

## Planning for Climate Change

Practical Strategies for Local Governments

Rocky Mountain Land Use Institute / March 6, 2020





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#### Climate Change!



## **Key Assumptions**

- Scientists predict that the Western United States will get hotter and drier as a result of climate change, and storm events will become more severe
- Climate science and policy are and will continue to be highly politicized at the state and federal levels
- Large-scale interventions are necessary to avoid catastrophic damage from climate change
- Land use patterns are a primary determinant of carbon emissions
- Local governments have an important role to play in land use regulation and climate adaptation policymaking

## Planning for Climate Change: Substance

- Three predictable problems will face the Western U.S. as a consequence of climate change:
  - Flooding
  - Wildfire
  - Urban heat island

## Planning for Climate Change: Process

- Whether framed as climate-related policies, pro-climate planning and regulation benefit everyone through:
  - Increased public health
  - Economic sustainability
  - Good design
- Climate mitigation measures have costs and benefits
  - As with every planning effort, there are winners and losers
  - Collective goal should be to maximize winning and minimizing losing
  - There are reasonable ideas, and there are impractical ideas...

## The practical realities of climate change in the Western U.S.

Increased River and Stream Flooding Due to Increased Storm Activity

#### Increased flooding

**Rainstorm forecasts** 

- Increased frequency
- Increased intensity
- Potential increase in flooded areas
- Reduced predictability

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WATER

JULY 28, 1997

#### More human impact than we thought

- Estimated at Risk
- 13 million in 100 year FEMA's mapped floodplains
- A new study by the Yale School of Environmental and Forestry Studies estimated that real number is 41 million
- New Mexico could experience fivefold increase in population in flood prone areas by 2100

"Producing maps the FEMA way essentially misses a lot of flood hazard" "One of the major problems is that FEMA's methods "tend to ignore smaller streams," which often run through heavily populated areas."

Oliver E. J. Wing, doctoral candidate at the University of Bristol and lead author of the new Yale study

https://e360.yale.edu/digest/41-million-americans-live-in-flood-zones-three-times-the-fema-estimate-finds-new-study

#### Increased flooding

- Huge financial losses from Superstorm Sandy (LA) and Hurricane Katrina (LA) resulted in major new studies and recommendations
- Some of which are relevant to stream/river (rather than shoreline) flooding



Hurricane Sandy FEMA After-Action Report July 1, 2013

Increasing required elevation above Base Flood Elevation (BFE)

Under the Flood Insurance Reform Act of 2012, You Could Save More than \$90,000 over 10 Years if You Build 3 Feet above Base Flood Elevation



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www.fema.gov

- Permeable Ground Floor Design
  - Requiring that all habitable areas rather than the whole house – be elevated
  - And/or that the ground floor be designed to allow water to flow through with minimal damage





- Revised Setbacks
  - Adjust required primary building setbacks to be measured from FEMA floodplain boundaries rather than property lines



 Allow automatic adjustment of side and rear lot lines to allow homes to be built on the same lot – but further from flood risk

- Construction Size Limits
  - Reduce maximum size of allowed structures near flood risk areas to reduce maximum occupancy (and perhaps frequency of occupancy)





- Clustering and development rights pooling
  - Where property size would allow multiple single-family lots – require clustering of smaller lots away from flood risks.
  - Allow lots closer to flood risk to transfer building potential (units or floor area) to adjacent lots located further from flood risks



- Flood accommodating open space designs
  - Revise open space requirements to allow some portion of the area to serve as temporary floodwater accommodation areas
  - The very small number of days when the open space will not be usable due to floodwaters is a small price to pay for more efficient and affordable use of the remaining land.



- FEMA Community Rating System (CRS) can reduce community flood insurance by:
  - Not approving expansions of buildings in the floodplain by more than 25% -- even if the addition would be raised above base flood elevation
  - Requiring waterproof sanitary sewer systems
  - Requiring that access roads must be elevated above the 1% flood
  - Giving builders credit for required open space located in the floodplains
  - Many others



- Focus on Political Realities
  - Emphasize the dollar costs when similar sized communities have had to add temporary staff, repair roads and infrastructure, and operate shelters when a flood occurred – because the burden of new regulations on property owners need to be balanced against the costs imposed on the entire community when a flood occurs.
  - Trying to prevent property owners from building anything on their properties is probably a non-starter (read the <u>Lucas</u> case).
  - Emphasize what <u>can</u> be built or occupied on the stream and riverfront properties -- there are lots of cases where zoning prevents property owners from building exactly what they want – and this is one of them.
  - A cabin is almost always a "reasonable economic use of properties"



**Community Wildfire Planning Center** 

#### Adapting to Climate Change through Wildfire Planning Tools

Molly Mowery, AICP Community Wildfire Planning Center

Rocky Mountain Land Use Institute Conference March 2020







#### Wildfire Planning Tools

FIRE COI	DE	<i>Mainten</i> Agreem	nance ents	Hazard	Mitigation Plan	USE STA	-SPECIFIC NDARDS
Conse	Site I	Design Fasemer	Standa	rds	<b>Open Space</b>	Plan	Community
Comprehe Plan	ensive	SUBDI REGU	VISION LATION	Land	<i>Acquisition</i> Vildland-Ur	<i>n</i> ban <sup> </sup>	Wildfire Protection Plan
Site-Spe <i>Nuisance</i>	ecific Ass	essment	Buildi	ng Code	Interface Regulation	) 1S	Future Land Use Map
<b>Ordinance</b>	Lands Requir	caping rements	Zone D	istrict	Post-Disaster Morator	<sup>,</sup> Build ium	ing Development Fees

#### 1. Comprehensive Plan

Foundational starting point to guide future policies and regulations, encourages alignment with other climate and hazard-related objectives.



Blue Line Indicates Exis

#### 2. Subdivision Regulations

Broad opportunity to influence development through application requirements for fuel management, lot siting, phasing, access, water supply, and more.



#### 3. Wildland-Urban Interface (WUI) Code

Model set of standards for construction materials and building requirements, access, water supply, vegetation management, and more.



#### 4. Vegetation Management

Addresses appropriate placement and type of vegetation in wildfire-prone areas, includes plant selection lists.



#### 5. Setbacks / Hillside Protection Ordinance

Increases setbacks from steep slopes and can be combined with other hillside and hazard protection objectives.

![](_page_27_Picture_2.jpeg)

#### 6. Site Assessments

Offers site-specific assessments through voluntary or regulatory pathways, can be combined with incentives for property owners.

![](_page_28_Picture_2.jpeg)

## 7. Enforcement

Ensures wildfire risk reduction occurs on building, site, and other features; can be enforced through nuisance provisions, weed/hazard abatement programs, and others.

![](_page_29_Picture_2.jpeg)

## Strategies

- Align with other planning objectives
- Engage, educate, collaborate, collaborate, collaborate, collaborate....
- Show effective, science-based approach
- Create financial incentives
- Capitalize on recent events

#### Lessons

- Education and outreach is essential but not everything
- Ensure partnerships with fire department
- Expect incremental change
- Plan for election cycles, staff turnover

FIRST BAPTIST CHURCH ——of Cuyler —— STOP. DROP & ROLL NOT WORK IN HELL Planning for Climate Change / Rocky Mountain Land Use Institute / March 6, 2020

#### Contact / Resources

![](_page_32_Picture_1.jpeg)

Molly Mowery, AICP Executive Director Community Wildfire Planning Center 303-358-9589 molly@communitywildfire.org

![](_page_32_Picture_3.jpeg)

Molly Mowery, AICP, Anna Read, AICP, Kelly Johnston, RFP, and Tareq Wafaie, AICP

## Addressing Urban Heat Island: The Denver Green Roofs Story

#### **Urban Heat Island**

![](_page_34_Figure_1.jpeg)

#### Urban Heat Island: What's the Problem?

- Increased energy consumption
- Elevated air pollutant emissions
- Human comfort and health
  issues
- Water quality impacts

![](_page_35_Figure_5.jpeg)

Source: EPA

#### What is a Green Roof?

![](_page_36_Figure_1.jpeg)

# Green Roof Impacts on Urban Heat Island

- Traditional roofing materials (asphalt, rubber, etc.) absorb heat
- Green roofs use a combination of plant materials that reduce heat absorption
- Benefits:
  - Reduced energy demand
  - Reduced air pollution
  - Stormwater management
  - Habitat
  - Aesthetics

![](_page_37_Picture_9.jpeg)

Source: Architecture & Design

#### So What's the Problem?

#### **ADDITIONAL WATER DEMAND**

• Additional potable demand ranges from 576 Acre Feet – 1836	
Acre Feet	

	Building sqft (existing 2014)	New Water Demand AF	Building sqft 2014-2045	Future Water Demand AF	Est. Building sqft 2050	2045 Green Roof Water Demand AF
Commercial	23,841,794	258	13,983,842	151	37,825,635	409
Industrial	2,275,023	25	1,334,361	14	3,609,384	39
Residential	7,511,113	81	4,405,466	48	11,916,579	129
Total	33,627,930	363	19,723,669	213	53,351,599	576

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#### **Cost-Benefit Analysis**

![](_page_39_Figure_1.jpeg)

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#### **Cost-Benefit Analysis**

![](_page_40_Figure_1.jpeg)

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# Other Efforts at Green Roof Requirements

![](_page_41_Picture_1.jpeg)

The Planning Department has researched best practices, current green building process, and best site-specific solutions for the City to make living roofs a more viable option for existing and planned buildings. The Department will continue to work with other City agencies to explore how

#### Initiative I-300

![](_page_42_Picture_1.jpeg)

![](_page_42_Picture_2.jpeg)

#### Initiative I-300

Section 0001

#### Denver Green Roofs - Full Text of Measure

Be it enacted by the City and County of Denver:

Section 1: The Denver, Colorado Code of Ordinances, Title I, Chapter 10, is hereby amended to include a new Article XIII:

#### ARTICLE XIII. DENVER GREEN ROOFS

#### Sec. 10-300. Definitions.

The following terms shall have the meanings indicated:

APPLICANT -The owner of a building or property who applies for a permit or any person authorized by the owner to apply for a permit on the owner's behalf.

AVAILABLE ROOF SPACE - The total roof area of the building or building addition excluding:

- A. Areas designated for renewable energy devices;
- B. Private terraces no greater in area than the floor of the abutting residential unit at the roof level; and
- C. In the case of a residential building or a building addition to a residential building, the Required Outdoor Amenity Space.

AVERAGE GRADE - The average elevation of the ground surface measured at the street property line.

BASEMENT - The portion of a building between the first floor and any floor below the first floor.

BUILDING CODE, DEVER BUILDING CODE or DBC - Means or refers to the Denver Building and Fire Code as established through the Revised Municipal Code, Chapter 10, Article II.

COMMUNITY PLANNING AND DEVELOPMENT DEPARTMENT - The Community Planning and Development Department as established through the Revised Municipal Code, Chapter 12, Article II, Division 1.

COMPLETE BUILDING PERMIT APPLICATION - An application submitted to The Community Planning and Development Department for an above grade building permit which

- "Green roof" defined as requiring a growing medium, plantings, waterfiltration layer, and a drainage system
- Green roof or solar panels required on buildings of 25,000 square feet or more
- 20-60% of available roof space was required to be covered with green roof or solar
  - Roof coverage percentage increased as building size expanded
- Applied to existing buildings
- Cash-in-lieu option, starting at \$25 per square foot of exempted roof space

#### Initiative I-300

Initiated Ordinance 300					
YES/FOR - SI/EN FAVOR DE	63,256 votes		53.3 <mark>6</mark> %		
NO/AGAINST - NO/EN CONTRA DE	55,299 votes		<mark>46</mark> .64%		
Total Votes	Under Votes		Over Votes		
118,555	4,004	3.27%	36	0.03%	

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#### Denver of the Future?

![](_page_45_Picture_1.jpeg)

quentindevine.con

**Building Owners** 

#### Unintended Consequences

- High cost on top of high construction costs adds to housing affordability challenges, development challenges
- Increased water usage in a semi-arid climate
- Ongoing maintenance challenges for green roofs leads to enforcement concerns
- Extending lifespan of older roofs has opposite effect of encouraging newer, less heat absorbent construction practices

### **Modified Ordinance**

- Limit "available roof space" definition
  - Exempt private terraces, amenity spaces, rooftop mechanical equipment, skylights, areas used for renewable energy devices
- Addition of "cool roof" concept
  - High solar reflectance roofing materials

![](_page_47_Figure_5.jpeg)

#### **Modified Ordinance**

![](_page_48_Figure_1.jpeg)

#### Cool roof PLUS

- Green space equal to 10% of GFA of building, 60% of total roof area, or available roof space, whichever is LEAST; or
- On-site solar panels equal to 70% of total roof area or provide 100% of estimated annual average electricity; or
- Off-site renewable energy purchase; or
- Decreased energy consumption of at least 12% above building code requirements; or
- LEED Gold certification; or
- Combination of the above

#### **Modified Ordinance**

- Requirements for existing buildings
  - Cool roof PLUS
    - Green space equal to 2% of GFA of building, 18% of total roof area, or available roof space on building, whichever is LEAST; or
    - On-site solar panels; or
    - LEED Silver; or
    - Enrollment in energy program
- Cash-in-lieu at \$50 per square foot of total green space requirement
- "Character-defining" roof may be exempted from green roof requirement
- Campus-wide compliance options for multi-building projects

#### Modified ordinance

- Green building fund
  - Acquire green space in the city
  - Improve green space in the city
  - Water quality improvements and green infrastructure
  - Urban forest protection/expansion
  - Green roof creation
  - Solar adoption

#### Lessons Learned

- Climate activism can start the dialogue
- Despite being outspent 12-to-1 by opponents, the initiative passed due to grassroots outreach and a compelling problem statement (or misunderstanding of the impact)
- Every good idea has unintended consequences
- Resolving a small, concrete problem is easier than tackling big collective action problems
- Need input from all sides to get buy-in and to solve for unintended consequences

#### **Questions for Discussion**

- What are some other areas of climate-friendly land use regulation where these principles apply?
- What other land use planning goals could be achieved by tackling the items on which everyone agrees?
- What is the path to implementation of regulations?
- How can we achieve greater buy-in on climate adaptation and mitigation planning?
- How do we speed up change to actually respond to the climate emergency?
- Any other examples of impractical ideas turned practical?

#### **Questions and Answers**

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