

# “Green Density in the Core”

UM Prof. Doug Kelbaugh FAIA, Dean Emeritus

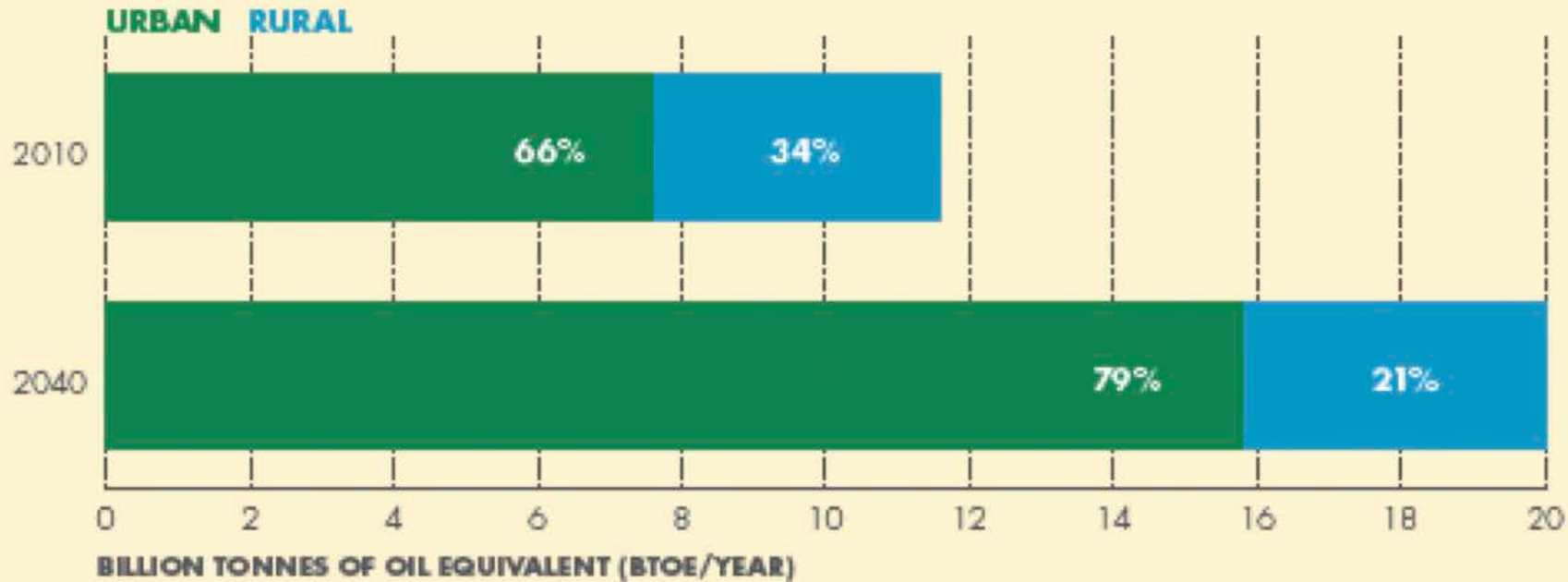
December 9, 2019



# Some “laws” of urban scaling

- As cities grow, the number of interactions increases at the square of the population.
- As cities get bigger, income and wealth increase faster than population.
- As cities get larger, there are less of them.
- “Everything is related to everything else, but near things are more related than distant things.”
- As cities get bigger, they get more sustainable - the environmental paradox of cities.

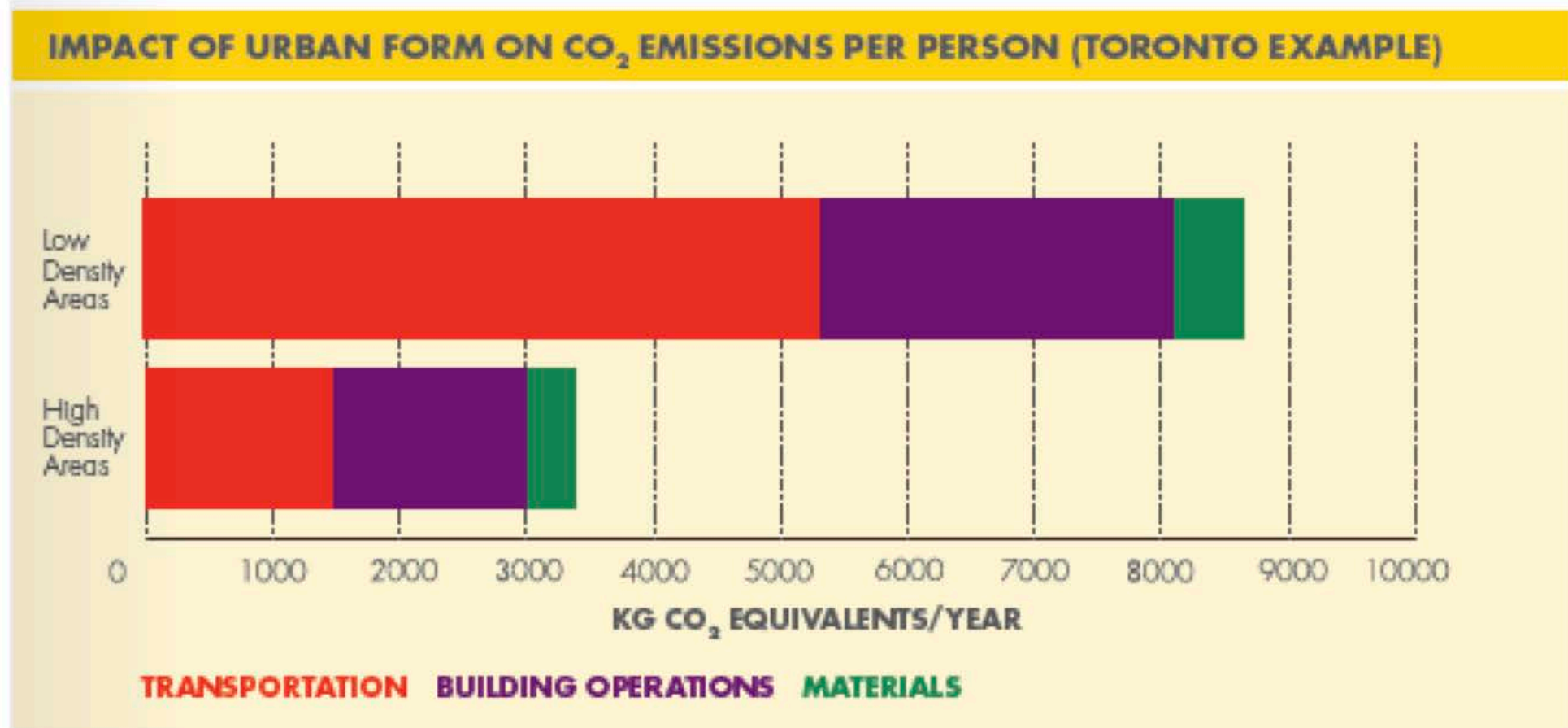
## URBAN & RURAL WORLD ENERGY CONSUMPTION



Source: Booz & Company analysis

Cities consume most of the world's energy, and produce most of the CO<sub>2</sub>; and they are projected to get worse, and yet...

The "environmental paradox of cities" is counter-intuitive.



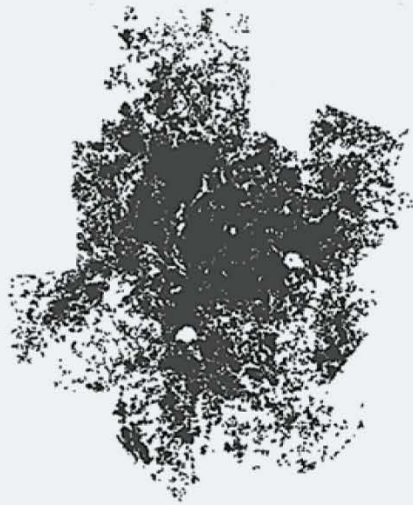
*Source: Journal of Urban planning and development (2006)*

# Some cities are much “greener” than others.

Atlanta and Barcelona have similar populations but very different carbon productivity

Atlanta

Built-up area



Barcelona

Built-up area



Population

**2.5**  
million

Urban area

**4,280**  
km<sup>2</sup>

Transport carbon emissions

**7.5**  
tonnes CO<sub>2</sub>/person  
(public + private transport)

Population

**2.8**  
million

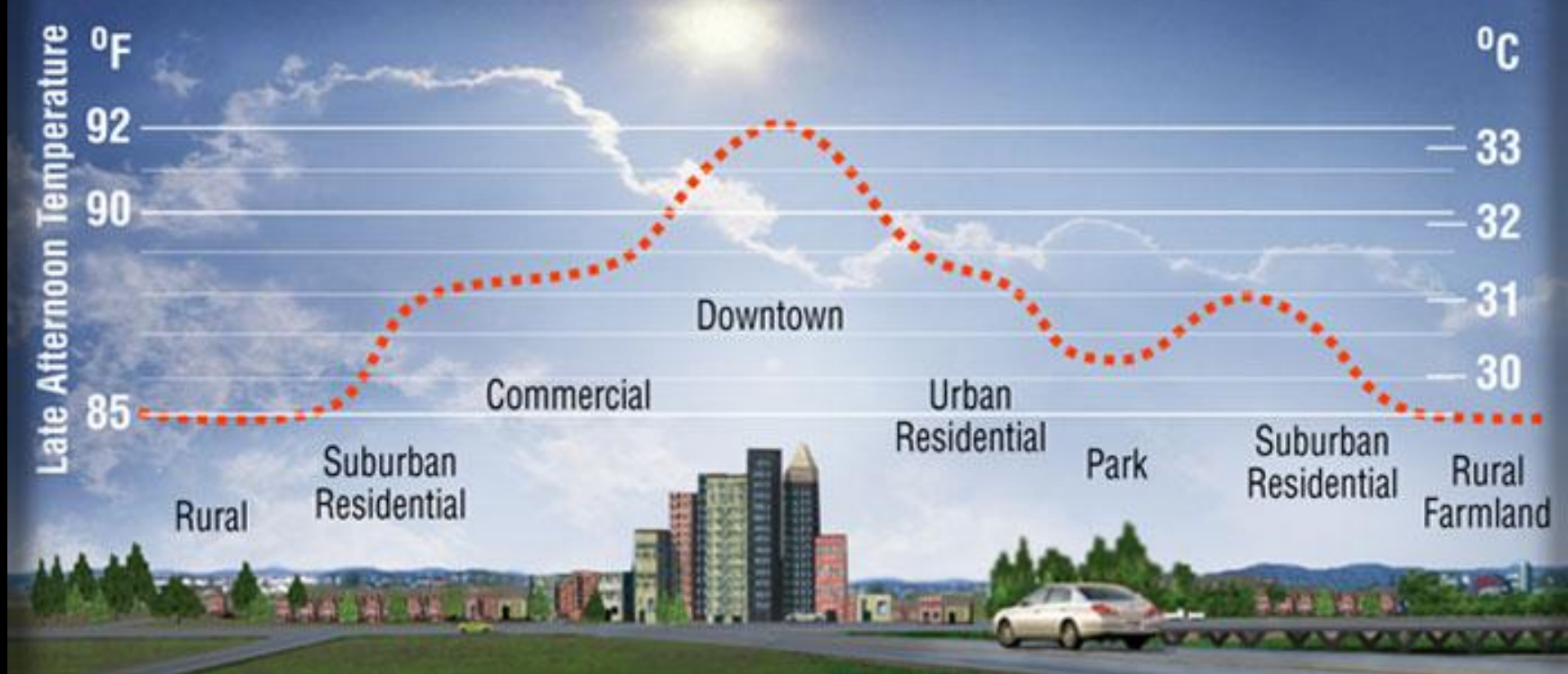
Urban area

**162**  
km<sup>2</sup>

Transport carbon emissions

**0.7**  
tonnes CO<sub>2</sub>/person  
(public + private transport)

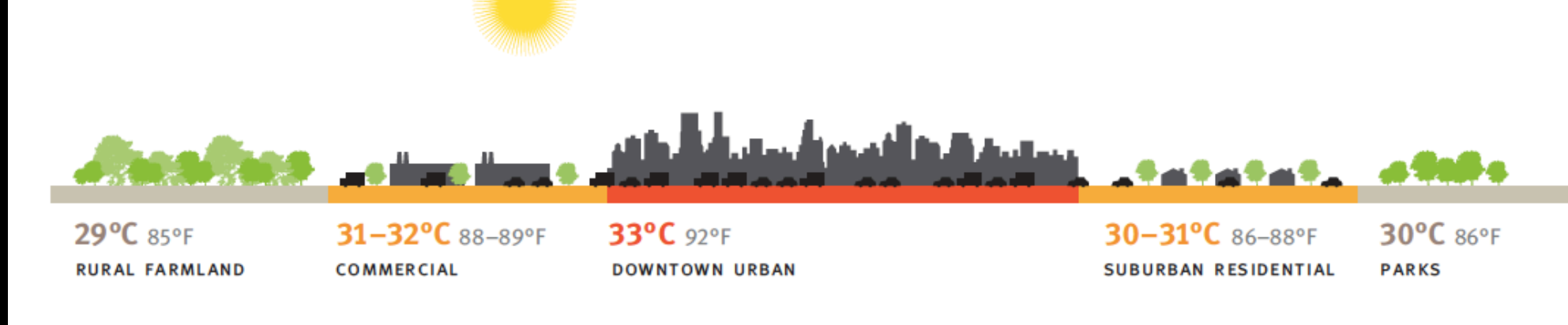




The “Urban Heat Island Effect” is the build up of *sensible* heat from hot tailpipe and chimney emissions, and from dark surfaces heated by the sun. It is *not* the same thing as greenhouse heating of the atmosphere.

“...large cities in the U.S. tend to be warming at *more than twice the rate of the planet as a whole* as a result of the loss of naturally vegetated land covers...global estimates of climate change are likely to underestimate rates of warming in the very places where most of the global population now resides: cities.”

Brian Stone, G.I.T. Urban Climate Lab



We are SO lucky:  
The 4 strategies to mitigate and adapt to Urban Heat Islands are consistent with strategies to deal with Climate Change.



# 1. Albedo enhancement = Lighter colored pavement and roofs



Lighter colored pavement is cooler.







Nixon service road



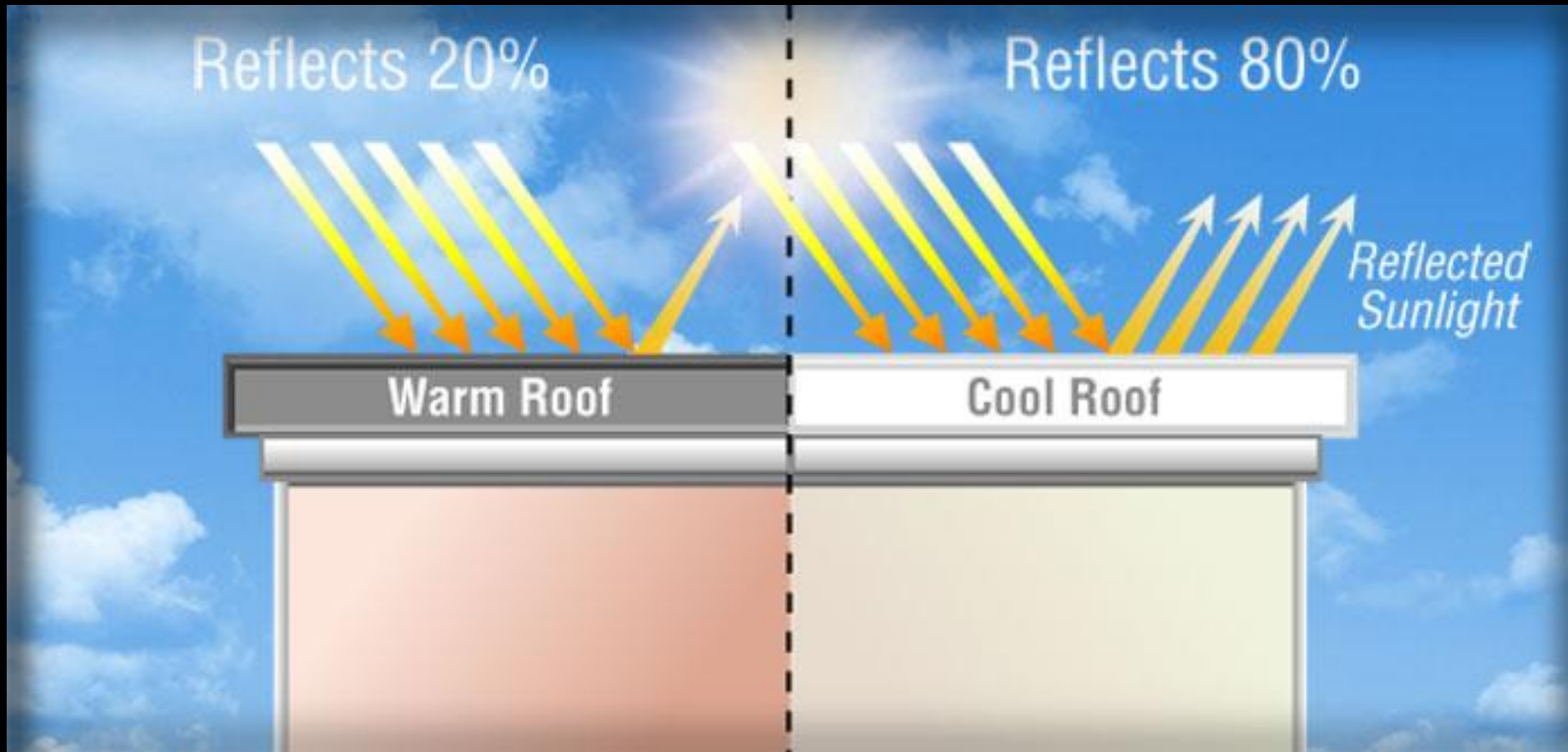
Hiscock & Miner Sts. on Water Hill

Depave parking strips; plant trees, shrubs, ground cover, and/or grass.





# The simplest passive solar technology: white paint!



A white roof reflects 4X solar rays as a dark roof, and is 3X more effective than a green roof against CC.



Students painting a NYC roof white; white roofs can reduce the city's air temp. by 1F, with a 5% cut in mortality risk.

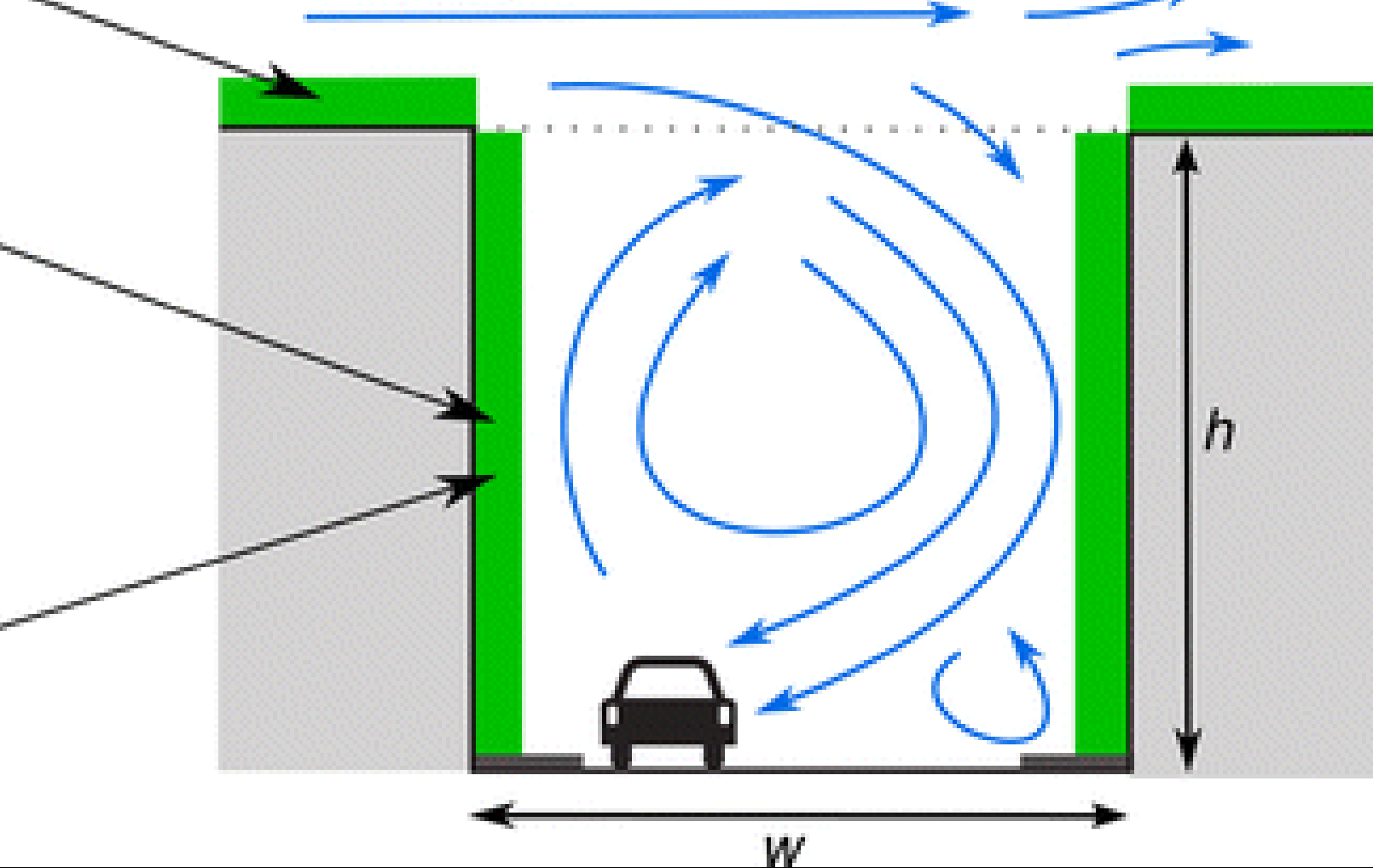




PV panels and hot water panels on our *white* roof, in downtown Ann Arbor.

2. Less Waste Heat from tailpipes, through more walkable, transit-oriented and less auto-dependent cities.





### 3. The Urban Section

– Open and lighten up street canyons, which trap heat.





## Trees are multi-taskers:

- beautify, lend biophilic presence
- provide cool shade
- retain soil/prevent erosion
- detain and retain storm water
- sequester CO<sub>2</sub>
- produce oxygen
- filter particulate pollution
- cool the air by evapo-transpiration
- provide bird/animal habitat
- produce flowers, fruit, fragrance
- offer tree climbing for children
- absorb sound
- reduce crime
- increase real estate values
- wood for construction, furniture... -
- wood for fuel
- planting and maintenance jobs
- humanize over-scaled urban spaces
- soothe the psyche
- “soak up nuclear blasts”! (Poland)



Because urban trees grow bigger, and their shade reduces AC loads, they mitigate CC 16X more than non-urban trees. Trees in metro Chicago provide an estimated \$350M of value in annual carbon storage. The estimated value of this forest is over \$50 billion. A major insect infestation of trees costs \$Bs!





A number of cities in the United States have adopted canopy goals – Providence, Baltimore, Chattanooga, and Chicago...E.g., Washington, D.C .has a citywide 40 percent tree canopy goal...To achieve this goal by 2032, the city must increase its canopy cover from the existing 35 percent and plant 8,600 trees per year...Seattle plans to increase from 18 to 30% in 30 years.

Emily Oaksford, *APA Sustaining*

The **Carbon Neutral Cities Alliance** (CNCA or “**Alliance**”) is a collaboration of leading global **cities** working to cut greenhouse gas emissions by 80% or more by 2050 or sooner (“80x50”) — the most aggressive greenhouse gas reduction targets undertaken by any **cities** across the globe.

**Focus:** Deep carbon reductions, climate change

**Founded:** June 2014 Copenhagen, Denmark

**Type:** International organization





## ANN ARBOR, MI

2030 Districts are designated urban areas committed to meeting the energy, water, and transportation emissions reduction targets of the 2030 Challenge for Planning.

1 MILLION SQUARE FEET

ALBUQUERQUE

ANN ARBOR

BURLINGTON

CINCINNATI

CLEVELAND

DALLAS

DENVER

DETROIT

GRAND RAPIDS

ITHACA

PHILADELPHIA

PITTSBURGH

PORTLAND

SAN ANTONIO

SAN DIEGO

SAN FRANCISCO

SEATTLE

STAMFORD

TORONTO

TUCSON

### ACHIEVING DISTRICT-WIDE GOALS

2030 Districts commit to reducing:



BUILDING  
ENERGY USE



WATER  
CONSUMPTION



TRANSPORTATION GHG  
EMISSIONS

50% BY 2030

Portland has addressed climate change for nearly 25 years and has steadily cut carbon emissions for more than a decade.



#### Emissions Reduction

↓ **21%**  
Since: 1990

#### Economic Growth

↑ **24%**  
Since: 1990

#### Renewable Energy Target

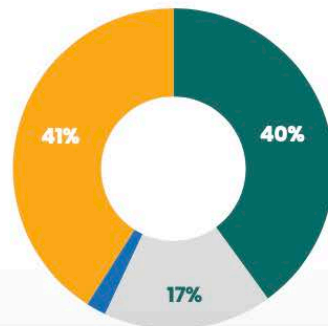


**100%  
BY 2050**

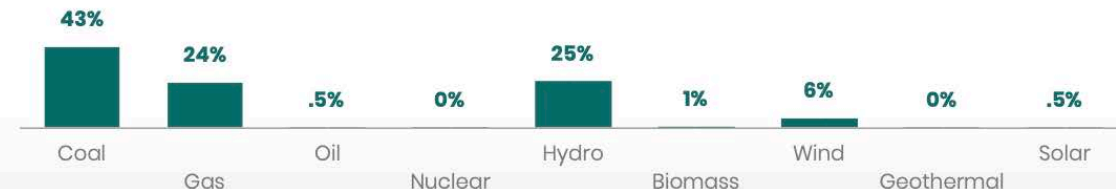
#### Emissions Reduction Target

↓ **80% BY 2050**  
Baseline: 1990

#### Emissions by Source



#### Electricity Mix



In December 2016, Boulder City Council formally adopted goals to guide Boulder's climate action efforts.



#### Emissions Reduction

↓ **16.2%**  
Since: 2005

#### Economic Growth

↑ **57%**  
Since: 2005

#### Renewable Energy Target

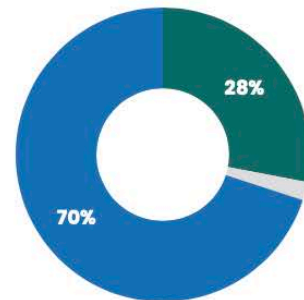


**100%  
BY 2030**

#### Emissions Reduction Target

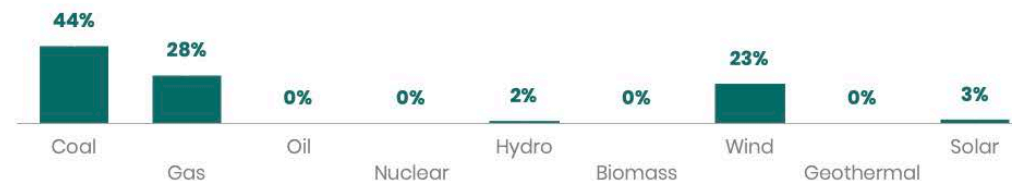
↓ **80% BY 2050**  
Baseline: 2005

#### Emissions by Source



● **TRANSPORT** 28%   ● **WASTE** 2%  
● **BUILDINGS** 70%

#### Electricity Mix



As of: 2017





# LEED for Cities and Communities

## A new way forward for resilient, green, inclusive and smart cities

LEED for Cities and LEED for Communities provide cities and communities with a globally consistent way to measure and communicate performance.

The LEED v4.1 for Cities and LEED v4.1 for Communities certification programs revolutionize the way cities and communities are planned, developed and operated in order to improve the quality of life of people around the world. The programs provide a framework for planning, designing, measuring and managing the performance of social, economic and environmental conditions on a city-wide or community level.

LEED v4.1 for Cities and LEED v4.1 for Communities helps cities and communities develop responsible, sustainable and specific plans for natural systems, energy, water, waste, transportation and many other factors that contribute to quality of life.



Infill housing on Liberty and Washington is compact, efficient, walkable, bike-able and transit-served.





# Town & Gown Objectives

## 1. QIMBY: Quality In My Backyard

QIMBY promotes: healthy, affordable, and programmed design options for development



## 5. Activate Parkland

Through increased programming, improved landscape design, less invasive vegetation.



## 9. Town & Gown close cooperation

Treeline should be a collaborative effort citywide



## 2. Inclusive development process

Invite all neighborhood residents to participate in designing exciting change in the city.



## 6. Appropriately increase compact, walkable development

Sites determined through careful study



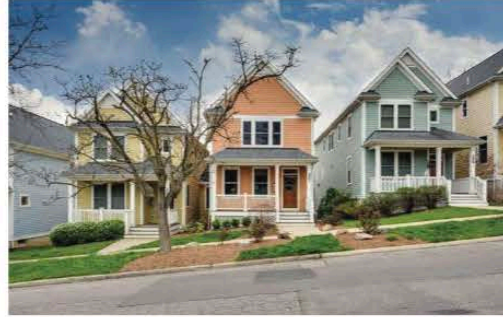
## 10. Expand DDA area & responsibility

to include oversight of new riverfront TIF to support 14-mile trail loop



## 3. Increase housing stock diversity

More housing of all types, especially at moderate and lower price levels.



## 7. Consider sites citywide

All vacant or low density parcels throughout the city are considered for development



## 11. Locally led community development

Take charge locally rather than count on federal funding or out-of-state developers



## 4. Increase multi-modal transit options:

walk, bike, scooter/bike share, bus, train, car share, driverless transit



## 8. Neighborhood community space

Increase local retail such as cafe and convenience in distant neighborhoods



## 12. What are your objectives?



Green Density simultaneously addresses multiple problems -from jobs to preservation of green space to housing affordability and carbon neutrality. This won't be easy or painless, but your kids and grandkids will be forever grateful. DO IT NOW!





THANK YOU!