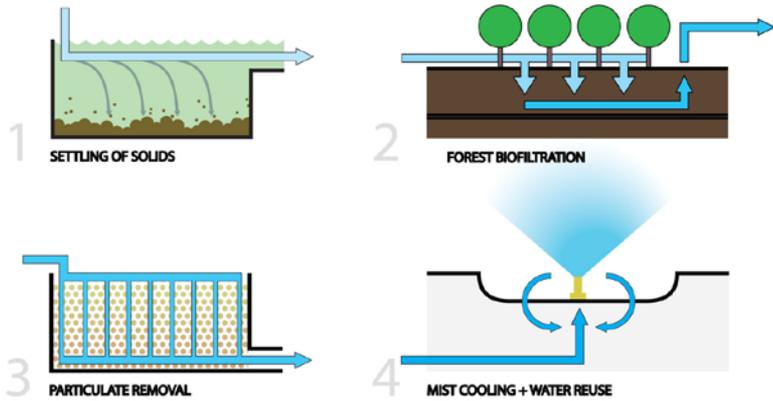
Future Home of  
The Formula 1 United States Grand Prix™  
formula1.unitedstates.com



Conceptual Master Plan

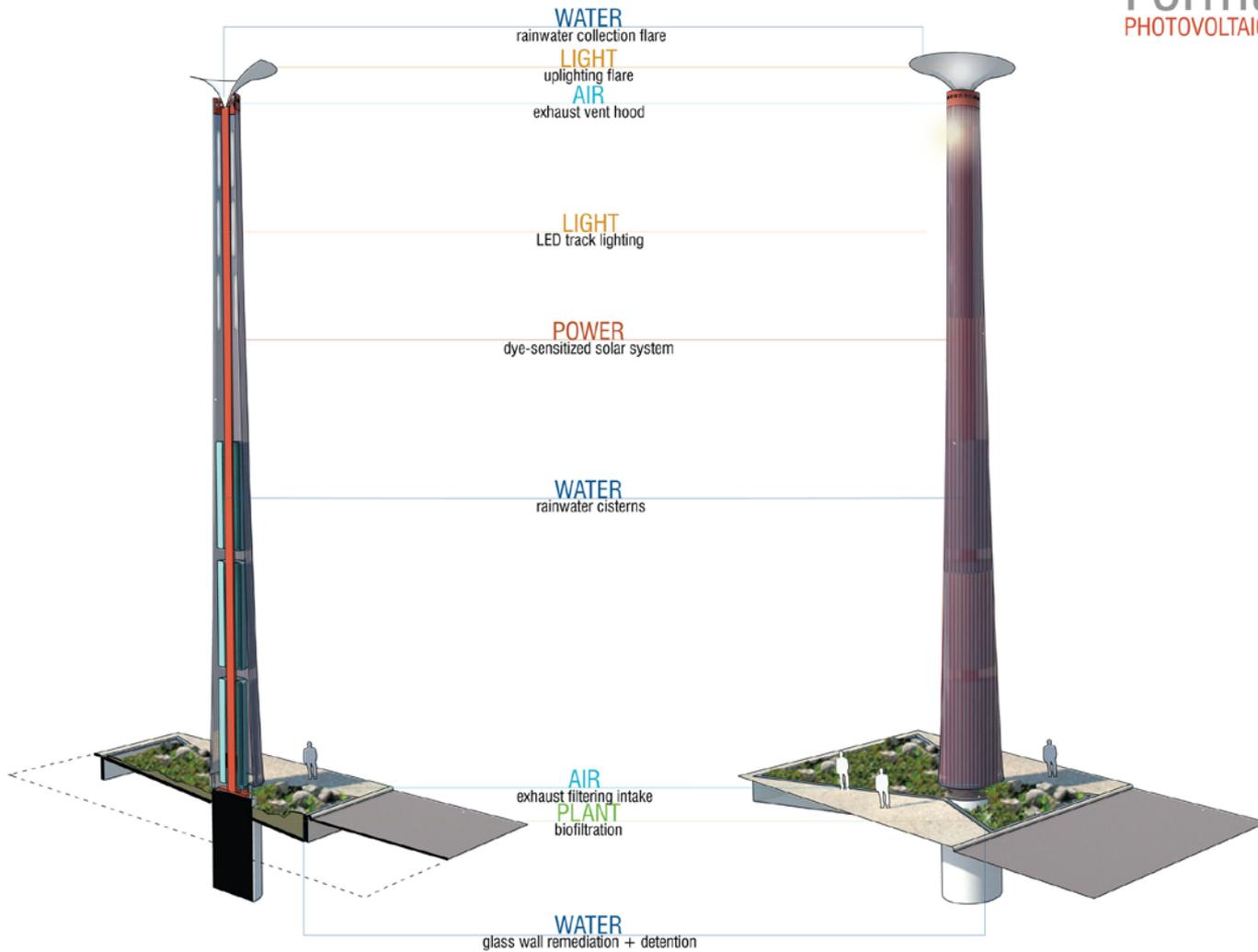


Use of Eco-machines as advertisement



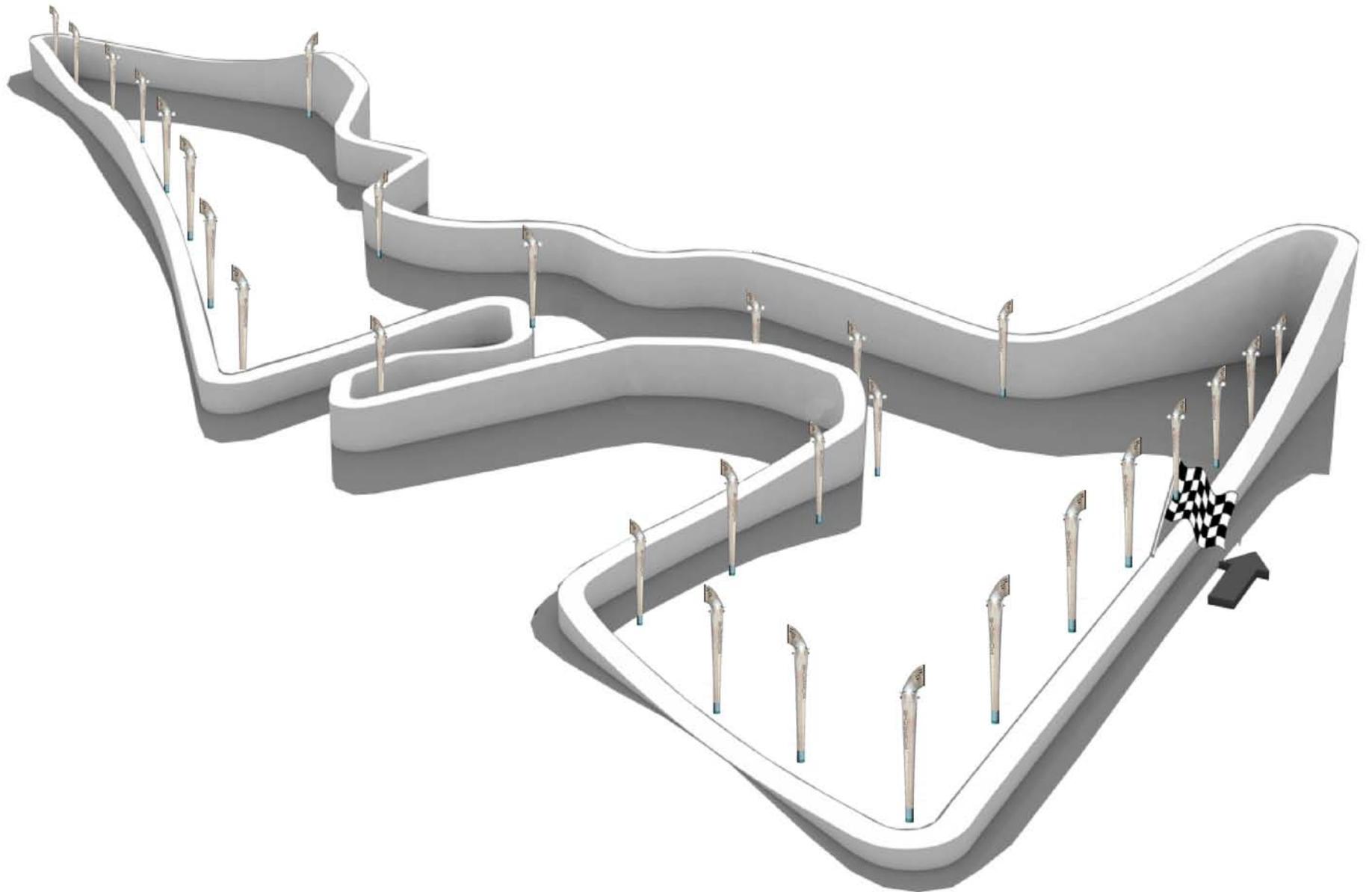
# Formula Green

PHOTOVOLTAIC INTEGRATED TOWER



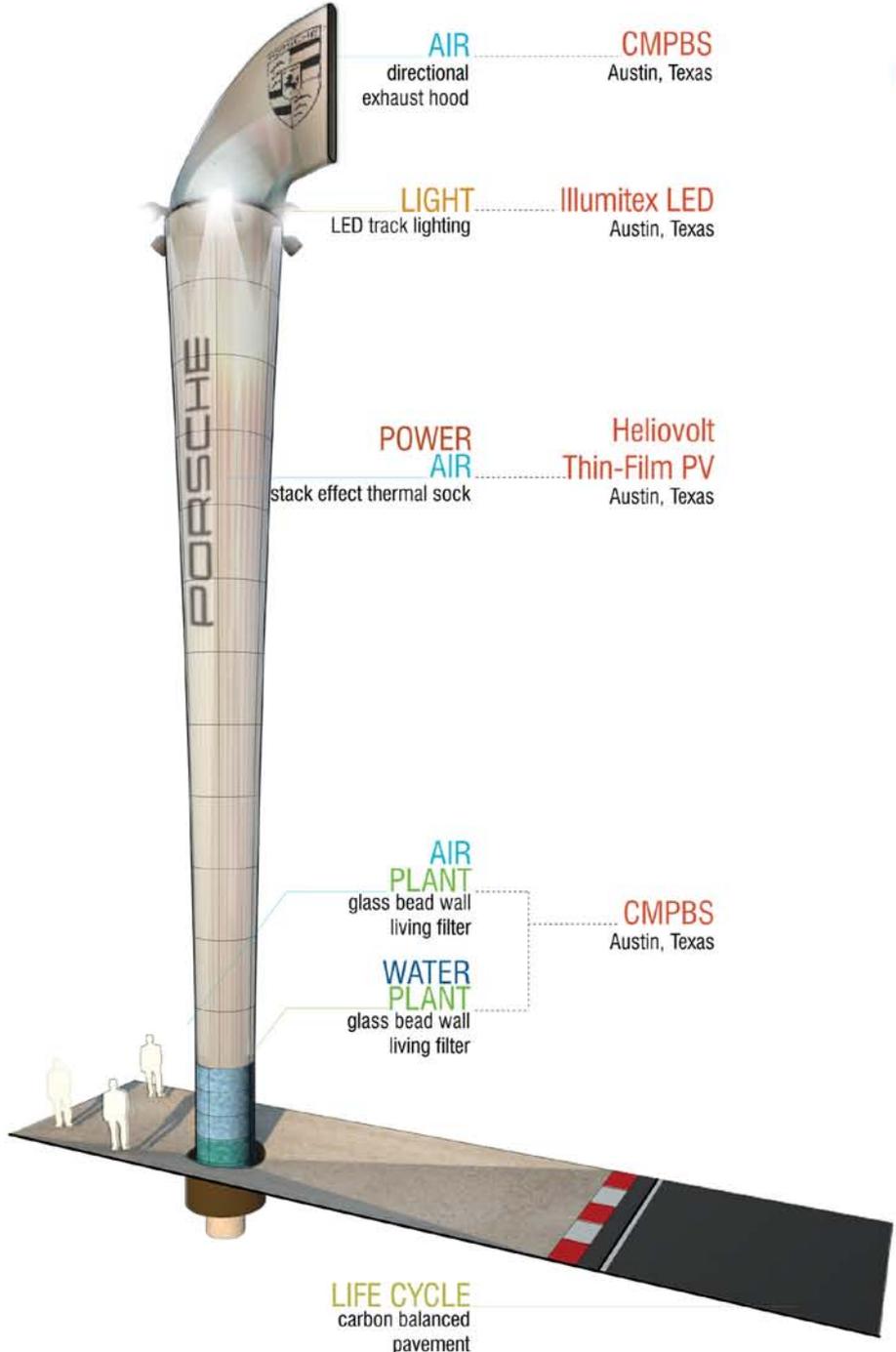
# Formula Green

TOWER PLACEMENT DIAGRAM



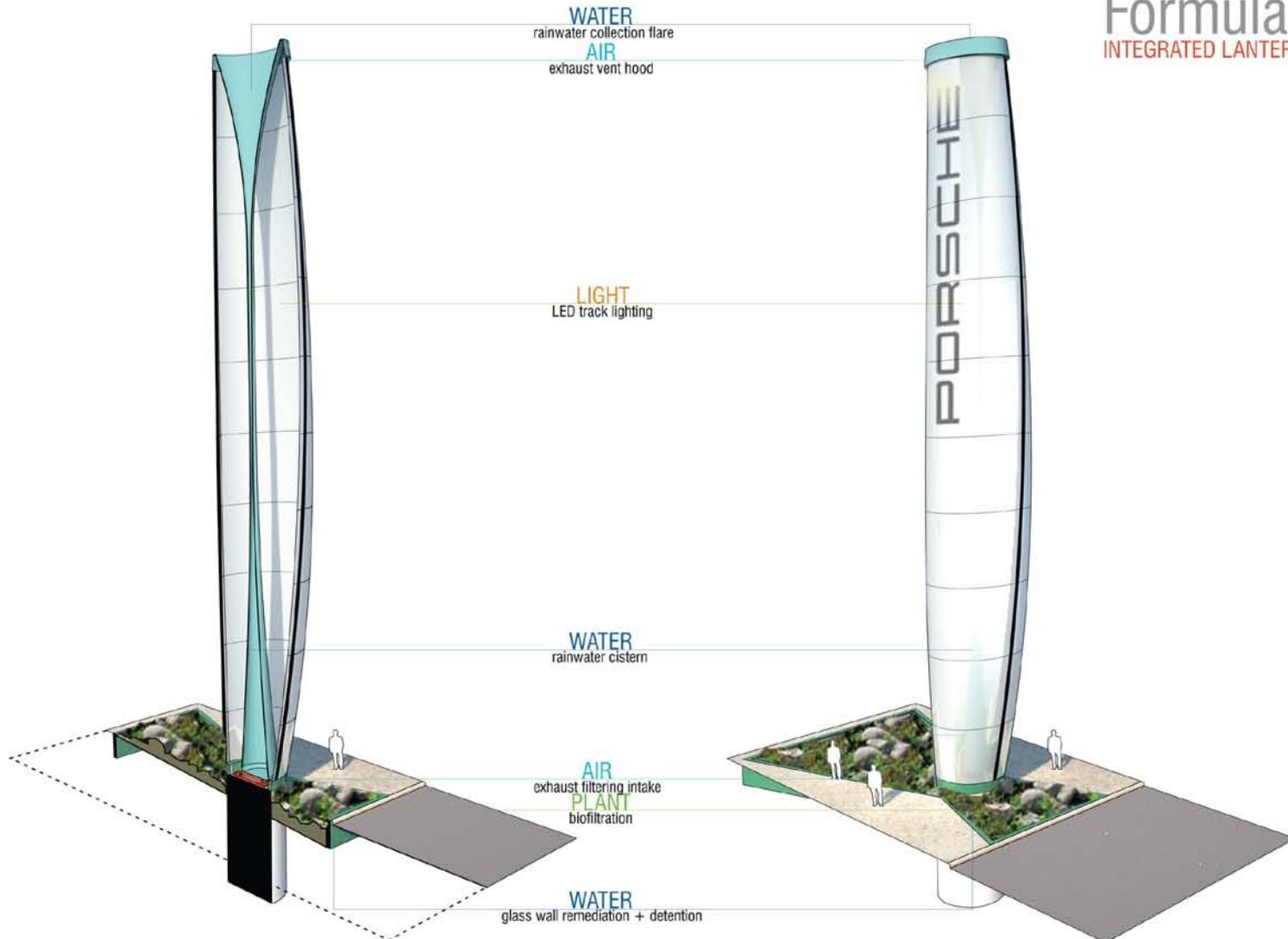
# Formula Green

INTEGRATED LANTERN TOWER



# Formula Green

INTEGRATED LANTERN TOWER

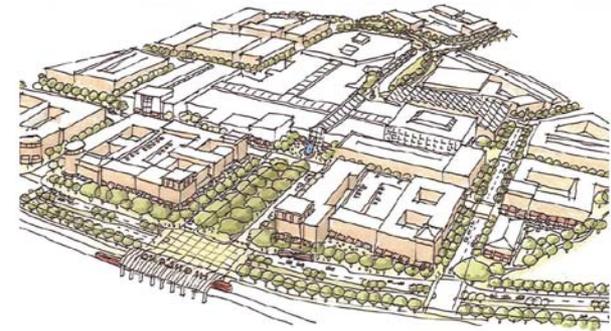




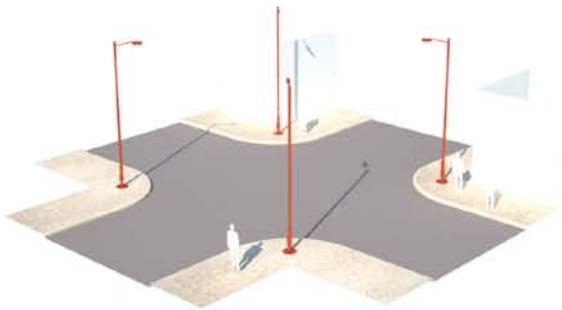
**HIGHWAY | RACEWAY**  
Formula Green



**STREET**  
Austin Great Streets



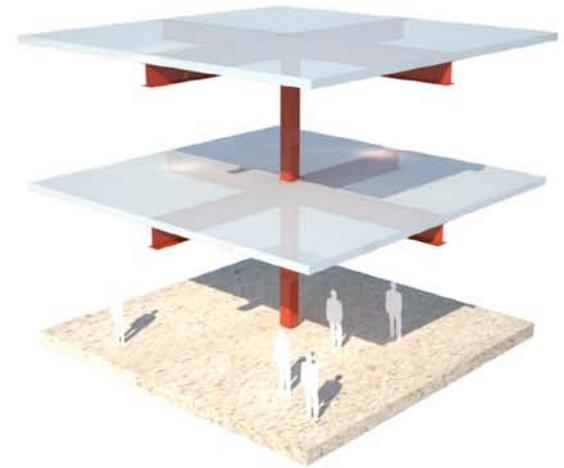
**BUILDING**  
Highland Mall-ACC Masterplan



**URBAN INTERSECTION**  
Typical Condition



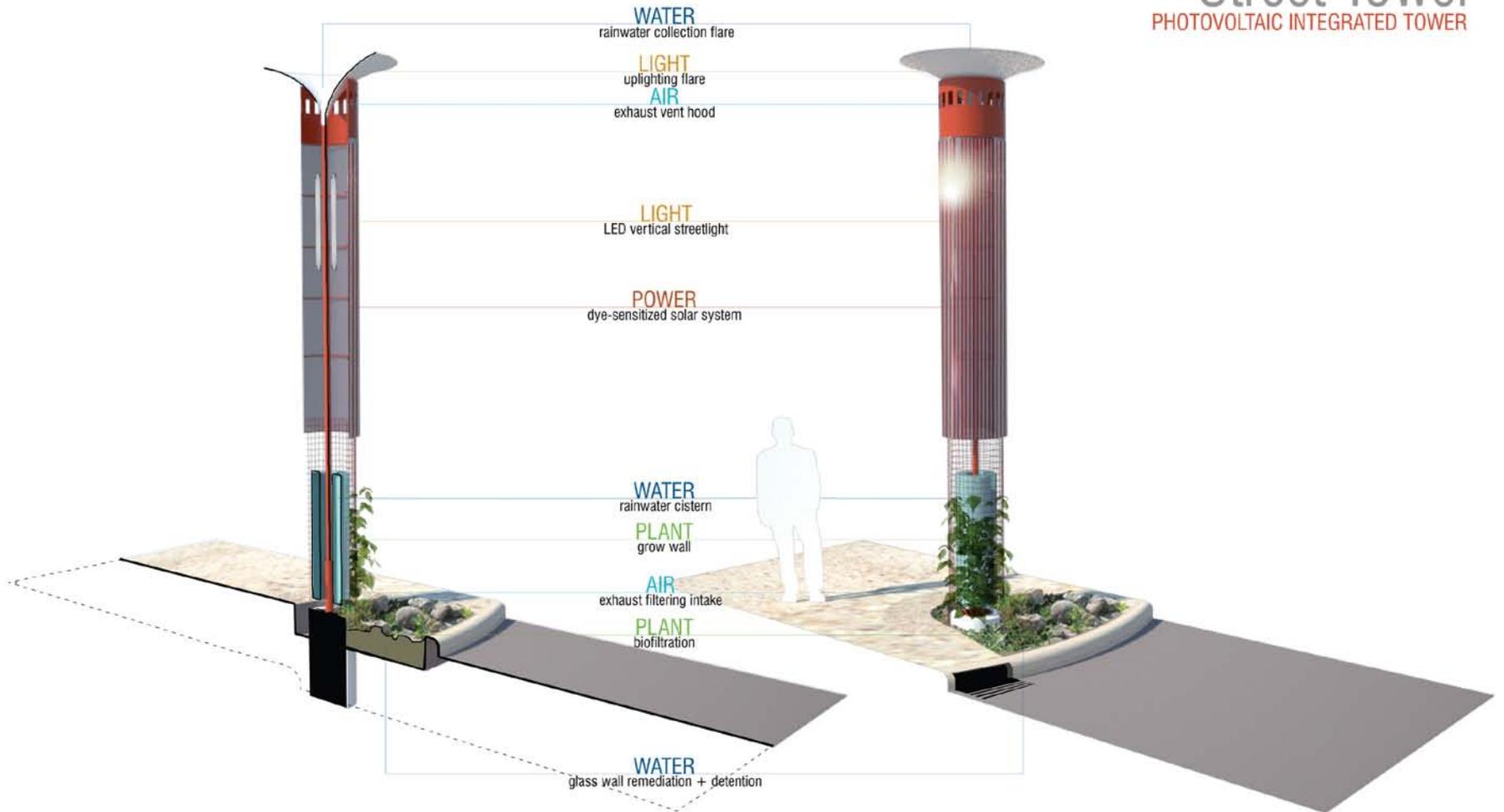
**HIGHWAY | RACEWAY**  
Typical Condition



**HEAVY STEEL BUILDING**  
Typical Condition

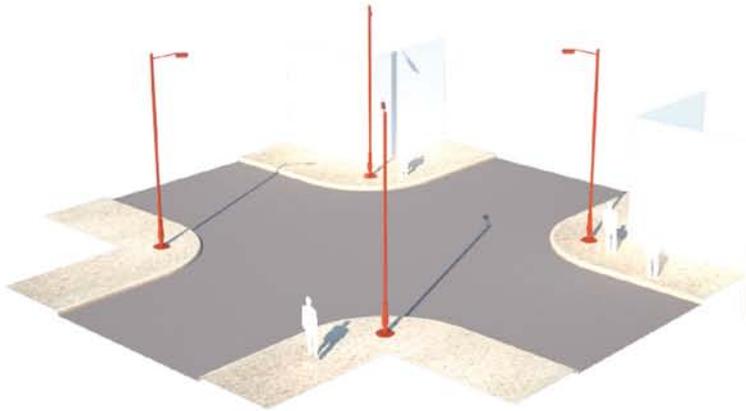
# Street Tower

PHOTOVOLTAIC INTEGRATED TOWER

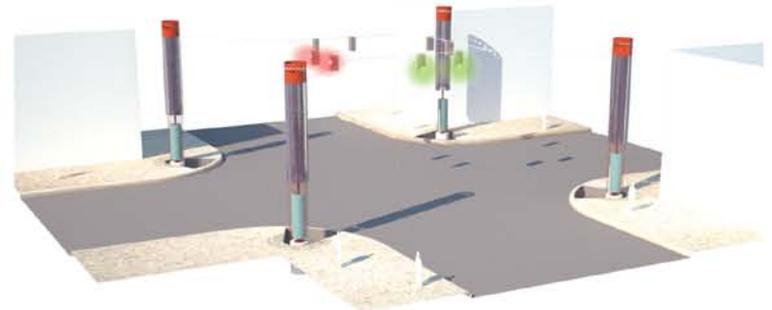
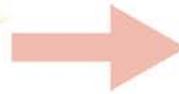


# Street Tower

PHOTOVOLTAIC INTEGRATED TOWER



**STANDARD INTERSECTION**  
Existing Condition



**GREEN INTERSECTION**  
Integrated Condition

# Street Tower

IMPLEMENTATION STRATEGY

