



## BOULDER'S CLIMATE COMMITMENT

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*Rising to the climate challenge, powering a vibrant future.*

# A Busy Few Weeks.....



*“We know that technology based on the use of highly polluting fossil fuels—especially coal, but also oil and, to a lesser degree gas—needs to be progressively replaced without delay.”*

Pope Francis, Encyclical. 2015

# Creating a Roadmap to Energy System Transformation

A USDN Convening / Boulder, CO  
July 22, 2015



# Participating Cities



# 6 City Convening on Energy System Transformation

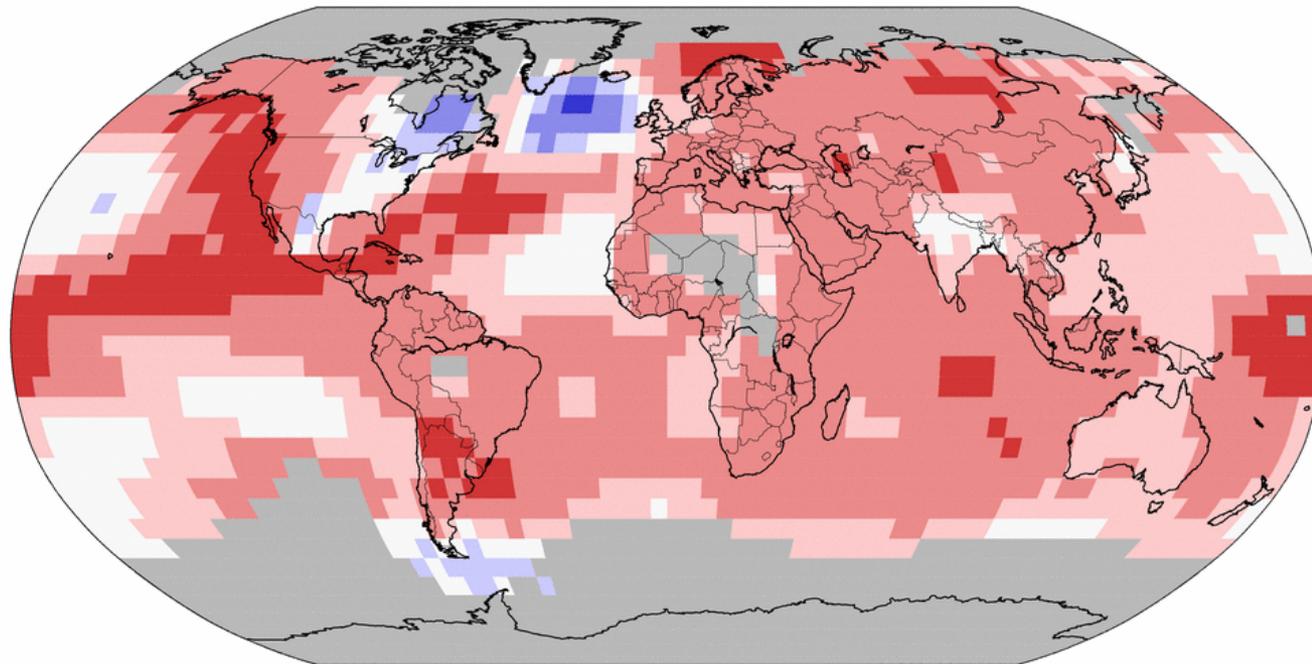


# The Unprecedented Challenge— Climate Change

## Land & Ocean Temperature Percentiles Jan–Jun 2015

NOAA's National Centers for Environmental Information

Data Source: GHCN–M version 3.3.0 & ERSST version 4.0.0



  
Record  
Coldest

  
Much  
Cooler than  
Average

  
Cooler than  
Average

  
Near  
Average

  
Warmer than  
Average

  
Much  
Warmer than  
Average

  
Record  
Warmest



# Climate Change on the Front Range



Projected to be 2 to 6 degrees F warmer by 2050.

## What's this look like for Boulder?

+2°  
Fahrenheit



+6°  
Fahrenheit



# An Unprecedented Opportunity

- \$10+ Trillion Global Marketplace for Climate Stabilizing Products and Services  
(Jigar Shah, Creating Climate Wealth)
- Retain much of the more than \$300 million spent in our community on fossil fuels
- Create more opportunity and equity across all parts of our community

# Boulder's Climate Commitment

We will rapidly transition to a clean energy economy and lifestyle through innovative strategies, products and services that dramatically reduce greenhouse gas emissions, enhance our community's resilience, and support a vital and equitable economy.

## Our Goal

To rise to the climate challenge, and power a vibrant future, **we will reduce Boulder's greenhouse gas emissions at least 80% below 2005 levels by 2050.**



# Climate Commitment-Strategy



# Boulder's Climate Commitment Strategy Four Summary Points:

1. There is a plausible path to an 80% GHG emissions reduction by 2050
2. Achieving this scale of reduction requires transformation of our entire energy system—electricity, natural gas & petroleum.
3. This transformation is leading to new roles for the public sector, esp finance & economic development
4. Climate stabilization will require energy system change and focused action on resource use and ecosystem management & restoration.

# 1. A Plausible Path to an 80% Emissions Reduction by 2050



# Where We Are Starting From

## 2012 BOULDER COMMUNITY GREENHOUSE GAS INVENTORY

Measure our present. Design our future.



### TAKING CLIMATE ACTION - WE DON'T JUST MEASURE — WE ACT.

Boulder values sustainability. Using voter-approved Climate Action Plan tax funds and other sources, city programs and community action have avoided **147,000 metric tons** of emissions since 2005. That's equivalent to taking **30,000 cars** off the road

### 147,000 METRIC TONS OF AVOIDED EMISSIONS

\*ENERGY EFFICIENCY: 8,200 MT 

VEHICLE TRAVEL: 8,400 MT 

SOLAR (2007-2012): 14,300 MT 

HYDRO (2005-2012): 116,100 MT 

\*Energy efficiency through EnergySmart includes residential, commercial and SmartRegs



WE STILL HAVE WORK TO DO! LEARN MORE AT [BOULDERCLIMATE.COM](http://BOULDERCLIMATE.COM)

### BOULDER EMISSIONS - PRESENT AND FUTURE

WHERE WE ARE  
**2012**  
1,952,500 MT

OUR GOAL IS AN  
**80% REDUCTION**

WHERE WE WANT TO BE  
**2050**  
392,500 MT

### HOW DO WE COMPARE? GHG EMISSIONS PER PERSON

COLORADO: 25 MT

BOULDER, CO: 19 MT

FORT COLLINS, CO: 17 MT

BOZEMAN, MT: 10 MT

NEW YORK, NY: 7 MT

BOULDER, CO: 2050: 3 MT



\*MT = metric ton = 2,204 lbs

# The “Baseline Year” Question 1990 or 2005?

**2012 Total Emissions = 1,960,000 Metric Tons**

## **Rationale for Changing to 2005**

- Original 1990 numbers were “backcast” estimates based on ~2005-2006 data
- Many other cities and the State of Colorado are using 2005

**The Difference in Numbers—Reduction to Achieve 80%.**

1,700,000 MT –1990 Baseline

1,600,000 MT—2005 Baseline

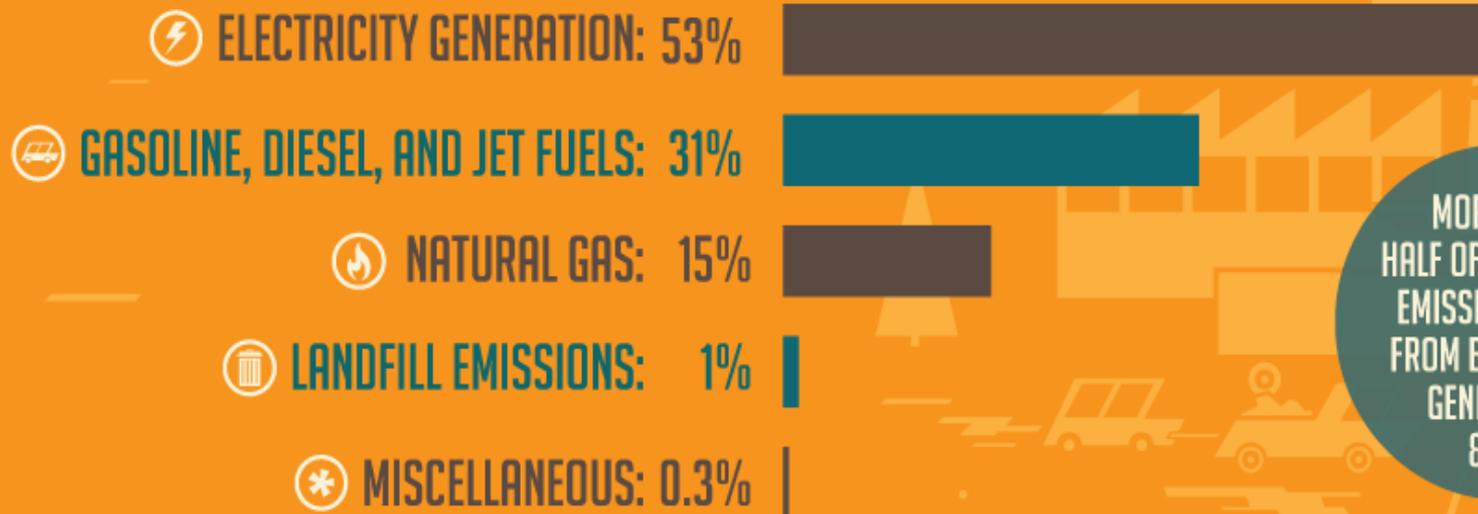
**100,000 MT ~ 5% Difference**

# The Point is—Start Bailing FAST!!!!



# Boulder 2012 Energy-Related Emissions—Where it Comes From

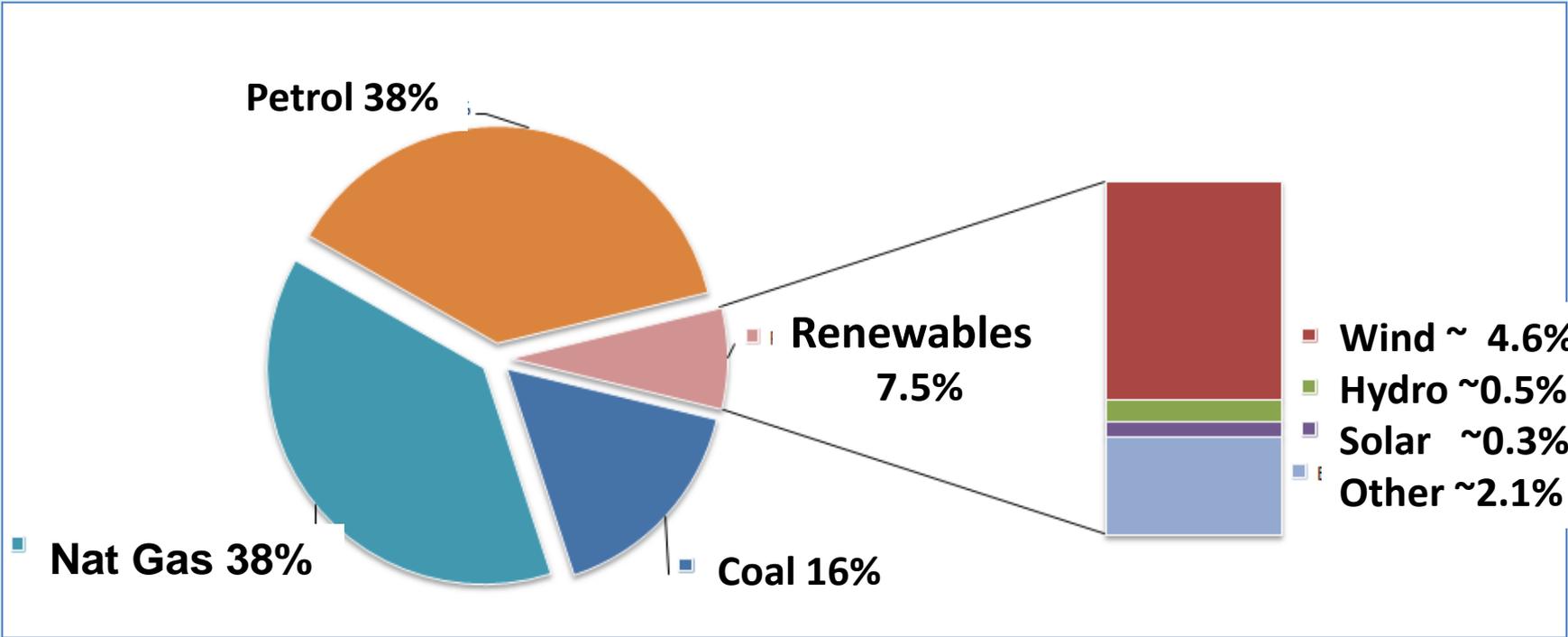
## WHERE GHGs COME FROM - EMISSIONS BY SOURCE



MORE THAN  
HALF OF BOULDER'S  
EMISSIONS COME  
FROM ELECTRICITY  
GENERATION  
& USE

**99% From Energy**

# Boulder 2012 Energy Sources



## 2. Deep Emissions Reduction = Whole Energy System Change

### Three Core Elements of Energy Systems Change

1. **Reducing demand**--Maximize productivity and efficiency of electric uses to minimize additional generation capacity needed
2. **Decarbonizes Supply**
  - 100% Clean Electricity Source
  - 80% or greater retirement & conversion of-NG
  - 80% or greater retirement/conversion-petro
3. **Build energy resilience**

# How much clean energy do we need?

## ENERGY TYPE



Electricity

## TOTAL NEEDED

200-250 Megawatts (current usage)



Natural Gas (converted to electricity)

35-50 Megawatts



Petroleum (converted to electricity)

50-80 Megawatts

TOTAL ELECTRICITY NEEDED

**285-380MW**

These estimates are based on 2012 energy consumption. With the substantial efficiency measures implemented across the building and transportation sectors, the total electricity requirement could be reduced by 20 to 30 percent by 2050.

# How much clean energy is available?



~ **600MW** of solar rooftop capacity for Boulder and surrounding area (NREL & Mapdwell Analysis)



Currently Colorado generation ~**2,332 MW**  
DOE projects capacity at **387,220MW**



**15X** more latent energy below and around the average house than is needed to heat and cool!

# Climate Action At a Glance—Existing Programs

## High Performance Buildings

### 1. Building Codes

Residential  
Commercial

### 2. Building Ordinances

SmartRegs  
C&I Ordinance

### 3. Voluntary Programs

Energy Smart  
PACE



## Mobility

### 4. Mobility Strategies

Transport Master Plan



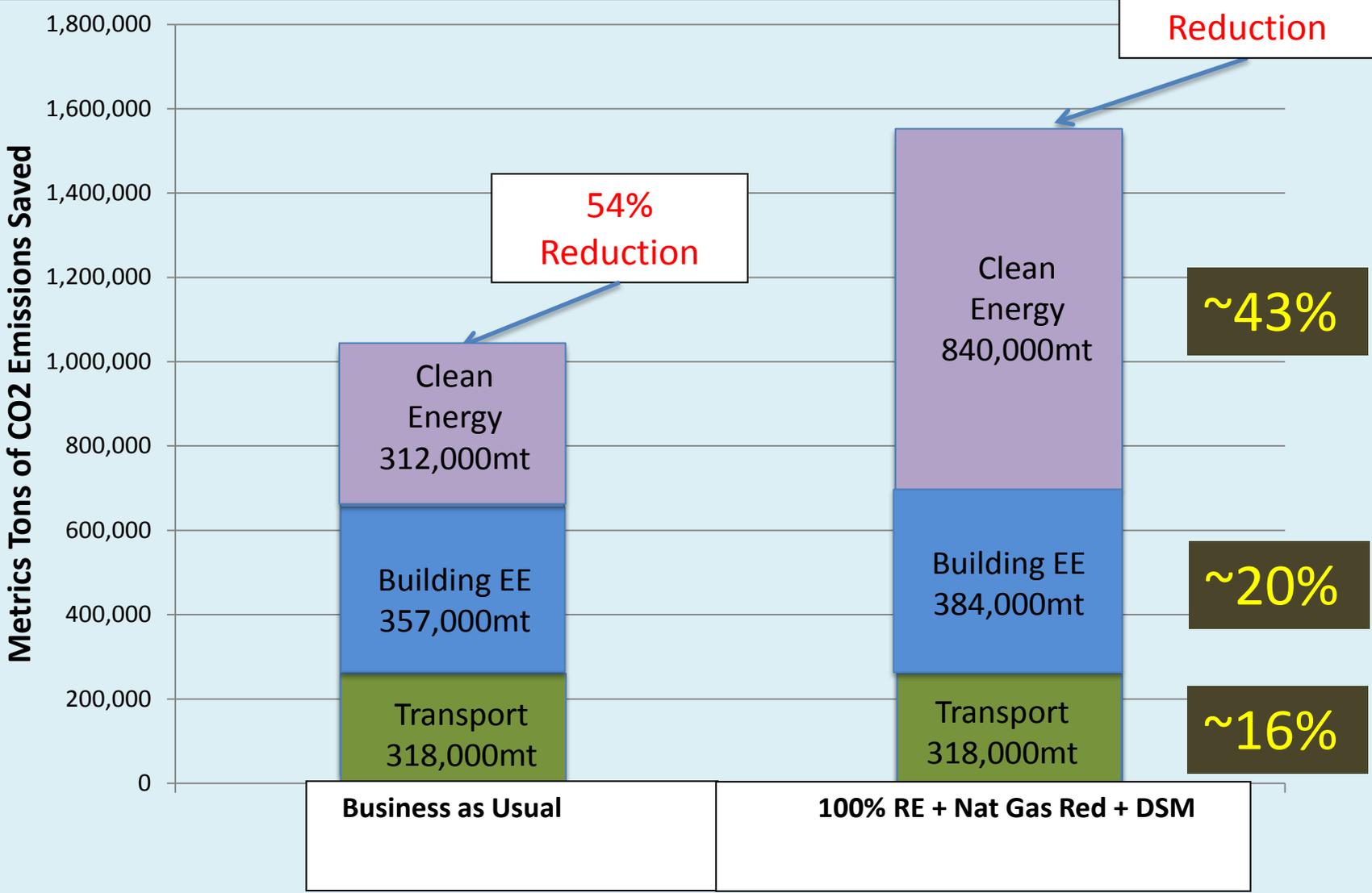
## Energy Source

### 5. Municipalization

# CLEAN LOCAL ENERGY

low-cost. reliable. possible.

# Two Potential Pathways: Existing Utility & 100% Clean Energy Utility



# Climate Action: Pilots & Initiatives

## High Performance Buildings

1. Solar Grants
2. Community Power Partnership
3. EV/PV/EE Pilot -SNUGG Home (BEC)
4. Boulder Housing Partners Pilot (BEC)
5. Thermal Decarbonization Strategy
6. Superior Ecotech (BEC)

## Energy Source

11. Solar Capacity Analysis
12. Solar + Storage Pilot (BEC)
13. Nanogrid Pilots
14. Local Carbon Offset Fund
15. Energy Transformation Roadmap

## Mobility

7. Lightning Hybrids (BEC)
8. eGo Carshare Pilot (BEC)
9. Workplace Charging Challenge
10. Employee EV Commute Pilot



**BOULDER ENERGY CHALLENGE**

# 3. New Roles for the Public Sector

- **Research and Demonstration**
- **Market Transformation**



# Pilots—Highlighted Initiatives

## Buildings & Uses

1. Solar Grants
2. Community Power Partnership
3. EV/PV/EE Pilot -SNUGG Home (BEC)
4. Boulder Housing Partners Pilot (BEC)
5. Thermal Decarbonization Strategy
6. Superior Ecotech (BEC)

## Mobility

7. Lightning Hybrids (BEC)
8. eGo Carshare Pilot (BEC)
9. Workplace Charging Challenge
10. Employee EV Commute Pilot

## Energy Source

- 11. Solar Capacity Analysis**
- 12. Solar + Storage Pilot (BEC)**
13. Nano grid Pilots
14. Local Carbon Offset Fund
15. Energy Transformation Roadmap

## Supply Decarbonization



## Solar Potential Study

# Pilots—Highlighted Initiatives

- Buildings & Uses**
1. Solar Grants
  2. Community Power Partnership
  3. EV/PV/EE Pilot -SNUGG Home (BEC)
  4. Boulder Housing Partners Pilot (BEC)
  5. Energy Transformation Roadmap
  - 6. Thermal Decarbonization Strategy**
  7. Nanogrids Pilot Projects
  8. Superior Ecotech (BEC)

- Energy Source Mobility**
9. Lightning Hybrids (BEC)
  10. eGo Carshare Pilot (BEC)

11. Solar Capacity Analysis
12. Local Carbon Offset Fund
13. Solar + Storage Pilot (BEC)

## Whole Energy System Transition

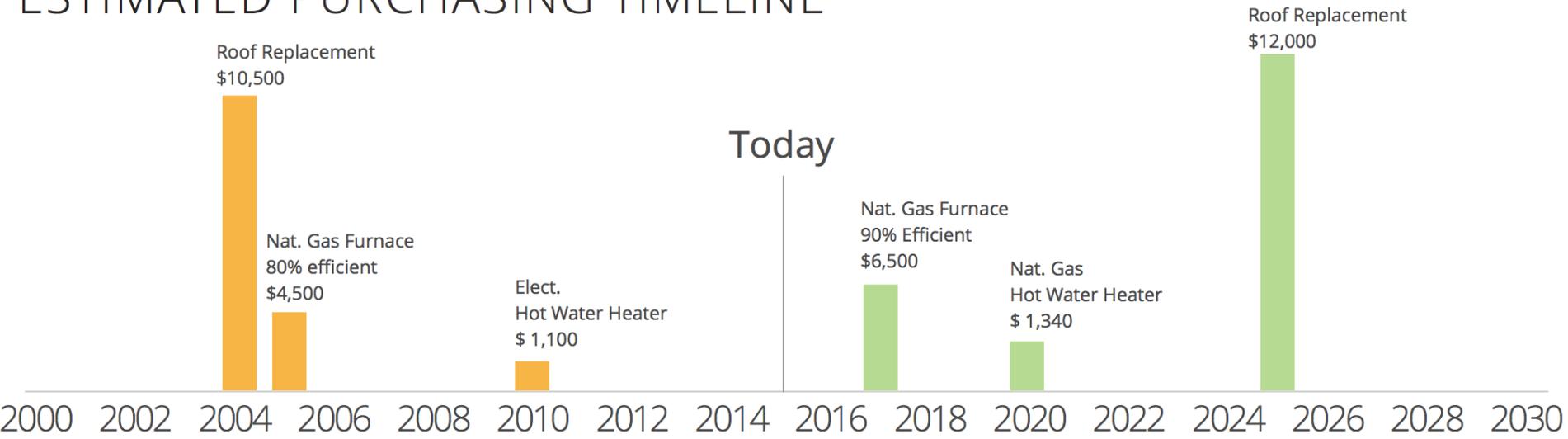
### Natural Gas Replacement Strategy



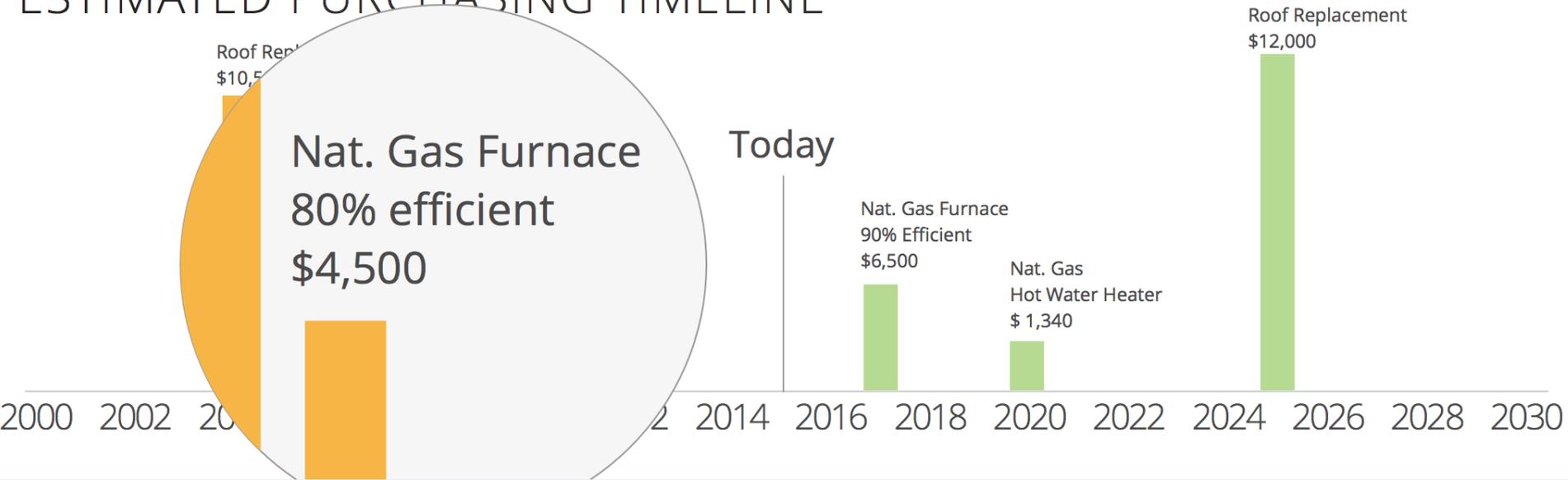
Carbon Neutral Cities Alliance grant to fund analysis

# Natural Gas Decarbonization Strategy

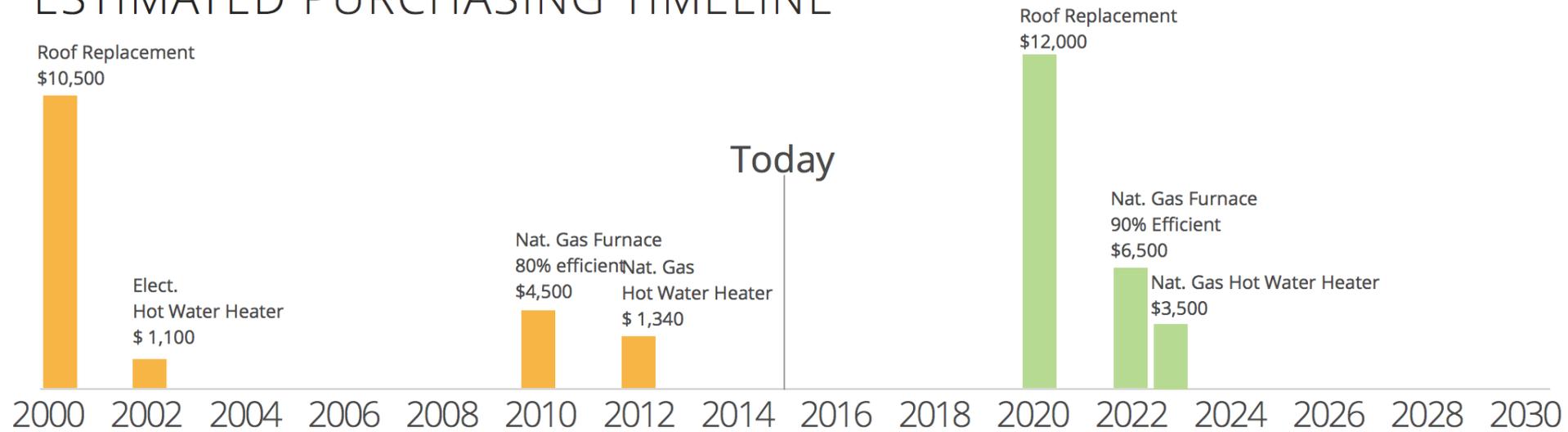
# ESTIMATED PURCHASING TIMELINE



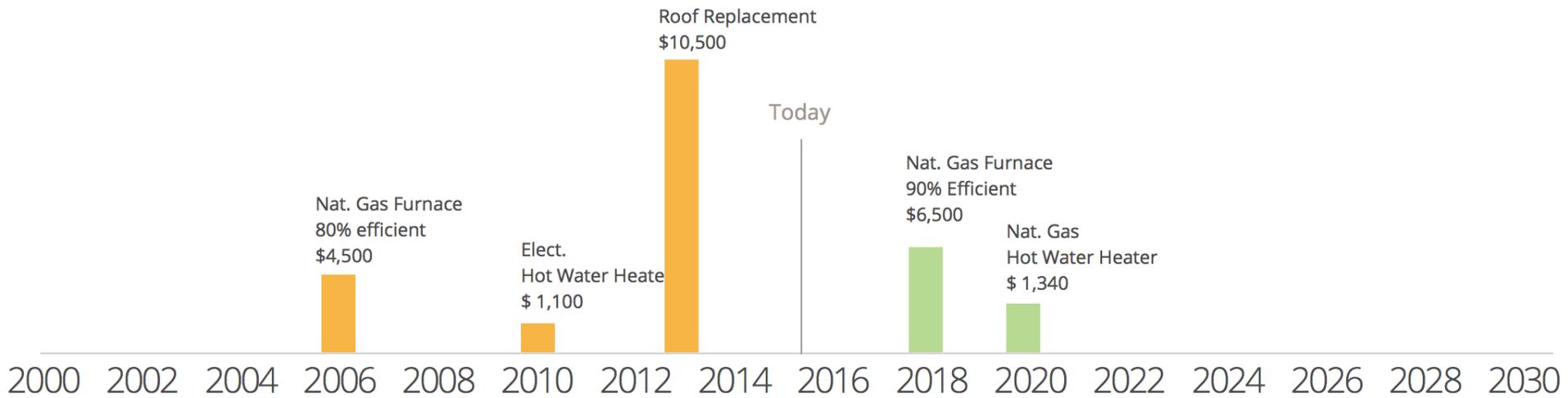
# ESTIMATED PURCHASING TIMELINE



# ESTIMATED PURCHASING TIMELINE



# ESTIMATED PURCHASING TIMELINE



# 4. Addressing Resource Use & Ecosystems

A photograph of green leaves, likely from a tree or shrub, positioned at the top of a white rectangular box. The leaves are vibrant green and have a slightly blurred, natural appearance. The white box contains the text 'Rethinking the Framework Encompassing Climate Action' in a bold, black, sans-serif font.

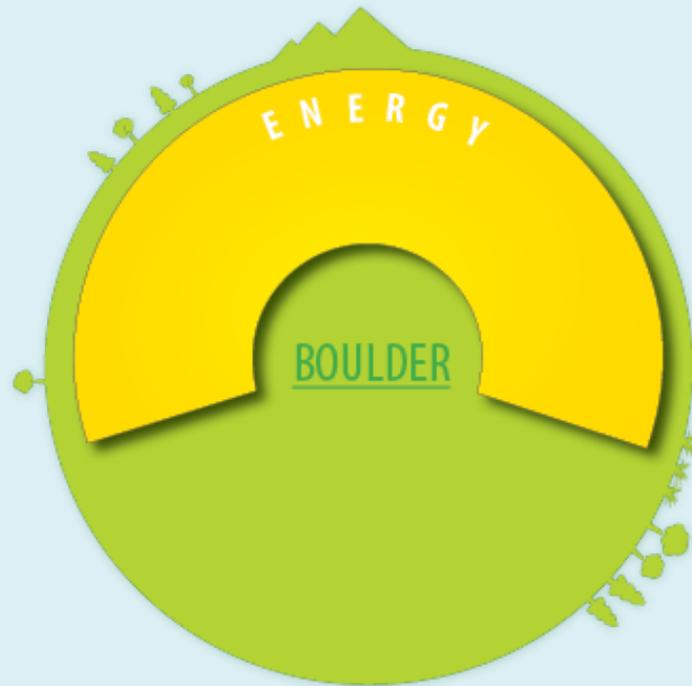
**Rethinking the Framework  
Encompassing Climate Action**

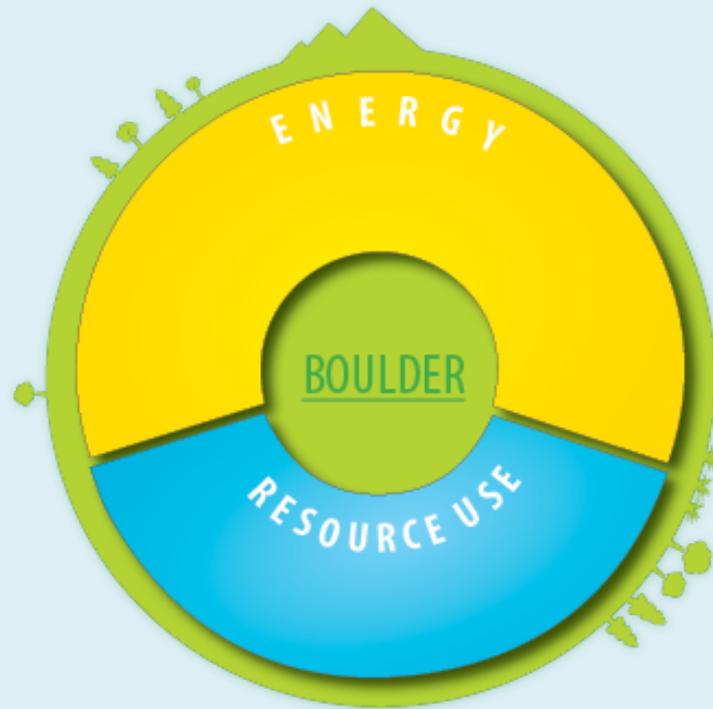
# Rethinking the Framework Encompassing Climate Action

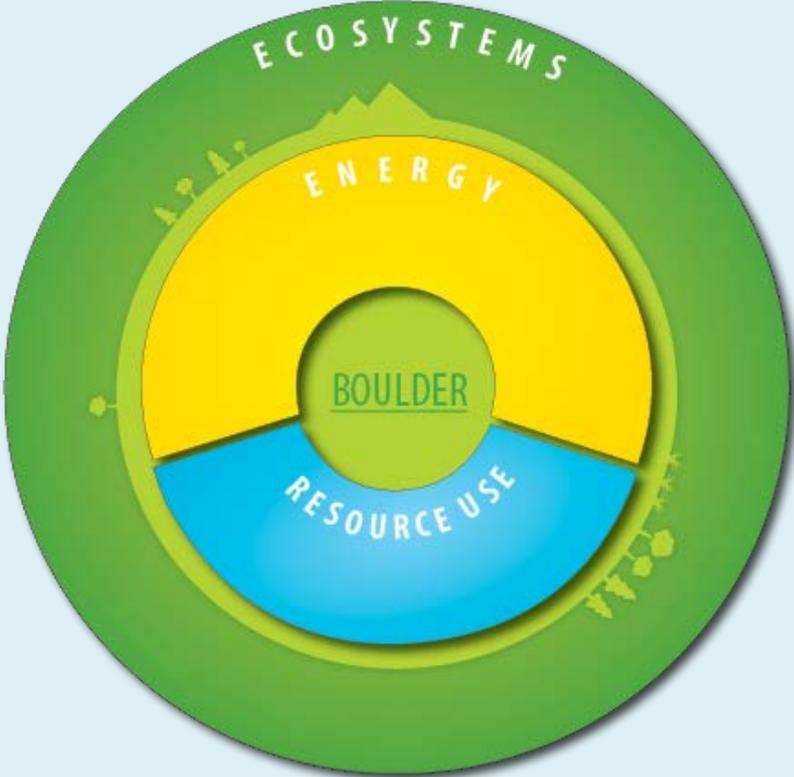
Emissions  
Reduction

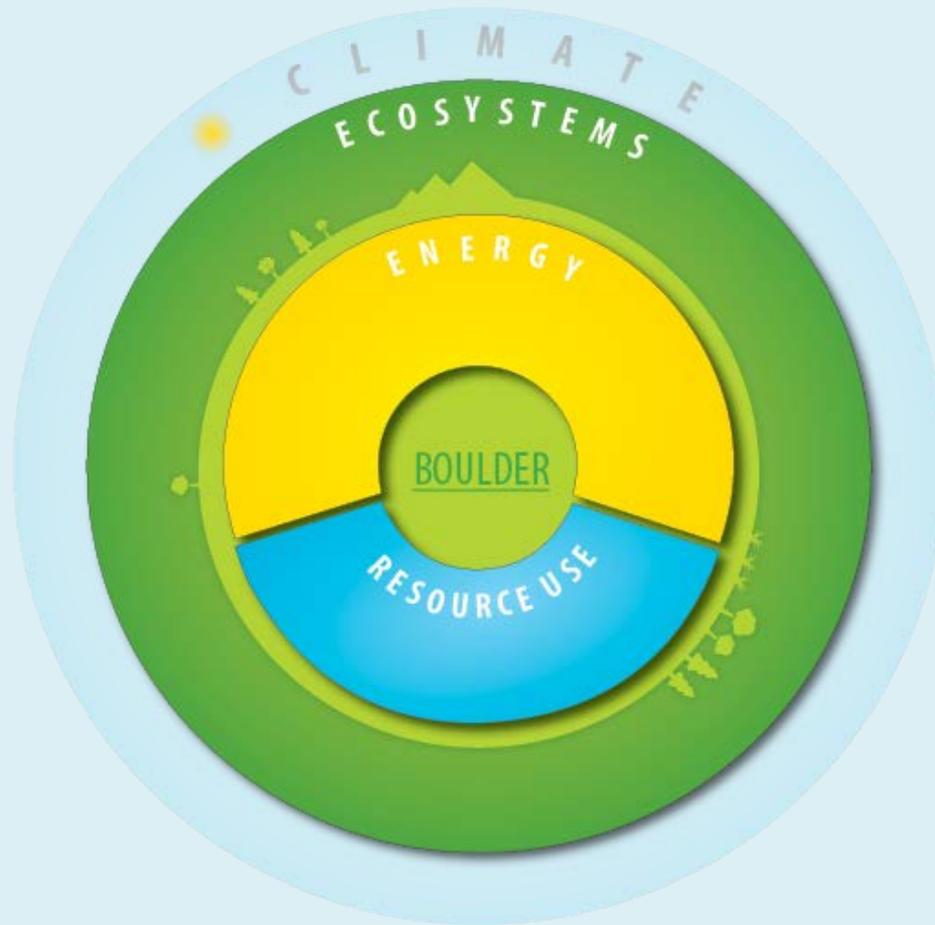


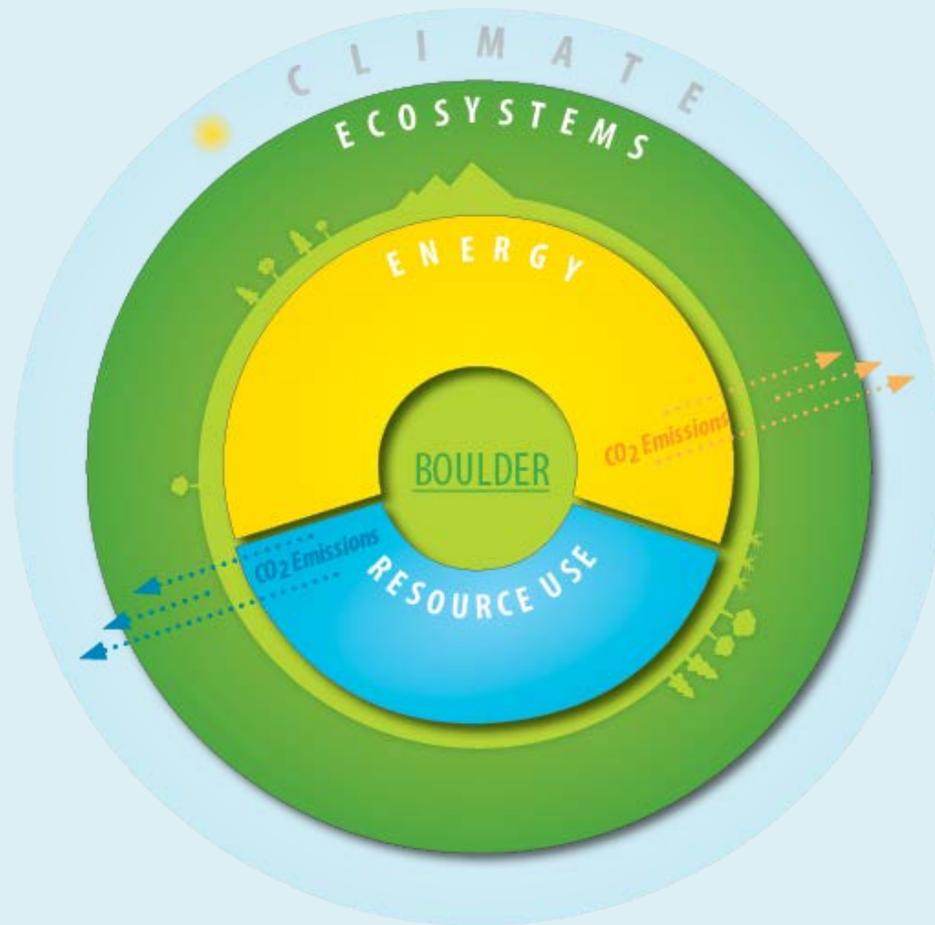
Climate  
Stabilization

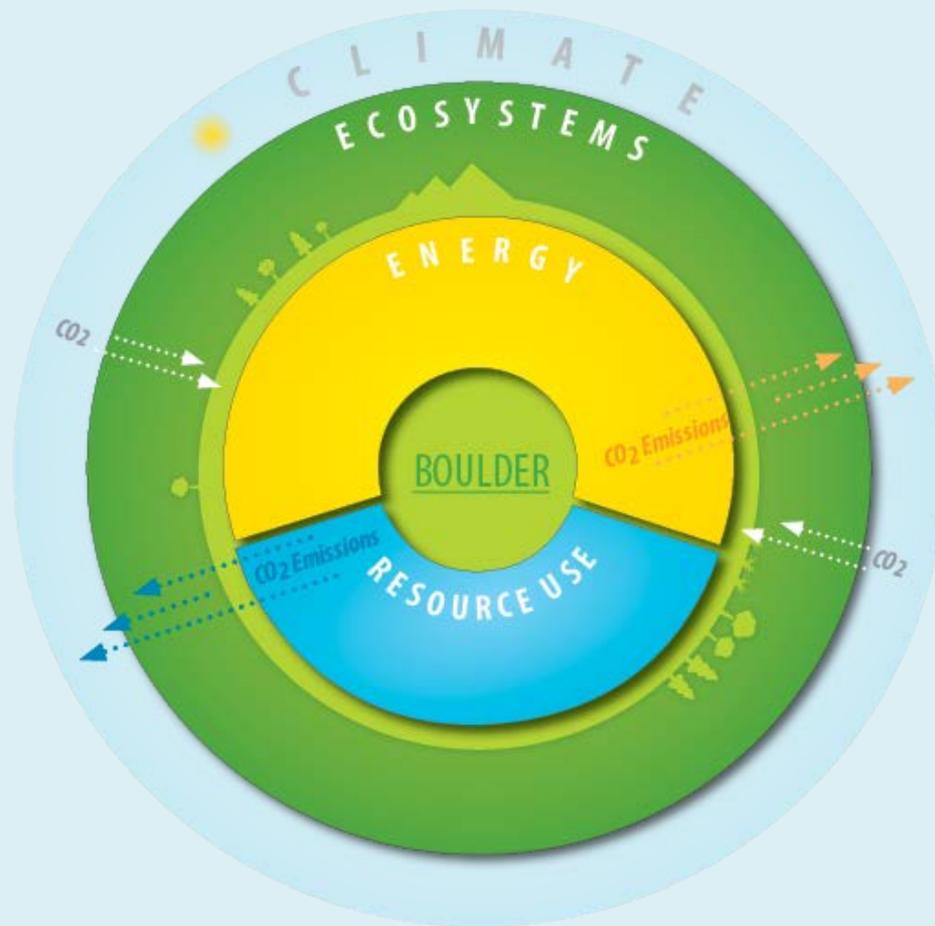


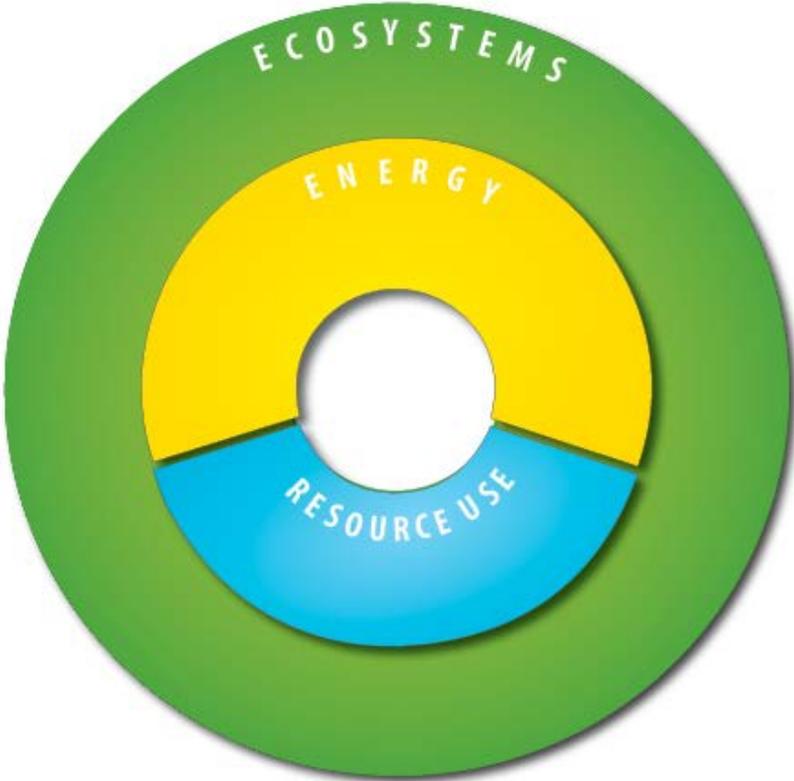








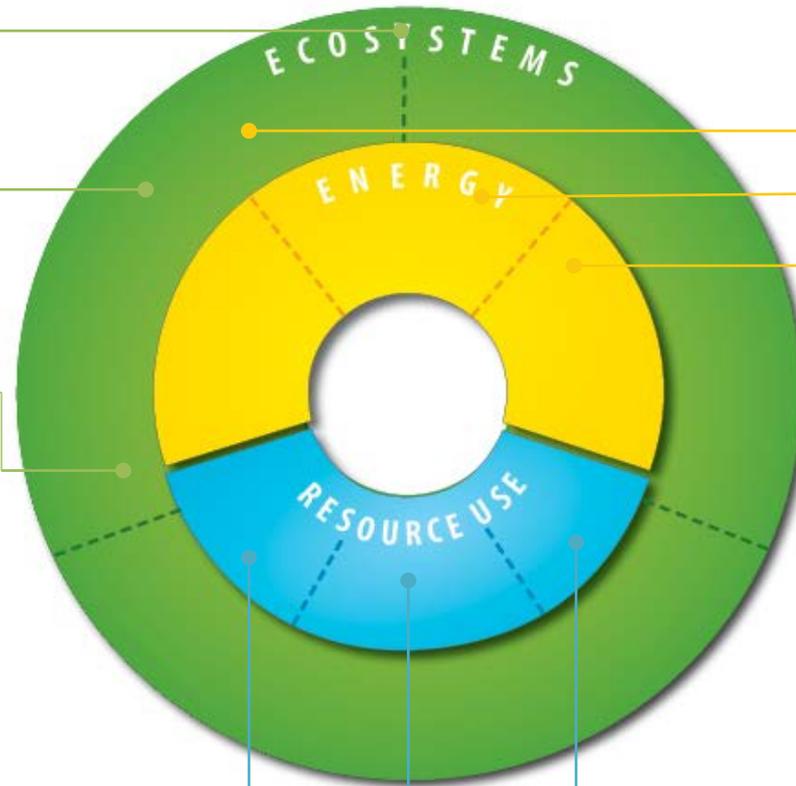




Urban Ecosystems

Wildland Ecosystems

Agriculture Ecosystems



Buildings

Energy Sources

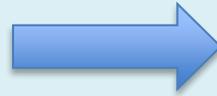
Transportation

Water

Food

Waste

# Climate Action In Resources-- WASTE

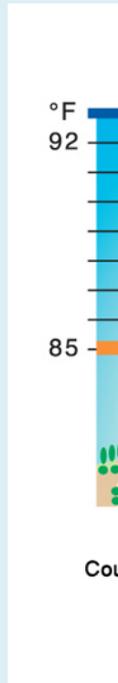


## Full emissions counting for diversions:

- Avoided Emissions from Recyclables
- Avoided Emissions from Organics
- Hauling distance emissions
- End use/energy recovery values

# Climate Action In Ecosystems

## Urban Ecosystems



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20

# 100 Resilient Cities Supported Urban Forest Management Pilot Project



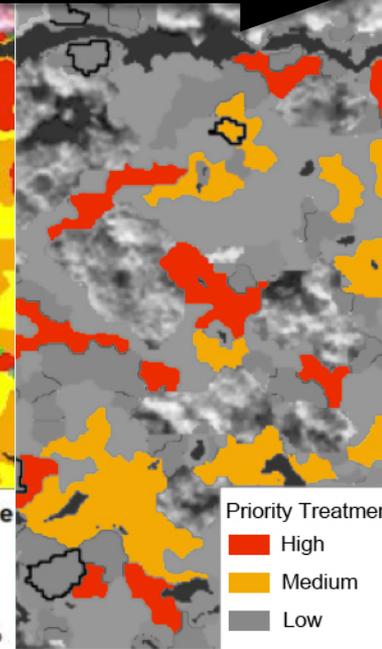
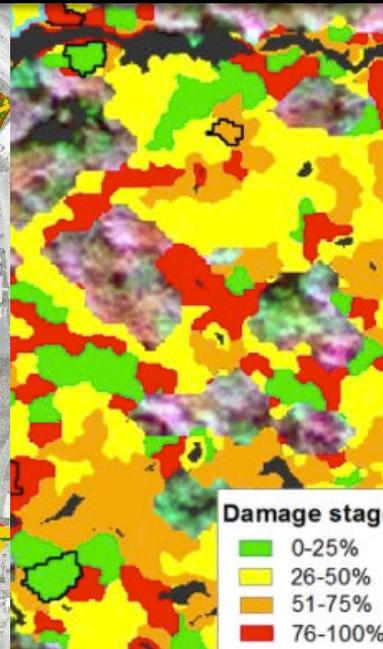
**IMAGERY** | Digital Globe



**ANALYSIS** | Trimble eCognition



**PLANNING** | GIS



Imagery

Urban Canopy

Heat Island

Impacted Areas

Priority Planning

**Damage stage**

- 0-25%
- 26-50%
- 51-75%
- 76-100%

**Priority Treatment**

- High
- Medium
- Low

# Community Engagement



# Community Engagement—Next Steps

**August through December 2015:** Update, awareness and brainstorming about possible individual actions, contributions

- Sharing goal, strategy and framework
- Getting feedback and ideas for refining the city & community strategy
- Connecting individual stakeholders with “Climate Culture Collaborative”

**Early 2016: Individual action initiative**

- Integrate community feedback into a community-wide initiative that supports households, businesses and institutions “doing their part” to reach our community goal





$$1 + 1 > 2$$







Event/Gathering Spaces in Boulder

- Blue dot: Non-Profit
- Purple dot: Government
- Green dot: Civic

Key:

# CLIMATE CULTURE COLLABORATIVE ASSET MAP

**Core Team + vision**

Next actions

Entities outside of the bubble

**CLIMATE ACTION LEADERS**

**CLIMATE ACTION / ORGANIZATIONS**

- Business/technological: 12**
- policy/political: 18**
- research: 14**
- Communication**
- community**

Energy Codes

**STRATEGIES**

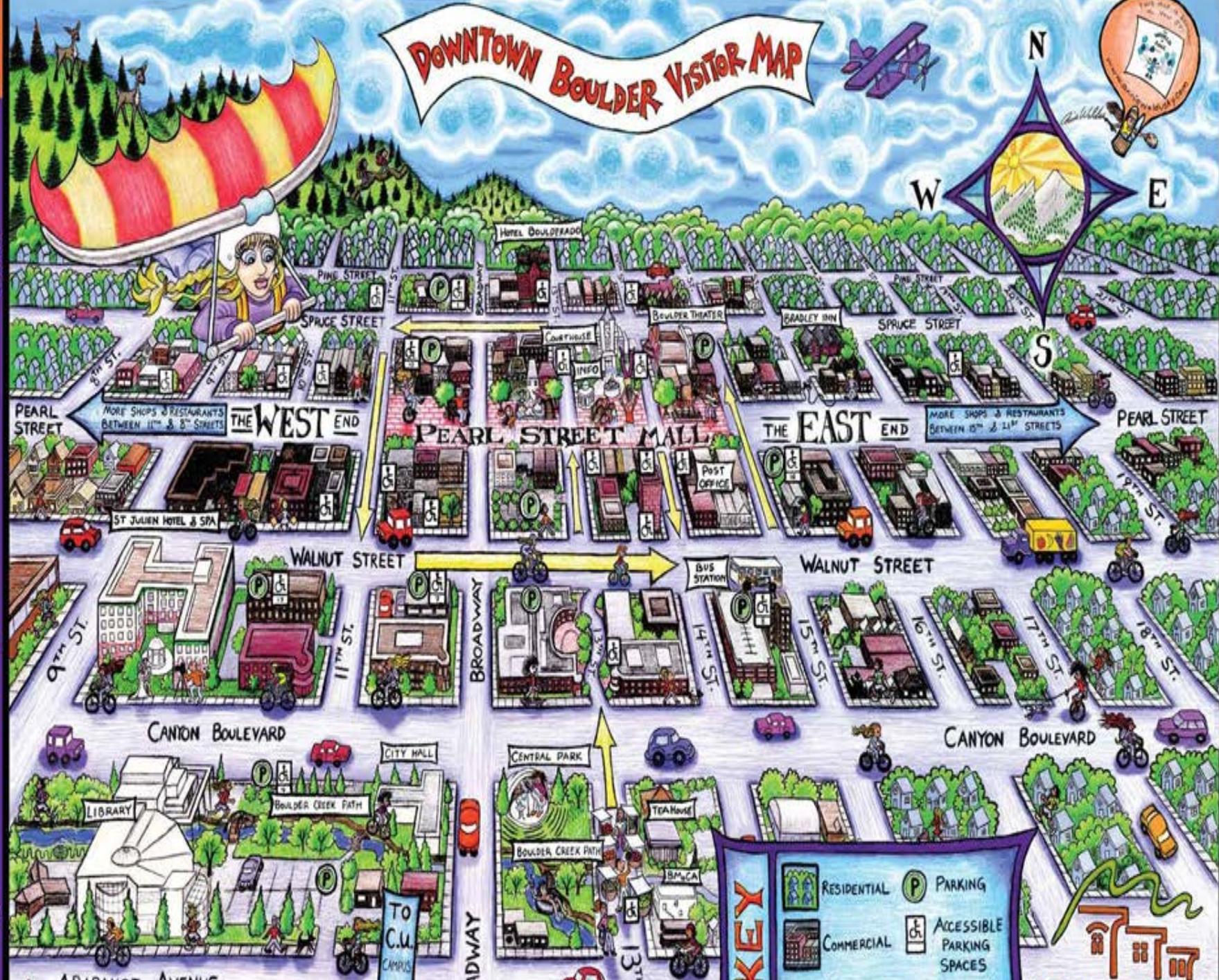
**RESOURCES**



**DOWNTOWN**  
Boulder

b: BoulderDowntown.com  
bile: m.BoulderDowntown.com  
king: BoulderParking.com

# DOWNTOWN BOULDER VISITOR MAP



**KEY**

- RESIDENTIAL
- COMMERCIAL
- PARKING
- ACCESSIBLE PARKING SPACES



# Climate Action—Next Steps

## **Council Review & Endorsement**

1. July 30<sup>th</sup> Study Session
2. Set the date for final review and ratification of goal & strategy

## **Community Engagement**

1. Community dialogue—Aug thru Dec 2015
2. Community action campaign—early 2016

## **Coordinated High Visibility Action**

1. Solar Adoption
2. Microgrids
3. Natural Gas replacement analysis

# Our Climate Action Plan

What kind of plan/strategy/roadmap do we need?

**One Community  
Climate Plan**



and

**50,000+ Energy Transition  
Roadmaps**



# Short-Term Target Development

## Targets 2020-2050

Prioritize actions to transition to a renewable energy-based economy and lifestyle. Continue to explore innovations in responsible resource use and effective stewardship of local ecosystems.



# Questions

1. Does Council support the proposed emissions reduction goal of 80 percent below 2005 levels by the year 2050; the overall framing and strategies associated with Boulder's Climate Commitment; and the proposed targets and actions identified as the focus of city efforts in the 2015-2020 time period?
2. Are there key emissions reduction actions not represented in the city's current programs and strategies that should also be considered?
3. Does Council have feedback and/or additional ideas on the plan for communications and engagement as outlined in the Climate Commitment Communications & Outreach Plan (Attachment C)?

Extra Slides

# Vatican Mayors Declaration Quotes

Climate change mitigation will require a rapid world transformation to a world powered by renewable and other low-carbon energy, and the sustainable management of ecosystems.

The world has within its technological grasp, financial resources, and know-how the means to mitigate climate change while also ending extreme poverty, through the application of sustainable development solutions including the adoption of low-carbon energy systems supported by information and communication technologies.

# Pilots—Highlighted Initiatives

## Buildings & Uses

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## Energy Source

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## Whole Household Energy Transition



Deep Retrofit



NG Appliance Retirement

PV installation



EV Substitution

**Potential Household Emissions  
Reduction  $\geq$  80%**

**Potential Household Financial  
Savings**

**\$10,000+ over 10 years!**