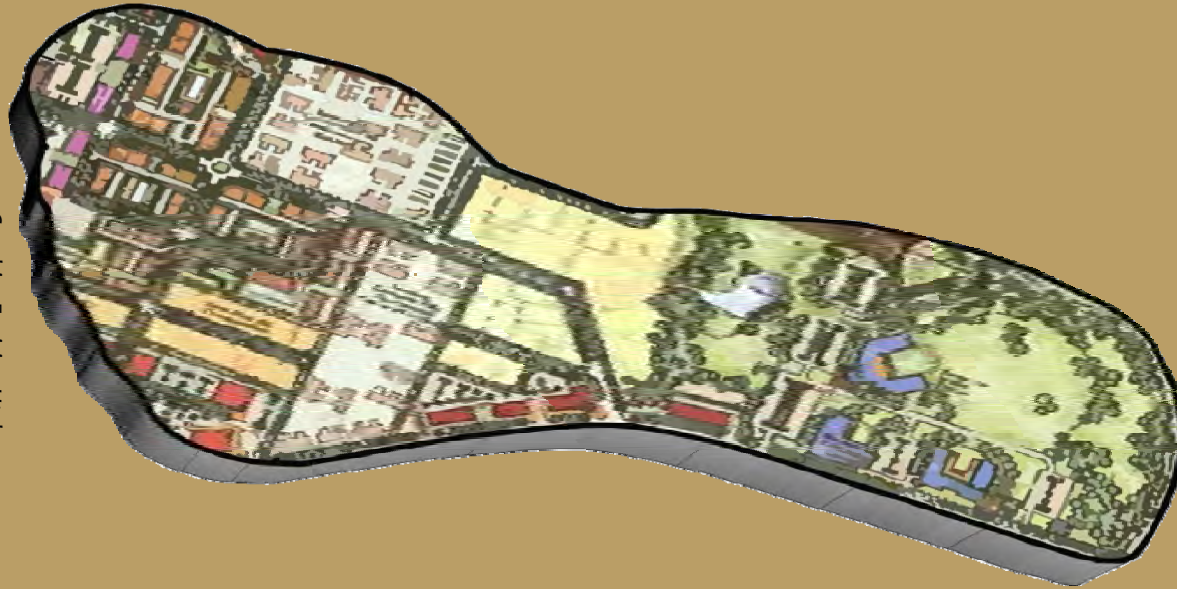


Cool Spots

Carbon Footprint Reduction Through Community Planning



Graphic: Envision Utah

Eliot Allen, AICP
Criterion Planners
Portland, OR
November 2008

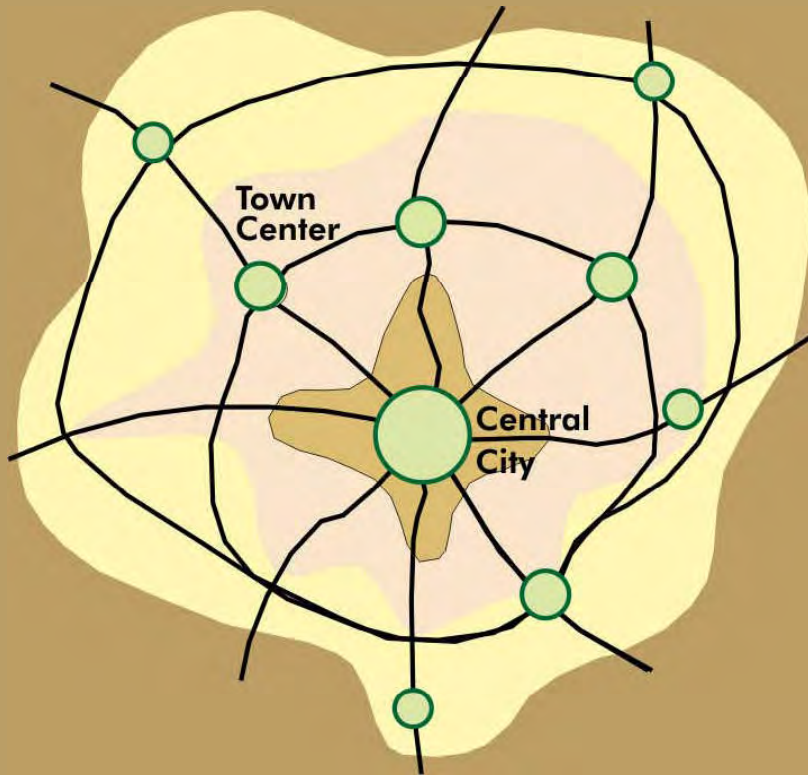
CRITERION
PLANNERS



crit.com

Cool Spots Defined

Region



Neighborhoods with:

Superior regional accessibility

+

High-density mixed land-uses

+

Multi-modal travel environment

+

High-efficiency infrastructure

+

Renewable energy production

+

Local food production

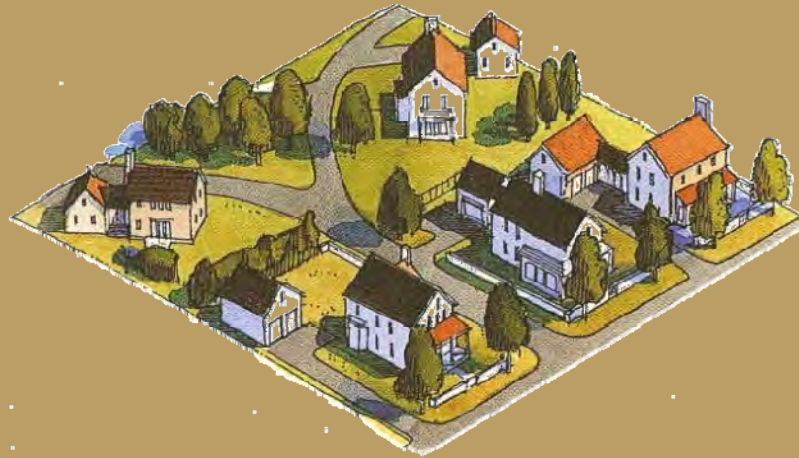
Lower per capita CO₂ emissions

Land-Use and CO₂

Suburban

8 DU/acre

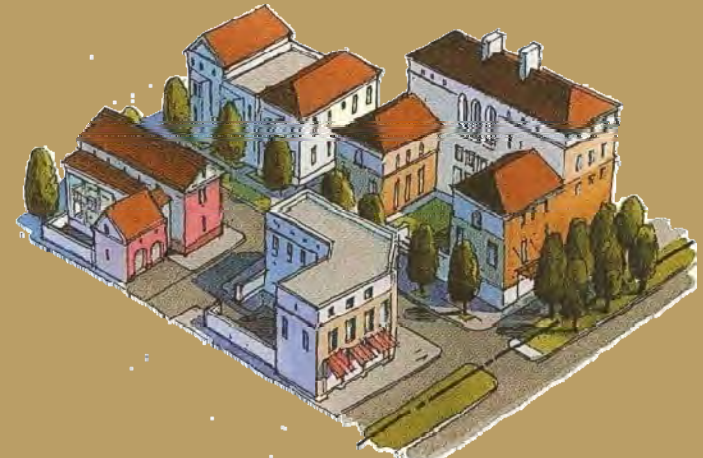
0.25 FAR



Urban

40 DU/acre

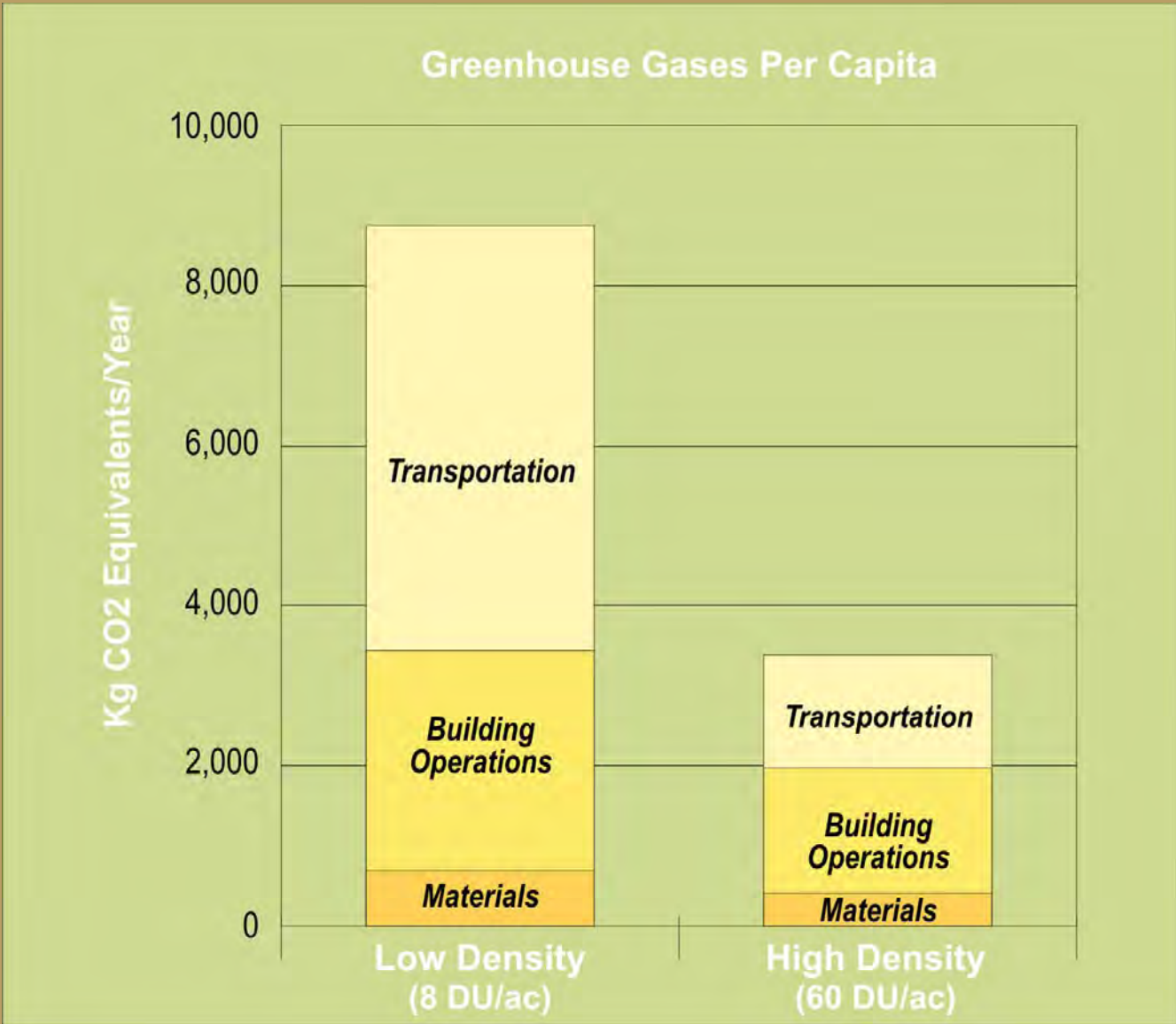
2.5 FAR



CO₂ Lbs/Yr/Household

Buildings	24,000	11,000
Transportation	<u>26,000</u>	<u>9,000</u>
Total	50,000	20,000

Toronto Case Studies



Source: Norman, et al., ASCE, 2006

Cool Spot Kit of Parts

CO₂ Reductions



Regional access – transit

Transportation efficiencies



Local travel – walk/bike/transit

Transportation efficiencies



High-density land-uses

Space conditioning reduction;
transportation savings



Mixed land-uses

Peak bldg. load diversity;
transportation savings



Solar orientation/
heat island reduction

Space conditioning reduction



District heating & cooling

Space conditioning/water
heating efficiencies



Distributed clean power
generation

Reduced generation emissions;
reduced distb. losses



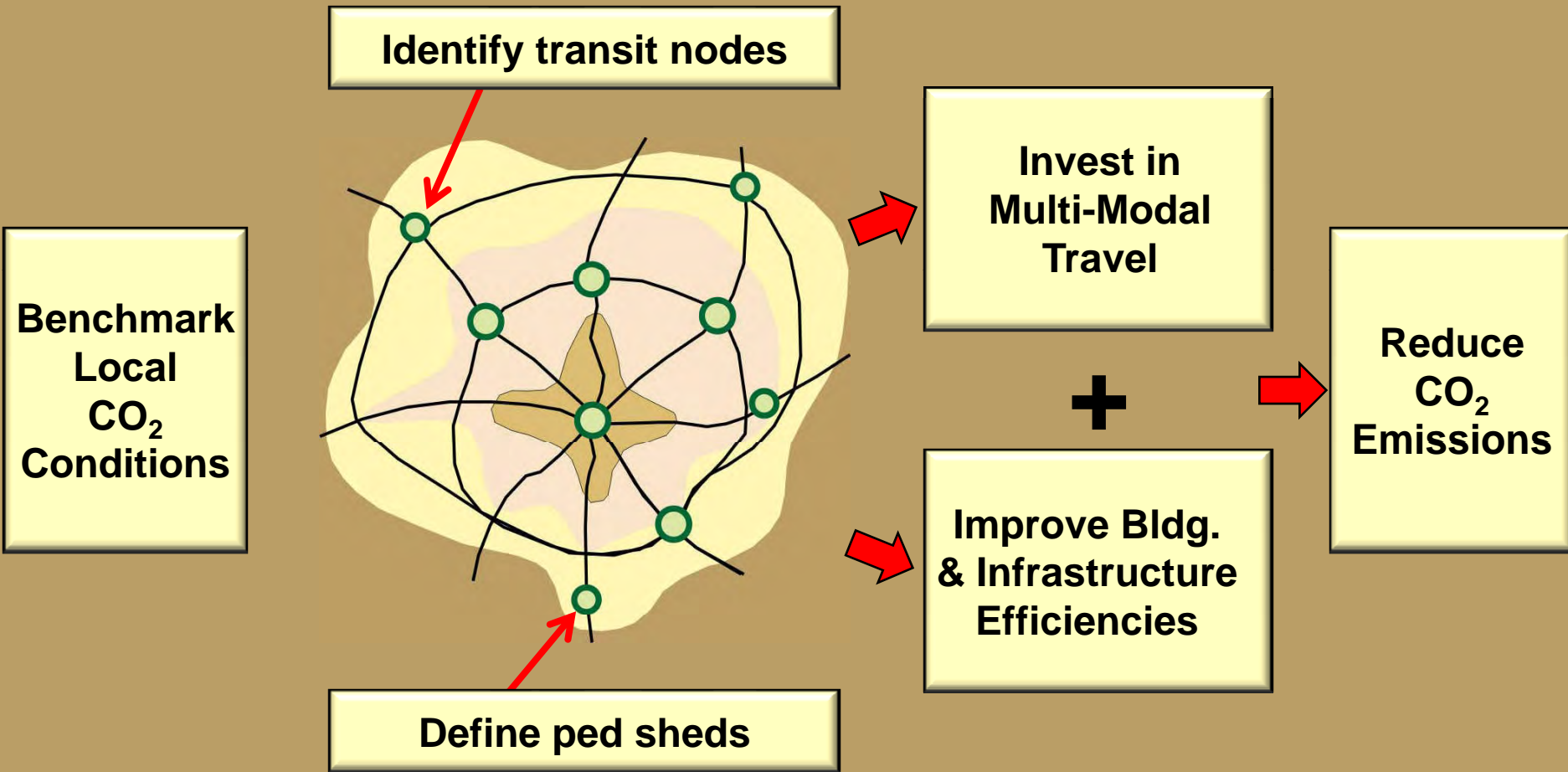
Compact electric grid

Reduced distb. losses

Who's Needed at the Drawing Board

- City/County planning department.
- Metropolitan planning organization (MPO).
- City/County/State transportation departments.
- Transit agency.
- Electric/natural gas utilities.
- Building designers/developers.

Strengthen Existing Cool Spots



Grow New Cool Spots



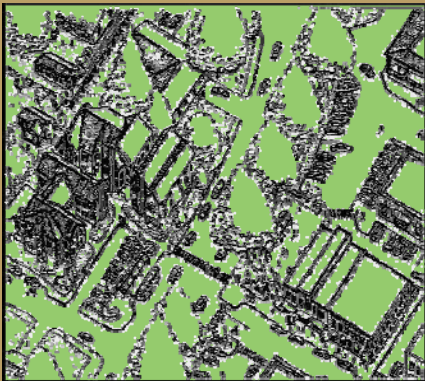
Year 1

- Build ped and bike network with initial development
- 200 MMBtu/capita/yr energy use
- 12 tons/capita/yr CO₂ emissions



Year 3

- Increase transit density & frequency as occupancy grows
- 150 MMBtu/capita/yr energy use
- 9 tons/capita/yr CO₂ emissions



Year 5

- Expand district heating and cooling from anchor loads
- 100 MMBtu/capita/yr energy use
- 6 tons/capita/yr CO₂ emissions

Develop a Carbon Transect

Community Design

	High Carbon	Low Carbon
Residential Density (net DU/ac)	0.10	35
Employment Proximity (jobs w/i 1 mi.)	10	30,000
Street Density (centerline mi./sq.mi)	1	25
Transit Proximity (avg. ft. DU-closest stop)	25,000	400
Auto Use (VMT/capita/day)	35	10

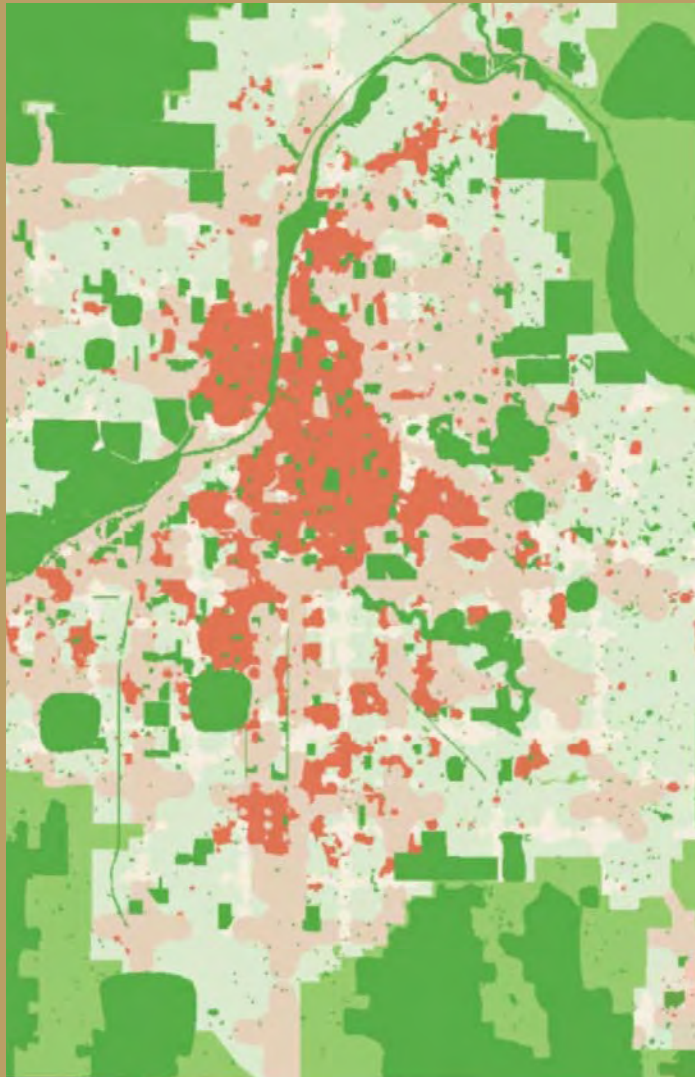
Carbon Performance

Energy Use (MMBtu/capita/yr)	230	75
CO ₂ Emissions (tons/capita/yr)	12	4

A tool for evaluating development and monitoring progress.



Express Plan Build-Out in GHG Terms



CO₂ lbs/yr/capita

25,000

20,000

15,000







10,000

Preserved Open Space

Reserved Open Space/TDRs

Getting Started

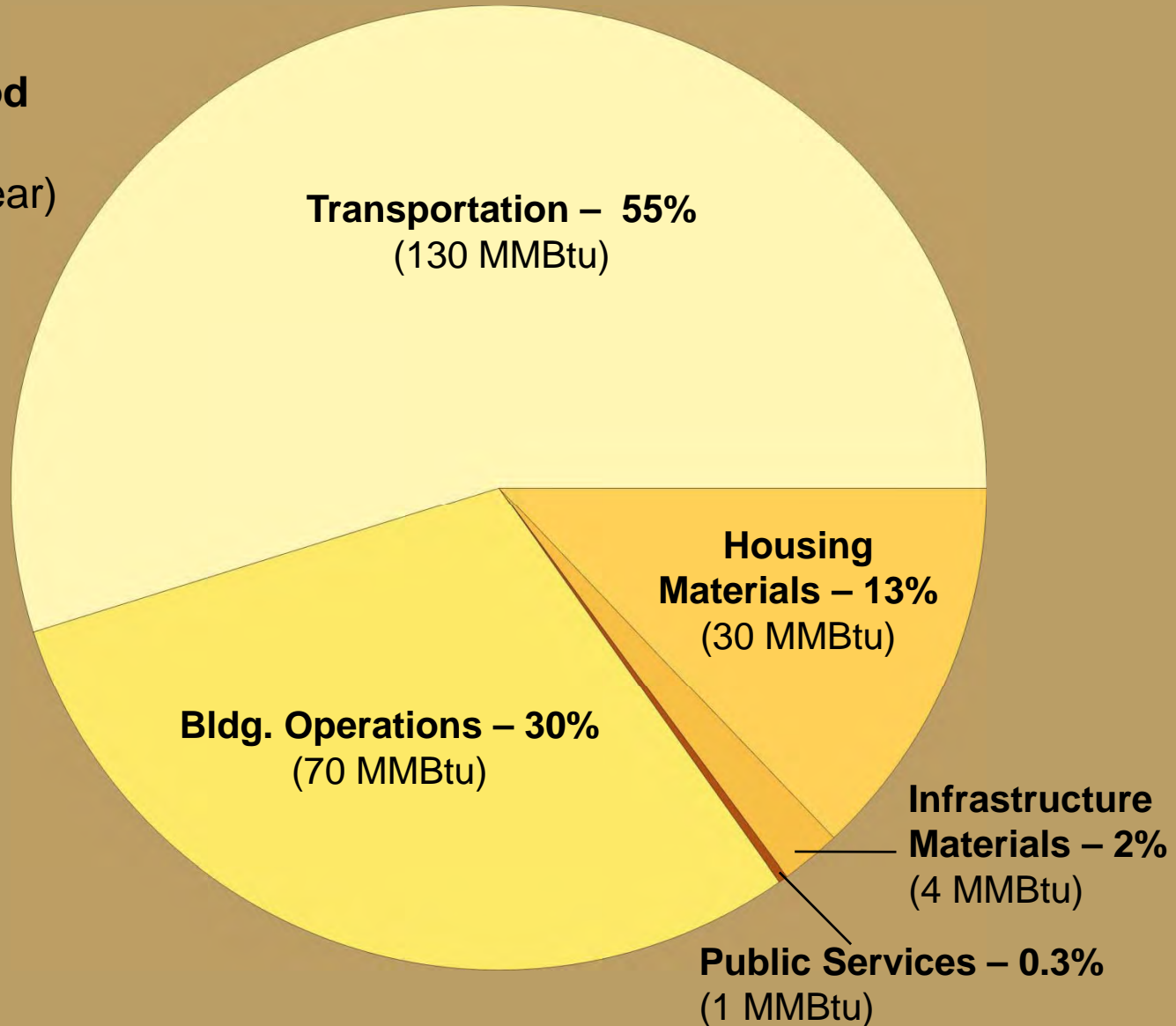
Calibrate local energy use and CO₂ emissions with a greenhouse gas inventory.

	Energy Use (MMBtu/yr)	Energy Cost (\$/yr)	(CO ₂ tons/yr)
 Single-family home	110	1,280	13
 10,000 sq.ft. store	850	10,240	129
 20,000 sq.ft. office	2,080	25,180	317
 Auto	80	740	6
 Bus	1,300	10,380	103
 Total per capita	150	1,650	17

Values vary by region.

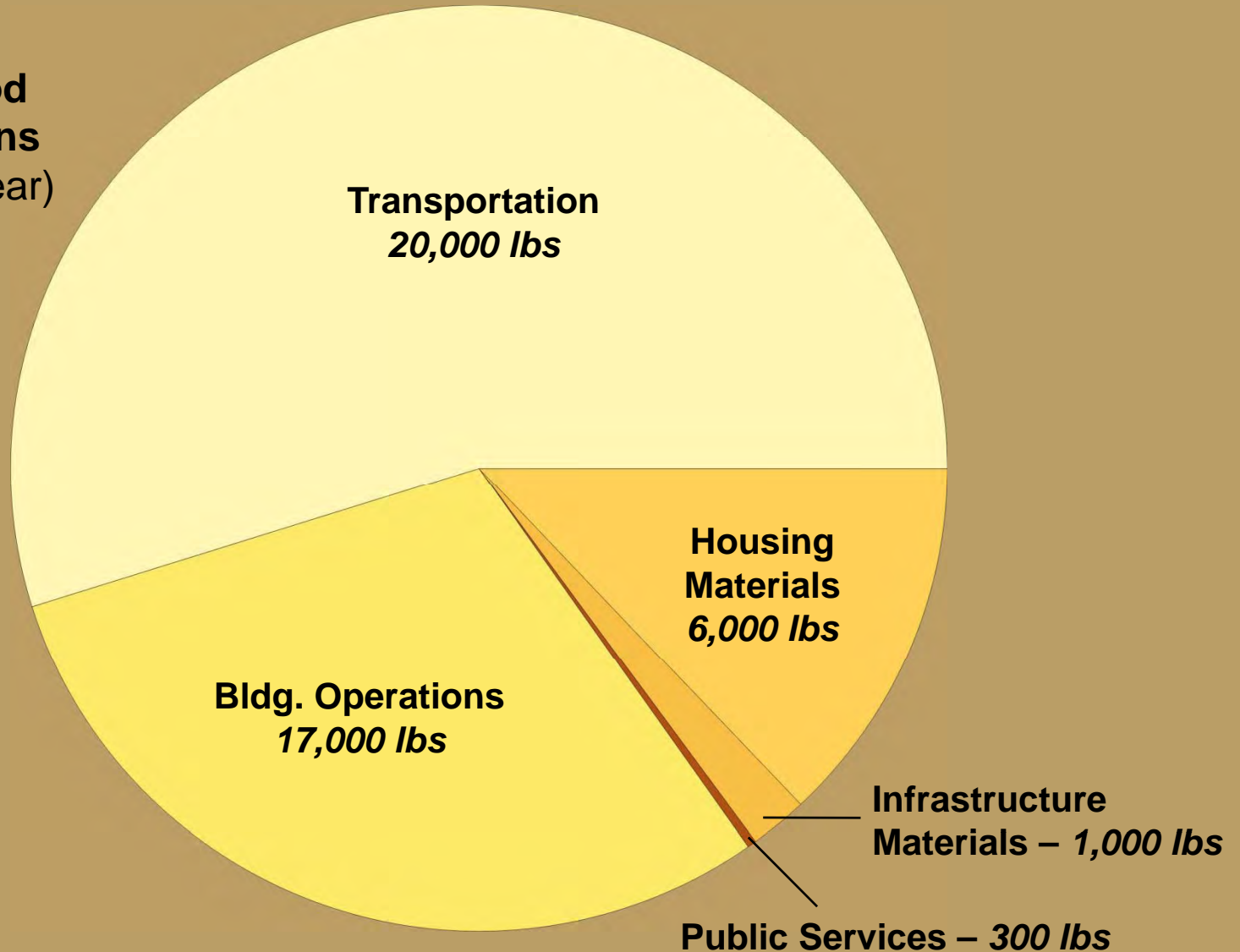
Assemble Energy Use at Neighborhood-Scale

**Illustrative
Neighborhood
Energy Use**
(household/year)

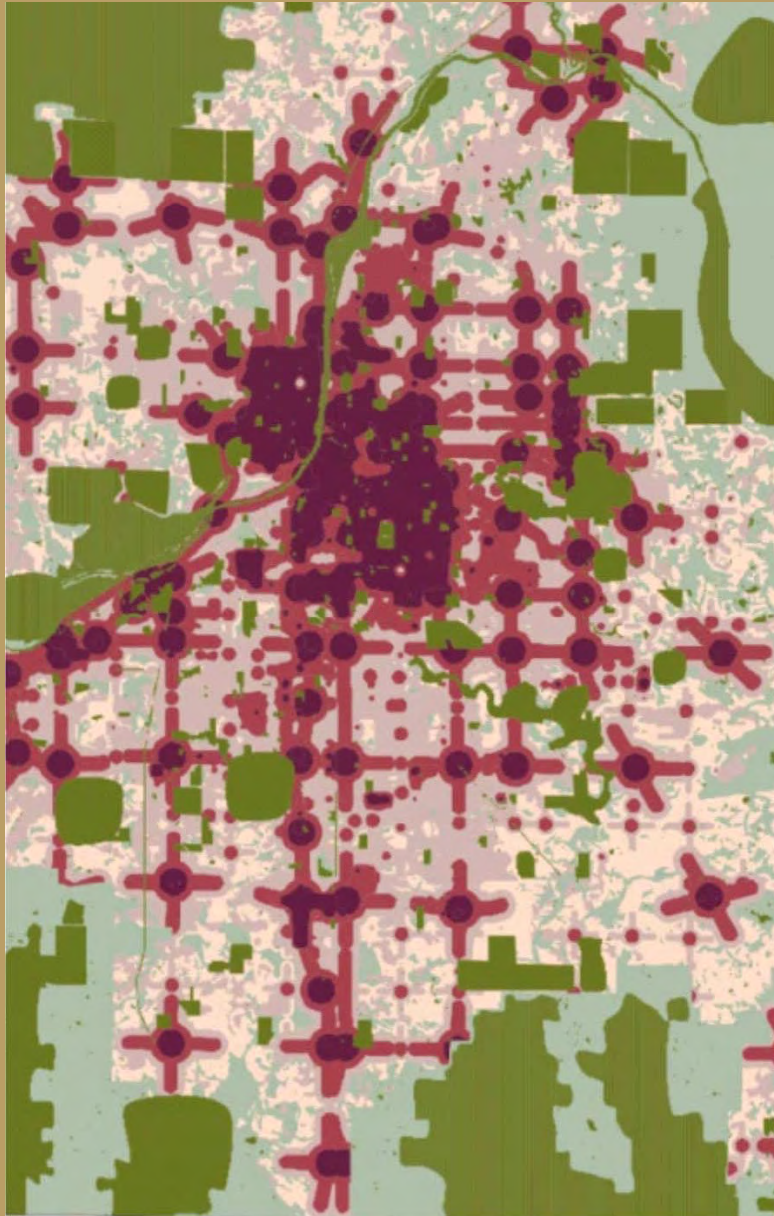


Convert Energy to CO₂ Emissions

**Illustrative
Neighborhood
CO₂ Emissions
(household/year)**

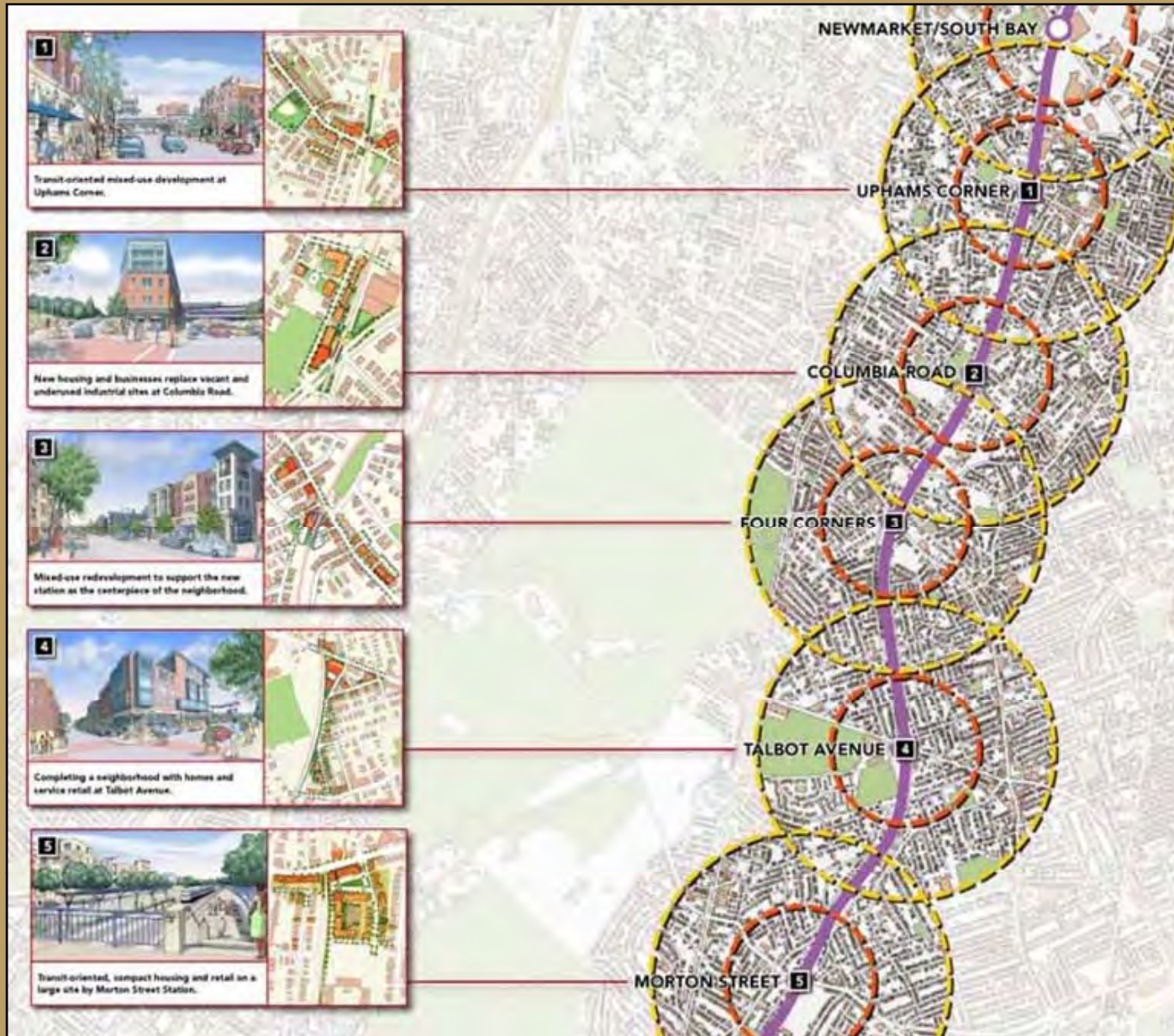


Survey Region for Transit Nodes



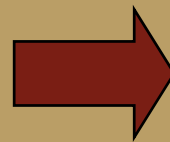
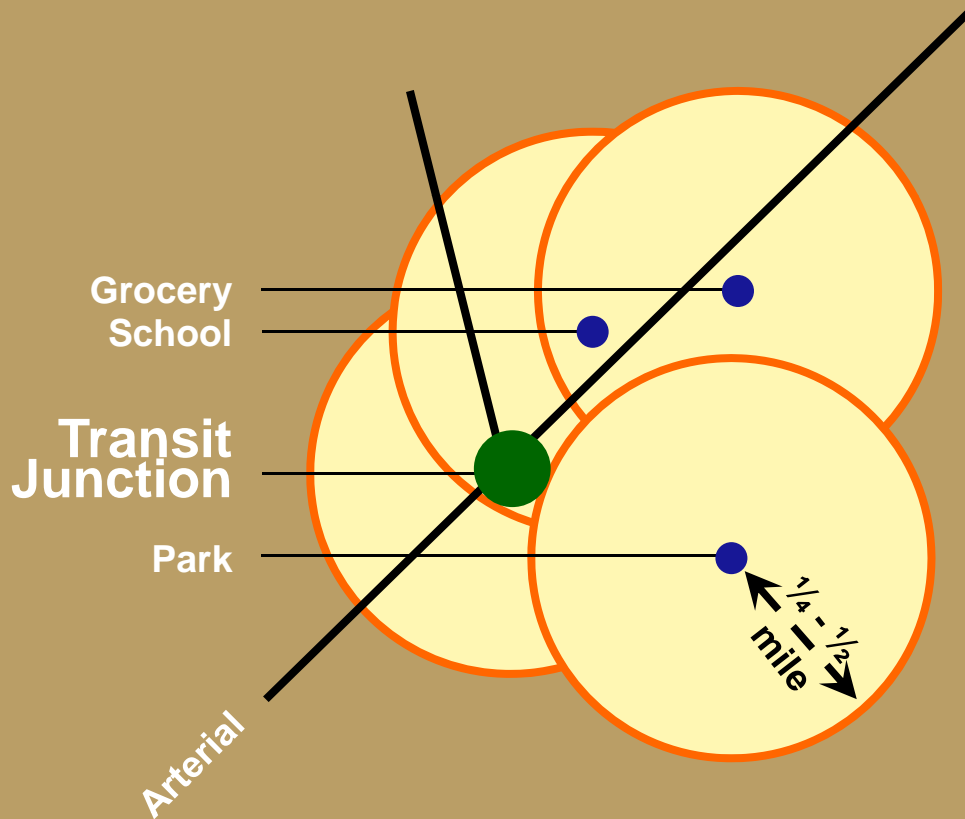
● High-capacity transit junctions

Boston Example

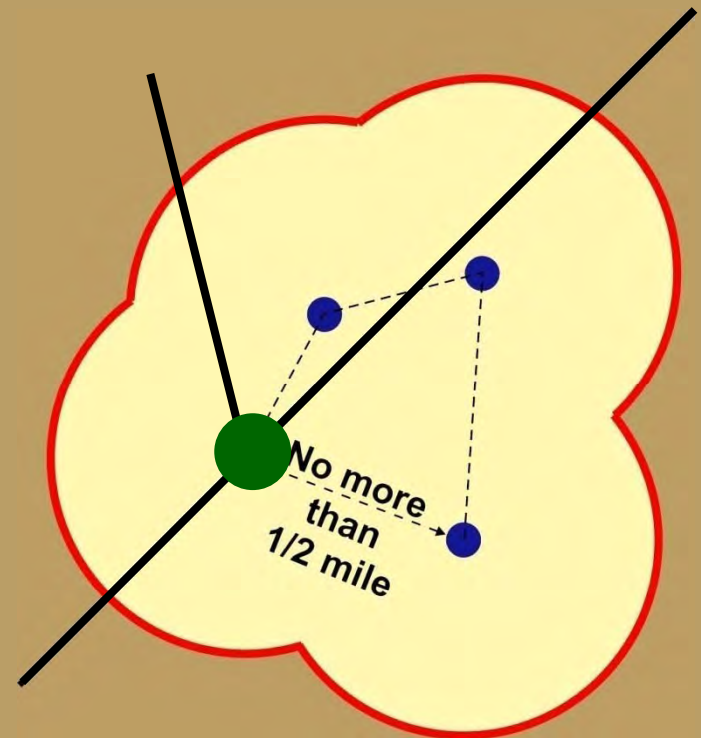


Assemble Ped Sheds Around Nodes

Single Destination Sheds

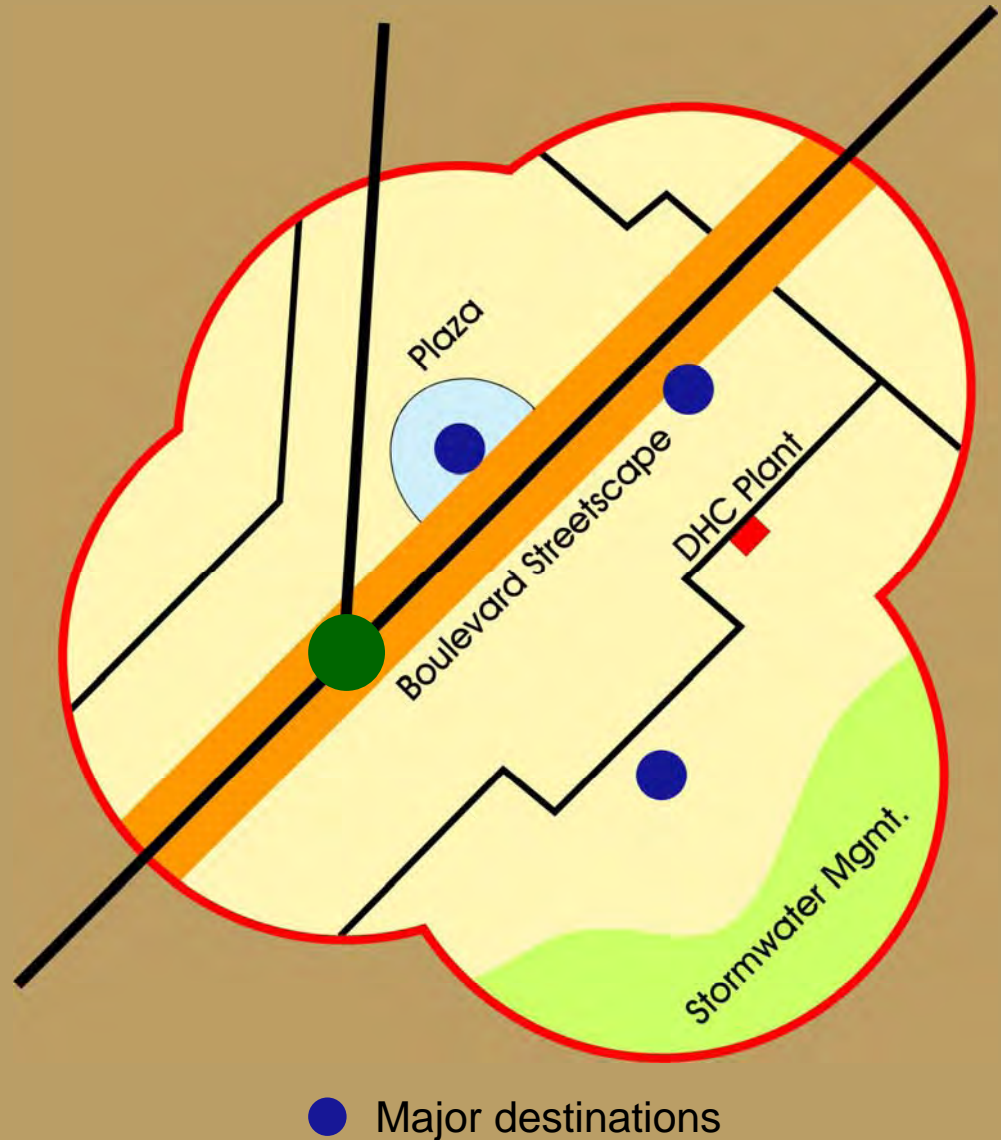


Cool Spot Composite Shed



Detail the Cool Spot

- Pedestrian, bicycle, transit facilities.
- Energy efficiency in buildings and infrastructure.
- Heat island reduction.
- District heating and cooling.
- Small-scale clean power generation.
- Parking management.
- Stormwater best management practices.



Cool Spot in a Box: LEED-ND

Yes

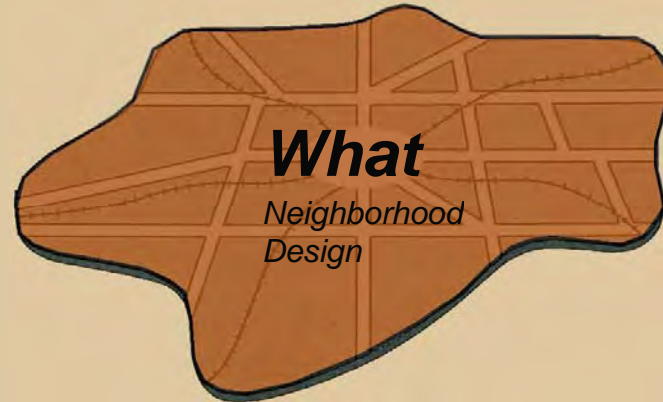
Regional accessibility
Infill
Use mix
Brownfield reuse
Jobs/housing proximity
School proximity
Transit service
Biking network



No

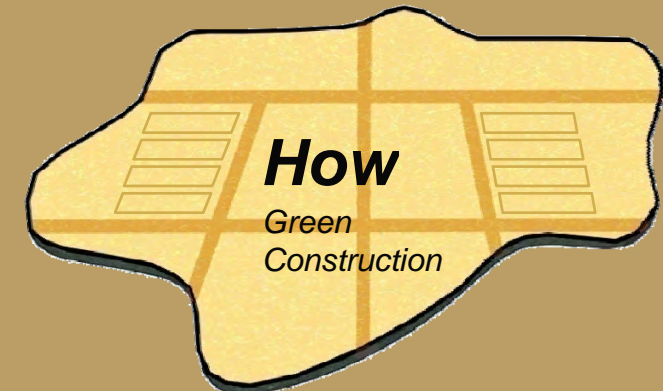
Wetlands disturbance
Agricultural land conversion
Floodplains encroachment
Sensitive habitat loss
Steep slopes development

Density
Use mix
Housing mix/affordability
Walkability
Transit service
Parks
Local food
Universal access



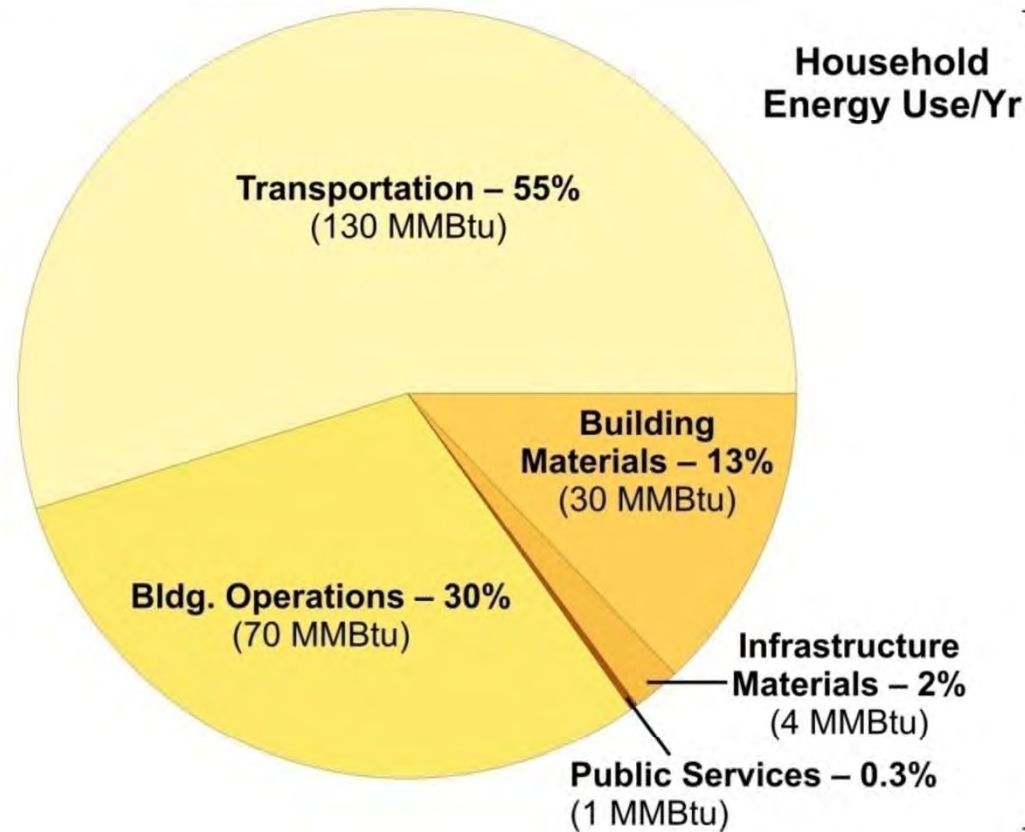
Gated streets

Energy/water efficiency
Building reuse
Historic preservation
Stormwater mgmt.
Solar orientation
On-site renewables
Wastewater reuse
Recycling



Construction pollution
Light pollution
Heat islands

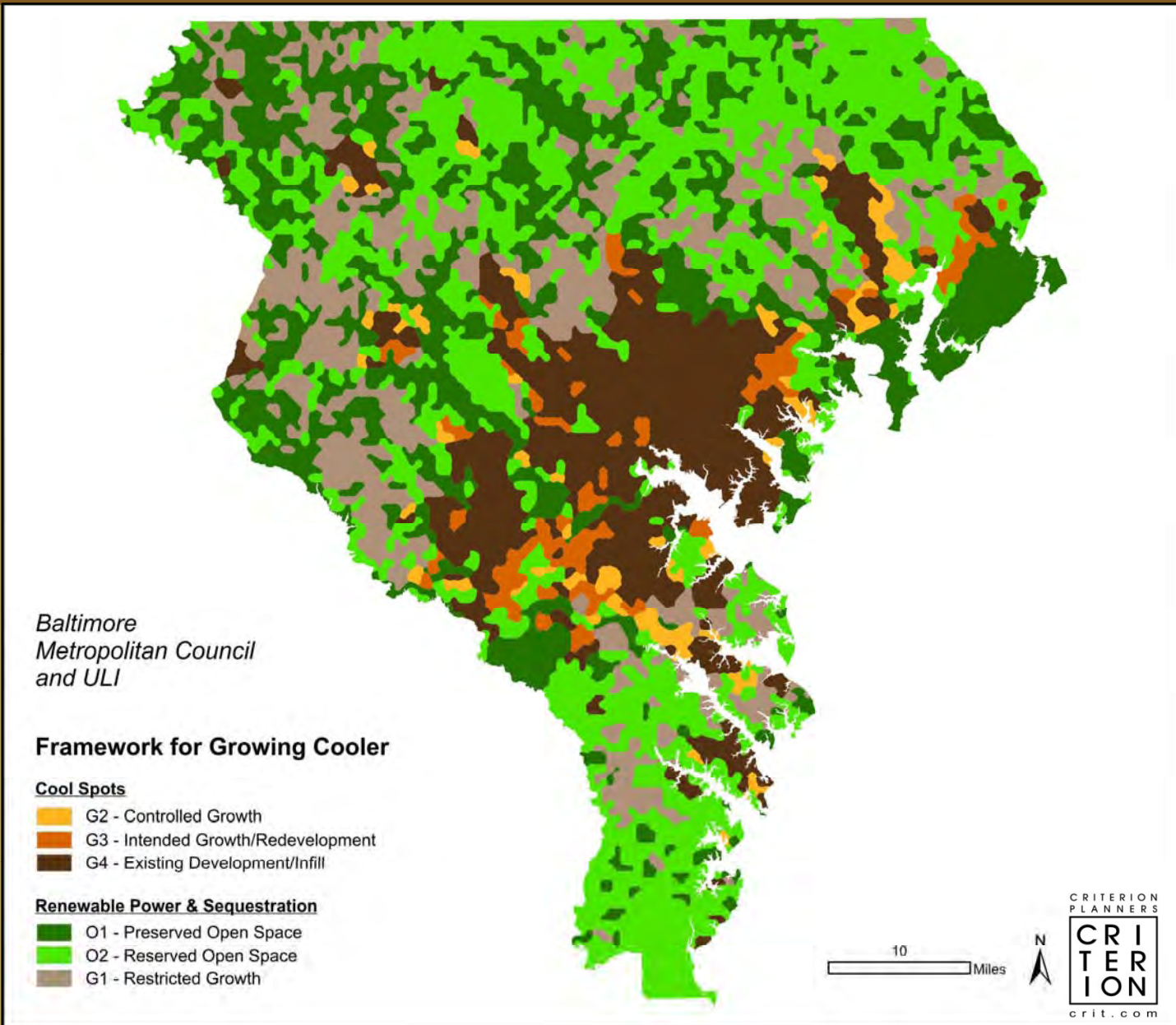
LEED-ND CO₂ Savings



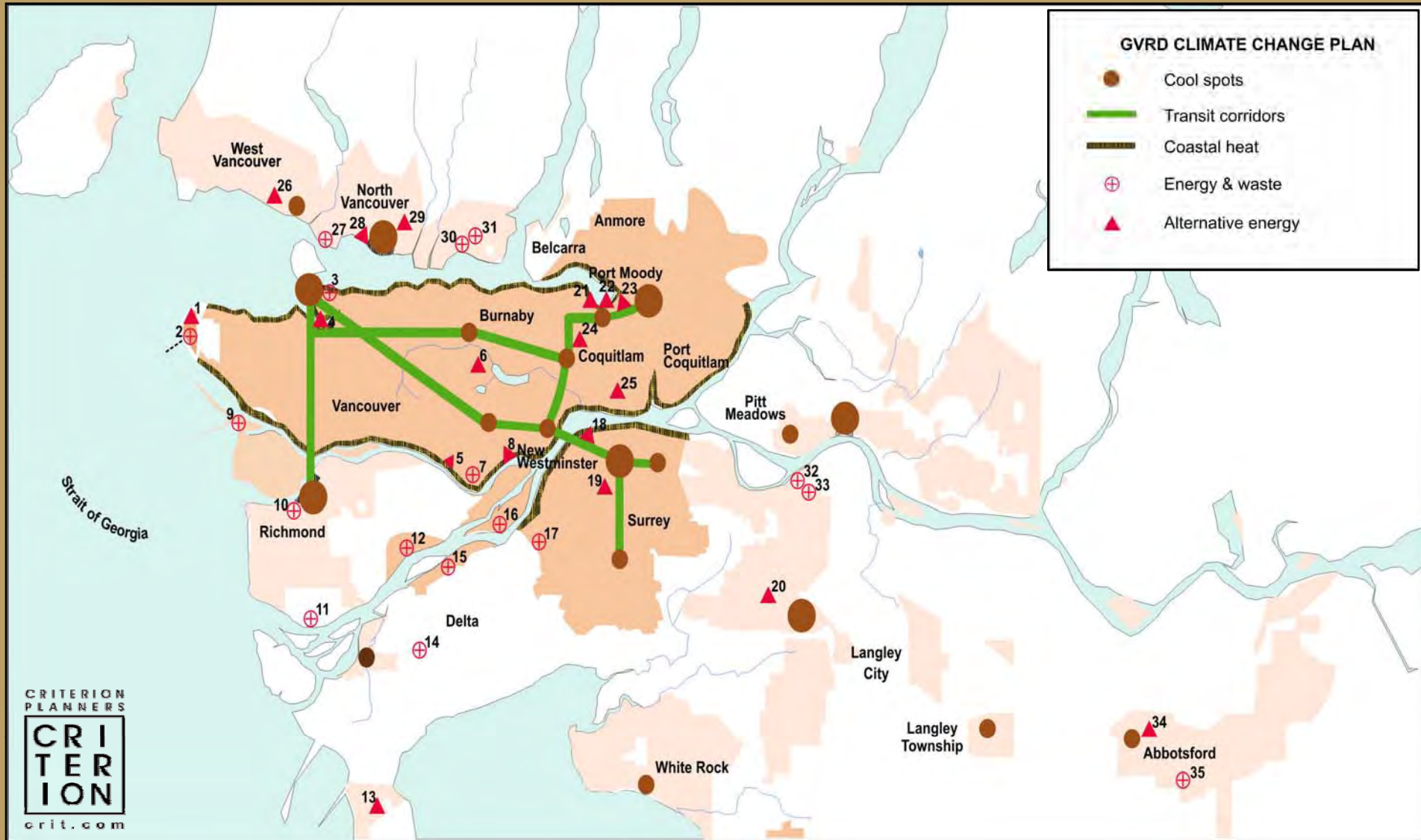
Potential LEED Savings	Household/Year	
	MMBtu	CO ₂ lbs
Transp. 25%	33	5,000
Bldg. Ops. 33%	23	3,000
	56	8,000

Source: Criterion Planners

Baltimore “Growing Cooler” Framework

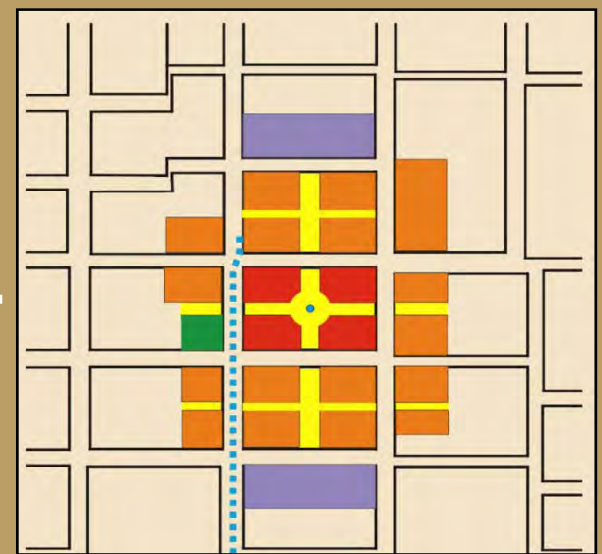
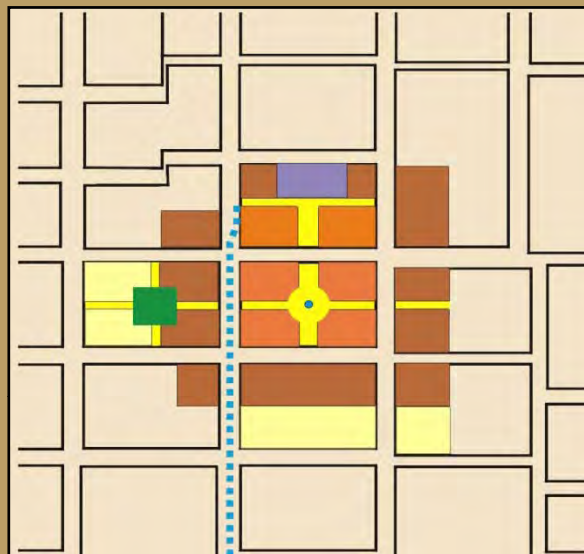
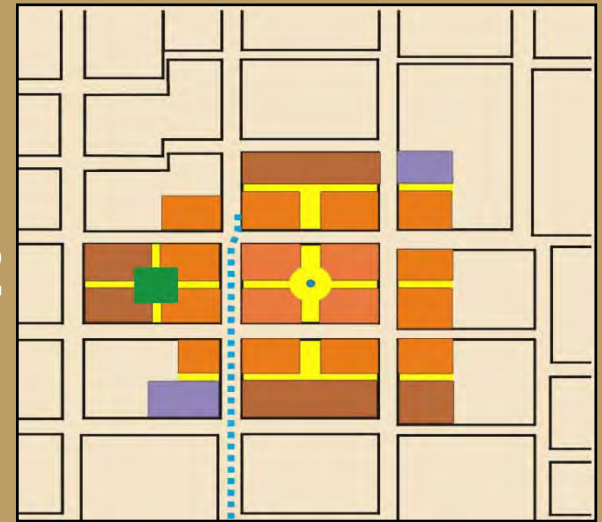
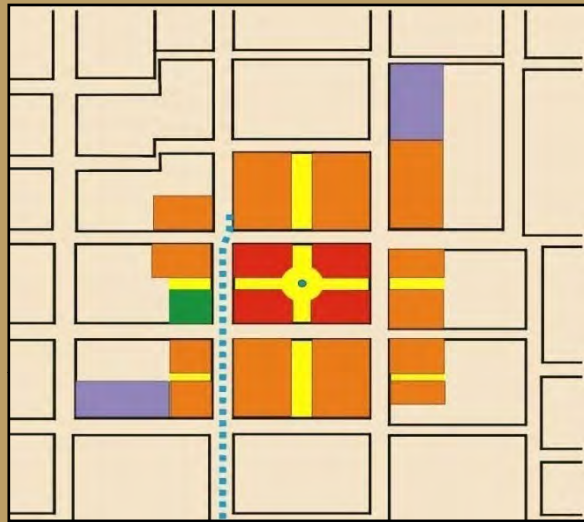


Cool Spots in Vancouver, B.C.



Designing a Cool Spot in Tampa

Scenarios

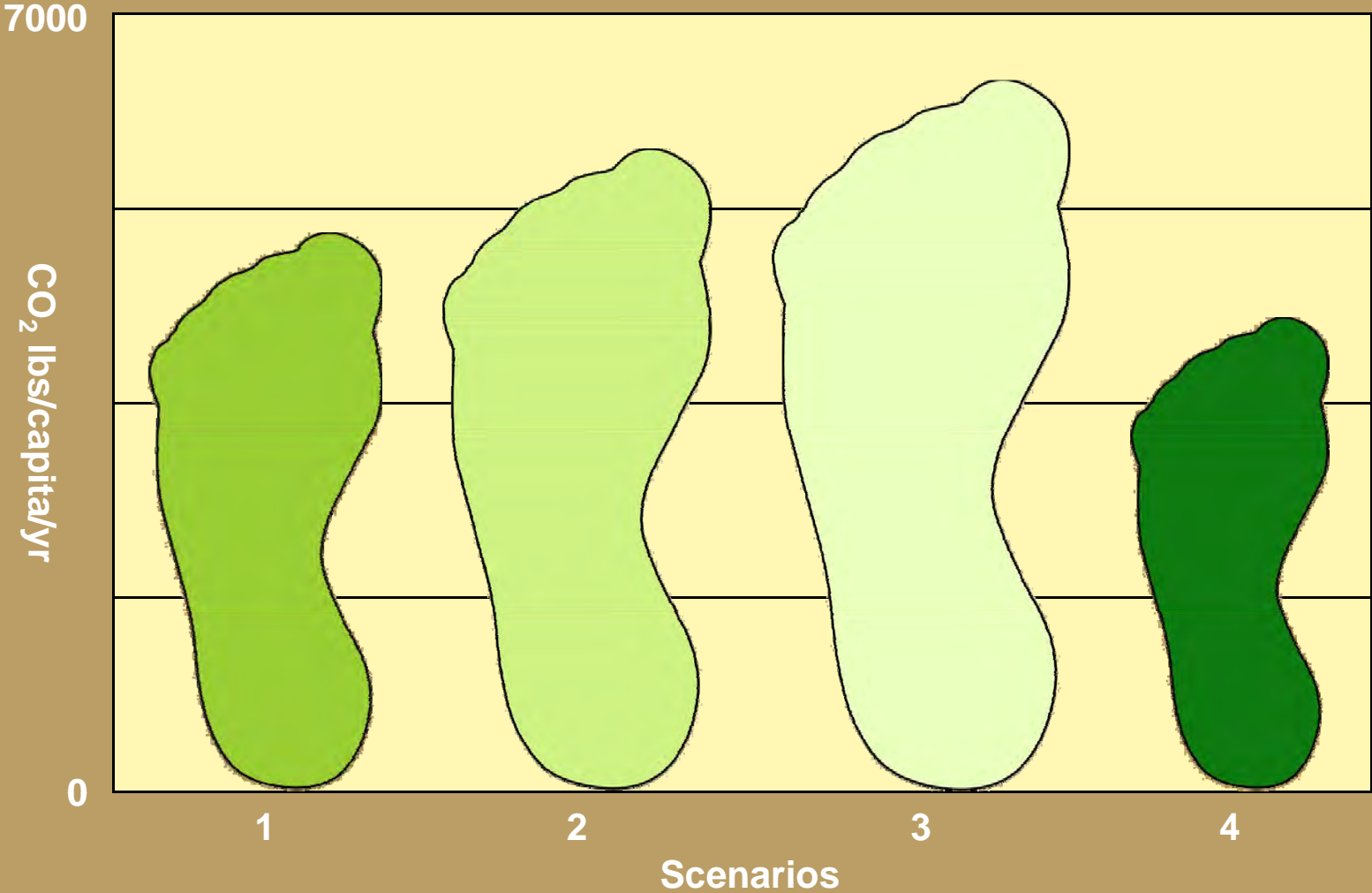


- Multi-family
- Mixed retail/office/res
- Mixed retail/res
- Parking garage

Tampa Cool Spot Scores

INDEX Indicators	Units	Existing Conditions	Goals	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Demographics							
Population	residents	817	open	2,256	1,752	1,367	2,267
Employment	employees	513	open	1,215	971	608	1,316
Population Density	residents/gross acre	7.07	open	19.54	15.17	11.84	19.64
Land-Use							
Use Mix	0-1 scale	0.37	0.50 or more	0.54	0.50	0.44	0.54
Use Balance	0-1 scale	0.73	0.80 or more	0.72	0.75	0.72	0.71
Development Footprint	net acres/1000 residents	95.1	60.0 or less	33.9	44.1	57.1	33.6
Housing							
Dwelling Density	DU/gross acre	3.00	5.00 or more	8.28	6.43	5.02	8.32
Dwelling Unit Count	total DU	346	none	956	742	579	961
Amenities Proximity	avg walk ft to closest grocery	1,244	800 or less	975	934	979	875
Transit Proximity to Housing	avg walk ft to closest stop	622	500 or less	483	479	509	453
Employment							
Jobs to Housing Balance	jobs/DU	1.48	0.90 to 1.10	1.27	1.31	1.05	1.37
Employment Density	emps/net acre	21.44	25.00 or more	41.91	35.46	26.62	40.89
Transit Proximity to Employment	avg walk ft to closest stop	553	500 or less	480	458	523	442
Recreation							
Park/Schoolyard Space Supply	acres/1000 persons	3.8	4.0 or more	1.5	2.0	2.5	1.5
Park/Schoolyard Proximity to Housing	avg walk ft to closest park/schoolyard	1,306	800 or less	893	921	978	880
Travel							
Home Based Vehicle Miles Traveled	mi/day/capita	18.0	15.0 or less	13.8	14.2	14.9	13.6
Environment							
Carbon Dioxide Emissions	lbs/capita/yr from HB VMT	8,395	7,000 or less	6,415	6,644	6,933	6,361

Tampa Cool Spot Carbon Footprints



Cool Spot in Lafayette CA for SB375

Downtown Action Measures	CO2 Reduction Targets C % Downtown Emissions by End-Use				
	Buildings			Transportation Fuels	Infrastructure Power
	Space Conditioning	Water Heating	Power		
Buildings					
LEED building certification	10	10	10		
Solar thermal		5			
Solar power			5		5
Land-use density	5			3	
Land-use mix	5	2		3	
Increased housing	3			5	
District cooling/cogen	5	5	5		
Heat island reduction	2				
Transportation					
Pedestrian facilities				2	
Bicycle facilities				2	
Transit service				2	
Parking management				2	
Infrastructure					
Lighting/pumping efficiency					10
Total	30	22	20	19	15

Making Cool Spots a Reality

- Collaborative audit of opportunities.
- Prioritize and design most robust responses.
- Fund implementation with “*Climate Protection Districts*” modeled after conventional LIDs.

