



Bozeman Climate Plan

2020





ACKNOWLEDGEMENTS

The Bozeman Climate Plan was led by the City of Bozeman, but it is a plan for our entire community. It was made possible by an accomplished team of committed community members representing students, non-profits, small businesses, utilities, civic associations, Montana State University, farmers, health care professionals, neighbors, and City staff. Thank you for joining us in this effort to help define our pathway to a low-carbon future.

CITY COMMISSION

Mayor Cyndy Andrus

Deputy Mayor Terry Cunningham

Commissioner I-Ho Pomeroy

Commissioner Jennifer Madgic

Commissioner Michael Wallner

CITY OF BOZEMAN STAFF

- Jon Henderson, Strategic Services Director
- Natalie Meyer, Sustainability Program Manager
- Heather Higinbotham Davies, Energy Cons. Tech
- Chris Saunders, Community Development Manager
- Sarah Rosenberg, Community Development Planner
- Tanya Andreasen, Community Housing Manager
- Melody Mileur, Communications Coordinator
- Jessica Ahlstrom, Water Conservation Manager
- Kayla Mehrens, Stormwater Program Coordinator
- Shawn Kohtz, City Engineer
- Taylor Lonsdale, Transportation Engineer
- Addi Jadin, Parks Planning & Dev. Manager
- Alex Nordquest, Forestry Division Manager
- Dani Hess, Neighborhoods Coordinator

CONSULTING TEAM

- Judy Dorsey, Executive Project Manager, Brendle Group
- Shelby Sommer, Project Manager, Brendle Group
- Becca Stock, Project Analyst, Brendle Group
- Katie Kershman, Graphic Design, Brendle Group
- Sarah Martin, Project Planner, Brendle Group
- Britt Ide, Energy Advisor, Ide Energy¹
- Bruce Meighen, Community Plan & Engagement Support, Logan Simpson Design
- Megan Moore, Community Plan & Engagement Support, Logan Simpson Design



¹ Britt Ide serves on the NorthWestern Energy Board of Directors, the Coalition for Green Capital Board of Directors, and co-authored the City of Boise's Energy Future, a plan to achieve 100% renewable energy.

CLIMATE TEAM

- Heather Bellamy, NorthWestern Energy
- Kristin Blackler, Montana State University
- Sara Blessing, Bozeman Sunrise Movement
- Emma Bode, Forward Montana
- Jennifer Boyer, Farm 51
- John Bushnell, NorthWestern Energy
- Randy Carpenter, Future West
- Wyatt Catron, Montana Weatherization Center
- Lori Christenson, Gallatin County Health Department
- Terry Cunningham, Bozeman City Commission
- Chris Dorsi, Montana Weatherization Center-MSU Extension
- Robert Drake, Bridger Bowl
- Douglas Fischer, Bozeman School District
- Jeff Fox, Renewable Northwest
- Eli Frandsen, Montana State University-Student Body
- Danae Giannetti, Western Transportation Institute
- Heather Grenier, Human Resources Development Council
- Bonnie Hickey, Bridger Bowl
- Erin Jackson, Gallatin Valley Farm to School
- Danica Jamison, United Way
- Libby Khumalo, World Wildlife Fund
- Karin Kirk, Freelance Writing, Science Education
- Jason Klimpke, Mystery Ranch
- Anders Lewental, Southwest Montana Building Industry Association
- Candace Mastel, Bozeman Area Bicycle Board, MSU Planning
- Addie Melvin, JM Engineering
- Owen Mitchell, Bozeman High School-Student Body
- Riley Nash Wanzek, Montana State University-Student Body
- Chris Naumann, Downtown Bozeman Partnership
- Chris Pope, Montana Legislature-HD 65
- Nicole Rowley, Gallatin County
- Lindsey Schack, Love Schack Architects
- Jay Sinnott, Bozeman Climate Partners
- Bill Stoddart, North Fork Financial
- Claire Vlases, Bozeman High School-Student Body
- Edie Wiley, Bozeman Health





Bozeman
Climate
Plan

CLIMATE PLAN EXECUTIVE SUMMARY

Implementing this ambitious Climate Plan will lower Bozeman's contribution to climate change while making the community more resilient to the local impacts from an already changing climate. Moreover, it will advance Bozeman's strategic priorities to be a safe, inclusive community that fosters civic engagement, a thriving diversified economy, a strong environmental ethic, and a high quality of life as the community grows and changes.

In setting bold new goals and actionable strategies, the plan reaffirms and expands past commitments made in the 2011 Community Climate Action Plan (CAP) and in a 2017 resolution to uphold the goals of the Paris Climate Agreement through local action.

RELEVANCE DURING UNPRECEDENTED TIMES

During the course of developing this plan, COVID-19 has swept the globe, and more recently there have been widespread protests to address systemic racial inequalities in our country. These events reinforce the timeliness and relevance of this plan, in particular the resiliency goals to protect human health and increase social cohesion and the cross-cutting focus on equity. Further, COVID-19 may be an insightful test of the community resolve and cooperative frameworks needed to manage through this pandemic. The experience demonstrates the need to remain resilient and flexible to changing economic conditions while proactively addressing climate change. Aligning these pursuits will help ease suffering among Bozeman's most vulnerable populations and create synergies with related priorities like affordable housing.

As national policy frameworks are being considered for building back better and more equitably after COVID-19, climate action takes on new meaning and opportunity. For example, considering Bozeman community members currently spend over \$100 million per year on electricity, natural gas, and transportation fuels, the transition to a carbon neutral economy over the next 30 years can and should be navigated with short-term economic conditions in mind. This includes prioritizing cost-effective solutions and aligning with the City's efforts to foster a strong economic base.



VISION FOR THE FUTURE AND STAYING THE COURSE

Given today's risks and a highly uncertain future, the plan's vision and guiding principles will help ensure relevance throughout Bozeman's 30-year journey to carbon neutrality.

Climate Vision

Through leadership and collaboration, the City of Bozeman will advance innovative solutions to cultivate a more equitable and resilient low-carbon community for current and future generations.

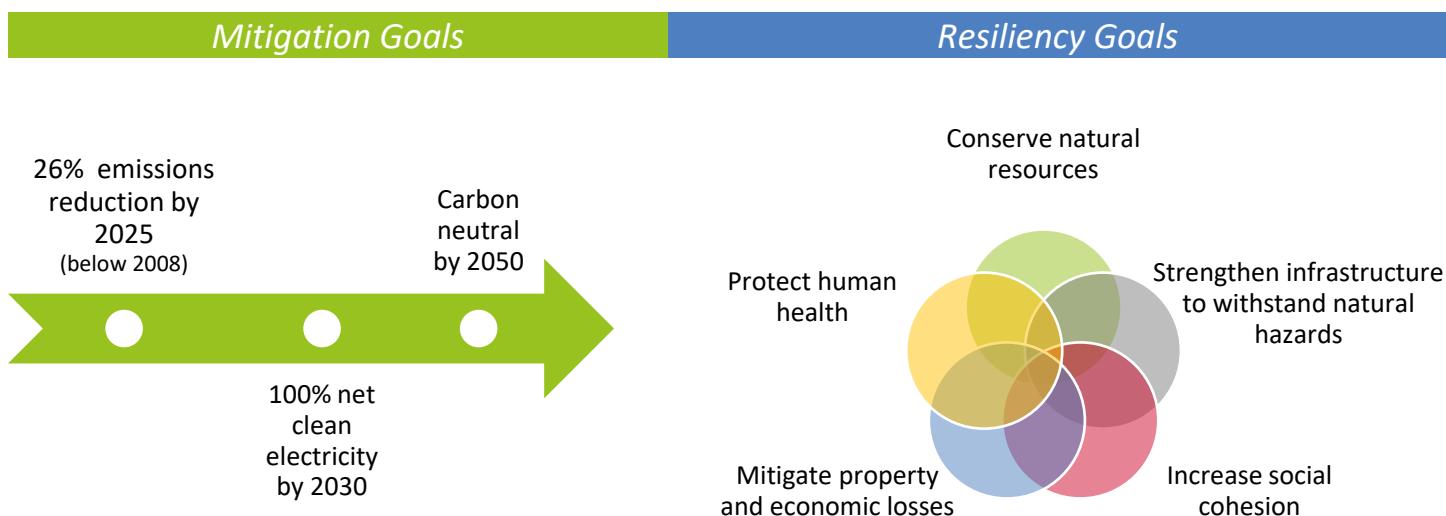
Guiding Principles

Bozeman will be a leader in addressing climate change by:

- Adopting bold targets for emissions reduction and renewable energy.
- Seeking innovative, actionable solutions to mitigate climate change.
- Weaving sustainability and resilience into decision-making processes.
- Pursuing partnerships with other municipalities and our utility provider.
- Inviting all Bozeman residents to join us, including current and future leaders.

BOLD TARGETS FOR EMISSIONS REDUCTION AND RENEWABLE ENERGY

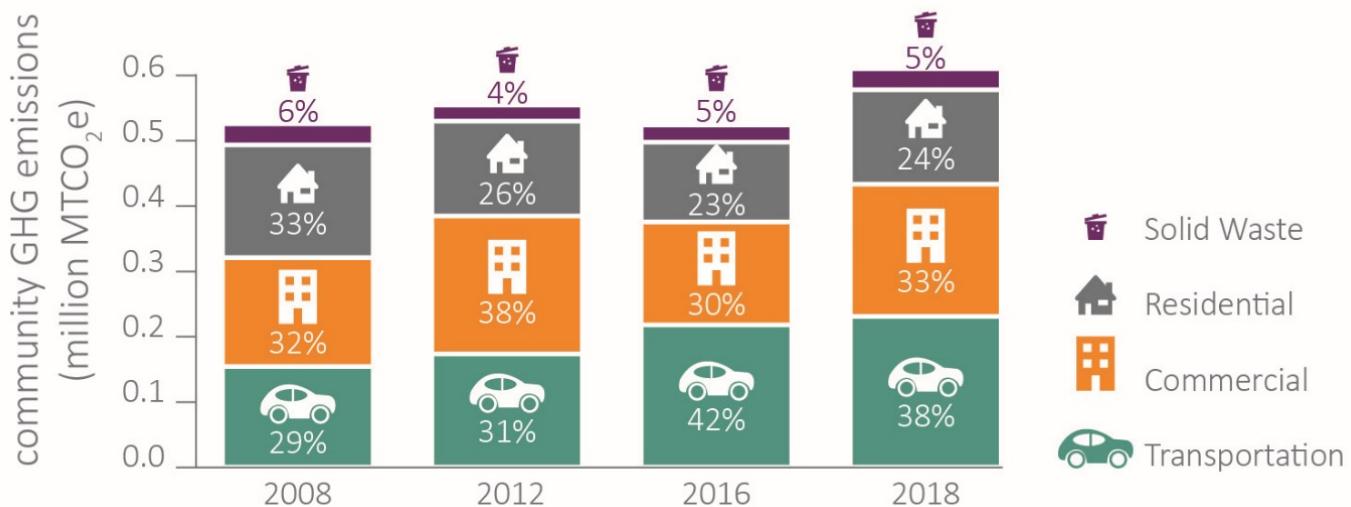
Delivering on the first guiding principle, the bold emissions mitigation targets summarized below set a pathway to carbon neutrality by 2050, starting with significantly reducing emissions in the next five years, then transitioning to 100% net clean electricity within 10 years.



The resiliency goals address the impacts of climate change identified in the 2019 [City of Bozeman Vulnerability Assessment and Resiliency Strategy](#):

 Extreme Heat	More frequent & intense	 Mountain Snowpack	Decline in volume
 Floods	More severe	 Wildfire	More extensive, frequent, & intense
 Drought	More frequent & intense	 Winter Storms	More severe

Despite years of climate action, total community emissions have increased since 2008. This increase is closely related to the 37% population growth the community experienced in the past decade. Overall, per capita emissions have declined by 15% since 2008. Looking to the future, Bozeman will need to continue addressing per-capita emissions by prioritizing high-impact emissions reduction opportunities. Because 57% of Bozeman's 2018 emissions came from building energy use, improving building efficiency and increasing renewable energy supply are paramount to achieving the near-term emissions reduction goal. Meanwhile, transportation is the fastest growing sector of community emissions with a 50% increase since 2008, requiring a strong immediate response to offset the growth. Over time, as building-related emissions decrease, efforts to reduce transportation and waste-related emissions will grow in importance to achieve carbon neutrality.



A ROBUST SET OF INNOVATIVE, ACTIONABLE SOLUTIONS

Adhering to the second guiding principle, this plan delivers a robust set of 16 innovative, actionable solutions organized across six focus areas:

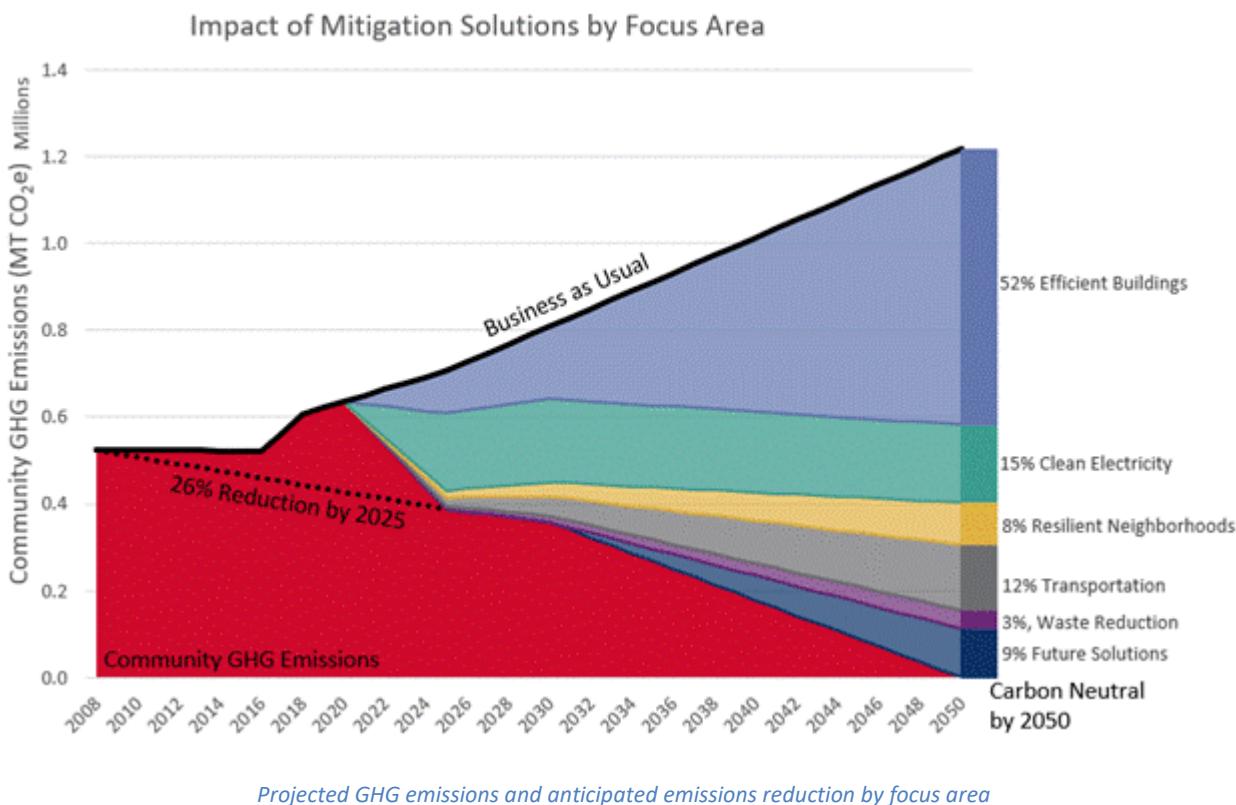


→ = Primary Mitigation Solution

● = Primary Resiliency Solution

Each solution includes a suite of supporting actions that ultimately help Bozeman achieve its climate vision and goals. Actions encompass a range of activities including advocacy, projects, programs, infrastructure, outreach, partnerships, policy, financial tools, studies, and more. To ensure the solutions are actionable, each action includes a detailed description, action priority level, identification of lead and implementing partners, and performance measures to keep the action on track.

Based on modeling of the emissions reduction potential for each solution, the following diagram summarizes the pathway to achieving Bozeman's GHG emissions reduction goals. The black line along the top of the graph represents actual or projected business as usual community GHG emissions and each colored wedge represents the contribution of solutions in each focus area to meeting Bozeman's GHG mitigation commitments. For more details on the individual solution contributions see the breakout in each focus area section. Note that two pathways for clean energy are explored in Focus Area 2: Responsible & Reliable Clean Energy Supply.



WEAVING SUSTAINABILITY AND RESILIENCE INTO DECISION-MAKING PROCESSES

The third guiding principle, weaving sustainability and resilience into decision-making processes, recognizes that the solutions and their strategies are economically feasible but will require community and political will and a culture shift in ensuring climate action is infused into city services, business operations, and lifestyle choices.

Embracing this guiding principle, the plan was developed through a comprehensive engagement process. The engagement process not only served to provide an inclusive approach for developing the elements of this plan, but also to raise the public and community partners' interest, understanding, and capacity for weaving climate action into daily decision-making.

The engagement approach included workshops with an intergenerational, transdisciplinary climate team, focus area meetings, in-person and online community forums, community survey, public-facing project website, community events such as a climate lecture at Montana State University, and City staff coordination meetings. See Appendix C: Climate Team

Workshop Summaries and Appendix D: Community Forum Summaries for detailed notes and materials from these engagement efforts.



CITY LEADERSHIP AND PARTNERSHIPS ARE CRITICAL TO SUCCESS

In addition to grassroots action across all decision-making, the fourth guiding principle, pursuing partnerships with other municipalities and our utility provider, recognizes the importance of the City leading the way through its municipal operations, collaborating with other municipalities regionally and at the state level, and advancing its strategic initiatives with NorthWestern Energy. Example Priority Level 1 actions in these areas include:

City Leading the Way

- Action 1.A.1. Increase Energy Efficiency at City Facilities
- Action 2.F.1. Plan and Install Renewable Energy Projects for City Facilities
- Action 6.O.1. Invest in Landscaping and Irrigation Upgrades at City Facilities
- Action 6.P.2. Maintain and Expand the Urban Forest

Collaborations with NorthWestern Energy

- Action 2.D.2. Collaborate and Innovate Utility-Scale Renewable Energy Solutions
- Action 4.K.1. Support Community EV Roadmap Development
- Action 4.K.2. Collaborate to Install Publicly Accessible EV Infrastructure

State-Level Partnerships with Other Municipalities

- Action 1.B.2. Advocate for Adoption of State-Wide Net Zero Energy Code
- Action 2.D.3. Support Policies to Expand Renewable Energy and Just Transition Initiatives

Collaborations with Regional Municipalities and Partners

- Action 3.G.1. Continue Regional Coordination on Compact Growth and Sustainable Development
- Action 4.J.1. Prioritize Regional Multi-Modal Planning and Connectivity
- Action 4.J.4. Pursue Sustainable Transit Funding and Expansion
- Action 4.J.6. Support Regional Transit Service Coordination and Outreach

INVITING ALL BOZEMAN RESIDENTS TO JOIN US, INCLUDING CURRENT AND FUTURE LEADERS

Finally, the fifth guiding principle recognizes the shared responsibility for implementing the solutions in this plan in order to achieve the myriad emissions reduction and resiliency benefits documented throughout this plan. As the City and its partners create climate action policies, programs, and services, Bozeman residents and businesses can do their part by learning about their contribution to Bozeman's greenhouse gas emissions and becoming supportive adopters of new climate actions as they become available. Example action items that invite all Bozeman residents, businesses, and community organizations to get involved are outlined on the following pages.



Inviting Bozeman Residents to Join the Climate Effort!

Bozeman residents are encouraged to print a copy of this page and the next as a quick reference guide for how you can do your part in supporting the Climate Plan. See the more detailed action descriptions in the Climate Plan to learn more about how each action contributes to Bozeman's climate goals. Check off actions as you complete them!

Action 1.A.2.

Reduce energy usage during peak energy demand (4pm to 8pm)

Healthy, Adaptive &
EFFICIENT BUILDINGS

Action 1.A.3.

Learn about and begin to make changes to your energy behaviors

Healthy, Adaptive &
EFFICIENT BUILDINGS

Action 1.A.3.

Contact NorthWestern Energy, or other qualified auditor, to schedule a home energy audit and make efficiency improvements to your home

Healthy, Adaptive &
EFFICIENT BUILDINGS

Action 1.B.2.

Advocate for more stringent state-wide energy and water efficiency regulations

Healthy, Adaptive &
EFFICIENT BUILDINGS

Action 2.F.4.

Explore opportunities to install on-site renewable energy and storage on your property

Responsible & Reliable
CLEAN ENERGY SUPPLY

Action 3.G.3.

Plan a neighborhood activity to help build social connections and improve community cohesion

Vibrant & Resilient
NEIGHBORHOODS

Action 3.H.3.

Get to know your neighbors and swap contact information for times of need or emergency

Vibrant & Resilient
NEIGHBORHOODS

Action 3.H.3.

Review City maps to understand if you are in a location that is vulnerable to flooding, fires, or other hazards and develop an emergency plan if a hazard event occurs

Vibrant & Resilient
NEIGHBORHOODS

Actions 4.J.2. & 4.J.6.

Walk, bike, carpool, or take transit to destinations instead of driving alone

Diverse & Accessible
TRANSPORTATION OPTIONS

Action 4.K.1.

Limit idling and combine trips when using a vehicle for transportation

Diverse & Accessible TRANSPORTATION OPTIONS

Action 4.K.6.

Consider investing in an electric vehicle for your next vehicle purchase

Diverse & Accessible TRANSPORTATION OPTIONS

Action 4.L.1.

Find alternatives to air travel, avoid binge flying, and/or purchase offsets for your next airline trip

Diverse & Accessible TRANSPORTATION OPTIONS

Action 5.M.1.

Review your waste and consumption practices and look for opportunities to reduce, reuse, or share products

Comprehensive & Sustainable WASTE REDUCTION

Action 6.N.2.

Volunteer at or donate to a local food bank

Regenerative Greenspace, Food Systems & NATURAL ENVIRONMENT

Action 6.N.3.

Learn to garden and grow your own food

Regenerative Greenspace, Food Systems & NATURAL ENVIRONMENT

Action 6.P.2.

Plant and maintain a tree

Regenerative Greenspace, Food Systems & NATURAL ENVIRONMENT

Action 6.O.2.

Update irrigation equipment and landscaping to use less water

Regenerative Greenspace, Food Systems & NATURAL ENVIRONMENT

Action 6.P.4.

Reduce pesticide and herbicide use

Regenerative Greenspace, Food Systems & NATURAL ENVIRONMENT



Inviting Bozeman Businesses and Community Organizations to Join the Climate Effort!

- Reduce energy usage during peak energy demand (4pm to 8pm) (Action 1.A.2.)
- Become a City of [Bozeman Energy Project](#) Partner (Action 1.A.3.)
- Contact NorthWestern Energy to schedule an energy appraisal and implement appraisal recommendations (Action 1.A.3.)
- Monitor and benchmark your building's energy performance (Action 1.A.4.)
- Explore opportunities to install on-site renewable energy and storage on your property (Action 2.F.4.)
- Review City maps to understand if you are in a location that is vulnerable to flooding, fires, or other hazards and develop an emergency and continuity of operations plan if a hazard event occurs (Action 3.H.3.)
- Engage your employees or constituents in emergency preparedness planning, drills, and protocols (Action 3.H.3.)
- Provide options and incentives for employee telecommuting and alternatives to single-occupancy vehicle travel (e.g., bike to work days, preferred parking spots, carpool matching, bicycle racks, wellness programs, etc.) (Actions 4.J.2. and 4.J.5.)
- Install electric vehicle charging infrastructure for fleet, employee, and potentially public use (Action 4.K.2.)
- Convert fleet vehicles and equipment to electric or alternative fuel models (Action 4.K.3.)
- Establish and enforce employee idling policies when using personal or fleet vehicles for business use (Action 4.K.5.).
- Limit non-essential airline travel and/or purchase carbon offsets for airline trips (Action 4.L.1.)
- Review your supply chain and consumption practices and look for opportunities to use less packaging, reuse or recycle materials, and compost organic waste (Action 5.M.1.)
- Provide markets for recycled products by supporting suppliers and businesses that use recycled materials (Action 5.M.1.)
- Reuse or donate used equipment and goods (Action 5.M.1.)
- Donate unused food and right-size large catering orders (Action 5.M.1.)
- Plant and maintain trees (Action 6.P.2.)
- Purchase products that support growth of the local food system (Action 6.N.3.).
- Update irrigation equipment and landscaping to use less water (Action 6.O.2.)
- Reduce pesticide and herbicide use (Action 6.P.4.)

Solution and Action Summary Table

Focus Area	Action	Priority Level
Focus Area 1. Healthy, Adaptive & Efficient Buildings	Solution A. Improve Efficiency of Existing Buildings	
	1.A.1. Increase Energy Efficiency at City Facilities	1
	1.A.2. Use Data and Price Signals to Advance Energy Efficiency	1
	1.A.3. Expand Energy Efficiency Information and Resources for Private Property	1
	1.A.4. Establish an Energy and Water Benchmarking Standard for Commercial Buildings	1
	1.A.5. Require Home Energy Labeling at Time of Listing	2
	1.A.6. Promote Energy Efficiency Financing and Investment	2
	1.A.7. Create a Rental Registry Program to Advance Renter Safety and Energy Efficiency	3
	Solution B. Achieve Net Zero Energy New Construction	
	1.B.1. Support High Performance Building Resources and Training for the Development Community	1
Focus Area 2. Responsible & Reliable Clean Energy Supply	1.B.2. Advocate for Adoption of State-Wide Net Zero Energy Code	1
	1.B.3. Encourage High Performance Construction for All Publicly Funded Buildings	2
	1.B.4. Analyze and Support Opportunities for District Energy	2
	1.B.5. Offer a Voluntary Pathway & Incentives for Above-Code Construction	3
	Solution C. Electrify Buildings	
	1.C.1. Advance Electrification Upgrades and Conversion Projects for City Facilities	2
	1.C.2. Include an Electrification Component for Above-Code Construction	3
	1.C.3. Support Outreach and Incentives for Electric Appliances and Equipment	3
	Solution D. Increase Utility Clean Energy Mix	
	2.D.1. Complete a 100% Net Clean Electricity Community Feasibility Study	2
	2.D.2. Collaborative and Innovate Utility-Scale Solutions with Utility Provider	1
	2.D.3. Support Policies to Expand Renewable Energy and Just Transition Initiatives	1
	2.D.4. Encourage Philosophical Shift for Utility Provider	1
	Solution E. Develop and Promote Utility Green Power Programs	
	2.E.1. Advance Green Tariff Program Development and Participation	1
	Solution F. Increase Community-Based Distributed Renewable Energy Generation	
	2.F.1. Plan and Install Renewable Energy Projects for City Facilities	1
	2.F.2. Streamline Solar Permitting and Adopt Solar-Ready Code Provisions	1
	2.F.3. Advance Distributed Solar Policies	2
	2.F.4. Promote Education and Incentives for Distributed Renewable Energy Storage	3

<i>Focus Area</i>	<i>Action</i>	<i>Priority Level</i>
Focus Area 3. Vibrant & Resilient Neighborhoods	Solution G. Facilitate Compact Development Patterns	
	3.G.1. Continue Regional Coordination on Compact Growth and Sustainable Development	1
	3.G.2. Review Development Code to Enhance Compact and Sustainable Development	1
	3.G.3. Develop Sustainable Neighborhoods Outreach	2
	Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards	
	3.H.1. Plan for Resilience Hubs at Critical Facilities	1
	3.H.2. Advance Resilience in Development Code and Development Review	1
	3.H.3. Support Business and Residential Preparedness Outreach	2
Focus Area 4. Diverse & Accessible Transportation Options	3.H.4. Incorporate Resilience into Infrastructure Plans	2
	Solution I. Enhance Social Infrastructure and Community Preparedness	
	3.I.1. Support Community and Neighborhood Resilience Programming	1
	Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit	
	4.J.1. Prioritize Regional Multi-Modal Planning and Connectivity	1
	4.J.2. Pursue Innovative Funding for Pedestrian and Bicycle Connections and Network	1
	4.J.3. Improve Maintenance of Multi-Modal Infrastructure	1
Focus Area 4. Diverse & Accessible Transportation Options	4.J.4. Pursue Sustainable Transit Funding and Expansion	1
	4.J.5. Support Employee Trip Reduction Programs and Transportation Demand Management	1
	4.J.6. Support Regional Transit Service Coordination and Outreach	1
	4.J.7. Leverage Parking Policies to Encourage Other Modes of Transportation	2
	4.J.8. Develop Bike and Car Share Programs	3
	Solution K. Decrease Direct Vehicle Emissions	
	4.K.1. Support Community EV Roadmap Development	1
	4.K.2. Collaborate to Install Publicly Accessible EV Infrastructure	1
Focus Area 4. Diverse & Accessible Transportation Options	4.K.3. City Fleet and Transit EV Investment	2
	4.K.4. Advocate for EV Utility Rates, Incentives, Infrastructure, and Efficiency Standards	2
	4.K.5. Limit Wasteful Vehicle Emissions	2
	4.K.6. Support EV Group Buy and Outreach	3
	Solution L. Improve Air Travel Efficiency	
	4.L.1. Build Awareness of Air Travel Impacts and Alternatives	2
Focus Area 4. Diverse & Accessible Transportation Options	4.L.2. Advocate for Increased Air Travel Efficiency	3

<i>Focus Area</i>	<i>Action</i>	<i>Priority Level</i>
Focus Area 5. Comprehensive & Sustainable Waste Reduction	Solution M. Move Toward a Circular Economy and Zero Waste Community	
	5.M.1. Actively Promote Source Reduction, Recycling, and Repair	1
	5.M.2. Expand Composting Services and Collection	1
	5.M.3. Improve Waste Policies, Services, and Operations	2
	5.M.4. Support Construction Waste Diversion	2
	5.M.5. Encourage the Development of Material Markets	3
Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment	5.M.6. Develop Plans for Green Purchasing and Zero Waste Events for City Operations	3
	Solution N. Cultivate a Robust Local Food System	
	6.N.1. Support the Formation of a Local Food Council	1
	6.N.2. Help Develop a Food System Assessment and Security Plan	2
	6.N.3. Encourage Local Agriculture and Preservation of Working Lands	2
	6.N.4. Support Local Food Production, Processing, and Distribution	3
	Solution O. Manage and Conserve Water Resources	
	6.O.1. Invest in Landscaping and Irrigation Upgrades at City Facilities	1
	6.O.2. Build on the Success of Water Conservation Education and Incentives	2
	6.O.3. Evaluate Additional Water Conservation Code and Water Rate Structure Adjustments	2
	Solution P. Manage Land and Resources to Sequester Carbon	
	6.P.1. Protect Local Wetlands for Flood Resilience and Water Quality	1
	6.P.2. Maintain and Expand the Urban Forest	1
	6.P.3. Enhance Greenspace and Carbon Sequestration for New Development	1
	6.P.4. Provide Outreach on Water Pollution Prevention and Carbon Sequestration Strategies	2



CONTENTS

Acknowledgements.....	ii
Climate Plan Executive Summary.....	iv
Chapter 1: Introduction.....	2
Aligning with Other Efforts	3
Plan Development Process	4
Bozeman's Climate Vision	6
Bozeman's Climate Goals.....	7
Plan Organization.....	9
Leading By Example	15
Chapter 2: Climate Trends & Goal Contributions	17
Baseline Inventory & Future Projections	20
Factors Influencing Emissions	25
Emissions Mitigation Goal Progress & Key Milestones.....	27
Resiliency Goal Contributions	33
Chapter 3: Focus Areas, Solutions & Actions	35
Focus Area 1. Healthy, Adaptive & Efficient Buildings.....	35
Focus Area 2. Responsible & Reliable Clean Energy Supply	59
Focus Area 3. Vibrant & Resilient Neighborhoods.....	80
Focus Area 4. Diverse & Accessible Transportation Options.....	98
Focus Area 5. Comprehensive & Sustainable Waste Reduction.....	124
Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment.....	135
Chapter 4: Implementation Guide	155
Implementation Considerations	155
Keeping the Plan on Track.....	160
Implementation Playbook.....	161
Community Guide to Implementation.....	164
References.....	169
Appendix A: Mitigation Analysis Summary.....	1
Quantitative Analysis Methodology.....	3
Appendix B: Existing Plan Summary.....	1
Appendix C: Climate Team Workshop Summaries	1
Appendix D: Community Forum Summaries.....	1

FIGURES

Figure 1. Climate Plan development process timeline	4
Figure 2: Vision words for the Climate Plan generated by the Climate Team	6
Figure 3: Proclamation of Intent related to the City of Bozeman's Climate Plan from October 2019	7
Figure 4. Goals of mitigation and resiliency.....	8
Figure 5. 2018 community emissions by sector.....	20
Figure 6. 2018 community emissions by source.....	21
Figure 7. 2018 energy flow diagram of community emissions by sector and source	22
Figure 8. Comparison of annual emissions by sector	23
Figure 9. Energy use by inventory year normalized for population and weather	25
Figure 10. Review of City of Bozeman population growth estimates.....	26
Figure 11. Range of projected GHG emissions with business as usual.....	26
Figure 12. Emissions reduction potential by solution.....	28
Figure 13. Projected GHG emissions and anticipated emissions reduction by focus area.....	29
Figure 14. Projected building GHG reductions by solution.....	36
Figure 15. Example from the Dept. of Energy's Home Energy Score Program.....	43
Figure 16. Projected clean energy GHG reductions by solution (pathway A)	61
Figure 17. Projected clean energy GHG reductions by solution (pathway B).....	62
Figure 18. Projected neighborhoods GHG reductions by solution	82
Figure 19. Projected transportation GHG emissions reduction by solution.....	99
Figure 20. Projected waste GHG emissions reduction by solution.....	125
Figure 21. Projected cost of energy use and social cost of carbon under the business-as-usual high-growth scenario.....	157
Figure 22. Various population projections for the City of Bozeman	A3
Figure 23. Estimated population growth scenarios	A4
Figure 24. Estimated emissions reduction potential by solution	A6

TABLES

Table 1. Under the stabilization emissions scenario (RCP 4.5), the difference, or change, projected from historical conditions (1971-2000) to mid-century (2040-2069) and end-of-century (2070-2099) thirty-year averages for Southwest Montana.....	17
Table 2. Under the business-as-usual emissions scenario (RCP 8.5), the difference, or change, projected from historical conditions (1971-2000) to mid-century (2040-2069) and end-of-century (2070-2099) thirty-year averages for Southwest Montana.....	18
Table 3. Total emissions (metric tons CO ₂ equivalent) by sector and inventory year.....	24
Table 4. Per capita emissions (metric tons CO ₂ equivalent) by sector and year	24
Table 5. Projected buildings solution mitigation targets	36
Table 6. Projected clean energy supply solution mitigation targets (pathway A)	61
Table 7. Projected clean energy supply solution mitigation targets (pathway B)	62
Table 8. Projected neighborhoods solution mitigation targets	82

Table 9. Projected transportation mitigation targets.....	100
Table 10. Projected waste reduction mitigation targets	125
Table 11. Projected fuel savings and return on investment per mitigation solution	158
Table 12. Summary of actions by focus area and priority level.....	161
Table 13: Contribution of each mitigation solution to Bozeman's mitigation goals	A1



Bozeman
Climate
Plan

CHAPTER 1:

INTRODUCTION



CHAPTER 1: INTRODUCTION

In 2017, the City of Bozeman passed [Resolution 4866](#) to join the [Climate Mayors](#), a partnership of over 400 United States mayors committing to uphold the goals of the Paris Climate Agreement through local action. This Climate Plan updates the City's previous emissions reduction goals, outlined in the [2011 Community Climate Action Plan](#) (CAP), to reflect this commitment. This plan also updates the mitigation strategies from the 2011 CAP to reflect the latest available climate science, new technologies, and evolving community priorities. Anticipating future changes and the need to adapt to the risks associated with changing local climate conditions, the Climate Plan also includes strategies to improve Bozeman's climate resiliency.

For more than a decade, Bozeman has made strong commitments to climate action and demonstrated significant progress in establishing and working toward its climate goals. Noteworthy achievements include launching and growing the [Bozeman Energy Project](#) for businesses, energy efficiency upgrades to municipal facilities, updates to the Unified Development Code, a food composting pilot program, installation of a 385 kW solar array at the Water Reclamation Facility through a partnership with NorthWestern Energy, and fare-free transit rides. This plan aims to leverage and grow these emissions mitigation activities, while also infusing new ideas and opportunities to reduce emissions and prepare the Bozeman community to be more resilient in anticipation of future climate change impacts.

This plan is a comprehensive and complex policy document, touching many different facets of daily life in the Bozeman community and greater region. As such, it is essential to focus on issues beyond emissions reduction and resiliency benefits and consider the related equity and human health and well-being facets of each solution and action. Implementation of this plan will undoubtedly create myriad co-benefits as well as impacts – some known and some yet to be discovered. Highlighting these considerations and tradeoffs in this plan is a first step in exploring and understanding these issues, though these concepts will need to remain important lenses and perspectives throughout plan implementation.

The Bozeman community faced many serious challenges and noteworthy events during the development of this Climate Plan, including the COVID-19 pandemic, wildfire, economic disruptions, community protests, and municipal leadership changes. While not all are climate-related, all are linked to community resiliency and Bozeman's ability to respond, recover, and adapt. The intent of this Climate Plan is to usher in a new era of community collaboration and innovation not only to address future climate-related goals, but also to recover and rebound together.

ALIGNING WITH OTHER EFFORTS

The Climate Plan is designed to align, support, and strengthen other City of Bozeman and regional efforts. It does not replace other plans; instead, it helps to create linkages between those plans and climate impacts, while also providing specificity in terms of implementation roles and priorities. Appendix B: Existing Plan Summary provides an overview of various plans and policies that relate closely to this effort.

Perhaps most notably, the 2018 City of Bozeman Strategic Plan establishes the overarching direction and strategic priorities for the City of Bozeman.

The 2020 strategic priorities include:

- Affordable Housing
- Annexation Analysis
- Climate Action
- Community Outreach
- Parks & Trails District
- Planning & Land Use
- Property Tax Relief / Tax Fairness

This plan directly addresses the priority of Climate Action, and also supports the strategic priorities of affordable housing, community outreach, and planning and land use.

Beyond the Strategic Plan, other closely linked efforts that helped shape the content of this Climate Plan include:

- [Bozeman Community Plan Update](#) (2020)
- [Montana Climate Solutions Plan](#) (2020)
- [City of Bozeman Climate Vulnerability Assessment and Resilience Strategy](#) (2019)
- [NorthWestern Energy Electric Supply Resource Procurement Plan](#) (2019)

Moving forward as other City of Bozeman plans and policies are updated, it is anticipated that this plan can serve as a resource to help infuse climate considerations and actions into those documents.



PLAN DEVELOPMENT PROCESS

In June 2019, the City of Bozeman initiated the Bozeman Climate Plan process. To help facilitate diverse public involvement, the City Manager invited a core group of approximately 30 Bozeman representatives to serve as Climate Team members to help guide the development of the Climate Plan (see [Resolution 5077](#)). Based on the Mayor's encouragement, the Climate Team includes four youth representatives from Montana State University and Bozeman High School and several early-career professionals to ensure that the City would hear from those who will be most impacted by climate change. See the Acknowledgements for a list of all Climate Team members.

The project management team planned engagement strategies for community members, the Climate Team, City Departments, and the City Commission. A summary of engagement activities to support the plan development is illustrated in the following graphic.

Note that following the COVID-19 pandemic declaration in March of 2020, the project approach and timeline was adapted to accommodate remote public engagement. Surveys and remote workshops were employed in lieu of a condensed in-person workshop.

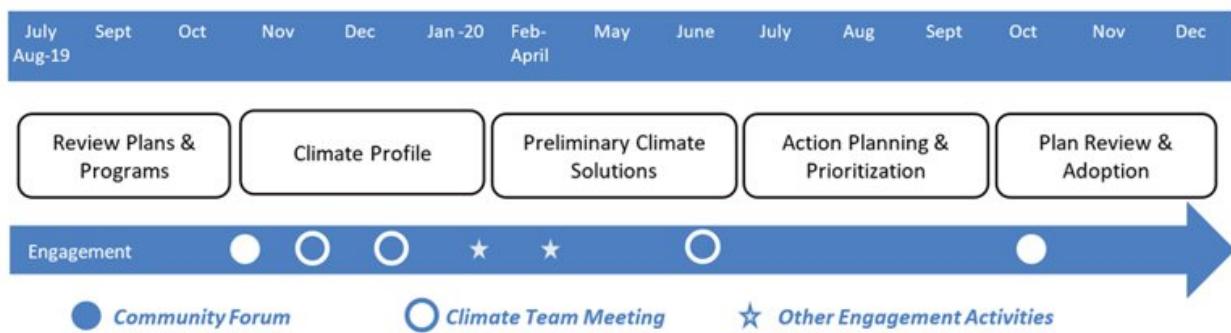
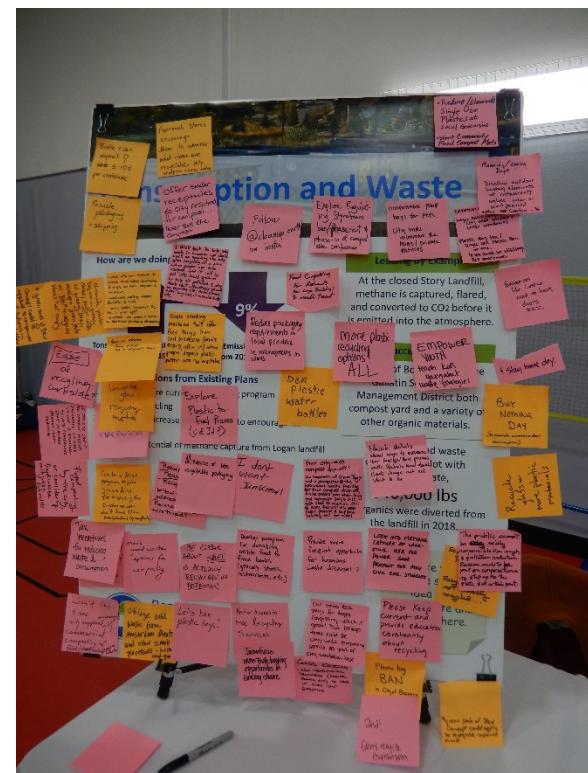
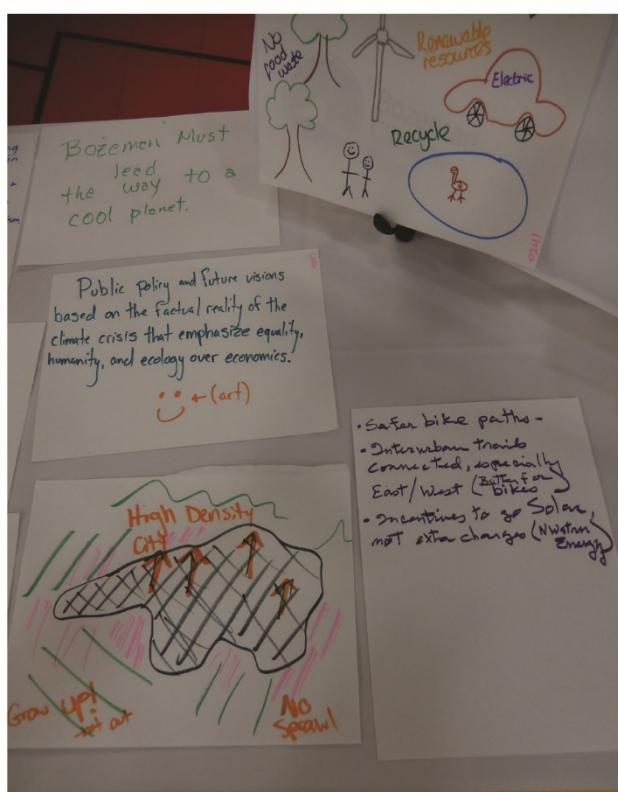
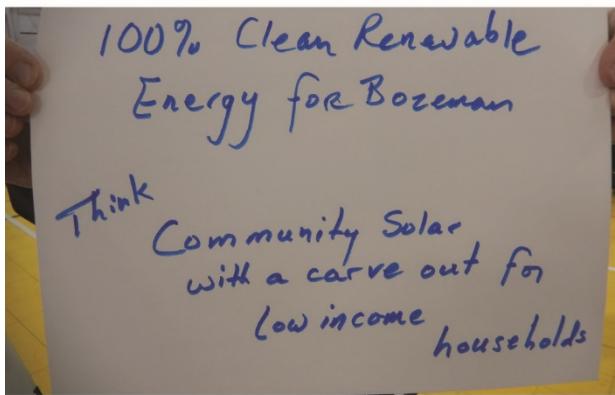
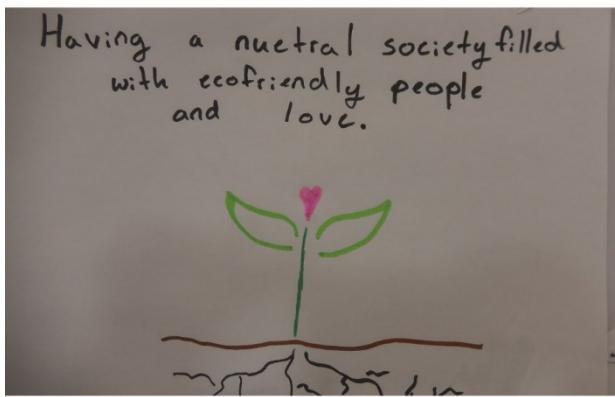
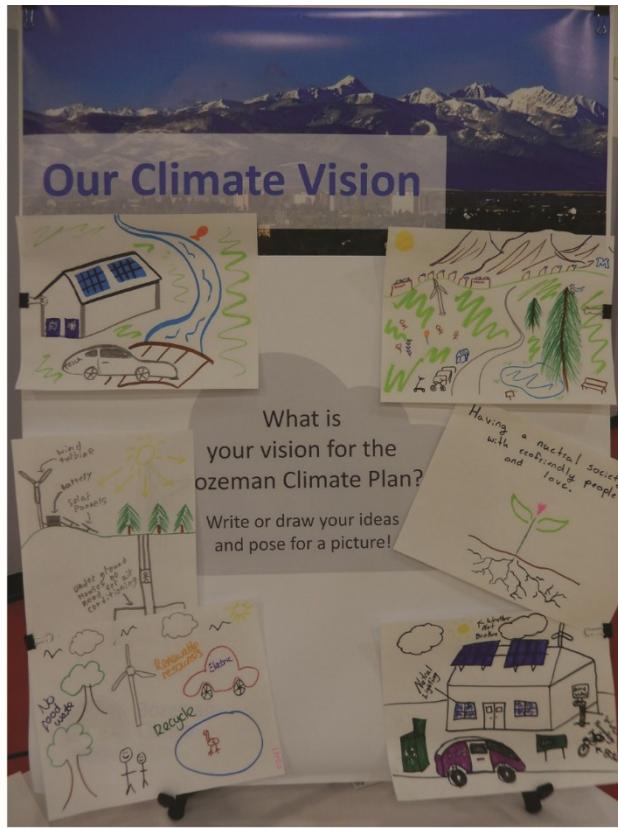


Figure 1. Climate Plan development process timeline





BOZEMAN'S CLIMATE VISION

A vision is the guiding force that orients the overarching direction for a plan. The Bozeman Climate Plan vision is organized into two components: a position statement and guiding principles. The position statement establishes the foundation upon which this plan was built, while the guiding principles form the pillars that hold up each component of this plan. Together, the position statement and guiding principles answer the question: how will the City of Bozeman address the imminent and far reaching impacts of climate change in a manner that lifts and strengthens the entire community?

Position Statement

Through leadership and collaboration, the City of Bozeman will advance innovative solutions to cultivate a more equitable and resilient low-carbon community for current and future generations.

Guiding Principles

Bozeman will be a leader in addressing climate change by:

- Adopting bold targets for emissions reduction and renewable energy.
 - Weaving sustainability and resilience into decision-making processes.
 - Pursuing partnerships with other municipalities and our utility provider.
 - Seeking innovative, actionable solutions to mitigate climate change.
 - Inviting all Bozeman residents to join us, including current and future leaders.

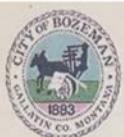


Figure 2: Vision words for the Climate Plan generated by the Climate Team

BOZEMAN'S CLIMATE GOALS

This Climate Plan establishes an assortment of goals for community greenhouse gas emissions reductions and climate resiliency. These climate goals are based on past City of Bozeman commitments, state-wide pledges, and the necessity established by current climate science, as summarized below.

- The 2011 Community Climate Action Plan established a goal of “reducing community-wide greenhouse gas emissions 10% below 2008 levels by 2025.”
- The 2011 Community Climate Action Plan established a goal of reducing per capita emissions to 10 metric tons of greenhouse gas emissions, not to exceed 695,000 metric tons, by 2020.
- In July 2019, Montana Governor Steve Bullock issued an Executive Order that establishes an interim goal of “net greenhouse gas neutrality for average annual electric loads in the state by no later than 2035.”
- The United Nations Environment Program (UNEP) 2019 [Emissions Gap Report](#) released on November 26, 2019 indicates that we must reduce global greenhouse gas emissions 7.6% each year between 2020 and 2030, and achieve carbon neutrality by 2050, to avoid more than 1.5°C (2.7°F of warming).



Proclamation of Intent Related to the City of Bozeman's Climate Action Plan

WHEREAS, an overwhelming body of scientific evidence indicates that climate change is occurring on our planet, and

WHEREAS, peer-reviewed scientific studies have concluded that climate change is caused in large part by human activity, and

WHEREAS, due largely to the combustion of fossil fuels, atmospheric concentrations of carbon dioxide, the principal greenhouse gas, are at a level unequaled for more than 400,000 years and as a result, an enhanced greenhouse effect is trapping more of the sun's heat near the earth's surface and gradually pushing the planet's climate system into uncharted territory, and

WHEREAS, global average temperatures have risen both on land and in the oceans, with observable impacts already occurring that foretell increasingly severe climate change, and

WHEREAS, climate change is resulting in serious and damaging effects to our planet at a pace that is likely to accelerate in the coming decades, and

WHEREAS, the federal government, rather than recognizing this impending climate crisis and taking urgent steps to address the root causes of climate change, is largely ignoring the issue and rolling back environmental protections, and

WHEREAS, a growing number of cities and towns throughout the United States recognize that, absent federal assistance and leadership in this matter, local municipalities must fill the void by providing the impetus for change, and

WHEREAS, the City of Bozeman Strategic Plan identifies the revision of its Climate Action Plan as a prioritized action item, and

WHEREAS, the City of Bozeman has convened a diverse consortium of talented and passionate citizens to develop a draft Climate Action Plan to serve as a comprehensive strategy for addressing climate change in Bozeman, and

WHEREAS, the plan will identify strategies and actions to reduce our community's greenhouse gas emissions and build resiliency to the impacts of climate change.

NOW, THEREFORE, AS THE MAYOR OF BOZEMAN, I PROCLAIM THAT:

- Bozeman shall be a leader in addressing climate change by developing a climate action plan that identifies bold targets for carbon reduction and climate change mitigation, and
- We will create a policy document that will weave sustainability and climate change resilience into the City of Bozeman's decision-making processes, capital planning and city budgets, and
- Bozeman will pursue partnerships with other municipalities and our utility provider to reach a goal of 100% net renewable energy for the City of Bozeman by 2030 and
- We call upon the Montana governor's office, state agencies, the state legislature, the Public Service Commission, Gallatin County, Northwestern Energy and all Bozeman residents to join us as we seek bold, actionable climate solutions to reverse global warming and leave a better world for future generations.

Signed and Proclaimed this 22nd day of October, 2019.

A handwritten signature of Cynthia L. Andrus in blue ink.

Cynthia L. Andrus
Mayor
Bozeman, Montana



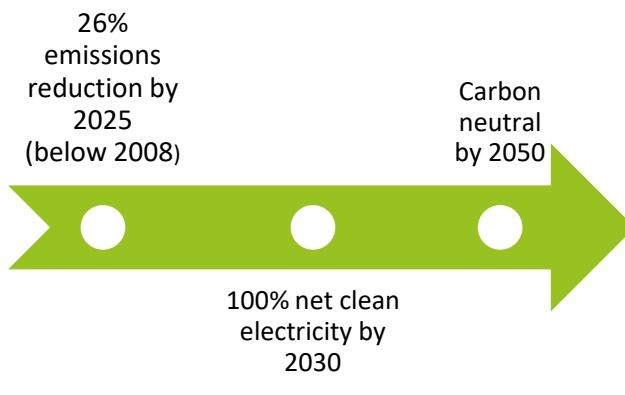
Figure 3: Proclamation of Intent related to the City of Bozeman's Climate Plan from October 2019

Bozeman's goals include a mix of quantitative emissions mitigation goals and qualitative community resiliency goals. Together, these goals work to position the city to achieve its climate vision.

Emissions Mitigation

Mitigation focuses on interventions to reduce or prevent emissions of greenhouse gases and lessen the human impact on the climate system.

The City of Bozeman's mitigation goals recognize that a rapid transition to non-carbon emitting clean energy is necessary to eliminate over one-third of community greenhouse gas emissions. Furthermore, clean electricity has the potential to replace gasoline and diesel, which represent an additional one-third of overall greenhouse gas emissions. The goals include a mix of near- and longer-term goals for the years 2025, 2030, and 2050.



Resiliency

Resiliency focuses on increasing the ability of the community to prepare, plan for, absorb, respond to, recover from, and adapt to the effects of climate-related shocks and chronic stressors.

This plan emphasizes the need for the City of Bozeman to incorporate climate change resiliency considerations into all City decision making. The resiliency goals center around being a community that prepares for, responds quickly to, and recovers from climate-related events and stressors through well-planned infrastructure, supportive social networks, and balanced economic prosperity.

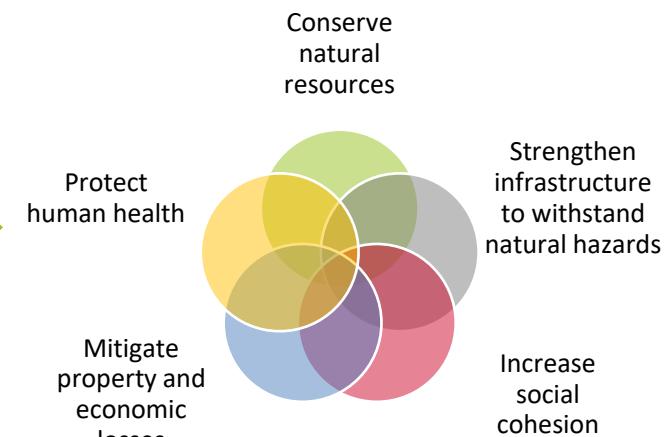


Figure 4. Goals of mitigation and resiliency



PLAN ORGANIZATION

The Climate Plan is organized to support Bozeman's climate vision and goals. The plan emphasizes **six focus areas** that help categorize the solutions and actions of the plan. Each focus area presents one or more **mitigation and/or resiliency solutions** that can support achievement of the vision and goals.

The final chapter describes how the plan can be **implemented** and updated over time to reflect new opportunities and changing community conditions. A series of appendices provide more detailed documentation and technical information that supported plan development.

Focus Areas

The focus areas serve to categorize the actions necessary for Bozeman to mitigate, and adapt to, projected climate change impacts. The focus area sections are ordered by their potential to achieve the mitigation goals, with an underlying concept of "efficiency first." By focusing on efficiency first, the Bozeman Climate Plan seeks to accelerate mitigation and resiliency efforts that will maximize the community's return on investment. The six focus areas of the Bozeman Climate Plan are:



Focus Area 1:
**Healthy, Adaptive &
EFFICIENT BUILDINGS**



Focus Area 2:
**Responsible & Reliable
CLEAN ENERGY SUPPLY**



Focus Area 3:
**Vibrant & Resilient
NEIGHBORHOODS**



Focus Area 4:
**Diverse & Accessible
TRANSPORTATION OPTIONS**



Focus Area 5:
**Comprehensive & Sustainable
WASTE REDUCTION**



Focus Area 6:
**Regenerative Greenspace,
Food Systems &
NATURAL ENVIRONMENT**

Each focus area section includes an introduction to the theme and how it relates to Bozeman's greenhouse gas emission trends and recent efforts. Additional components detailed within each focus area section include:

Where are we now

Related and supporting plans, policies, and programs

Key activities in this focus area that are necessary to achieve Bozeman's emissions reduction goals

Reduction targets for each emissions reduction goal

Resiliency opportunities and considerations for each climate hazard



Cross-Cutting Topics

In addition to the six focus areas, three cross-cutting topics are infused throughout the entire plan: equity, health and well-being, and City of Bozeman assets. Each component of this plan was developed within the context of these three topics, highlighting their importance and relevance to each focus area. A description of how each of these are addressed throughout the plan is provided in the Climate Solutions section that follows. Similarly, each Climate Solution includes discussion of how it supports the City of Bozeman's Strategic Plan priorities.



Equity



Human Health
& Well-Being



City Assets

Equity

Providing a more equitable future for the entire Bozeman community is a core value captured in the vision of this plan. Under an equitable climate plan, all community members will reap the benefits of mitigation and adaptation efforts. Ensuring an equitable path toward a resilient and low-carbon future will mean considering how each solution proposed in this plan might positively or negatively impact diverse sectors of the Bozeman community. For example, though pursuing distributed renewable energy (see Solution F. Increase Community-Based Distributed Renewable Energy Generation) is central to achieving mitigation goals, not every resident may be able to afford the upfront costs, and therefore cannot reap the long-term savings. Through this careful consideration, all actors involved in implementing this plan can work to maximize equitable benefits, while avoiding or mitigating negative equity impacts wherever possible.

Human Health and Well-being

This cross-cutting topic seeks to prioritize the physical, mental, and emotional well-being of Bozeman's community members in the context of climate action. Mitigation and resiliency activities often yield significant health benefits, though in some cases, there may be unintended or negative consequences associated with solutions. For example, if a more diverse transportation future includes significant on-demand transportation (e.g., Uber and Lyft), air pollution may increase where idling occurs. As with equity considerations, exploring all of the potential impacts on human health and well-being can help ensure benefits are maximized, while unintended consequences are limited or avoided.

City Assets

In 2019, the City of Bozeman completed the [Vulnerability Assessment and Resiliency Strategy](#) specific to City assets. This plan identified the City's most vulnerable assets and set forth strategies for improving resiliency in the face of five natural hazards. The recommendations from the 2019 Vulnerability Assessment and Resiliency Plan find synergies in this Climate Plan. Though every member of the Bozeman community is responsible for implementing this plan, the City will seek to lead by example, making direct and influential impact by leveraging City Assets.



Climate Solutions

Climate solutions are the big ideas that help further organize and describe how the community will make progress toward Bozeman's climate vision. Each focus area has one to three proposed solutions, identified through the first two workshops with the Climate Team. As with the focus areas, solutions are organized around the concept of improving and maximizing efficiency first, to establish a solid foundation upon which to build other approaches and innovations. For example, community efforts should focus first on improving the efficiency of existing buildings, before layering in opportunities to switch fuel sources.



Focus Area 1:
**Healthy, Adaptive &
EFFICIENT BUILDINGS**

- Solution A. Improve Efficiency of Existing Buildings
- Solution B. Achieve Net Zero Energy New Construction
- Solution C. Electrify Buildings



Focus Area 2:
**Responsible & Reliable
CLEAN ENERGY SUPPLY**

- Solution D. Increase Utility Clean Energy Mix
- Solution E. Develop and Promote Utility Green Power Programs
- Solution F. Increase Community-Based Distributed Renewable Energy Generation



Focus Area 3:
**Vibrant & Resilient
NEIGHBORHOODS**

- Solution G. Facilitate Compact Development Patterns
- Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards
- Solution I. Enhance Social Infrastructure and Community Preparedness



Focus Area 4:
**Diverse & Accessible
TRANSPORTATION OPTIONS**

- Solution J. Increase Walking, Bicycling, Carpooling, and Use of Transit
- Solution K. Decrease Direct Vehicle Emissions
- Solution L. Improve Air Travel Efficiency



Focus Area 5:
**Comprehensive & Sustainable
WASTE REDUCTION**

- Solution M. Move Toward a Circular Economy and Zero Waste Community



Focus Area 6:
**Regenerative Greenspace,
Food Systems &
NATURAL ENVIRONMENT**

- Solution N. Cultivate a Robust Local Food System
- Solution O. Manage and Conserve Water Resources
- Solution P. Manage Land and Resources to Sequester Carbon



Solution Template Overview

Each solution begins with an introductory narrative that provides an overview of the solution's scope, the regulatory context within which the solution operates, and key areas of impact for the solution. These introductory narratives also highlight specific resiliency considerations and call out related efforts led by the City or key community partners. In addition to a general overview of scope, each solution introduction identifies the equity, health and well-being considerations, and City asset opportunities relevant for that solution. Each cross-cutting topic description is marked with an icon.



Equity considerations explore how a solution might provide equity benefits, or how it might negatively impact equity. Wherever possible, solutions should be implemented to maximize equity benefits, while avoiding unintended consequences.



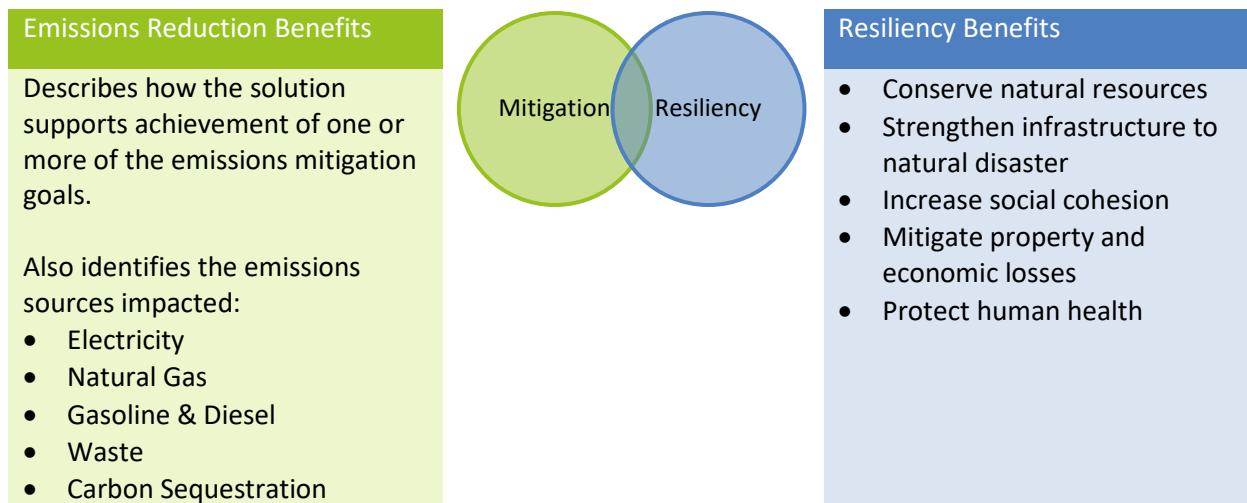
Health and well-being considerations identify how a solution could positively or negatively impact the physical, mental, and emotional health and well-being of Bozeman community members.



City asset considerations identify opportunities for the City to lead by example through improvements to public facilities and infrastructure and municipal operations.

Climate Goal Contributions

Each solution is categorized as primarily a mitigation solution or primarily a resiliency solution. For solutions that provide climate mitigation, the benefits are summarized in terms of which emissions reduction goals are supported and which fuel sources are impacted. For solutions that provide resiliency benefits, the summary tables identify which resiliency goal(s) the solution helps to advance.



Related Solutions

None of the solutions in this plan stand alone. In some cases, one solution may find synergies with another or many other solutions. In other cases, a solution may be wholly dependent on the successful implementation of one or more solutions. The lists of related solutions help to identify these interdependencies, and act as a reminder that Bozeman cannot and will not achieve its vision without collaboration and partnership.



Actions

Each solution in this plan includes a suite of supporting actions that provide strategy and focus to help advance the solutions to ultimately help Bozeman achieve its climate vision and goals. Actions encompass a range of activities including advocacy, projects, programs, outreach, partnerships, policy, financial tools, studies, and more. Each action begins with a background narrative to explain the steps and activities necessary to advance the idea. A summary table presents other important details associated with each action:

Priority	<p>1 – The action is a top priority to show municipal leadership or proof of concept; to capture the momentum of existing efforts, is necessary to achieve 2025 goals; some resources for implementation may be available; and/or may be a necessary building block for subsequent actions.</p> <p>2 – The action is important to advance in the near-term, but may be dependent on other actions to begin first; may not be as time sensitive and is more closely related to long-range goals; and/or the resources for implementation need to be identified or secured.</p> <p>3 – The action is a longer-term priority; it may need to begin after other actions; and/or additional resources are needed for implementation.</p>
Lead & Implementing Partners	Achieving the goals in this plan will require a community-wide effort. The City of Bozeman can play a leadership role by investing taxpayer resources in ways that advance the goals, but will need the participation of residents, businesses and community organizations, utilities, and more to successfully implement the solutions identified. Each action identifies an implementation lead, as well as supporting partners.
Strategic Plan Alignment	The City of Bozeman Strategic Plan was adopted via Resolution 4852 to focus on specific outcomes and guide policy and funding decisions over the next 2-5 years. This section references actions that align with priorities from the Strategic Plan.
Performance Measures	Periodic greenhouse gas emissions inventories will continue to serve as the overarching metric of progress towards Bozeman's goals. In addition to monitoring total greenhouse gas emissions, one or more metrics are identified to quantitatively measure and monitor the implementation status, impact, or performance of each action.



Note that all of the solutions in this plan require a coordinated and collaborative community effort to ensure successful implementation. The major groups that will play leading and supporting roles in implementing the solutions and actions within the plan are noted below and referenced throughout this document.

Government

- City of Bozeman
- Gallatin County
- State of Montana
- Adjacent Jurisdictions

Utilities

- NorthWestern Energy
- Solid Waste
- Telecommunications
- Water & Sewer

Businesses & Community Organizations

- Businesses
- Developers
- Investors
- Montana State University
- Non-profits
- Schools

Residents

- Homeowners
- Renters
- Students
- Taxpayers
- Property owners
- Homeowners associations



LEADING BY EXAMPLE

The City of Bozeman has demonstrated a commitment to reducing emissions and enhancing resiliency through various municipal projects, programs, and initiatives. Below are just a few recent and noteworthy achievements.



Focus Area 1:
**Healthy, Adaptive &
EFFICIENT BUILDINGS**

- From 2012-2019, municipal energy efficiency upgrades saved 3,583 MWh and \$371,440.
- Bozeman Energy Project business partner savings from 2015-2019 equaled 522 MWh and \$54,882.



Focus Area 2:
**Responsible & Reliable
CLEAN ENERGY SUPPLY**

- From 2009-2019, Solar PV on city property generated 1,390 MWh of electricity.
- The City of Bozeman partnered with NorthWestern Energy to install a 385 kW solar array at the Water Reclamation Facility, which produces enough electricity to offset the annual consumption of 60 homes.



Focus Area 3:
**Vibrant & Resilient
NEIGHBORHOODS**

- In April 2018, the Unified Development Code was adopted to address the growing population; it includes changes to standards such as allowing higher density requirements and smaller lot sizes.
- The Landscaping chapter in the Bozeman Municipal Code requires drought tolerant landscaping.



Focus Area 4:
**Diverse & Accessible
TRANSPORTATION OPTIONS**

- Streamline Transit provided 283,714 fare-free rides in 2018.
- Bozeman was designated a 2016 Silver Bike Friendly Community by the League of American Bicyclists.



Focus Area 5:
**Comprehensive & Sustainable
WASTE REDUCTION**

- Both the City of Bozeman and the Gallatin Solid Waste Management District compost yard waste and a variety of other organic materials.
- At the closed Story Landfill, methane is captured, flared, and converted to CO₂ before it is emitted into the atmosphere.
- Through a food waste composting pilot with Montana State, 540,000 pounds of organics were diverted from the landfill in 2018.



Focus Area 6:
**Regenerative Greenspace,
Food Systems &
NATURAL ENVIRONMENT**

- The Story Mill Community Park is helping to build healthy streams and wetlands. The project received the 2017 Montana Wetland Stewardship Award and doubled the size of Bozeman's largest wetland to 14 acres.
- The 7th Ave. streetscape project integrated green infrastructure components, including permeable pavers and underground soil vaults to collect and absorb stormwater while supporting the maintenance of new street trees.



Bozeman
Climate
Plan

CHAPTER 2:

CLIMATE TRENDS & GOAL CONTRIBUTIONS





CHAPTER 2: CLIMATE TRENDS & GOAL CONTRIBUTIONS

According to the 2017 Montana Climate Assessment, climate change in Montana is predicted to lead to temperature variability, shifts in precipitation, varying risk of certain severe weather events, and changes to other features of the climate system (Whitlock et al., 2017).

Table 1 and Table 2 summarize the Montana Climate Assessment's future projections of impacts to Bozeman under two future emissions concentration scenarios (i.e., Representative Concentration Pathways (RCP)), RCP 4.5 and RCP 8.5, respectively. Under the stabilization scenario, RCP 4.5, greenhouse gas emissions peak around 2040 and then begin to decline through the end of this century as atmospheric carbon dioxide (CO₂) concentration begins to level off. Under the business-as-usual scenario, RCP 8.5, greenhouse gas emissions increase through 2100 and warming continues to rise.

The Montana Climate Assessment examined 20 global climate models and calculated the strength of consensus for each climate variable's direction of change (either increasing or decreasing). This is reported as the percentage of model agreement. Additional information on the climate modeling approach can be found in the [Montana Climate Assessment](#).

Table 1. Under the stabilization emissions scenario (RCP 4.5), the difference, or change, projected from historical conditions (1971-2000) to mid-century (2040-2069) and end-of-century (2070-2099) thirty-year averages for Southwest Montana.

	RCP 4.5 (2040-2069)	RCP 4.5 (2070-2099)	Model Agreement
Average annual temperature	+4.5°F	+5.6°F	100%
Average daily summer maximum temperature	+4.5°F	+6.5 °F	100%
Average number of days above 90° F	+25 days	+29 days	100%
Average number of freeze free days above 32° F	+30 days	+41 days	100%
Average annual precipitation ²	+0.9 inch/year	+1.1 inch/year	85% ³ /90% ⁴
Change in summer precipitation	-0.1 inch/month	-0.1 inch/month	65%

² Interannual variability projected to range from -0.5 inch/year to +1.5 inch/year ($\leq 80\%$ model agreement).

³ 85% model agreement for RCP 4.5 (2040-2069).

⁴ 90% model agreement for RCP 4.5 (2070-2099).



Table 2. Under the business-as-usual emissions scenario (RCP 8.5), the difference, or change, projected from historical conditions (1971-2000) to mid-century (2040-2069) and end-of-century (2070-2099) thirty-year averages for Southwest Montana.

	RCP 8.5 (2040-2069)	RCP 8.5 (2070-2099)	Model Agreement
Average annual temperature	+6.0°F	+9.8°F	100%
Average daily summer maximum temperature	+6.0°F	+11.8°F	100%
Average number of days above 90° F	+33 days	+54 days	100%
Average number of freeze free days above 32° F	+41 days	+70 days	100%
Average annual precipitation ⁵	+1.2 inch/year	+1.7 inch/year	85% ⁶ /100% ⁷
Change in summer precipitation	-0.1 inch/month	-0.1 inch/month	65%

As characterized in the modeled scenarios, average and annual seasonal temperatures in Montana have been increasing since the mid-20th century and are predicted to continue to increase through the end of the century. Likewise, in the modeled scenarios, the timing of precipitation (i.e., winter versus spring and summer) and the form in which it will occur (i.e., rain versus snow) is anticipated to shift. This combination of increasingly warmer days with variable precipitation results in interrelated, indirect local climate impacts.

For example, decreased snowpack may lead to more severe droughts in the summer and a susceptibility to wildfire risk in the watershed. This type of direct impact will have a broad range of additional, indirect effects on the local and regional economic and social systems. The heightened susceptibility to wildfire could reduce the amount and quality of water available, along with damaging ecosystems and infrastructure, potentially limiting city-wide services available to address the impacts. Therefore, the local outdoor and tourist economy could be compromised in addition to public health considerations.

Another indirect consequence of climate change is human migration caused by sea level rise and other extreme weather shocks and stressors. Sea-level rise in coastal communities in the United States is predicted to increase net-migration to Gallatin County up to an estimated 50,000 people by the end of the century, exacerbating Bozeman's existing challenge of rapid population growth (Hauer, 2017).

⁵ Interannual variability projected to range from -0.4 inch/year to +1.9 inch/year ($\geq 80\%$ model agreement).

⁶ 85% model agreement for RCP 8.5 (2040-2069).

⁷ 100% model agreement for RCP 8.5 (2070-2099).



Local Climate Change Impacts

Over the past decade, the City of Bozeman has changed rapidly due to a growing population and bustling economy, leading to increased urbanization, suburbanization, and stress on the area's natural resources. Climate change is a major factor that has the potential to continue to significantly shape the community's future. Evidence of climate change is well documented throughout the United States (Climate Change Impacts in the United States: The Third National Climate Assessment, 2014) and Rocky Mountain West region. The potential climate impacts for Montana (Whitlock, Cross, Maxwell, Silverman & Wade, 2017) and Bozeman are significant.

The 2019 [City of Bozeman Vulnerability Assessment and Resiliency Strategy](#) identifies the following consequences of climate change. This plan explores solutions to mitigate the community's impacts on climate change, as well as solutions that enable the community to adapt and be resilient to these impacts.



Extreme Heat

More frequent & intense



Floods

More severe



Drought

More frequent & intense



Mountain Snowpack

Decline in volume



Wildfire

More extensive, frequent, & intense



Winter Storms

More severe



Snowblowing Efforts December 12, 2005



Bozeman Creek Flooding May 24, 2011

©Rachel Leathe/Chronicle



Bozeman Creek December 11, 2009



Still-standing house, surrounded by charred fields September 6, 2020



BASELINE INVENTORY & FUTURE PROJECTIONS

The City of Bozeman has been tracking community greenhouse gas (GHG) emissions since 2008 to better understand the sources of Bozeman's GHG emissions and monitor progress over time. The information is used to help inform City decision-making. This inventory adheres to the Global Protocol for Community-Scale Emissions and the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas (GHG) emissions. The City of Bozeman Sustainability Office collected data related to energy, transportation, solid waste, water, wastewater, and emissions factors. We calculated our carbon emissions using the ICLEI ClearPath platform.

For Bozeman, GHG emissions result from four primary sectors: energy use in homes, energy use in commercial buildings, fuel use in transportation, and solid waste (see Figure 5). In 2018, Bozeman's overall community emissions totaled 607,139 metric tons of carbon dioxide equivalent (MT CO₂e). Since the baseline year of 2008, total community emissions have increased 16% while population has increased 37% over the same period. Based on 2018 census data, Bozeman had 48,532 people, resulting in per capita emissions of 12.5 MT CO₂e per person. Since 2008, per capita emissions have decreased by 15%. Over half of these emissions (57%) are linked to the energy generated to power our homes, businesses, and institutions. The next largest source of emissions comes from transportation fuel sources (38%)—most transportation emissions come from gasoline (63%). The remaining emissions result from solid waste (5%) and wastewater treatment (<1%).

2018 Community Emissions by Sector

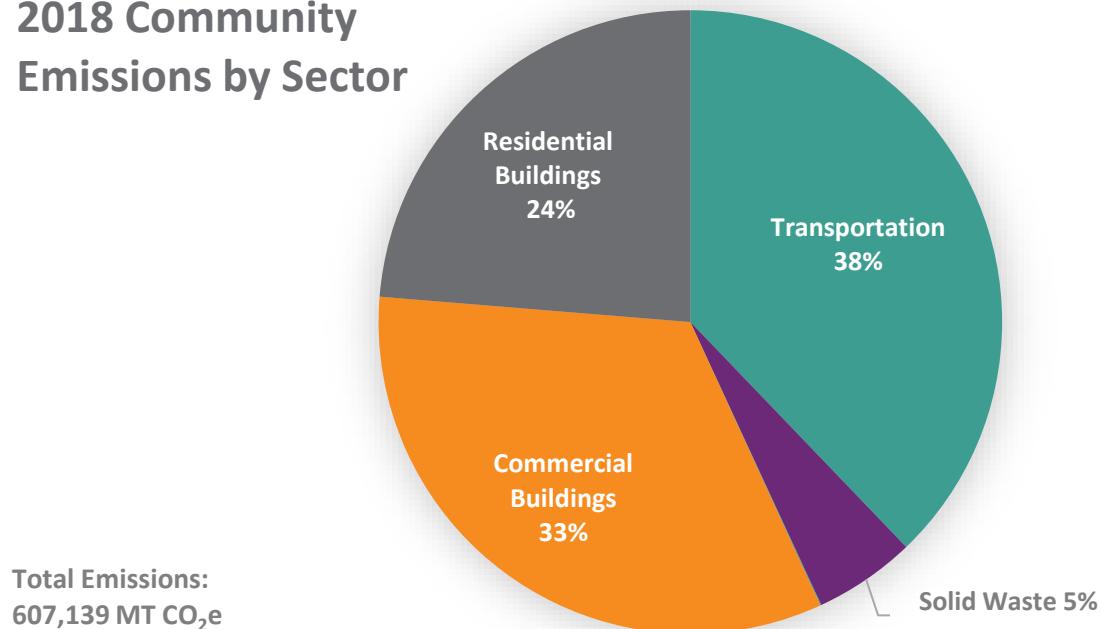
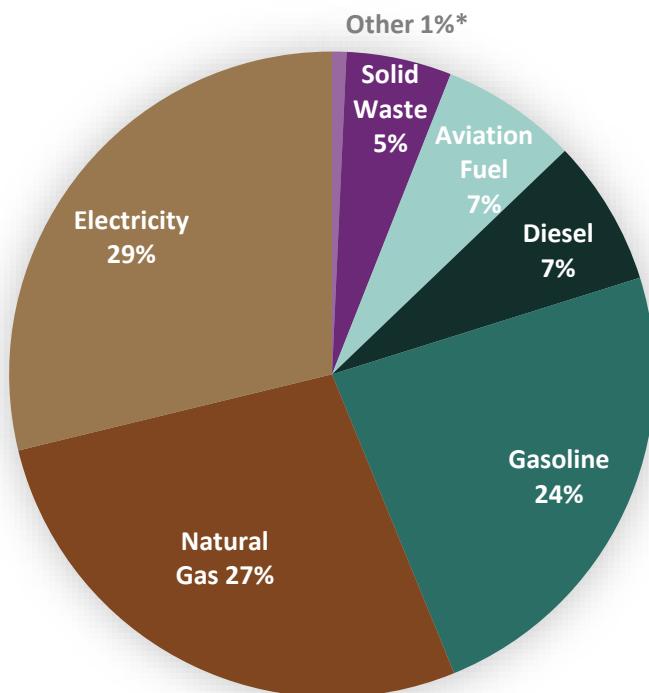


Figure 5. 2018 Bozeman community emissions by sector



The three primary greenhouse gas emissions sources at the local level are electricity, natural gas, and fuel for our vehicles (Figure 6). Electricity generation remains the largest source of greenhouse gas emissions at 29%, which is driven by the carbon intensity of coal and natural gas burned to produce the electricity that serves Bozeman. Natural gas is the second leading emissions source at 27%, which is primarily used to heat buildings. Gasoline for transportation is the third leading source of emissions totaling 24%.

2018 Community Emissions by Source



*Sources <1% include propane, wood, and wastewater

Figure 6. 2018 community emissions by source

Energy Emissions

Energy supports our modern way of life. We use it for lighting, heating, cooking, powering our devices, manufacturing, and beyond. This energy use encompasses the largest proportion (56%) of our GHG emissions. A slight majority of building energy emissions (29%) come from electricity consumption. Natural gas, which is largely used for building heating, comprises 27% of emissions (Figure 6). Commercial, institutional, and municipal buildings account for 33% of total emissions and residential buildings account for 24% of total emissions (Figure 5).

The two primary factors that influence emissions trends over time are the amount of energy used in different sectors and the composition or carbon intensity (carbon emissions per unit of energy) of the energy source. As an example, the carbon intensity of Bozeman's grid electricity has decreased by 23% since 2008, due to the addition of hydroelectricity and wind energy resources. As of 2018, approximately 60% of the power grid that delivers electricity to Bozeman was derived from low-carbon sources (46% hydro, 15% wind, and <1% solar) and 40% from non-renewable sources (20% coal and 19% natural gas). Bozeman consumed nearly 340,000 megawatt hours of electricity in 2018.

Figure 7 shows the how the emissions by sector relates to each of the emissions sources. Note that some of the smaller emissions sources have been combined in previous graphics. For example, line loss emissions have been combined with electricity and fugitive natural gas emissions have been combined with natural gas use emissions.

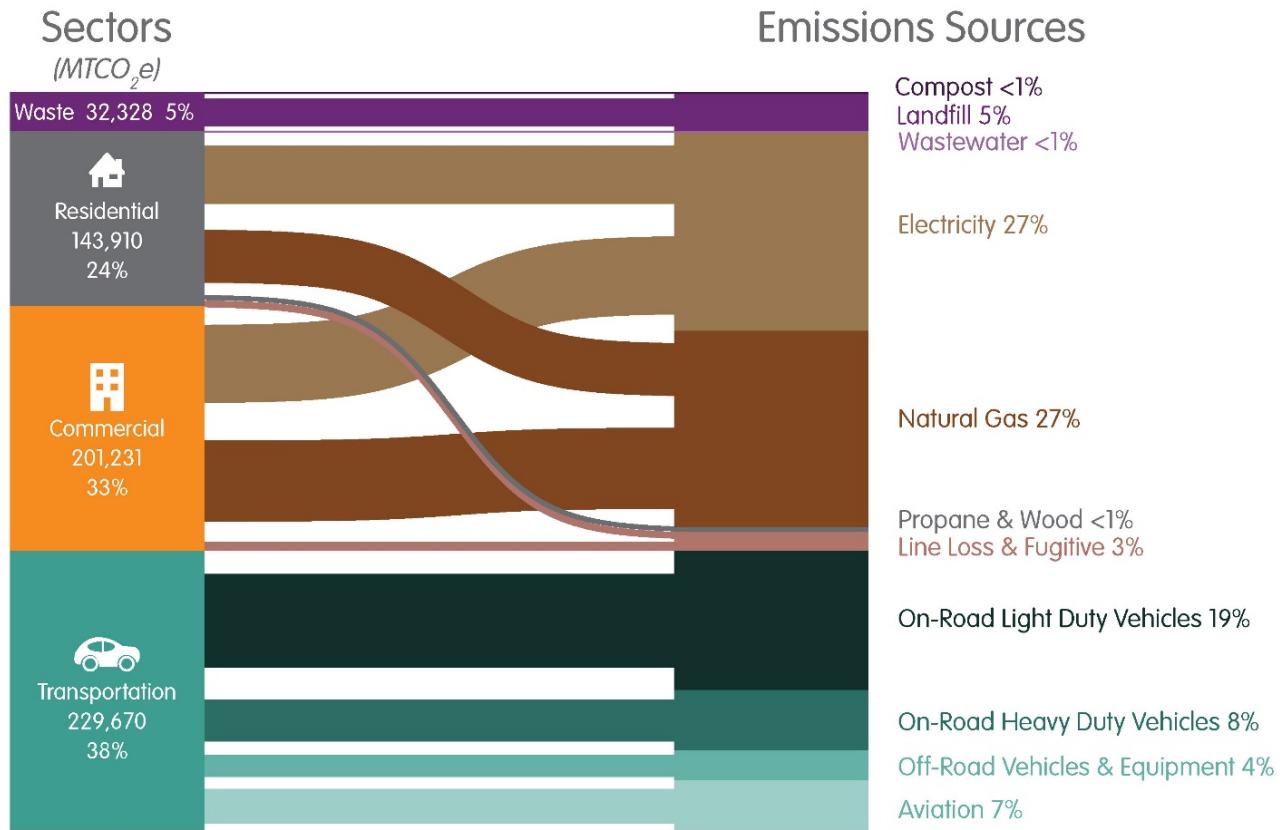


Figure 7. 2018 energy flow diagram of community emissions by sector and source

Transportation Emissions

Bozeman residents use a variety of transportation modes, but the city remains a car-centric community. According to the 2017 [Bozeman Transportation Master Plan](#), nearly 70% of Bozeman commuters drive a personal vehicle to work. The mean commute time is 14.5 minutes, while the national average is 26 minutes.

[Streamline Transit](#), operated by the Human Resources Development Council, is Bozeman's major public transportation service that offers fare-free paratransit, local, and commuter bus service. In fiscal year 2018, Streamline reported 283,714 fare-free rides.

In 2018, 38% of total emissions came from the transportation sector. On-road emissions from passenger cars and light duty trucks contributed 19% of total emissions. On-road emissions came from heavy duty commercial hauling, and freight vehicles accounted for 8% of total emissions. In 2018, Bozeman residents, tourists, commuters, and commercial vehicles drove over 315 million miles in city limits.

Off-road vehicles and equipment, such as lawn mowers, construction equipment, recreational vehicles, and boats, contributed approximately 4% of total emissions. Aviation emissions, estimated based on fuel use for locally originating flights from Bozeman-Yellowstone International airport, contributed approximately 7% of total emissions.



Waste Emissions

Solid waste represents about 5% of our total inventory. In fiscal year 2019, the City of Bozeman Solid Waste Division serviced approximately 11,800 residential customers with curbside garbage service and 34% of these customers use curbside recycling service. During the same period, residents helped divert over 3,000 tons of waste through the City's composting and recycling programs. Composting organic materials, like yard waste and kitchen scraps, reduces greenhouse gas emissions compared to landfilling. Composting emissions totaled less than 1% in 2018. Private haulers also serve commercial and residential customers in Bozeman, and the City does not operate an active landfill for household waste. Bozeman's waste is hauled to the Logan Landfill, which is operated by the Gallatin Solid Waste Management District; City of Bozeman waste emissions are estimated based on total municipal solid waste received from Gallatin County and Bozeman's population.

Wastewater Emissions

A small amount of methane and nitrous oxide emissions are associated with wastewater treatment processes. This generated less than 1% of total emissions in 2018.

Comparison Between Inventories

The 2018 emissions sector and source results are relatively consistent with previous inventory years (Figure 8). Total community emissions have increased by 16% (Table 3) since the baseline year of 2008 and the most recent inventory year of 2018. Notable increases in emissions, as compared to the baseline, are transportation and commercial emissions. Notable decreases are residential emissions. From 2016 to 2018, there were evident increases in the commercial, residential, and solid waste sectors.

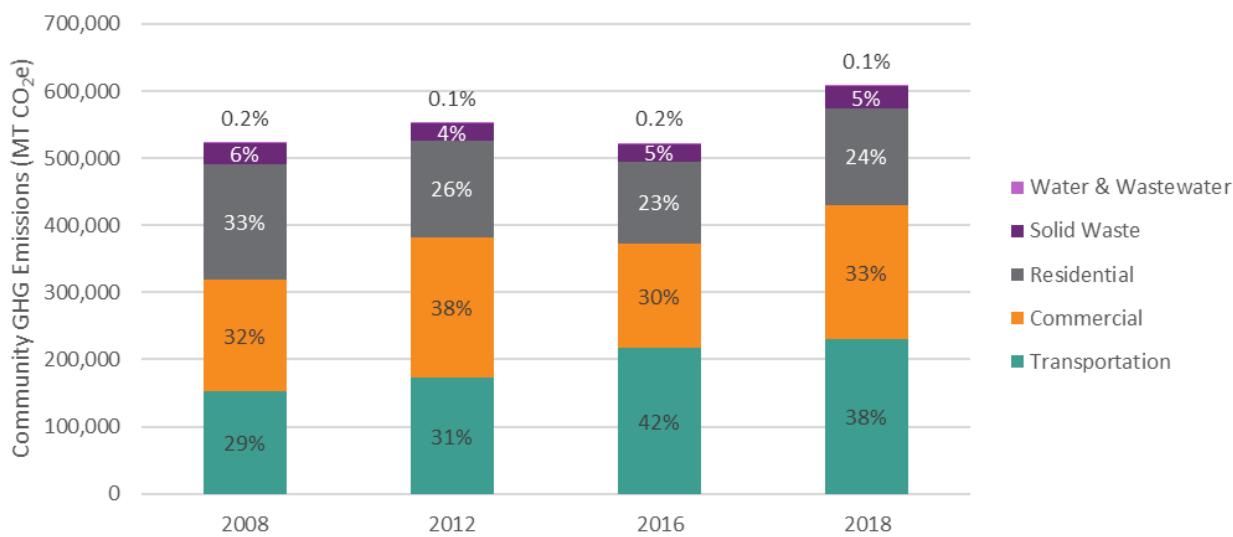


Figure 8. Comparison of annual emissions by sector



While it is critical for Bozeman to achieve absolute emissions reductions to meet the challenge of climate change, normalizing for population growth can make greenhouse gas emissions figures more relatable and help uncover efficiency trends. Table 4 provides a summary of the sectors on a per capita basis. Overall, 2018 per capita emissions have declined by 15% since 2008 with decreases in all sectors except transportation. Since 2016, per capita emissions increased by 8%, though there was a slight yet encouraging decrease in per capita transportation emissions.

Per capita emission trends help Bozeman residents better conceptualize how their local activity fits within the broader context of greenhouse gas emissions. Overall, residents of Bozeman contributed 12.5 MT CO₂e per person in 2018. To meet our 2025 goals and the intent of the Paris Climate Agreement, Bozeman residents will need to reduce emissions to between 7.2 to 4.3 MT CO₂e per person. The range reflects potential low and high growth scenarios.

Table 3. Total emissions (metric tons CO₂ equivalent) by sector and inventory year

	2008	2012	2016	2018	Change since 2008	Change since 2016
Transportation	153,211	172,391	216,608	229,670	50%	6%
Commercial	166,005	210,082	156,894	201,231	21%	28%
Residential	171,457	144,384	121,344	143,910	-16%	19%
Solid Waste	32,232	24,502	26,354	32,025	-1%	22%
Wastewater	921	757	1,204	303	-67%	-75%
Total	523,826	552,116	522,404	607,139	16%	16%

Table 4. Per capita emissions (metric tons CO₂ equivalent) by sector and year

	2008	2012	2016	2018	Change since 2008	Change since 2016
Transportation	4.3	4.6	4.8	4.7	10%	-1%
Commercial	4.7	5.6	3.5	4.1	-11%	20%
Residential	4.8	3.8	2.7	3.0	-39%	11%
Solid Waste	0.9	0.7	0.6	0.7	-27%	13%
Wastewater	0.0	0.0	0.0	0.0	-76%	-77%
Total	14.7	14.7	11.5	12.5	-15%	8%



Factors Influencing Emissions

Both commercial and residential natural gas consumption increased in 2018 and appears to be a primary reason for the emissions increase in 2018. The winter of 2018 was relatively cold with several days of record low temperatures, which was coupled with particularly low natural gas prices. This may have encouraged residents and businesses to turn up the thermostat.

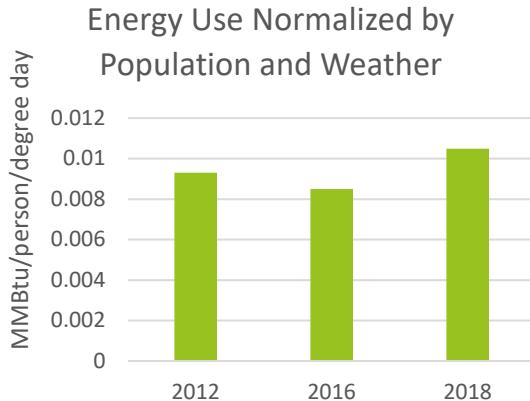


Figure 9. Energy use by inventory year normalized for population and weather

However, normalizing for both population and weather shows that energy use per person per degree days (the total number of degrees above or below 65° F during a given period) increased in 2018 relative to the inventory years of 2012 and 2016 (Figure 9). While we cannot provide evidence that cold weather necessitated more heating and natural gas use, we can presume that the perception of extreme cold may have been a factor.

The community indicator of growth is an important trend to track in relation to greenhouse gas emissions. In the decade between our baseline inventory of 2008

to 2018, population increased by 37%. The annualized growth rate between 2010 and 2018 was 3.4% (American Community Survey). Enrollment at Montana State University has increased to 16,900 students with 3,000 employees. Employment growth in Gallatin County has grown at a rate of 4% per year since 2010, with 80% of this growth occurring in Bozeman.

Key Findings from 2018 Inventory

The 2018 City of Bozeman community GHG inventory showed an emissions value of 607,139 metric tons of carbon dioxide equivalent (MT CO₂e), representing a 16% increase in total emissions from the 2008 baseline and previous inventory year of 2016. Per capita emissions were 12.5 MT CO₂e, which is an increase from 2016, but still 15% below the 2008 baseline. Population growth and an increase in natural gas use in the residential and commercial sectors were significant contributors to the increase in emissions.

The majority of Bozeman's local greenhouse gas emissions can be attributed to residential and commercial energy and transportation. Within these sectors, the three leading sources of emissions are electricity, natural gas, and light-duty gasoline vehicles.

Projected Future Emissions

Based on the 2016 baseline inventory, the community GHG emissions were projected to 2050. This projection is used to understand the magnitude of emissions reductions required to meet the community's climate mitigation goals. Bozeman is a rapidly growing community, with 20% population growth between 2012 and 2016. Because of this tremendous growth and the unknowns with regard to climate migration and the potential for future pandemic migration, there is considerable uncertainty around the growth rate looking out to 2050.

Population growth will have a significant impact on the projected GHG emissions for the community. To best understand the range of emissions likely, population estimates from various sources, including the [Demographic and Real Estate Market Assessment from 2018](#), were compiled as shown in Figure 10. Using

this array of population estimates, minimum and maximum growth scenarios were estimated to encompass the majority of the data points.

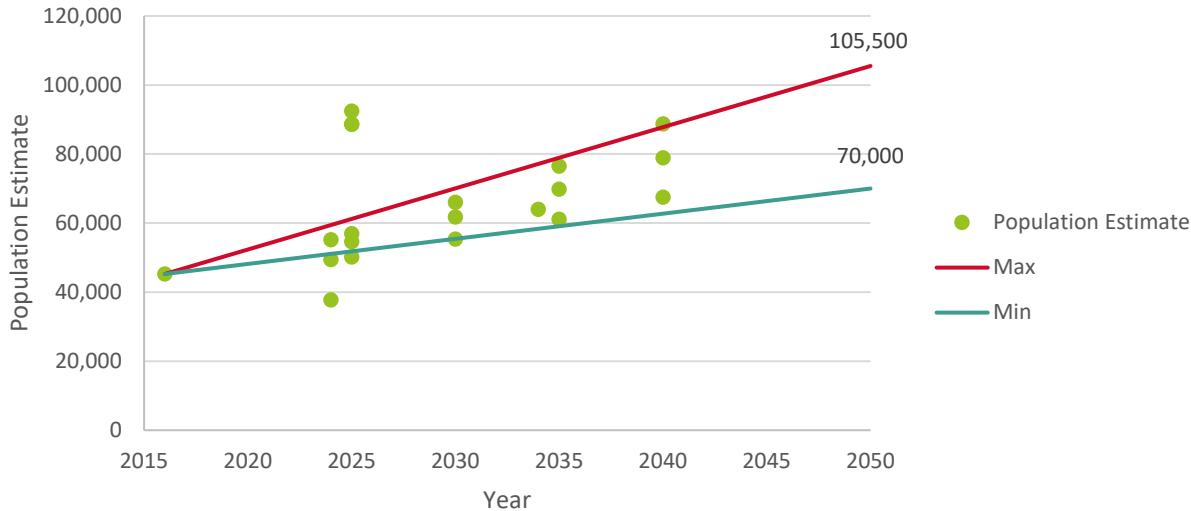


Figure 10. Review of City of Bozeman population growth estimates

To translate this likely population growth to expected GHG emissions, it was assumed that in the business-as-usual scenario, the patterns of use for energy, energy sources, and equipment efficiency remain unchanged over this time, keeping the per capita emissions constant. As shown in Figure 11, this leads to significant uncertainty in the estimated GHG emissions in 2050. For the purposes of this report, we looked at a high growth rate scenario to ensure the community is able to achieve its GHG reduction goals for any of the likely population growth forecasts.

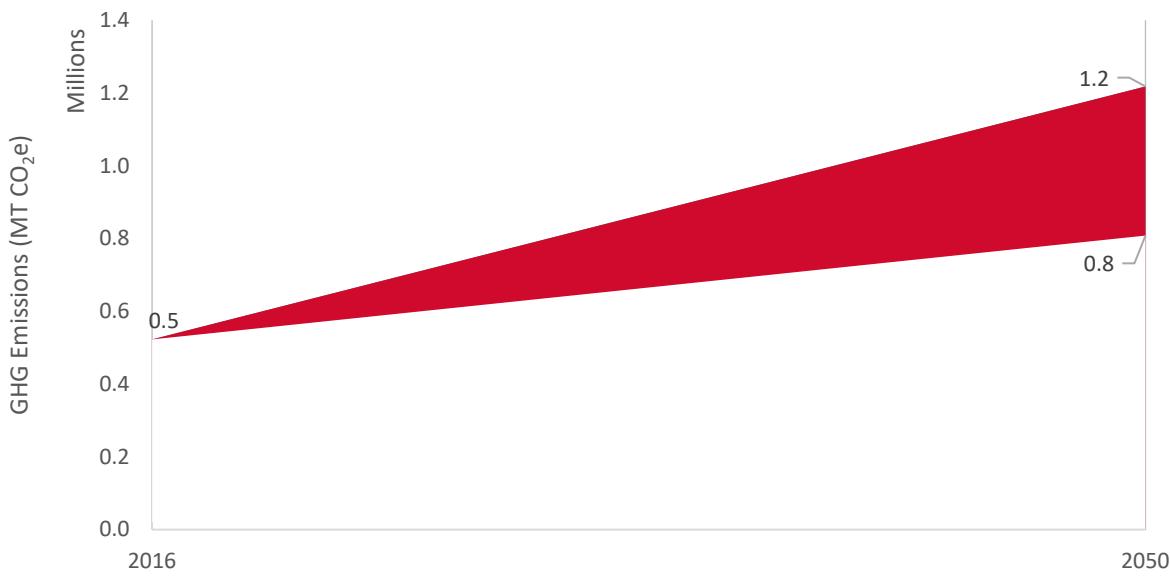


Figure 11. Range of projected GHG emissions with business as usual



EMISSIONS MITIGATION GOAL PROGRESS & KEY MILESTONES

To establish a pathway to achieve Bozeman's climate mitigation goals, it is necessary to look at both the potential magnitude of impact of each solution and the sequencing of solutions. In terms of sequencing, this plan focuses on applying efficiency opportunities to reduce overall energy needs first, followed by renewable energy generation, and then switching to alternative fuel sources. While these solutions work in tandem, reducing overall energy needs first will help ensure that renewable energy and fuel-switching efforts are appropriately scaled.

Efficiency Solutions

Solutions that reduce the community's overall energy demand through improving efficiency of existing buildings, vehicles, equipment, or thoughtfully planning community growth should be implemented first. By reducing the community's energy demand, the amount of energy that must be produced through renewable energy generation is reduced. This improves the feasibility of conversion to 100% renewable energy as well as reduces the investment in infrastructure required to meet the community's energy needs. Solutions considered to be efficiency solutions are:

- Solution A. Improve Efficiency of Existing Buildings
- Solution B. Achieve Net Zero Energy New Construction
- Solution G. Facilitate Compact Development Patterns
- Solution J. Increase Walking, Bicycling, Carpooling, and Use of Transit
- Solution M. Move Toward a Circular Economy and Zero Waste Community

Renewable Energy Generation

These solutions focus on meeting the community's energy needs through clean energy sources and include:

- Solution D. Increase Utility Clean Energy Mix
- Solution E. Develop and Promote Utility Green Power Programs
- Solution F. Increase Community-Based Distributed Renewable Energy Generation

All three of these solutions work together to meet the community's clean energy needs. With efficiency of scale, the utility can generally provide the lowest cost clean energy generation. Over time, this will provide the largest source of clean energy for the community. It does take time for the utility to convert its generation to clean sources while ensuring that utility rates do not cause undue burden on vulnerable populations. Community participation in green power programs can help demonstrate the City's desire for more renewable energy and enable the utility to install clean generation more quickly than would otherwise be feasible. Distributed generation provides the smallest portion of electricity to the community but is an important tool for improving resiliency. These systems can provide back-up power to critical buildings in the case of a power outage or natural disaster.

Fuel Switching

For some GHG emissions sources, and with today's technology, there are no clean alternatives for these fuels. In this case, the source of power for these uses can be switched to electricity which is generated through clean sources to eliminate these emissions. Fuel switching solutions include:

- Solution C. Electrify Buildings
- Solution K. Decrease Direct Vehicle Emissions



Potential Emissions Reduction by Solution

To understand the range of emissions reduction potential from each solution, the expected reduction potential from each strategy through existing Bozeman efforts was compared to top performing communities from across the country. Stakeholder input was used to refine this range of possible emissions to reflect the probable potential reduction for Bozeman.

In Figure 12, the colored bars indicate the range of potential impact for each solution in Bozeman. The low end of that range is what the emissions reduction might be if existing initiatives continue at current levels of engagement and the high end is the maximum emissions reduction that could be expected from that strategy. The grey bars extending beyond the expected range shows the expected emissions from the best-case scenario, which may not be practical or feasible in Bozeman based on local factors or conditions (e.g., state regulations, or growth forecasts) or current technology. This analysis is used to break the solutions into categories based on their expected impact on Bozeman's GHG emissions as shown below.

Please note that this analysis is used to inform scenario modeling and does not consider interaction between strategies. For detailed information on this analysis and scenario modeling, please reference Appendix A. This analysis assumes the maximum growth scenario discussed in the baseline inventory section.

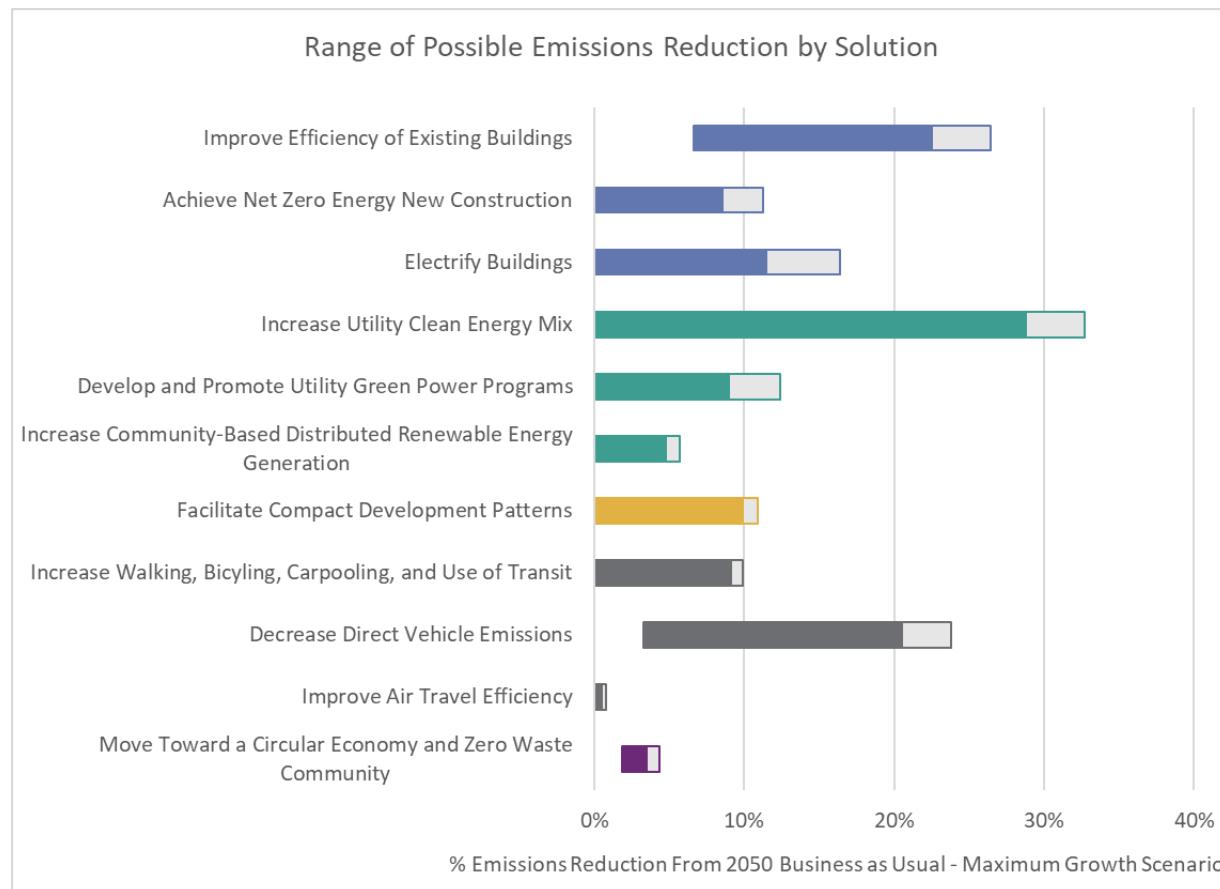


Figure 12. Emissions reduction potential by solution



Scenario Modeling

The range of potential impact for each solution shown in Figure 13 as well as the expected rate and timing of implementation were used to model the most likely scenarios for Bozeman to meet each of solution's GHG mitigation goals. The two graphs below show the business as usual emissions projections on the left and the estimated emissions reduction by focus area in each goal year on the right. Note that the future solutions section in the 2050 emissions reduction shows that there are some emissions sources for which there are not currently good solutions to address, such as aviation fuel use and heavy-duty vehicles. It is expected that between now and 2050 there will be new technologies or policies that can be used to address these emissions sources.

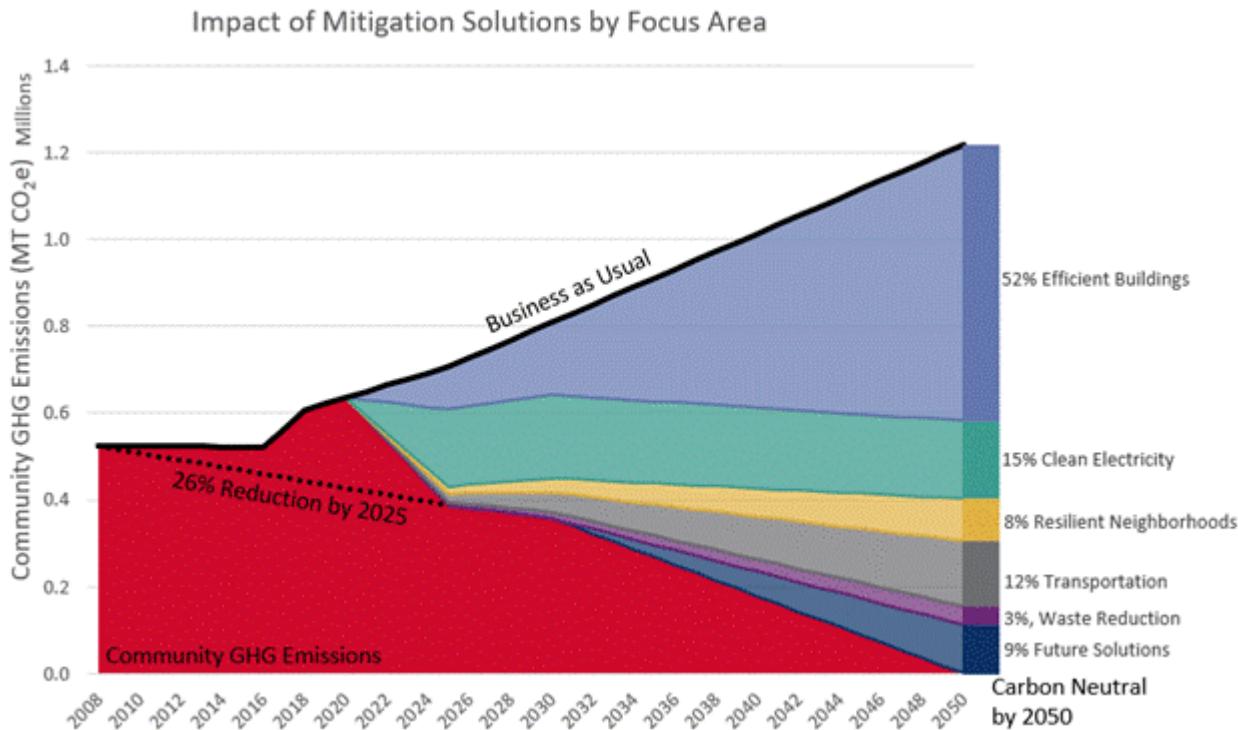


Figure 13. Projected GHG emissions and anticipated emissions reduction by focus area

For more detailed information on the contributions of each solution, see the corresponding chapter. The details of each goal scenario are shown in Appendix A: Analysis Summary, Table 13, and key takeaways for each goal year are outlined in the following sections.



26% reduction in GHG emissions by 2025 (below 2008)

To meet the community's commitment to uphold the Paris agreement, swift action will be required on key mitigation strategies that can be implemented over the next 5 years, including encouraging NorthWestern Energy to advance new utility-scale clean energy and to develop a green tariff program that together provide 204 million kWh, or 40% of the projected community's electricity use, above and beyond the 280 million kWh clean electricity delivered to the City via the utility's current generation mix. These strategies are supported by improving efficiency in new and existing buildings, as well as distributed renewable electricity generation (16 million kWh). Energy efficiency improvements in existing buildings and rooftop or community solar have the potential to be a major contributor to meeting Bozeman's sustainability goals, but the capital improvements necessary cannot be implemented as quickly as other strategies. The community should target about 2% energy savings from existing building efficiency programs each year.

There will also be lesser contributions from a variety of other solutions. While these solutions are not as readily scalable to meet the 2025 goal, it is important to start working on these solutions to set the community up for success on future goals.

2025 Climate Goal

26% reduction in GHG emissions by 2025 (compared to 2008)

2025 Goal: Reduce Emissions to 388,000 MT CO₂e

- Electricity Savings: 126,000,000 kWh
- Additional Clean Electricity Production: 220,000,000 kWh
- Natural Gas Savings: 6,900,000 therms
- Gasoline Savings: 4,400,000 gal
- Other Emissions Reductions: 8,100 MT CO₂e

Total GHG Emissions Reduction: 319,000 MT CO₂e*

2008 Community GHG Emissions: 524,000 MT CO₂e

Primary mitigation solutions

- Increase Utility Clean Energy Mix
- Develop and Promote Utility Green Power Programs

Secondary mitigation solutions

- Improve Efficiency of Existing Buildings
- Achieve Net Zero Energy New Construction

Supporting or long-term mitigation solutions

- Increase Community-Based Distributed Renewable Energy
- Facilitate Compact Development Patterns
- Increase Walking, Bicycling, Carpooling and Use of Transit
- Decrease Direct Vehicle Emissions
- Limit Emissions from Air Travel
- Move Toward a Circular Economy and Zero Waste Community

* As compared to the 2025 business-as-usual projection



100% net clean electricity by 2030

The next milestone set by the City is to supply the community electricity needs with 100% net clean electricity by 2030. To meet this milestone, NorthWestern Energy will need to continue to meet its emissions reduction targets and the community will need to continue to advocate to NorthWestern Energy to increase the percentage of utility-scale clean energy and to develop and grow a green tariff program. To meet the City's goals, the total grid delivered clean energy must be at least 484 million kWh in 2025 and 478 million kWh by 2030. These values include the 280 million kWh clean electricity delivered to the City via the Utility's current generation mix. The energy efficiency improvements for existing buildings need to continue at the rate of 2% energy savings across sectors each year.

High performing new construction is also important to ensure that new growth is as efficient as possible. Housing and commercial building space projections from the [Bozeman Community Plan](#) estimate 12,700 new homes (an average of 450 new homes per year), and 6.3 million square feet of non-residential construction demand through the year 2045.

Transportation emissions reduction measures required to keep the community on track to meet their 2050 emissions reduction goals will increase the demand for renewable electricity as more of the community fleet is electrified. This additional electrical load has been accounted for in the required renewable electricity generation calculations.

2030 Climate Goal

100% net clean electricity by 2030

2030 Electricity Emissions Goal: Net Zero MT CO₂e

- Business-as-Usual Electricity Use: 712,000,000 kWh
- Additional electricity use from electric vehicles: 19,000,000 kWh
- Electricity Efficiency Savings: 213,000,000 kWh
- Clean Energy Production
 - Baseline: 280,000,000 kWh
 - Additional: 238,000,000 kWh

Primary mitigation solutions

- Improve Efficiency of Existing Buildings
- Increase Utility Clean Energy Mix
- Develop and Promote Utility Green Power Programs

Secondary mitigation solutions

- none

Net Carbon-based Electricity Use: 0 kWh

Supporting or long-term mitigation solutions

- Achieve Net Zero New Construction
- Increase Community-Based Distributed Renewable Energy



Carbon Neutral by 2050

To meet the community's commitment to be carbon neutral by 2050, the community will need to transition natural gas used in buildings for heating and cooking to electric appliances and 100% renewable electricity. Likewise, a nearly complete transition of personal passenger and fleet vehicles to electric vehicles will be required between 2030 and 2050. Even so, scenario modeling indicates certain harder to reach portions of the GHG emissions inventory that will require some combination of future technologies, carbon sequestration opportunities, or carbon offsets to achieve the goal to become a carbon neutral community by 2050. These harder to reach areas include emissions from airline fuel use, heavy duty trucks and equipment not currently conducive to electrification, and energy storage.

2050 Climate Goal

Carbon neutral by 2050

2050 Emissions Goal: Net Zero MT CO₂e

- Electricity Savings: 750,000,000 kWh
- Additional Clean Energy Production: 386,000,000 kWh
- Natural Gas Savings: 50,400,000 therms
- Gasoline Savings: 32,000,000 gal
- Other Emissions Reductions: 48,200 MT CO₂e
- Future Solutions: 113,000 MT CO₂e

Total GHG Emissions Reduction: 1,218,000 MT CO₂e

Business-as-Usual: 1,218,000 MTCO₂e

Primary mitigation solutions

- Improve Efficiency of Existing Buildings
- Increase Utility Clean Energy Mix
- Decrease Direct Vehicle Emissions

Secondary mitigation solutions

- Achieve Net Zero New Construction
- Electrify Buildings
- Facilitate Compact Development Patterns
- Increase Walking, Bicycling, Carpooling and Use of Transit

Supporting mitigation solutions

- Develop and Promote Utility Green Power Programs
- Increase Community-Based Distributed Renewable Energy
- Limit Emissions from Air Travel
- Move Toward a Circular Economy and Zero Waste Community



RESILIENCY GOAL CONTRIBUTIONS

This table illustrates which solutions connect with and help advance the community's resiliency goals. Shaded cells indicate that the solution provides direct benefits to support the goal.

RESILIENCY GOALS				
Conserve natural resources	Harden infrastructure to natural disaster	Increase social cohesion	Mitigate property and economic losses	Protect human health
Solution A. Improve Efficiency of Existing Buildings				
Solution B. Achieve Net Zero Energy New Construction				
Solution C. Electrify Buildings				
Solution D. Increase Utility Clean Energy Mix				
Solution E. Develop and Promote Utility Green Power Programs				
Solution F. Increase Community-Based Distributed Renewable Energy Generation				
Solution G. Facilitate Compact Development Patterns				
Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards				
Solution I. Enhance Social Infrastructure and Community Preparedness				
Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit				
Solution K. Decrease Direct Vehicle Emissions				
Solution L. Improve Air Travel Efficiency				
Solution M. Move Toward a Circular Economy and Zero Waste Community				
Solution N. Cultivate a Robust Local Food System				
Solution O. Manage and Conserve Water Resources				
Solution P. Manage Land and Resources to Sequester Carbon				



Bozeman
Climate
Plan

CHAPTER 3:

Focus Areas, Solutions & Actions



CHAPTER 3: FOCUS AREAS, SOLUTIONS & ACTIONS



Focus Area 1: **Healthy, Adaptive & EFFICIENT BUILDINGS**

More than half of Bozeman's greenhouse gas emissions come from energy use in buildings. Specifically, building energy use comprised 57% of emissions in 2018, with 33% from Bozeman's commercial buildings, and another 24% from residential buildings. While efficiency of the residential and commercial sectors is improving over time through more efficient building codes, more can be done to decrease emissions from existing buildings across the community. Improvements to building envelopes and energy systems can provide myriad benefits, such as enhancing building performance, stabilizing utility bills, improving comfort and safety of building occupants, and adapting to future climate conditions.

As a rapidly growing community, new construction threatens progress made on reducing overall building-related greenhouse gas emissions if not built efficiently. According to the [2018 Demographic and Real Estate Market Assessment](#), there is an estimated demand for 12,700 new housing units and 6.3 million square feet of new commercial space in Bozeman through 2045. By ensuring that new buildings are constructed efficiently and ready to adapt to changing technologies, Bozeman can help make sure that new buildings are helping the community achieve its emissions reduction and resiliency goals.

These solutions emphasize reductions in energy-related emissions from existing and future buildings by prioritizing energy efficiency as a primary objective, supported by converting natural gas consumption of buildings to electricity where feasible and appropriate. To meet the GHG emissions goals, the community will need to:

- **Solution A. Improve the Efficiency of Existing Buildings**
Maintain a concerted effort to improve efficiency of existing buildings over the 30-year planning horizon, including deep energy retrofits. The energy savings target should be 2% year over year energy savings from existing buildings.
- **Solution B. Achieve Net Zero Energy New Construction**
Ramp up to 100% of new buildings being net zero energy by 2030.

RELATED PLANS & STUDIES

- [Bozeman Community Plan](#)
- [NorthWestern Energy Electric Supply Resource Procurement Plan](#)
- [Climate Vulnerability Assessment and Resilience Strategy](#)
- [Downtown Bozeman Improvement Plan](#)
- [Community Greenhouse Gas Emissions Report](#)
- [Municipal Greenhouse Gas Emissions Report](#)

- **Solution C. Electrify Buildings**

Focus on electrification of building heating and cooking loads in tandem with pursuing renewable energy targets. Future technologies will be required to eliminate any natural gas loads that cannot be electrified with current technologies.

Detailed energy savings targets for each goal year are shown in Table 5.

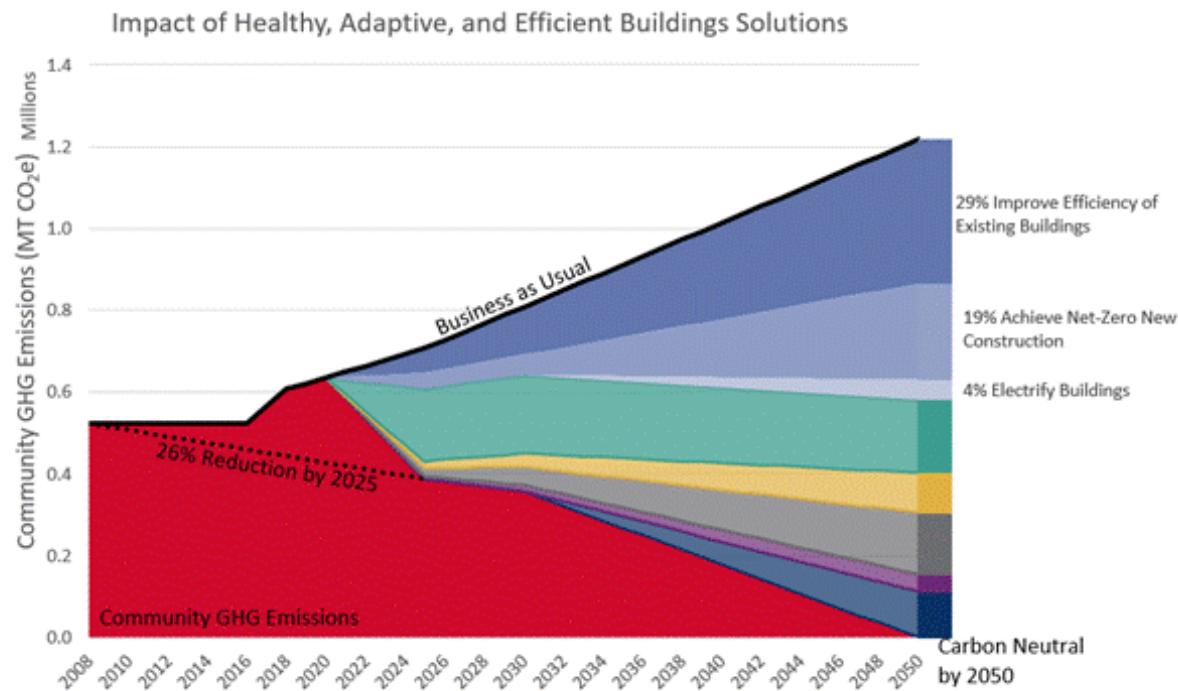


Figure 14. Projected building GHG reductions by solution

Table 5. Projected buildings solution mitigation targets

Solution	Metric (annual savings)	Target	Target	Target
		2025 Paris Accord	2030 100% Net Clean Electricity	2050 Carbon Neutral
Solution A. Improve Efficiency of Existing Buildings	Electricity (kWh)	75 million	149 million	447 million
	Natural Gas (therms)	4.2 million	8.4 million	25 million
Solution B. Achieve Net Zero Energy New Construction	Electricity (kWh)	51 million	64 million	303 million
	Natural Gas (therms)	2.7 million	3.4 million	16.2 million
Solution C. Electrify Buildings	Electricity (kWh)	0	0	-269 million
	Natural Gas (therms)	0	0	9.2 million

Focus Area 1. Healthy, Adaptive & Efficient Buildings

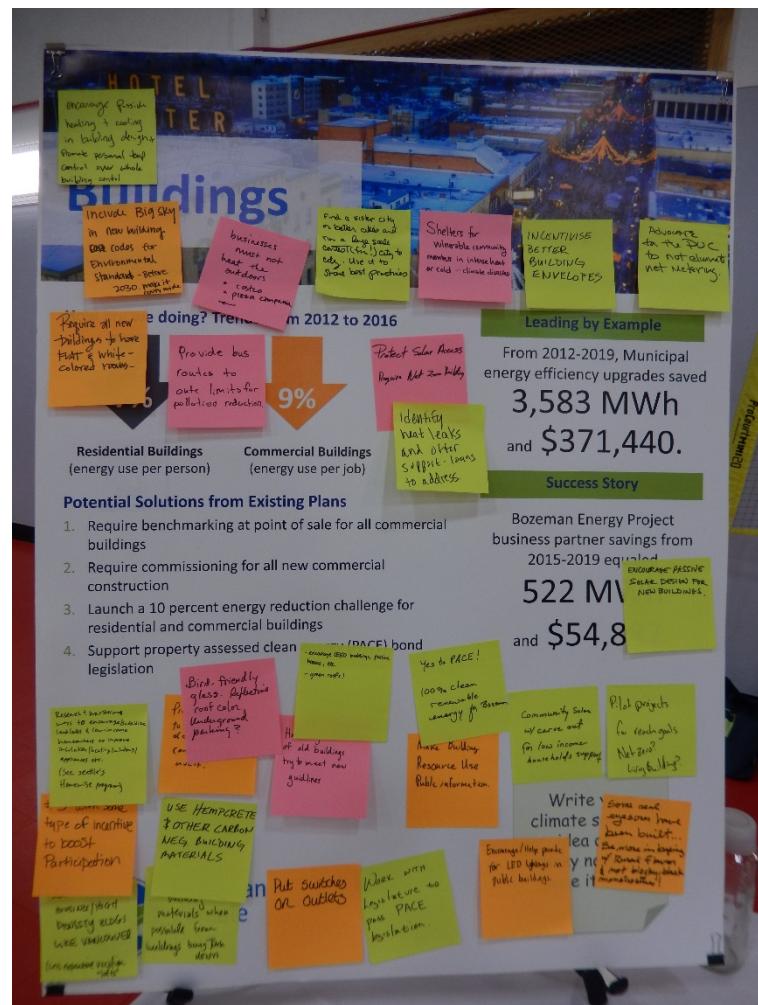
Solution A. Improve Efficiency of Existing Buildings

Solution A. Improve Efficiency of Existing Buildings

This solution emphasizes investment in existing buildings to improve energy and water efficiency, as well as building comfort and performance. An energy or water audit, especially one with thermal imaging, can be a great first step to help identify and prioritize efficiency improvement opportunities. Some efficiency improvements may be simple do-it-yourself quick fixes, while others may require more costly investments and renovations.

Many efficiency projects generate a positive cash flow and have a simple payback of less than five years. Numerous technologies exist to help building owners and occupants monitor utility consumption and automate building systems. Energy efficiency investments and technologies present tremendous opportunities for workforce development and job training, further bolstering the economy.

Various tax credit, rebate, and incentive programs exist at the local, utility, state, and federal levels to support efficiency improvements. However, the landscape of financial resources and incentives can be confusing for customers to navigate and access. Bozeman's electric and natural gas utility provider, NorthWestern Energy, offers some limited energy audit/appraisal programs for their residential and business customers. Utility rate structures and time-of-use pricing (paying a different price per kWh depending on when the energy is consumed) can be another financial mechanism to discourage high utility consumption at certain times or thresholds.



Focus Area 1. Healthy, Adaptive & Efficient Buildings

Solution A. Improve Efficiency of Existing Buildings



Equity

From an equity perspective, it is essential to recognize that many utility customers experience cost burden (i.e., have difficulty paying bills) and bitter cold Montana winters can make heating a lifesaving necessity. While such customers may implement efficient practices out of necessity, they may be unable to make costly efficiency investments, or may encounter challenges with time-of-use utility rate structures. Another important equity consideration is the fact that the costs and benefits of efficiency improvements are not always fairly distributed between owners and tenants.



Human Health & Well-Being

Health and well-being benefits associated with enhanced building performance can include improved indoor air quality and occupant comfort. All energy efficiency improvements should be coupled with ventilation measures to avoid negative impacts on indoor air quality.



City Assets

The City of Bozeman can lead by example by planning, financing, and implementing energy and water efficiency improvements across municipal facilities and operations. The City can also continue to lead education and outreach efforts to help share efficiency information and resources with the community.

This solution primarily addresses Bozeman's greenhouse gas mitigation goals, while also providing supporting resiliency benefits.



Related Solutions

- Solution E. Develop and Promote Utility Green Power Programs
- Solution F. Increase Community-Based Distributed Renewable Energy Generation
- Solution O. Manage and Conserve Water Resources

Focus Area 1. Healthy, Adaptive & Efficient Buildings

Solution A. Improve Efficiency of Existing Buildings

Action 1.A.1. Increase Energy Efficiency at City Facilities

To advance our goal of 26% reduction in greenhouse gas emissions (compared to 2008 levels) by 2025, the City will identify and implement efficiency improvements in all City facilities through comprehensive energy audits and energy efficiency upgrades. Energy Service Performance Contracts (ESPC) may be used to help finance and install energy conservation and renewable energy projects at City-owned buildings and properties.

The City has already completed energy audits and Facility Condition Inventories, as well as an ESPC completed in 2015 that included an LED retrofit of 190 city-owned and metered streetlights and an LED upgrade in the Bridger Parking Garage. Individual solar photovoltaic installations, lighting upgrades, and other energy projects continue to be initiated by multiple City departments as opportunities arise, but a comprehensive ESPC approach across the entire City will help maximize efficiency, speed project deployment, and link efficiency, production, and energy storage in new ways.

While retrofitting involves replacing outdated equipment, retro-commissioning focuses on improving the efficiency of what is already in place. Using City building benchmarking (measuring energy performance against past usage or other buildings' energy usage) and energy consumption trends, the City will fine-tune existing buildings and systems in order to make them operate optimally and more efficiently through scheduling, sequencing, controls programming, optimizing set points, and equipment maintenance. Retro-commissioning can save energy and money, while also extending the service life of equipment.

In preparation for our carbon neutrality goal, the City will adopt ambitious high-performance net zero energy construction standards for all new or major renovations for City facilities. This standard should incorporate life cycle analysis (LCA) during the development or redevelopment of all municipal facilities, such as the standards established in the [building life-cycle impact reduction credit](#) available through the Leadership in Energy and Environmental Design (LEED) building rating system.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	• City of Bozeman	<ul style="list-style-type: none">• 4.3 Strategic Infrastructure Choices• 6.3 Climate Action	<ul style="list-style-type: none">• Establish building energy benchmarking• Improve building energy use intensity

Focus Area 1. Healthy, Adaptive & Efficient Buildings

Solution A. Improve Efficiency of Existing Buildings

Action 1.A.2. Use Data and Price Signals to Advance Energy Efficiency

Customer access to data can be a powerful tool to drive energy conservation and reduce peak demand. Advanced Metering Infrastructure (AMI) refers to meters, communication networks, and data management systems that collect, transmit, and record electricity consumption data in daily or shorter intervals. More timely and granular data provides operational benefits to utilities, and can be used to engage, motivate, and reward customers.

AMI data alone does not necessarily lead to energy savings. Data paired with customer engagement tools, time-of-use (TOU) pricing, and programs with incentives that motivate and support customers are needed to change when and how customers use energy. A 2017 study of 50 utilities with TOU pricing mechanisms found an average peak demand reduction of 16% and an average reduction in overall consumption of over 2%. Utilities that offered TOU pricing plus peak-time rebates realized an overall consumption reduction of over 7% (Gold, 2020).

NorthWestern Energy is in the process of deploying AMI in its South Dakota service area and plans to extend this service to its Montana service area beginning in 2021. The City of Bozeman will coordinate with NorthWestern Energy and encourage early deployment of AMI for Bozeman residents, as well as encourage NorthWestern Energy to couple AMI with real-time resource consumption and generation source information for their customers. Reducing peak demand should be a priority in order to address NorthWestern Energy's peak load challenges referenced in the [2019 Electricity Supply Resource Procurement Plan](#) and help eliminate the need for costly investment in additional fossil fuel generation.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• NorthWestern Energy• City of Bozeman• Potential third-party data analyst (e.g., WattTime)	<ul style="list-style-type: none">• 4.3 Strategic Infrastructure Choices• 6.3 Climate Action	<ul style="list-style-type: none">• % Installation of Advanced Metering Infrastructure• Establishment of a time-of-use rate designed to offset utility peak demand• % Reduction of peak energy demand

Focus Area 1. Healthy, Adaptive & Efficient Buildings

Solution A. Improve Efficiency of Existing Buildings

Action 1.A.3. Expand Energy Efficiency Information and Resources for Private Property

In support of Advanced Metering Infrastructure and time-of-use rates, the utility, City, and numerous community partners can provide general outreach, social marketing, and education regarding energy appraisals, energy and water efficiency rebates, energy efficiency tips, and strategies to avoid peak energy demand. The city and its partners can create a conversation around the critical role of smaller homes and apartments, as well as the size, number, and efficiency of appliances, in reducing overall energy use. Targeted outreach to low-income residents, renters, and residents living in mobile homes and older homes represents an important segment of the Bozeman community and each population requires customized recommendations. Possible opportunities to explore include working with Montana State University to develop a curriculum to engage and inform students as they move off campus or training student “energy squads” to assist with basic rental retrofits. Using technology such as aerial thermal imaging could map high energy use hotspots and energy efficiency opportunity zones.

Improving the conversion rate from commercial and residential energy appraisals to execution and completion of energy upgrades is a wide-spread challenge. The City and NorthWestern Energy should partner on innovative strategies to improve this conversion rate. One successful model involves partnering with an energy service provider to provide turn-key service from the energy appraisal to on-bill financing to contractor services for energy upgrades. With partners such as the Montana State University Extension Montana Weatherization Center, Bozeman could pilot an energy service provider training and certification program.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• City of Bozeman• NorthWestern Energy• Human Resource Development Council• Montana State University• Montana Weatherization Training Center• Southwest Montana Building Industry Association• Montana Department of Environmental Quality Energy Office	<ul style="list-style-type: none">• 4.5 Housing and Transportation Choices• 6.3 Climate Action	<ul style="list-style-type: none">• Reduced Peak Energy Demand• Average Energy Use Per Household• Increase Audit to Retrofit Conversion Rate

Focus Area 1. Healthy, Adaptive & Efficient Buildings

Solution A. Improve Efficiency of Existing Buildings

Action 1.A.4. Establish an Energy and Water Benchmarking Standard for Commercial Buildings

With 33% of Bozeman's greenhouse gas emissions generated from commercial buildings, it remains a priority to advance efficiency in this sector. Building energy benchmarking tracks a building's energy performance over time and allows for transparent comparison of performance relative to other similar buildings or relative to modeled simulations of reference buildings built to a specific energy code. This comparison helps identify opportunities for technological and operational energy efficiency improvements. Benchmarking is useful for local governments to facilitate energy and water use accounting, comparing a building's energy and water use to similar buildings to assess opportunities for improvement, and quantifying or verifying energy savings. Across many commercial building markets, the practice has become standard operating procedure as energy costs and associated sustainability issues have raised awareness around the importance of energy management. Benchmarking can help ensure that building systems, such as mechanical, electrical, heating, ventilation, and air conditioning, are operating at optimal efficiency as intended by building architects and engineers. Retro-commissioning can also help extend the life of existing systems, defer expensive upgrades, and ensure timely identification of energy and water efficiency opportunities. Disclosure and data transparency enable future policy creation and enhance decision-making from both public and private entities. Social marketing, recognition, and incentives are all tools that would help accelerate benchmarking and retro-commissioning.

Using Department of Energy or Environmental Protection Agency benchmarking tools, the City should partner with NorthWestern Energy, the MT Energy Office, Montana State University, the Montana Weatherization Center, commercial and multi-family building owners and tenants, the Bozeman Chamber of Commerce, the outdoor industry, financial institutions, and others to develop a "better buildings challenge" focused on energy and water efficiency policy to require annual benchmarking and energy use disclosure for large commercial buildings. The program would initially be piloted for government and institutional buildings.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• City of Bozeman• NorthWestern Energy• MT Energy Office• Montana State University• Montana Weatherization Center• Commercial and Multi-family building owners and tenants• Chamber of Commerce• Bozeman Outdoor Industry• Financial Institutions	<ul style="list-style-type: none">• 6.1 Clean Water Supplies• 6.3 Climate Action	<ul style="list-style-type: none">• % of commercial buildings complying with benchmarking policy• % of reporting buildings that achieve an ENERGY STAR score >75

Focus Area 1. Healthy, Adaptive & Efficient Buildings

Solution A. Improve Efficiency of Existing Buildings

Action 1.A.5. Require Home Energy and Water Use Labeling at Time of Listing

Energy and water bills are a significant household expense, and yet prospective home buyers and renters are typically unable to factor this information into their decision making. Utility data is rarely provided unless a prospective buyer specifically requests it. A home energy label provides information about a property's energy consumption and costs, plus recommendations for cost-effective energy saving improvements. Like a snack's nutrition label or a car's MPG rating, it reveals valuable and comparable information not otherwise apparent to consumers.

Cities across the U.S. are working to adopt energy labeling and disclosure policies for residential properties to better inform major consumer investment decisions and provide a critical foundation for driving energy efficiency upgrades that improve our building stock and reduce greenhouse gas emissions. Residential energy use accounts for 24% of the community's 2018 greenhouse gas emissions. The City will explore a policy for Bozeman under which home sellers would disclose home energy labels to real estate agents and potential buyers through the Multiple Listing Service (MLS).



Figure 15. Example from the Dept. of Energy's Home Energy Score Program

The Department of Energy's [Home Energy Score](#) and the U.S. EPA [WaterSense Labeled Home](#) are practical tools for implementing home energy and water labeling programs. Such programs improve consumer protection through information transparency and create data to measure progress toward climate and water efficiency goals. Home sellers can increase the market value of their home while buyers and renters can better compare options in terms of energy performance and costs and consider financing options for upgrades. New jobs in energy assessments and contracting are created in the local economy. According to the Department of Energy's [Better Building's Initiative](#), energy efficient certified homes sell faster and for 4 to 6% more.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	<ul style="list-style-type: none">• City of Bozeman• Gallatin Association of Realtors• Southwest Montana Building Industry Association• NorthWestern Energy• Chamber of Commerce• Montana State University-Montana Weatherization Center• Financial Institutions	<ul style="list-style-type: none">• 1.4 Business and Institutional Partnerships• 4.5 Housing and Transportation Choices• 6.3 Climate Action	<ul style="list-style-type: none">• Implementation of energy use disclosure policy• Number of days on market for high performance properties

Focus Area 1. Healthy, Adaptive & Efficient Buildings

Solution A. Improve Efficiency of Existing Buildings

Action 1.A.6. Promote Energy Efficiency Financing and Investment

Today local governments are on the front lines when it comes to handling the COVID-19 pandemic, growing civil unrest, and severe weather events. Local leadership is necessary to meet local needs, including the task of recovery and job creation. State and local actors around the country are doing their part to help spur investment and job creation with public and private investment in clean infrastructure and energy efficiency.

The availability of low-cost financing is a critical factor for widespread deployment of energy efficiency and renewable energy. Green Banks are one way to help secure low-cost capital for clean energy projects, such as solar PV or energy efficiency upgrades, at favorable rates and terms. Green Bank products may be targeted at end users such as a home, business, or other finance providers, such as retail and investment banks. Examples include residential solar loan and lease programs, credit support mechanisms for energy efficiency and solar, and commercial Property Assessed Clean Energy (PACE) programs that support a variety of energy conservation measures. Through such products, Green Banks can help secure private capital by multiple diverse means. According to the [National Renewable Energy Lab](#), as of 2016, the most advanced Green Banks in the country in Connecticut and New York have collectively invested \$575 billion in total clean energy investment. These investments reportedly spur private sector investment into projects by three to six times the amount of public sector dollars.

Creating and marketing a specific local program to encourage investments in residential and commercial properties will provide an incentive for homeowners and business owners to make the capital investments in their properties necessary to help achieve our building energy reduction goals. City Economic Development and Sustainability Divisions can collaborate with area lenders via Request for Proposals or by setting loan rates and standards to create a low-interest loan program (fixed or adjustable rate) for building energy efficiency, electrification, or installation of solar or geothermal systems. Once a brand name has been developed, marketing the program can be co-funded and executed by the City of Bozeman and participating institutions.

State and local governments have established Green Banks and low-interest loan programs under a variety of different structures, legislative directives, and funding sources.

The City of Bozeman will work with area financial institutions to develop a county-wide low-interest loan program to facilitate financing of energy efficiency and renewable energy systems. Through local and regional economic development entities, the City will build awareness and leverage partnerships to establish a statewide Montana Green Bank. Advancement of supporting tools such as utility on-bill financing, allocation of Universal System Benefit funds, and the authorization of commercial and residential PACE will be aid in the establishment of a Montana Green Bank and county-wide low-interest loan program.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measure
Level 2	<ul style="list-style-type: none">• City of Bozeman• Local Financial Institutions• NorthWestern Energy• MT Building Industry Association• Montana Legislature	<ul style="list-style-type: none">• 2.1 Business Growth• 6.3 Climate Action	<ul style="list-style-type: none">• Establishment of a county-wide low-interest loan program• Establishment of a Montana Green Bank

Action 1.A.7. Create a Rental Registry Program to Advance Renter Safety and Energy and Water Efficiency

With over 19,000 housing units in Bozeman, only 44% are owner occupied. Where tenants are responsible for energy and utility operating costs in addition to the monthly rent, owners have little incentive to invest in energy and water efficiency capital improvements because the tenant will be the sole beneficiary of the reduced operating costs. Where the tenant's monthly rent includes a predetermined amount to cover energy and utility operating costs, tenants have little incentive to save energy and water because the owner receives the benefits of those efforts. This split incentive between landlords and tenants makes this a particularly difficult sector in which to implement energy and water efficiency. With a consistently low rental vacancy rate in Bozeman, the market is unlikely to create the circumstances in which information, such as an audit or Home Energy Score, will lead to energy upgrades in rental properties.

The City will work with partners to develop consumer resources and develop a voluntary pathway to gradually phase in a residential renter safety and energy and water efficiency program that requires rental properties to meet minimum energy efficiency standards to receive a rental license. Such a program should be designed within a licensing program that complies with the limitations of the Landlord Tenant Act. Program specifications should be coordinated with existing and new utility incentives for lighting upgrades, water heaters and other appliances, plumbing fixtures, roof insulation, air sealing, and HVAC inspection and maintenance. Ideally, the program should be coupled with financing options, such as on-bill financing, residential Property Assessed Clean Energy, or Green Bank financing.

Performing an energy and water upgrade on a rental property (if required) can result in additional value streams for the owner including increased rent, higher tenant retention, and higher resale value. For the tenants, they are likely to experience safer, more comfortable living conditions and more affordable utility costs.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 3	<ul style="list-style-type: none"> • City of Bozeman • Montana State University • MSU Off-Campus Living Housing Program • Human Resource Development Council • Montana State University • Montana Weatherization Training Center • Montana Landlords Association • Financial Institutions 	<ul style="list-style-type: none"> • 1.4 Business and Institutional Partnerships • 4.5 Housing and Transportation Choices • 6.3 Climate Action 	<ul style="list-style-type: none"> • % of Participating Rental Properties in Outreach Program • % of Participating Rental Properties Completing Energy Upgrades

Solution B. Achieve Net Zero Energy New Construction

This solution focuses on the design and construction of high-performance buildings. A Net Zero Energy (NZE) building is one with zero net energy consumption, typically on an annual basis. In other words, the total amount of energy used by the building is equal to (or even less than) the amount of on-site renewable energy generated. The most efficient and cost-effective pathway to achieve NZE is through new construction; however, major renovation projects can present NZE opportunities as well. Even in cases where on-site renewable energy is not feasible, Net Zero Energy Ready (NZER) or high-performance construction helps advance the intent of this solution by reducing overall energy demand and consumption.

Since Bozeman is a rapidly growing community, new building efficiency will play an important role in meeting the community's climate goals. The magnitude of impact on emissions reductions will be heavily dependent on community growth rate, but this solution is important to couple with energy efficiency in existing buildings so that emissions from all buildings (existing and future) are addressed.

The State of Montana is expected to adopt the 2018 International Building Code's International Energy Efficiency Code (with amendments) by the end of 2020. All new construction must comply with those code requirements and communities cannot adopt code requirements that are more stringent than the state adopted code. NZE construction is considered an "above code" opportunity, which can be encouraged with voluntary incentives, but not required. There are myriad resources available to inform NZE construction and many approaches align with third-party building certification programs, such as the U.S. Department of Energy's [Zero Energy Ready](#) certification program and [Leadership in Energy and Environmental Design \(LEED\)](#) certification. There are various ways to incentivize NZE construction, including permit fee reductions, expediting permitting processes, utility programs and rebates, tax credits, and low-interest loans. Property Assessed Clean Energy (PACE) financing is not currently available as a financing mechanism in Montana but may be considered for commercial buildings in future State legislative sessions.

Constructing new buildings to higher efficiency standards requires upfront capital investments from the developer, but the investments are repaid in reduced utility costs over the life of the home or building. A 2019 study by the Rocky Mountain Institute found the estimated incremental cost for a Net Zero Ready home in Bozeman was 2.2% with a payback of 4.6 years for homes with electric heating systems and 7.6 years for homes with natural gas heating systems (Rocky Mountain Institute, 2019). Similar assumptions likely apply to commercial buildings, but building loads vary more widely by building use type.

Focus Area 1. Healthy, Adaptive & Efficient Buildings

Solution B. Achieve Net Zero Energy New Construction



Equity

Benefits of NZE construction include but are not limited to efficient use of energy, low and consistent energy bills, improved occupant comfort, less reliability on the electric grid, increased resale values, and tenant attraction. High efficiency new construction often results in improved indoor air quality when the building is properly ventilated.



Human Health & Well-Being

Some of the challenges of NZE construction, such as upfront costs and finding skilled designers and builders, can be overcome with measures such as rebates, incentives, and training and education programs. Additional equity considerations include the fact that new construction of high-performing buildings may be out of reach for lower-income community members. Similarly, the potential costs to retrofit existing buildings to NZE levels need to be carefully considered.



City Assets

In terms of municipal assets, the City of Bozeman can lead by example by constructing new facilities to NZE standards and training the development community in these design and construction practices.

This solution primarily addresses Bozeman's greenhouse gas mitigation goals, while also providing supporting resiliency benefits.



Related Solutions

- Solution C. Electrify Buildings
- Solution E. Develop and Promote Utility Green Power Programs
- Solution F. Increase Community-Based Distributed Renewable Energy Generation
- Solution G. Facilitate Compact Development Patterns
- Solution K. Decrease Direct Vehicle Emissions
- Solution O. Manage and Conserve Water Resources

Focus Area 1. Healthy, Adaptive & Efficient Buildings

Solution B. Achieve Net Zero Energy New Construction

Action 1.B.1 Support High Performance Building Resources and Training for the Development Community

While state code determines minimum building standards for all construction, the development community in Bozeman is largely responsible for whether buildings are built beyond the minimum standard. By providing high-performance building resources and training, the City can engage the development community in shifting from current baseline construction practices to more efficient buildings.

There are widespread resources available for the design and construction of high-performance buildings. The City of Bozeman will partner to develop and provide guidance for developers regarding energy and water efficient design (e.g., passive design, energy efficient building materials, low-carbon building materials, water efficient plumbing fixtures, etc.) and develop a pilot program to train builders and contractors on net zero energy construction best practices.

The City will partner with development community stakeholders such as homeowners' associations to identify opportunities to facilitate net zero energy and water efficient building practices through the development of model covenants. Through educational partnerships, the City will encourage owners of high-performance and net zero energy buildings to share and market best practices.

Given the incremental costs associated with high-performance buildings, financing must be a consideration. This will be achieved by partnering with local banks to identify opportunities for providing lower interest loans and [energy efficient mortgages](#) for high performance buildings (see also 1.A.6). High performance and net zero buildings are more durable and resilient, reducing risk for lenders. Additionally, promoting targeted financing will create value and recognition of energy efficiency. The City can also identify partnerships with building material manufacturers to encourage the production, marketing, and sale of low-carbon and energy efficient building materials.

Within the context of building energy performance, the city will continue to consider building siting and transportation requirements as important factors in building energy efficiency. The City will continue to encourage covered bicycle parking, locker facilities for commuters, integration with transit routes, or redevelopment of an existing site that does not require addition street construction.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• City of Bozeman• Montana State University• Montana Weatherization Training Center• Gallatin College• Southwest Montana Building Industry Association• Montana Code Collaborative• Montana Dept. of Environmental Quality• Montana Renewable Energy Association	<ul style="list-style-type: none">• 1.3 Public Agencies Collaboration• 4.5 Housing and Transportation Choices• 6.3 Climate Action	<ul style="list-style-type: none">• Number of Trainings Hosted• Number of Participants

Focus Area 1. Healthy, Adaptive & Efficient Buildings

Solution B. Achieve Net Zero Energy New Construction

Action 1.B.2. Advocate for Adoption of State-Wide Net Zero Energy Code

While the City of Bozeman cannot require anything more or less stringent than what the state of Montana adopts, it can advocate for state level policies and regulations that increase building efficiency.

The City will collaborate with other municipalities in the state to advocate for adoption of a statewide voluntary net zero energy stretch building code. Having a statewide stretch code would provide consistency across communities and ensure builders don't have to navigate multiple versions of stretch code requirements.

The City will advocate for adoption of any necessary health and safety measures (e.g., proper ventilation), incorporation of solar-ready and electric vehicle-ready construction requirements into state building and energy codes, and more stringent statewide energy and water efficiency regulations. The City will encourage manufacturers to disclose the carbon intensity of building materials.

Priority	<i>Lead & Implementing Partners</i>	<i>Strategic Plan Alignment</i>	<i>Performance Measures</i>
Level 1	<ul style="list-style-type: none">• City of Bozeman• Montana State University• Montana Weatherization Training Center• Southwest Montana Building Industry Association• Montana Code Collaborative• Montana Dept. of Environmental Quality• Montana Dept. of Labor & Industry	<ul style="list-style-type: none">• 4.2 High Quality Urban Approach• 4.5 Housing and Transportation Choices• 6.3 Climate Action	<ul style="list-style-type: none">• Establishment of a state-wide above-code building standard• Improved energy efficiency with each code adoption cycle

Focus Area 1. Healthy, Adaptive & Efficient Buildings

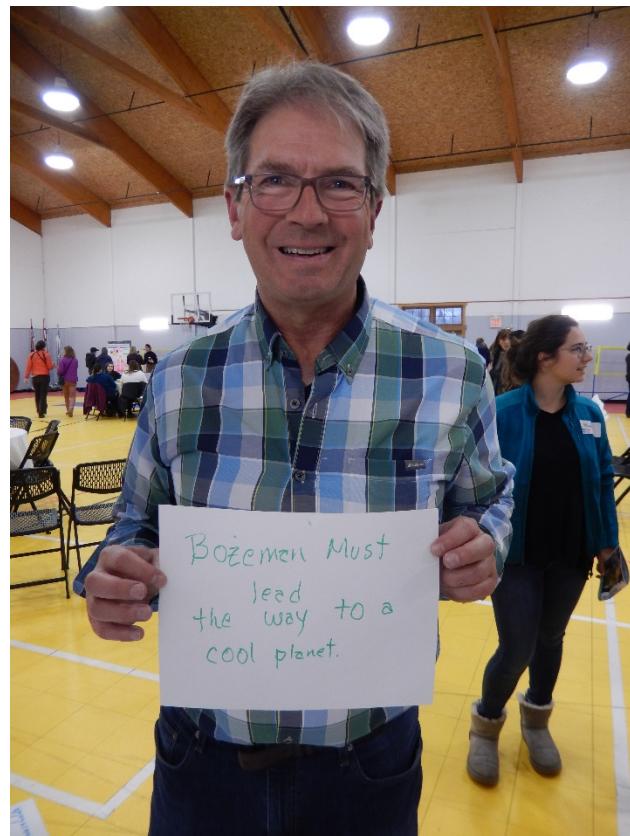
Solution B. Achieve Net Zero Energy New Construction

Action 1.B.3. Encourage High Performance Construction for All Publicly Funded Buildings

The City cannot mandate policies for non-municipal facilities that receive public funding, but it can encourage and/or incentivize high performance construction.

The City will partner with other agencies, such as the Bozeman School District and Montana State University, to identify opportunities and mechanisms to upgrade current facilities and construct new facilities to incorporate water efficiency and net zero energy standards. The City will encourage cost-effective high-performance construction for other publicly funded projects, such as affordable housing.

The City of Bozeman has direct control over the performance of municipal buildings and will adopt ambitious high-performance NZE building practices and maximize water efficiency for City-owned facilities where feasible (see Action 1.A.1).



Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	<ul style="list-style-type: none">• City of Bozeman• Montana State University• Human Resources Development Council• Community Affordable Housing Advisory Board	<ul style="list-style-type: none">• 4.2 High Quality Urban Approach• 4.5 Housing and Transportation Choices• 6.3 Climate Action	<ul style="list-style-type: none">• Establishment of High Performance Building Ranking Criteria in Workforce Housing Application• Number of Above-Code Affordable Housing Units

Focus Area 1. Healthy, Adaptive & Efficient Buildings

Solution B. Achieve Net Zero Energy New Construction

Action 1.B.4. Analyze and Support Opportunities for District Energy

Heating, cooling, and water heating account for roughly half of global energy consumption (IEA, 2011). District heating energy systems pipe steam, hot water, or cold water from a centralized plant through a system of pipes to multiple buildings within a network and can be applied on the scale of neighborhoods or even a city. District heating is an integrated solution that can support energy efficiency, building electrification, climate resilience, renewable energy storage, support a green economy, and deep decarbonization of cities. District heating systems can also produce electricity locally. Renewable energy can provide high levels of affordable heat and cooling when incorporated into district energy systems through economies of scale and diversity of supply. District energy plus renewable energy can help communities achieve 100% renewable energy goals.

The City of Bozeman will develop a plan for City and State support of district energy through avenues such as district energy in energy efficiency building standards, state tax incentives, Combined Heat and Power (CHP) and renewable heat incentives, mapping of potential resources, land use planning, and permitting for heating and cooling infrastructure. The City will explore funding and collaboration models to study district heating in more detail, including Montana State University's advanced district energy case study (NREL, 2020), and coordinate with NorthWestern Energy and other community partners. The City will highlight replicable business models and build the business case around public-private partnerships.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	<ul style="list-style-type: none">• City of Bozeman• Montana State University• Health Care Institutions• Development Community• Bozeman Public Schools	<ul style="list-style-type: none">• 2.2 Infrastructure Investments• 4.3 Strategic Infrastructure Choices• 6.3 Climate Action	<ul style="list-style-type: none">• Development of a Plan to Support District Energy Systems

Focus Area 1. Healthy, Adaptive & Efficient Buildings

Solution B. Achieve Net Zero Energy New Construction

Action 1.B.5. Offer a Voluntary Pathway & Incentives for Above-Code Construction

Building codes are the minimum standard for what is legally allowed to be built, yet the practice of building “above code” is relatively uncommon. As noted earlier in this chapter, the City of Bozeman is not permitted to require anything more stringent than the state-adopted code.

Creating a specific designation for superior-performing buildings, the City can encourage the development community to strive to achieve above-code construction outcomes. By setting the standards for the award designation, and creating a positive-sounding title for the achievement of the standards, a “Bozeman Net Zero Hero” building can be marketed by the builder as a model for others to follow.

The City has limited tools to incentivize above-code construction practices. Through a combination of Planned Unit Development point accumulation, fee waivers and other incentives, developers would be encouraged to make specific choices that help the City achieve its stated goals. Development code relaxations and trade-offs must be carefully considered to avoid undesirable outcomes to the built environment. Such a program would evaluate a number of factors – from neighborhood orientation to solar installation to net-zero construction – and award the appropriate amount of incentives for achieving specific benchmarks. Sequencing of a city incentive relative to the developer’s stated deliverables will require further evaluation.

The City of Bozeman will create a recognition program that bestows a specific designation (e.g., “Bozeman Net Zero Hero”) on buildings that meet net-zero or other objective standard of energy performance and market the program to the development and real estate community as a way of distinguishing superior performing buildings.

Further, the City will develop an incentive program for new construction (commercial and residential) that encourages all buildings to be designed and constructed to:

- Minimize energy and water use with ultra-low Energy Use Intensity (EUI) or Home Energy Score
- Maximize solar energy system electricity production to achieve Net Zero Energy (NZE) and electric vehicle ready
- Encourages passive design and optimizes neighborhood orientation
- Discourages the use of outdoor gas/electric heaters

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 3	<ul style="list-style-type: none">• City of Bozeman• Montana State University• Montana Weatherization Training Center• Gallatin College• Southwest Montana Building Industry Association• Montana Code Collaborative• Montana Dept. of Environmental Quality	<ul style="list-style-type: none">• 4.2 High Quality Urban Approach• 4.5 Housing and Transportation Choices• 6.3 Climate Action	<ul style="list-style-type: none">• Establishment of a recognition program• Establishment of a voluntary above-code building standard• % of building permit applicants voluntarily participating

Solution C. Electrify Buildings

This solution emphasizes the conversion of heating equipment and cooking appliances in buildings from natural gas or propane to electricity. By shifting to electricity, it allows for energy needs to be met through renewable energy, thus reducing overall emissions from building energy consumption. This solution is vital to addressing building natural gas use and is an important element to achieve carbon neutrality by 2050.

According to the 2018 American Community Survey 5-year estimates for Bozeman, approximately 10,848 homes (59%) heat their properties with utility gas, 6,786 (37%) heat their homes with electricity, and only 382 homes (roughly 2%) use propane or fuel oil for heating fuel. While there are various appliances and equipment systems that could be converted to electricity, recommended opportunities to prioritize for conversion are propane or heating oil systems and all-electric new construction. Other system and appliance conversions should be considered on a case-by-case basis as not all conversions will be cost-effective. There is currently a higher fuel cost for electricity, yet electric heating is typically more efficient than natural gas.

As with building energy efficiency measures, conversion to or installation of building heating and cooking systems that use electricity rather than natural gas will require capital investment by the building owner or developer. A [2018 study](#) found that electrification in residential homes for retrofits was not cost-effective. The exception to this conclusion is that “electrification is cost-effective for customers switching away from propane or heating oil, for those gas customers who would otherwise need to replace both a furnace and air conditioner simultaneously, for customers who bundle rooftop solar with electrification, and for most new home construction” (Billimoria, Guccione, Henchen, & Louis-Prescott, 2018). For this reason and to provide the greatest GHG emissions reductions, robust implementation of this solution is recommended after 2030 when the community reaches its 100% renewable electricity goal. At that time, it is expected that the economics will be more favorable as a 20 to 38% price reduction for air-source heat pumps and 42 to 48% price reduction for heat pump water heaters is expected by 2050 (National Renewable Energy Laboratory, 2017). Again, we expect similar economics to apply to commercial buildings, but due to the variation in building load, the economics in commercial spaces is more difficult to model.

Focus Area 1. Healthy, Adaptive & Efficient Buildings

Solution C. Electrify Buildings



From an equity perspective, some households and businesses may not be able to afford the capital investment required for equipment and building retrofits. Furthermore, the last remaining users of natural gas, which may include older homes, commercial buildings, and lower-income households, should not be left with the financial burden of electrification. This means that careful attention must be paid so that they are not stuck with increasing natural gas rates as the number of natural gas customers decline.



Health and well-being considerations associated with electrification of buildings include improved safety with the reduction in pilot lights needed for natural gas equipment. As building energy consumption shifts to electricity provided by renewable sources, air quality improvements will likely ensue. Residential electrification may increase demand for wood burning stove and compromise local air quality during the winter.



As with improving efficiency and implementing Net Zero Energy practices at City of Bozeman facilities, there are opportunities for the City to lead by example and test out and pursue beneficial electrification projects at existing and future City facilities, especially those facilities with high natural gas or propane consumption.

This solution primarily addresses Bozeman's greenhouse gas mitigation goals, while also providing some supporting resiliency benefits.



Related Solutions

- Solution B. Achieve Net Zero Energy New Construction
- Solution D. Increase Utility Clean Energy Mix
- Solution F. Increase Community-Based Distributed Renewable Energy Generation

Action 1.C.1. Advance Electrification Upgrades and Conversion Projects for City Facilities

The City has direct influence over its own municipal facilities. Reducing and eliminating fossil fuel use in City-owned facilities is one way the City can lead by example with the Bozeman Climate Plan.

The City will convert select City facilities and equipment to all or mostly electric, with the goal of full electric conversion as technologies advance. The City will also require all-electric new construction for new City facilities where feasible.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	<ul style="list-style-type: none"> • City of Bozeman • Rocky Mountain Institute • Montana State University • NorthWestern Energy 	<ul style="list-style-type: none"> • 4.3 Strategic Infrastructure Choices • 4.5 Housing and Transportation Choices • 6.3 Climate Action 	<ul style="list-style-type: none"> • Number of Electrification Conversion Projects • % Reduction in Natural Gas Use



Action 1.C.2. Include an Electrification Component for Above-Code Construction

Building on the goals in Action 1.B.2: Offer a Voluntary Pathway & Incentives for Above-Code Construction, the City will conduct a feasibility study to explore the implication, costs, and benefits of electrification for different types of buildings in Bozeman, partner with NorthWestern Energy to encourage all-electric new construction, and advocate for all-electric new construction requirements in the stretch code and future building codes. The City will evaluate its engineering standards and NorthWestern Energy connection standards to determine if new developments are discouraged or prohibited from installing electric only service, including consideration for ground source energy or district energy technology requirements.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 3	<ul style="list-style-type: none"> • City of Bozeman • NorthWestern Energy • Montana State University • Montana Weatherization Training Center • Montana Codes Collaborative • Montana Dept. of Environmental Quality • Montana Dept. of Labor & Industry • Southwest Montana Building Industry Association • Human Resources Development Council 	<ul style="list-style-type: none"> • 4.2 High Quality Urban Approach • 4.5 Housing and Transportation Choices • 6.3 Climate Action 	<ul style="list-style-type: none"> • Adoption of an all-electric new construction code • % Increase of Homes with Electric Heating and Appliances

Action 1.C.3. Support Outreach and Incentives for Electric Appliances and Equipment

While the City of Bozeman cannot require all-electric appliances or equipment in buildings, it has the ability to educate the community on the health and safety benefits of and encourage installation of all-electric appliances and equipment in homes and businesses.

The City will develop educational materials to encourage customers to select electric equipment or appliances where alternatives to gas exist and will incentivize private conversion of natural gas appliances to electric through avenues such as a bulk purchasing program. The City will partner with homeowners' associations to explore opportunities to electrify equipment and appliances across neighborhoods. The City will establish bulk purchase and retrofit programs to help natural gas users transition to all-electric appliances and equipment. With a robust educational program in place, the City will be positioned to advocate for appliance electrification within the state building code and explore other available pathways to accelerate the conversion to all-electric appliances and equipment.

Priority	<i>Lead & Implementing Partners</i>	<i>Strategic Plan Alignment</i>	<i>Performance Measures</i>
Level 3	<ul style="list-style-type: none"> • City of Bozeman • Montana State University • Montana Weatherization Training Center • Human Resources Development Council • Community Affordable Housing Advisory Board 	<ul style="list-style-type: none"> • 1.2 Community Engagement • 4.5 Housing and Transportation Choices • 6.3 Climate Action 	<ul style="list-style-type: none"> • % Increase of Buildings with Electric Heating and Appliances

Increasing Resiliency to Climate Hazards

The following opportunities and considerations summarize how the solutions in this chapter can help improve resiliency to future climate hazards.

Opportunities	Considerations
	Extreme Heat
<ul style="list-style-type: none"> Reducing energy demands during hot days can reduce risk of energy shortages. Efficient buildings cost less to cool and can reduce energy cost burden. 	<ul style="list-style-type: none"> Electrification could reduce system diversity (by eliminating natural gas), increasing vulnerability if system is overloaded during a period of high demand, thus amplifying the need for energy storage and microgrids.
	Flooding
<ul style="list-style-type: none"> Reduced risk of damage to natural gas infrastructure if building stock was fully electrified. Net-zero energy buildings may avoid service interruptions if powered by onsite renewable energy. 	<ul style="list-style-type: none"> Siting of new construction away from flood prone areas is critical.
	Drought & Mountain Snowpack
<ul style="list-style-type: none"> High efficiency building design often includes water conservation measures in addition to energy efficiency. 	<ul style="list-style-type: none"> Electrifying buildings will increase demand for electricity, which is currently associated with water consumption.
	Wildfire
<ul style="list-style-type: none"> Efficient buildings are better sealed and better ventilated, yielding better air quality in the event of a wildfire. 	<ul style="list-style-type: none"> Electrified buildings could be more vulnerable to power disruptions if electricity infrastructure is damaged. Tightly sealed buildings with poor ventilation could worsen indoor air quality.
	Winter Storms
<ul style="list-style-type: none"> Efficient buildings cost less to heat and can reduce energy-burden for low-income customers. 	<ul style="list-style-type: none"> Electrifying existing building systems could increase utility costs depending on timing and utility rate structures. Electrification could reduce system diversity (by eliminating natural gas), increasing vulnerability if system is overloaded during a period of high demand. Currently, there may be limitations to cost-effective electric heating.



Focus Area 2: Responsible & Reliable CLEAN ENERGY SUPPLY

NorthWestern Energy is the primary energy utility serving the Bozeman community, providing electricity and natural gas to residential, commercial, and some industrial customers. Some community members also heat or power their homes and facilities through other energy sources or technology, including but not limited to propane, wood, solar, and geothermal. As noted in Chapter 3, more than half of Bozeman's GHG emissions come from energy use in buildings. In 2018 emissions from electricity use alone accounted for 29% of community GHG emissions. The solutions in this focus area complement the solutions in Focus Area 1: Healthy, Adaptive & Efficient buildings that emphasize energy efficiency and conversion to electric equipment and solutions. They focus on lowering energy-related emissions by addressing the energy supplied from the grid to utility customers, as well as expanding distributed generation opportunities.

RELATED PLANS & STUDIES

- [Bozeman Community Plan](#)
- [NorthWestern Energy Electric Supply Resource Procurement Plan](#)
- [Climate Vulnerability Assessment and Resilience Strategy](#)
- [Community Greenhouse Gas Emissions Report](#)
- [Municipal Greenhouse Gas Emissions](#)

In addition to emphasizing a shift to cleaner energy sources over time, these solutions advance other important topics and issues such as energy efficiency, access and affordability, electric grid stability and reliability, a just and equitable transition of the traditional energy economy, and environmental and air quality.

These solutions are focused on the generation of the required renewable electricity to serve the community's energy needs. To meet Bozeman's climate goals, the community will need to:

- **Solution D. Increase Utility Clean Energy Mix**
Strongly encourage NorthWestern Energy to meet Bozeman's goal of 100% net clean electricity by 2030.
- **Solution E. Develop and Promote Utility Green Power Programs**
Collaborate with NorthWestern Energy and stakeholders to introduce a green tariff. This is a key strategy to meet the City's aggressive short-term goals.
- **Solution F. Increase Community-Based Distributed Renewable Energy Generation**
Work across the community to increase the adoption of distributed renewable energy on public and private properties.

Focus Area 2. Responsible & Reliable Clean Energy Supply

Increasing Resiliency to Climate Hazards

As illustrated in Tables 6 and 7, Bozeman will need 503 million kWh of clean electricity in 2025, 519 million kWh in 2030, and 666 million kWh in 2050 to meet the community's greenhouse gas emissions mitigation goals. These electricity consumption projections include the increased electricity use from projected growth, the anticipated electricity use reduction from implementing efficiency (Solutions A and B), as well as the increased electricity use from implementing building and vehicle electrification (Solutions C and K).

The projected electricity use will come from a combination of utility-scale clean energy generation (Solutions D and E) as well as local distributed generation (Solution F). There are two pathways for renewable energy generation presented in the following subsections. The first represents the no change pathway where NorthWestern Energy does not add any additional clean energy generation, and the second represents the pathway where NorthWestern Energy uses additional clean energy generation to meet and exceed their stated carbon intensity reduction goals and reduced total emissions.

In each case, utility-scale green power programs (Solution E) are used to procure the necessary renewable energy to allow the City to meet their stated goals. The amount of distributed generation (Solution F) does not change between pathways and is set to show consistent annual increase in generation capacity to meet Bozeman's target in 2050. For more information on calculation methodology, see Appendix A.



Photo: Onsite Energy

No Additional Utility Renewable Energy Generation

This analysis illustrates the pathway if NorthWestern Energy does not add any additional renewable energy generation (pathway A).

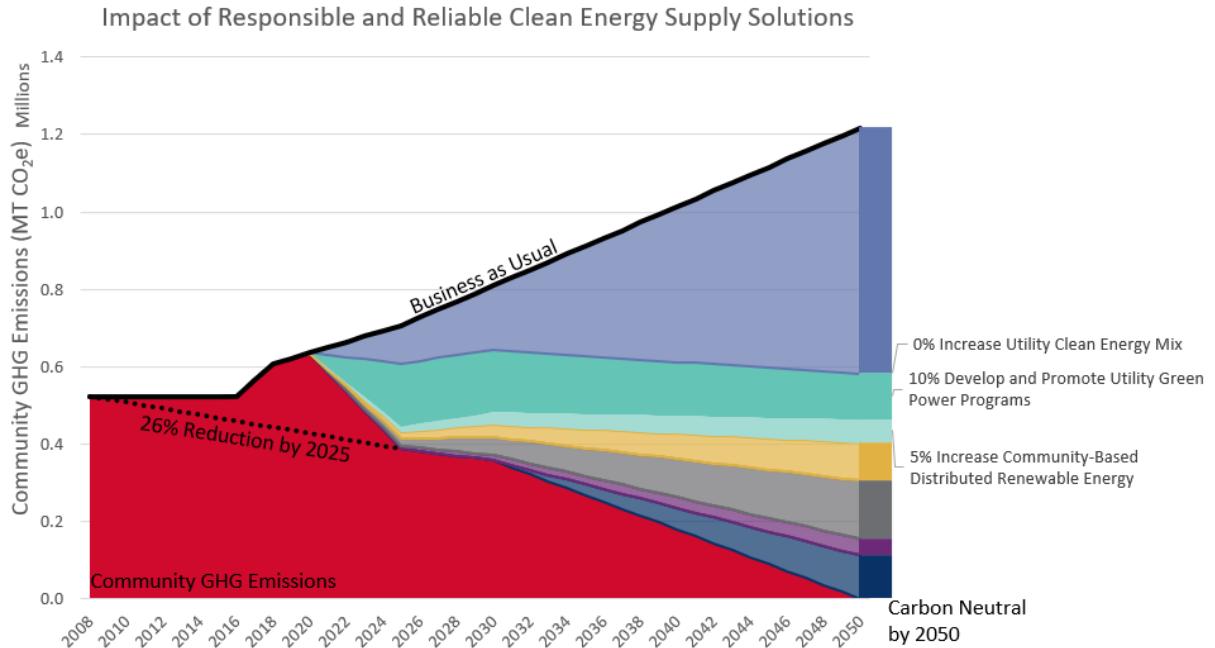


Figure 16. Projected clean energy GHG reductions by solution (pathway A)

Table 6. Projected clean energy supply solution mitigation targets (pathway A)

Solution	Metric (unit)	Target	Target	Target
		2025 Paris Accord	2030 100% Net Clean Electricity	2050 Carbon Neutral
Total Projected Electricity Consumption	Electricity Use (kWh)	503 million	519 million	666 million
Baseline Clean Energy	Clean Electricity (kWh)	281 million	281 million	281 million
Solution D. Increase Utility Clean Energy Mix	Additional Clean Electricity (kWh)	0	0	0
Solution E. Develop and Promote Utility Green Power Programs	Additional Clean Electricity (kWh)	204 million	198 million	256 million
Solution F. Increase Community-Based Distributed Renewable Energy Generation	Additional Clean Electricity (kWh)	16 million	40 million	130 million

Note: Columns may not add up to the total due to rounding.

Focus Area 2. Responsible & Reliable Clean Energy Supply

Increasing Resiliency to Climate Hazards

Additional Utility Renewable Energy Generation

This analysis illustrates the pathway where NorthWestern Energy uses additional clean energy generation to meet and exceed their stated carbon intensity reduction goals and reduces total emissions (pathway B).

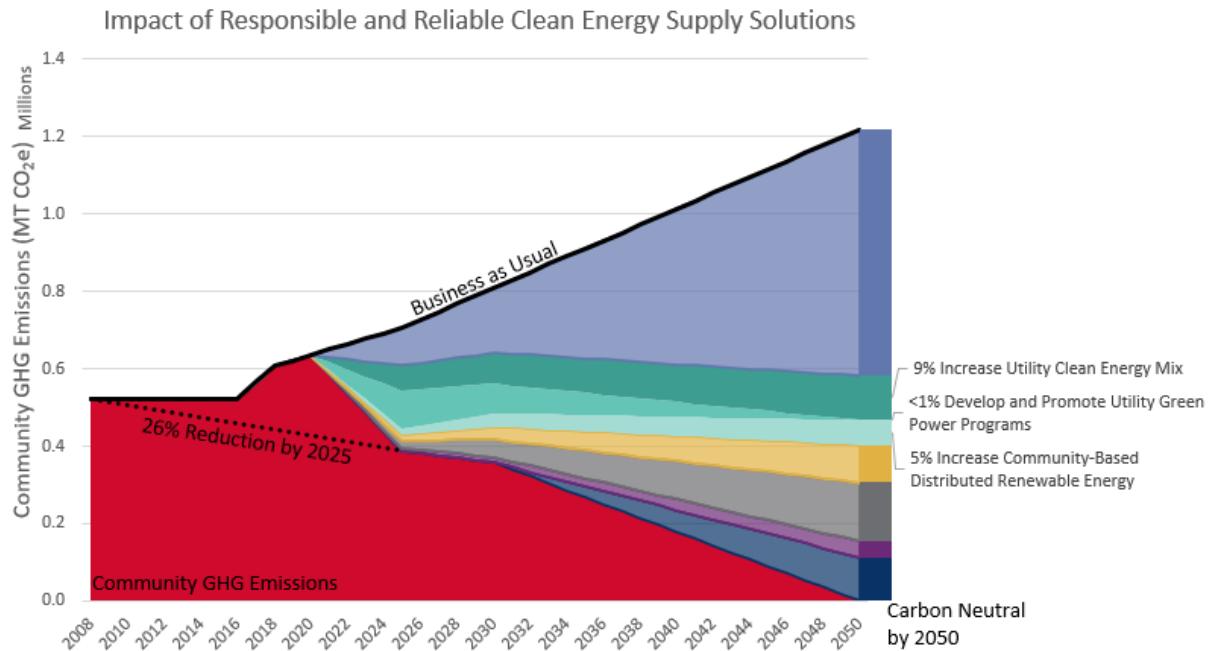


Figure 17. Projected clean energy GHG reductions by solution (pathway B)

Table 7. Projected clean energy supply solution mitigation targets (pathway B)

Solution	Metric (unit)	Target	Target	Target
		2025 Paris Accord	2030 100% Net Clean Electricity	2050 Carbon Neutral
Total Projected Electricity Consumption	Electricity Use (kWh)	503 million	519 million	666 million
Baseline Clean Energy	Clean Electricity (kWh)	281 million	281 million	281 million
Solution D. Increase Utility Clean Energy Mix	Additional Clean Electricity (kWh)	80 million	100 million	306 million
Solution E. Develop and Promote Utility Green Power Programs	Additional Clean Electricity (kWh)	124 million	98 million	0
Solution F. Increase Community-Based Distributed Renewable Energy Generation	Additional Clean Electricity (kWh)	16 million	40 million	80 million

Note: Columns may not add up to the total due to rounding.

Focus Area 2. Responsible & Reliable Clean Energy Supply

Solution D. Increase Utility Clean Energy Mix

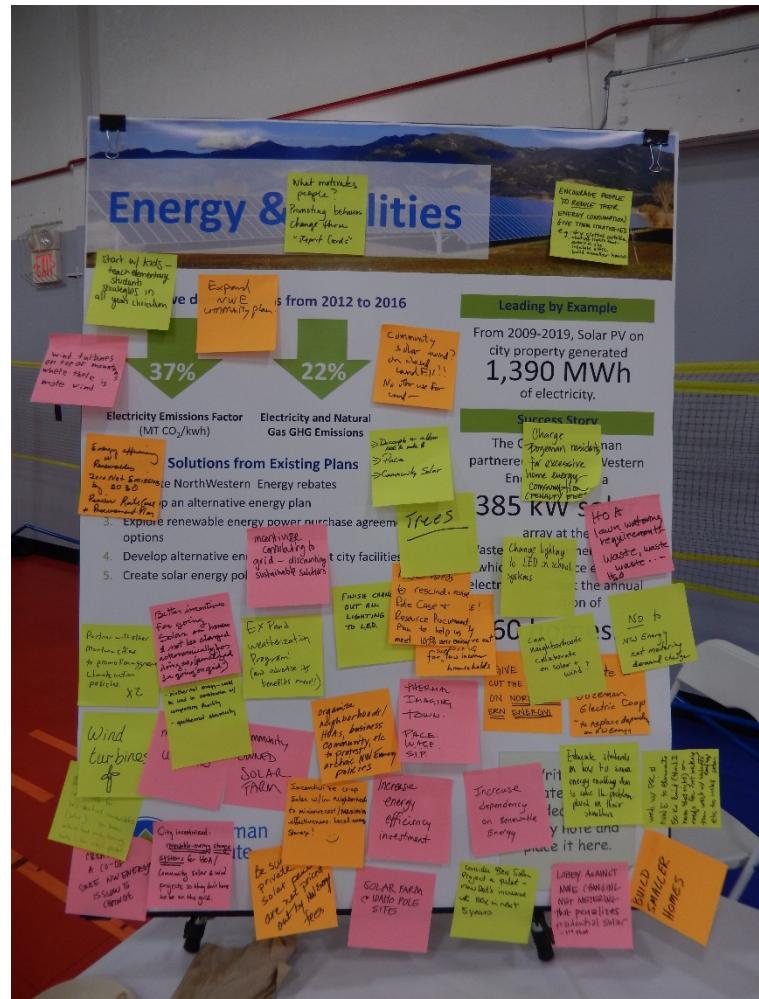
Solution D. Increase Utility Clean Energy Mix

This solution emphasizes the role of utilities in providing energy to customers and communities. Because of their large reach and economies of scale, utility-scale solutions are often some of the most transformational and cost-effective opportunities for communities to achieve their climate goals. A utility's resource mix typically includes an assortment of energy generation sources that are balanced to meet customer demand.

In 2018, 61% of the energy owned by NorthWestern Energy for Montana came from carbon-free sources, which includes hydropower (46%), wind (15%), and solar (<1%) (NorthWestern Energy, 2019). In 2019, NorthWestern Energy voluntarily committed to reducing the carbon intensity of its electric portfolio for Montana by 90% by 2045, from a 2010 baseline (NorthWestern Energy). If the goal is achieved with new renewable energy generation, this transition has the potential to provide significant impact and momentum, but will not advance quickly enough to achieve the City's short-term goals and may not be sufficient to achieve carbon neutrality by 2050.

Because renewable energy is not always available when customer energy demand is highest (dark, cold, still, winter evenings), solar and wind cannot be the sole solution. Clean energy portfolios should include cost-effective storage to ensure that renewable energy generation can be stored for times when generation is not available. In addition, well-designed demand response programs and time-of-use rate design can reduce peak energy demand. Customers can help reduce energy demand at peak times in evenings (usually about 4pm to 8pm). For example, delaying dishwashers until late evening and moving other non-essential energy uses to off-peak hours can reduce the peak energy need and allow more reliance on renewables rather than fossil fuel capacity resources.

Public-private partnerships have an important role to play in this solution, and innovation and the willingness of current and future partners to work together across sectors will be necessary to advance renewable energy adoption.



Focus Area 2. Responsible & Reliable Clean Energy Supply

Solution D. Increase Utility Clean Energy Mix



Equity considerations associated with significant shifts in the utility's energy generation portfolio are vast. A rapid transition could potentially cause a rate shock and increase rates, disproportionately burdening low-income households. Over the long-term, however, costs may stabilize or decrease, ultimately reducing the energy cost burden for lower-income households. More analysis is needed to accurately quantify these costs. Furthermore, the workforce associated with non-renewable energy production may experience declining employment opportunities, meaning that careful planning to provide a just transition for that workforce is essential.



Health and well-being opportunities associated with this solution include improved air quality with the reduction in burning of fossil fuels. Over time, non-renewable energy facilities may need to be decommissioned, leading to additional environmental and human health benefits, as well as employment opportunities.



Whether advancing new clean energy resources or other related efforts focused on energy efficiency and electrification, the City will advance a triple bottom line approach based on social, environmental, and economic benefits to inform utility partnership efforts.

This solution primarily addresses Bozeman's greenhouse gas mitigation goals, while also providing some supporting resiliency benefits.



Related Solutions

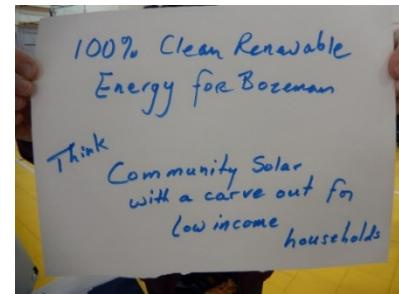
- Solution B. Achieve Net Zero Energy New Construction
- Solution C. Electrify Buildings
- Solution E. Develop and Promote Utility Green Power Programs
- Solution K. Decrease Direct Vehicle Emissions

Focus Area 2. Responsible & Reliable Clean Energy Supply

Solution D. Increase Utility Clean Energy Mix

Action 2.D.1. Complete a 100% Net Clean Electricity Community Feasibility Study

With approximately 60% of Bozeman's grid energy sourced from clean resources, Bozeman is positioned to achieve 100% net clean energy by 2030. To help map the pathway, the City will seek interlocal partnerships with interested jurisdictions to complete an independent economic analysis focused on the rate implications and environmental benefits of pursuing utility-scale clean energy solutions. The scope of the study will include an assessment of the potential cost of available policy mechanisms, including 1) the creation of a collaborative community-wide renewable energy program, modeled after [Utah's Community Renewable Energy Act](#) (HB 411), allowing communities to choose to be supplied with 100% net clean electricity with new renewable energy sourced through the utility and 2) a Community Choice Aggregation (CCA) program, which allows local governments to procure power from an alternative supplier while the utility still provides transmission, distribution, and billing services in regulated electric markets, like Montana. Both options would most likely require state enabling legislation.



Under a community-wide renewable energy program, NorthWestern Energy and interested communities would collaborate with stakeholders to help drive the path to 100% clean energy by taking advantage of low-cost renewable energy to meet growing customer demand. Under the unique Utah model, HB 411 directs the Public Service Commission to implement a 100% renewable plan for communities and their customers who opt into the program. It also provides legislative guidance for customer participation and key opt-out provisions for customers who do not wish to participate.

Under Community Choice Aggregation (CCA), local governmental entities (or a contracted third party) procure electricity on behalf of customers within a city, county, or group of jurisdictions. The CCA is responsible for choosing and procuring the mix of resources, as well as system reliability in regulated markets. Eight states have passed state CCA-enabling legislation and each state has at least one CCA that was formed when a local government body voted to aggregate its retail electricity or passed a public referendum. Most CCAs use an opt-out structure where customers are automatically enrolled unless they choose to switch to the basic utility service. CCA voluntary green power program structures vary, but many have "opt-up" products for their customers to select 100% renewable electricity (NREL, 2019).

As part of the City's due diligence to assess cost, long-term savings, and community equity considerations, the economic feasibility and policy options study will help inform the appropriate path forward to effectively meet Bozeman's clean energy goals.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	<ul style="list-style-type: none"> • City of Bozeman • Montana Cities and Counties • NorthWestern Energy 	<ul style="list-style-type: none"> • 1.3 Public Agencies Collaboration • 6.3 Climate Action 	<ul style="list-style-type: none"> • % Increase of Utility-Scale Renewable Energy • % Decrease in Delivered Electricity CO₂ Emissions Factor • Decrease in Total Annual Utility- Scale Emissions

Focus Area 2. Responsible & Reliable Clean Energy Supply

Solution D. Increase Utility Clean Energy Mix

Action 2.D.2. Collaborate and Innovate Utility-Scale Solutions with NorthWestern Energy

With a strong track record of collaboration with NorthWestern Energy on local efforts such as the [Bozeman Energy Project](#) and the [Bozeman Solar Project](#) at the City's Water Reclamation Facility, the City will seek to formalize the existing long-term partnership with NorthWestern Energy with a Memorandum of Understanding (MOU). The MOU will provide a framework of joint actions and implementation timeline for the City and NorthWestern Energy to seek mutually beneficial programs and policies that will address the City's clean energy goals and the utilities' stated electric capacity shortfall.



Examples of joint programs contained within the MOU may include efforts such as the development of green power purchasing options for the City and community members, formal engagement in the development of the Electricity Supply Resource Plan, community renewable energy projects, Demand Side Management (DSM) energy efficiency programs, Advanced Metering Infrastructure (AMI) deployment, local planning for large new commercial loads, electrification coordination, and possible support for batteries and pumped storage. Through the MOU, the City will urge greater transparency from NorthWestern Energy on their reported emissions factors and carbon goal and urge the utility to establish an absolute emissions reduction goal. The City will seek input from stakeholders and outside subject matter experts on the development of this MOU and community members will have an opportunity to comment on any final agreement. The City will continue to grow interlocal partnerships with Montana cities and counties to advance common clean energy and climate goals contained in the MOU.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• City of Bozeman• NorthWestern Energy• Montana Renewable Energy Association• Montana Dept. of Environmental Quality• Montana League of Cities & Towns• Renewable Northwest• World Resources Institute	<ul style="list-style-type: none">• 1.3 Public Agencies Collaboration• 6.3 Climate Action	<ul style="list-style-type: none">• % Increase of Utility-Scale Renewable Energy• % Decrease in Delivered Electricity CO₂ Emissions Factor• Decrease in Total Annual Utility-Scale Emissions

Action 2.D.3. Support Policies to Expand Renewable Energy and Just Transition Initiatives

The City of Bozeman can play a proactive role in shaping Montana's energy future. Cities have the ability to build support within our existing networks or form new partnerships to help advance our climate goals. While the City has supported a clean energy agenda in the Montana Legislature for over a decade, for the first time the City's [2021 Legislative Agenda & Priorities](#) includes clean energy among the top three priorities.

Offering testimony at the Montana Legislature and the Public Service Commission can help advance critical conversations across the state. Examples of policies aimed at advancing energy efficiency and clean energy may include time-of-use rate design, energy storage policies, utility business model reform, Property Assessed Clean Energy, oppose future efforts to acquire additional shares of Colstrip, or advancing state-wide research and development focused on the potential for geothermal, hydrogen resources, energy storage, or other disruptive technologies.

The decline of coal in Montana (U.S. Energy Information Administration, 2020, [Montana State Profile and Energy Estimates](#)) and closure of Colstrip Units 1 and 2 have helped reduce greenhouse gas emissions in the electricity sector, but more significant reductions are needed to achieve Bozeman's long-term climate goals. These emissions reductions will improve health, reduce the impacts and associated costs of climate change, and offer new economic opportunities. At the same time, these changes will cause significant economic disruption for workers and communities closely tied to fossil fuels in Montana.

A just transition focuses on policies that enable greater fairness for and input from workers and communities that are negatively affected by the transition away from fossil fuels, especially low-income communities that may have dealt with environmental injustice by living near polluting fossil fuel infrastructure. Examples of programs that could address just transition goals include economic development programs, Brownfield or Superfund programs, loan programs, clean energy tax credits, workforce development, and social safety net programs that benefit workers and communities impacted by the closure of coal mines, coal power plants, oil refineries, and associated industries. Robust cleanup efforts, such as dewatering Colstrip ash pond and implementing a "high and dry" secure storage of toxic material to protect ground water for future generations supports local environmental justice efforts. Bozeman will help advance rural priorities and just transition initiatives within the City's legislative priorities. Just transition funding should be qualified to guarantee that the funding goes toward workforce development, retraining programs, and impacted tribal entities. Locally, Bozeman may identify opportunities to support clean energy workforce development and job re-training programs through Gallatin College.

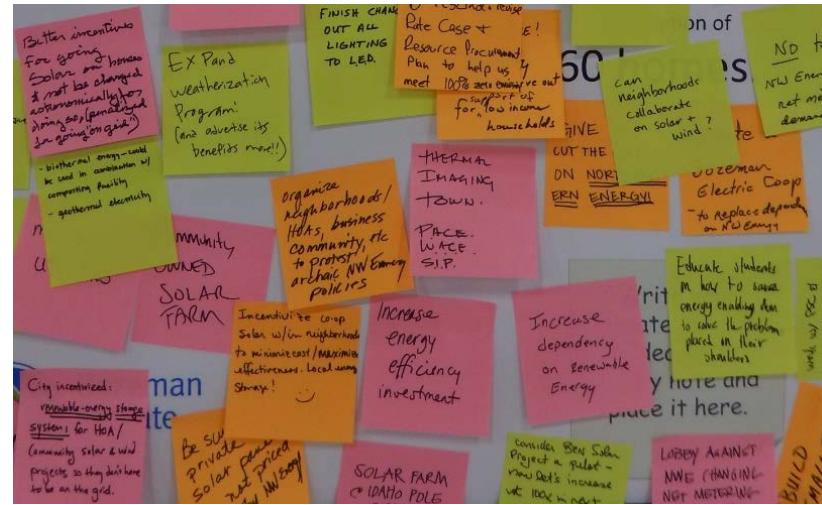
The City will proactively plan to advocate for clean energy and just transition initiatives in the Montana Legislature and Public Service Commission.

Focus Area 2. Responsible & Reliable Clean Energy Supply

Solution D. Increase Utility Clean Energy Mix

The City of Bozeman recognizes that the Intergovernmental Panel on Climate Change (IPCC) considers carbon pricing “necessary” to reach carbon reduction goals. While national carbon pricing legislation enacted by Congress would be the most efficient way to implement this market-based approach, there are also efforts underway on state and regional levels as well.

The City can become a leader by engaging in discussions about creative bipartisan market-based policies that effectively reduce greenhouse gas emissions by spurring low/no carbon innovation, and work in a way that sustains local economic development and offers other benefits to Bozeman and rural Montana. A revenue neutral carbon fee and dividend, carbon adjustments and regulatory reform, including eliminating fossil fuel subsidies, offer promising market-based approaches to combatting climate change. The City of Bozeman will support state and federal legislation that embodies the principles of effectiveness and equity (an example is H.R. 763, the Energy Innovation and Carbon Dividend Act) in addressing greenhouse gas emissions reduction



Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none"> • City of Bozeman • NorthWestern Energy • Montana Legislature • Public Service Commission • Montana Consumer Counsel • Energy and environment non-profits • Bozeman School District • Gallatin College 	<ul style="list-style-type: none"> • 1.3 Public Agencies Collaboration • 6.3 Climate Action 	<ul style="list-style-type: none"> • % Increase of Utility-Scale Renewable Energy • % Decrease in Delivered Electricity CO₂ Emissions Factor • Decrease in Total Annual Utility-Scale Emissions

Focus Area 2. Responsible & Reliable Clean Energy Supply

Solution D. Increase Utility Clean Energy Mix

2.D.4. Encourage Philosophical Shift for Utility Provider

Bozeman's ability to meet any of its stated goals is dependent upon a rapid transition to renewable energy sources by the utility. There is no current indication that NorthWestern Energy intends to make such a transition to meet Bozeman's goals. Other utilities have recognized that their corporate mission must recognize a responsibility for future generations—and they have set aggressive goals to transition away from fossil fuels. Absent a similar governing philosophy, NorthWestern Energy will not be able to serve the specific desires of their customer base. Representing the majority of NorthWestern Energy's Montana customer base, Bozeman, Gallatin County, Missoula (city and county), Helena and other partners should make direct appeals to the Board of Directors and major shareholders of the utility to meet the needs of their customers by adopting similar transition goals comparable to other enlightened utility providers.

The City will work with partner communities to encourage NorthWestern Energy's Board of Directors and shareholders to adopt a corporate philosophy that recognizes an urgent need to shift to renewable energy sources in order to safeguard the long-term health and well-being of their customers.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• City of Bozeman• Montana Cities and Counties• NorthWestern Energy	<ul style="list-style-type: none">• 1.3 Public Agencies Collaboration• 6.3 Climate Action	<ul style="list-style-type: none">• % Increase of Utility-Scale Renewable Energy• % Decrease in Delivered Electricity CO₂ Emissions Factor• Decrease in Total Annual Utility-Scale Emissions

Focus Area 2. Responsible & Reliable Clean Energy Supply

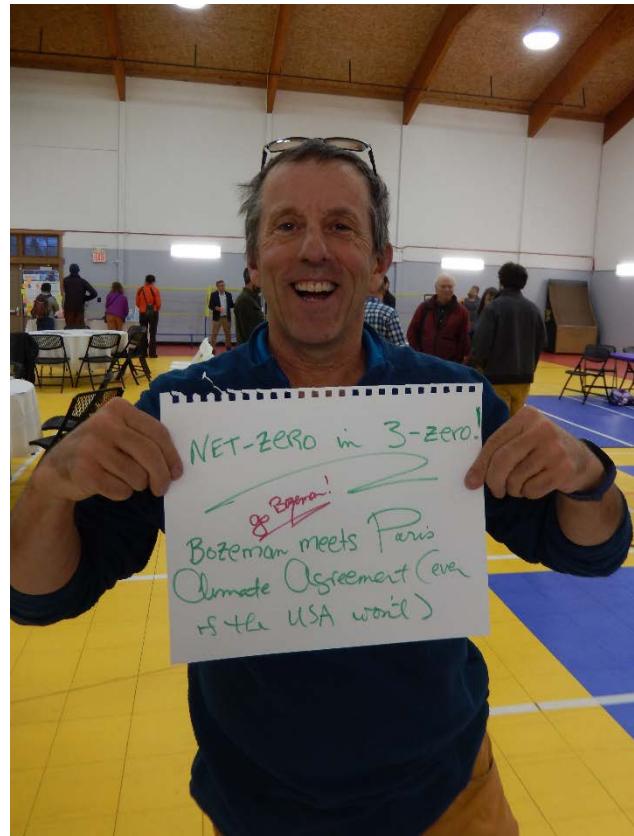
Solution E. Develop and Promote Utility Green Power Programs

Solution E. Develop and Promote Utility Green Power Programs

This solution focuses on institutional, business, and community voluntary participation in clean energy programs provided through the energy utility. Two common green power purchase program models are renewable energy certificates (RECs) and green tariffs.

Under a REC program, customers opt-in to paying a slight premium on their electric bill to support the development of renewable energy generation. In exchange, customers receive the RECs associated with electrical generation, which may be located inside or outside the utility's service area (unbundled RECs). If purchasing RECs, some buyers may want to consider buying RECs from areas with low renewable capacity or where the grid is dirtiest. Some disadvantages to RECs are that there may be potential for double counting of the clean energy attributes of renewable energy and RECs do not necessarily contribute to "additionality" or an increase in the amount of renewable energy on the local grid. NorthWestern Energy's green power purchase program is called E+ Green. It is available to the utility's electric customers. The E+ Green program currently provides RECs from the Bonneville Environmental Foundation, which has resources in Wyoming, Montana, and the Northwest. Energy purchased through the E+ Green program, or other similar REC programs, cannot be used to help Bozeman reach its' emissions reduction goals under the Global Protocol for Community-scale Greenhouse Gas Emissions.

Conversely, a green tariff is an increasingly popular optional pricing structure offered by a utility through a contractual arrangement that allows customers to purchase both the electricity from a large-scale renewable energy project and the associated RECs or environmental attributes (bundled RECs). For Bozeman, the key elements of green tariff program are the addition of clean electrons to the utility's grid and the associated RECs. Both are necessary to help reduce Bozeman's greenhouse gas emissions.



Focus Area 2. Responsible & Reliable Clean Energy Supply

Solution E. Develop and Promote Utility Green Power Programs



With respect to equity, this solution may be unattainable to lower-income or energy cost-burdened community members. Some entities provide scholarships or sponsorships to increase low-income access to green power purchase programs. Similarly, green tariff programs may only be available to large commercial, industrial, or municipal customers, not the entire community.



As with the solution to increase utility clean energy mix, increased investment in renewable energy technologies will likely lead to health and air quality benefits as fossil fuel consumption declines and facilities are decommissioned over time.



The City of Bozeman could advance this solution by opting into a green tariff for all facilities and electricity accounts.

This solution primarily addresses Bozeman's greenhouse gas mitigation goals, while also providing some supporting resiliency benefits.



Related Solutions

- Solution B. Achieve Net Zero Energy New Construction
- Solution D. Increase Utility Clean Energy Mix

Focus Area 2. Responsible & Reliable Clean Energy Supply

Solution E. Develop and Promote Utility Green Power Programs

Action 2.E.1. Advance Green Tariff Program Development and Participation

Increasing community demand for clean energy products will result in greater investment in clean energy across Montana. Developing and participating in a green tariff program by the City of Bozeman and other institutions, businesses, or residents will be necessary to ensure that Bozeman meets our 2025 emissions reduction goal.

A green tariff can be designed and branded in a variety of ways. The following green tariff programs represent cost-competitive examples that result in customer savings over longer-term contract periods:

- [Puget Sound Energy's Green Direct](#) – For commercial customers
- [Xcel's Renewable*Connect - Colorado](#) – For commercial customers
- [Florida Power & Light's Solar Together](#) - For commercial and residential customers with low-income participation option

NorthWestern Energy has agreed to develop a green tariff through a Green Power Stakeholder Advisory Committee, which includes City of Bozeman representation. The City of Bozeman, Missoula County, the City of Missoula, and the City of Helena are jointly seeking a third party consultant to advance the local governments' 100% net clean electricity goals and economic interests, including consideration for a residential program and low-income option to address equity. Bozeman's key principles for a green tariff product include: expanded choice in procuring renewable energy; cost competitiveness between the standard retail rate and the renewable energy product offering; and access to projects that are new and help drive emissions reduction beyond business as usual in NorthWestern Energy's Montana service territory.

Bozeman will continue to work with partner communities and NorthWestern Energy to develop the green tariff in 2021 and potentially support filing of a green tariff with the Montana Public Service Commission in 2022. Bozeman will continue to engage with stakeholders, institutional partners, and community members throughout the process. If successful, Bozeman will seek to procure renewable energy for city operations and actively recruit institutions, businesses, and residents to participate, as appropriate.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• City of Bozeman• NorthWestern Energy• Montana Cities• Public Service Commission• Montana Consumer Counsel• Energy & Enviro. Advocates• Business Leaders• Montana State University & Bozeman School District	<ul style="list-style-type: none">• 1.3 Public Agencies Collaboration• 6.3 Climate Action	<ul style="list-style-type: none">• Establishment of a voluntary Montana Green Tariff• Total kWh of clean energy procured for Bozeman through the Green Tariff

Focus Area 2. Responsible & Reliable Clean Energy Supply
Solution F. Increase Community-Based Distributed Renewable Energy Generation

Solution F. Increase Community-Based Distributed Renewable Energy Generation

This solution supplements utility-scale clean energy generation with more localized community investments. It encourages installation of distributed renewable energy technologies, such as on-site solar, community solar gardens, methane capture, and small wind and hydro generation.

Investment in local renewable energy showcases local commitment to sustainability and climate goals. For example, from 2009 to 2019, solar photovoltaic installations on City property generated 1,390 megawatt hours of electricity.

While typically more expensive than utility-scale projects, there are myriad resources and incentives to make distributed renewable energy projects economically viable. Plus, when linked to energy storage options like batteries, microgrid technologies, and district energy, distributed renewable energy increases opportunities for resiliency in the event of a power outage or grid failure.

NorthWestern Energy customers who install solar panels, small wind, or hydro technology on their properties can request net metering, which provides a utility bill credit for any surplus energy generated. Self-generating systems of up to 50 kW in size are allowed to net meter under current Montana law.



Focus Area 2. Responsible & Reliable Clean Energy Supply
Solution F. Increase Community-Based Distributed Renewable Energy Generation



Equity considerations associated with distributed renewable energy include access/availability to community members from various geographic and socio-economic positions. For example, some locations of the community are not well-positioned to take advantage of solar resources due to building orientation or tree coverage/other obstacles to solar access. Similarly, lower-income community members may not be able to afford investments into on-site improvements, and renters may be unable to make permanent improvements to structures. Solutions such as community solar gardens can help improve access and participation.



Like the other solutions in this focus area, increased investment in renewable energy technologies will likely lead to health and air quality benefits as fossil fuel consumption declines and facilities are decommissioned over time.



There are many opportunities for the City of Bozeman to continue to advance this solution. This includes planning for, financing, and implementing rooftop solar on municipal buildings and parking structures, making land available for community solar projects, and continuing to investigate opportunities for methane capture, small wind, and hydro generation projects at suitable City facilities.

This solution primarily addresses Bozeman's greenhouse gas mitigation goals, while also providing some supporting resiliency benefits.



Related Solutions

- Solution B. Achieve Net Zero Energy New Construction
- Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards

Focus Area 2. Responsible & Reliable Clean Energy Supply
Solution F. Increase Community-Based Distributed Renewable Energy Generation

Action 2.F.1. Plan and Install Renewable Energy Projects for City Facilities

The City will continue to lead and demonstrate the value of local renewable energy within municipal operations by setting a target of achieving 100% net clean electricity consumption by 2025. The City will identify, plan, and invest in municipal solar PV, or other suitable renewable energy projects, such as district energy, geothermal and Combined Heat and Power. To build resiliency, the City will plan and invest in cost-effective energy storage projects and microgrids to enhance reliability of renewable energy systems at strategic locations.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• City of Bozeman• NorthWestern Energy	<ul style="list-style-type: none">• 4.3 Strategic Infrastructure Choices• 6.3 Climate Action	<ul style="list-style-type: none">• % Increase of Distributed Renewable Energy for City Facilities



Focus Area 2. Responsible & Reliable Clean Energy Supply
Solution F. Increase Community-Based Distributed Renewable Energy Generation

Action 2.F.2. Streamline Solar Permitting and Adopt Solar-Ready Code Provisions

The City will continue to simplify and improve the permitting process for on-site renewable energy projects and begin tracking system installations to help estimate our communities' local generation potential.

Renewable energy options will be included in a voluntary above-code incentive program and the City will partner with developers and homeowner's associations to design model covenants that encourage more permissive and supportive frameworks for installing rooftop solar PV.

Further, with the adoption of the 2018 IECC and the solar-ready appendix, the City will evaluate the feasibility of adopting the appendix as a part of the local building code. This would help ensure that all new buildings are prepared to integrate cost-effective solar PV installations at a later date.



Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• City of Bozeman• Solar Installers• Southwest Montana Building Industry Association• Montana Code Collaborative• Montana Dept. of Environmental Quality• Montana Renewable Energy Association• NorthWestern Energy	<ul style="list-style-type: none">• 2.1 Business Growth• 4.2 High-Quality Urban Approach• 6.3 Climate Action	<ul style="list-style-type: none">• Adoption of the 2018 IECC solar ready appendix• Achieve SolSmart designation for solar permitting

Focus Area 2. Responsible & Reliable Clean Energy Supply
Solution F. Increase Community-Based Distributed Renewable Energy Generation

Action 2.F.3. Advance Distributed Solar Policies

Building on the success of the [Bozeman Solar Project](#), the City will evaluate all future options for this project with NorthWestern Energy, including co-investing to expand the project and develop a new tariff for utility-owned community solar. The City will partner to study a variety of public and private opportunity areas for community solar, evaluate rate models, and potential equity solutions to make community solar more accessible to all Bozeman residents.

In addition, the City will collaborate with renewable energy stakeholders to consider utility business model reform policies designed to remove the inherent disincentive for utilities to promote energy efficiency and distributed renewable energy generation. Given the limitations within Montana law to pursue local energy choice, the City may pursue state legislation to allow community solar, net energy metering aggregation, and net energy metering over 50 kW.

The City will continue to build the partnerships with Montana State University to test and learn from pilot renewable energy projects, including new technologies, financing models, community microgrids, and energy storage (e.g., off-duty school buses).

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	<ul style="list-style-type: none">• City of Bozeman• NorthWestern Energy• Montana Legislature• Public Service Commission• Montana Consumer Counsel• Energy and Environment Non-profits• Montana State University	<ul style="list-style-type: none">• 2.1 Business Growth• 6.3 Climate Action	<ul style="list-style-type: none">• Approval of a Community Solar Tariff through the PSC• Establishment of NorthWestern Energy community solar project

Focus Area 2. Responsible & Reliable Clean Energy Supply
Solution F. Increase Community-Based Distributed Renewable Energy Generation

Action 2.F.4. Promote Education and Incentives for Distributed Renewable Energy and Storage

The City and its partners, such as the Montana Renewable Energy Association, can work to improve access to solar energy by facilitating group purchasing of rooftop solar systems for Bozeman area residents. Allowing multiple homeowners to come together and aggregate their purchase reduces costs, making solar more affordable for many more households. The City will help develop resources and explore incentives to encourage residential and business investment in rooftop solar and energy storage, including current financing resources for renewable energy (see also supporting Action 1.A.6).

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 3	<ul style="list-style-type: none">• City of Bozeman• NorthWestern Energy• Montana State University• Montana Weatherization Training Center• Montana Renewable Energy Association• Financial Institutions	<ul style="list-style-type: none">• 1.2 Community Engagement• 6.3 Climate Action	<ul style="list-style-type: none">• Establish a method of tracking distributed renewable installations• % increase in commercial and residential renewable energy installations



Increasing Resiliency to Climate Hazards

The following opportunities and considerations summarize how the solutions in this chapter can help improve resiliency to future climate hazards.

Opportunities	Considerations
	Extreme Heat
<ul style="list-style-type: none"> A more diverse and distributed energy supply may have more capacity to handle wider fluctuations in demand. Distributed energy and storage can increase the grid's capacity to accommodate spikes in demand during extreme temperatures. 	<ul style="list-style-type: none"> Cooling demand on hot days could exceed renewable energy capacity. Community members may feel less motivated to practice efficiency if energy comes from “clean” sources.
	Flooding
<ul style="list-style-type: none"> Increased flows associated with large rain events could support micro-hydro systems. 	<ul style="list-style-type: none"> Floods may pose a risk to micro-hydro or other renewable energy infrastructure.
	Drought & Mountain Snowpack
<ul style="list-style-type: none"> 100% renewable mix could decrease water consumption associated with fossil fuel energy production long-term. Increasing the generation capacity of solar and wind can help reduce reliance on hydropower. 	<ul style="list-style-type: none"> Drought could increase water costs, leading to high overall utility cost burden. Drought could inhibit generation dependent on water (hydro, steam, solar heated water).
	Wildfire
<ul style="list-style-type: none"> Distributed energy and storage could decrease the number of customers impacted by grid disruptions due to wildfires. 	<ul style="list-style-type: none"> Smoke and ash may inhibit solar energy generation. Solar and wind infrastructure located within the wildland urban interface could be at risk for damage.
	Winter Storms
<ul style="list-style-type: none"> Distributed energy and microgrids can decrease the number of customers impacted by grid disruptions due to winter storms. Solar PV installed on steep roof pitches improves winter production and sheds snow more quickly. 	<ul style="list-style-type: none"> Accumulation of snow, ice, and extreme wind can inhibit solar and/or wind generation. May be challenging to service a decentralized system in the event of a severe winter storm. Siting of ground mounted PV should be tall enough to allow for snow accumulation from snowfall and clearing of panels.



Focus Area 3: Vibrant & Resilient NEIGHBORHOODS

Bozeman has a strong commitment to neighborhood and community planning to promote public health and safety, create a functional community that is beautiful and efficient, balance the desires of developers and community members, and support economic development. In addition to these benefits, well designed neighborhoods can help reduce the distance residents need to travel to work or to access services. This is important because it reduces transportation GHG emissions by facilitating a transition to active modes of transportation and reducing the miles traveled in personal vehicles. In 2018, transportation emissions made up 38% of community GHG emissions, and 19% of total emissions were from light-duty vehicles. Various plans, policies, and regulations exist to shape community growth, enhance existing community assets, and protect important resources. Moreover, these planning resources help establish the foundation for many other solutions and community investments such as buildings, infrastructure, transportation, and natural systems.

Per the [2020 Community Plan](#), Bozeman's Planning Area is generally the area of the City's future municipal water and sewer service boundary. It includes the City of Bozeman as well as a half-mile to two-mile area around, but outside, the City limits in the Gallatin County jurisdictional area. The Planning Area is nearly 70.8 square miles. The City's current footprint is 20.4 square miles. Since 1988, Bozeman has annexed, at landowners' request, more than 6,650 acres of land, about 10.3 square miles—more than doubling its size.

The projected land demand through 2040, based on estimated population growth, ranges from 3,820 acres to 5,716 acres, depending largely on levels of density in future residential developments. Faster rates of population growth will require additional land area. The 2020 Community Plan encourages development within the municipal boundaries where City services are available and thoughtful development in the Planning Area is guided by the Community Plan's goals and policies.

The neighborhood-focused solutions in this chapter support these existing planning resources and aim to further connect land use planning and development decision-making with climate-related considerations. They seek to reduce risk and vulnerability to natural hazards and to strengthen neighborhood capacity and resiliency. While the City of Bozeman can establish regulations and policies to inform investment and guide decision-making, private property owners have important roles to play in shaping neighborhood vibrancy and advancing resiliency.

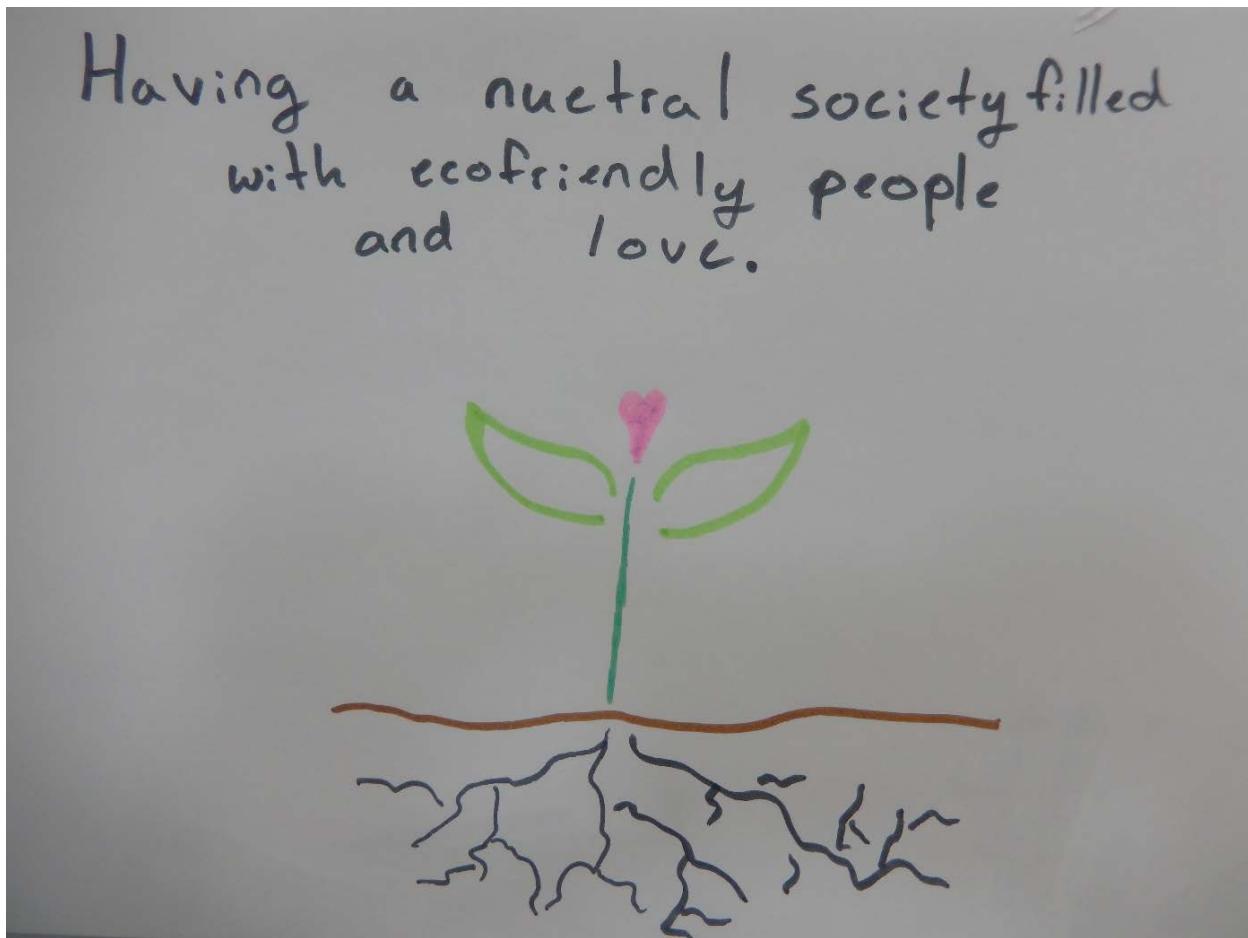
RELATED PLANS & STUDIES

- [Unified Development Code](#)
- [2020 Community Plan](#)
- [The Guidelines for Historic Preservation & The Neighborhood Conservation Overlay District](#)
- [Midtown Action Plan](#)
- [Triangle Community Plan](#)

These solutions are strongly tied to improving community resiliency, and compact development is also an important long-term strategy for reducing transportation-based emissions. Compact and efficient development patterns can lead to reduced building energy consumption on a per-unit basis, though new construction will likely lead to increased energy use overall, unless net zero construction practices are employed. To support achievement of the GHG emissions and community resiliency goals, the Bozeman community will need to:

- **Solution G. Facilitate Compact Development Patterns**
Proactively plan existing and future land uses to reduce the distance people need to travel for work and to access shopping and services.
- **Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards**
Leverage neighborhood and infrastructure design to improve capacity to adapt to natural hazards including wildfire, flooding, drought, extreme heat, and winter storms.
- **Solution I. Enhance Social Infrastructure and Community Preparedness**
Build social capital to improve community capacity to adapt to natural hazards and find resiliency in times of crisis.

Figure 18 shows the impact of solutions in this focus area on projected business as usual emissions and detailed fuel-saving targets for each goal year are shown in Table 8. Note that energy efficiency benefits from compact development patterns are accounted for in Solution B.



Focus Area 3. Vibrant & Resilient Neighborhoods

Increasing Resiliency to Climate Hazards

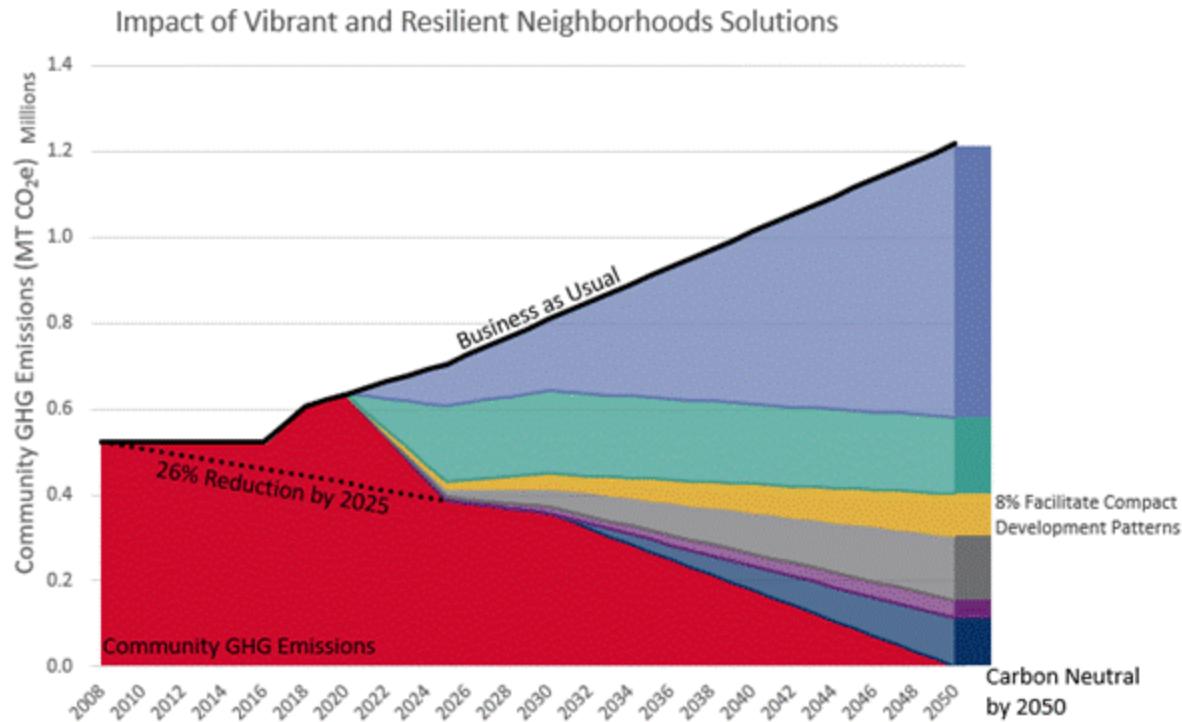


Figure 18. Projected neighborhoods GHG reductions by solution

Table 8. Projected neighborhoods solution mitigation targets

Solution	Metric (annual savings)	Target	Target	Target
		2025 Paris Accord	2030 100% Net Clean Electricity	2050 Carbon Neutral
Solution G. Facilitate Compact Development Patterns	Gasoline (gallons)	1.9 million	3.8 million	11.2 million

Focus Area 3. Vibrant & Resilient Neighborhoods

Solution G. Facilitate Compact Development Patterns

Solution G. Facilitate Compact Development Patterns

This solution emphasizes the importance of proactively planning existing and future land uses to reduce the distance people need to travel for work and to access shopping and services. Compact development can be difficult to achieve in some areas of historic growth within the City, so context-sensitive infill development and redevelopment approaches are essential. For future growth and development, leveraging key planning resources such as the future land use map and Unified Development Code can help spur compact development and compatible infill and redevelopment activities.

Compact development encourages or supports smaller lot sizes, reduced setbacks, multiple units per property, and multi-story buildings in appropriate locations. However, compact development patterns do not stop at the property line. For compact development to function properly, the public right-of-way must accommodate all users, including pedestrians, bicyclists, and transit users, in addition to those that need to move around by car. In addition to the physical design, compact development must also encourage the right mix of uses. Incorporating essential land uses, such as grocery stores, medical centers, offices, and beyond, is crucial to ensure that compact development improves access to employment, goods, and services.



Focus Area 3. Vibrant & Resilient Neighborhoods

Solution G. Facilitate Compact Development Patterns



Though compact development can improve access to goods and services, it is important to consider: who is gaining access and who is left behind? The [2019 City of Bozeman Community Housing Needs Assessment](#) showed that between 5,400 to 6,340 housing units are needed over the next five years to address the current housing shortfall for residents and the workforce and to keep up with job growth. Even where residential and commercial land uses are well mixed, residents may be forced to live in more affordable housing miles from where they are employed. Exacerbating this issue, improving access to goods and services can increase property values, which may make purchasing or renting a home even less attainable, pushing residents further away from these compact nodes. Fortunately, there are means of mitigating these unintended consequences. By encouraging, incentivizing, or even requiring the inclusion of affordable housing as part of compact development and redevelopment, residents typically pushed further away from activity centers can afford to live near goods and services.



In addition to improving resiliency and reducing greenhouse gas emissions, compact development can yield many co-benefits. By reducing the distance residents need to travel to access employment, goods, and services, compact development can support an uptick in the adoption of active modes of travel. In addition to reducing pollution associated with car travel, residents are able to engage in more active forms of transportation (e.g., biking and walking) and may reap the health benefits of increasing their physical activity. For many residents, compact development can also increase social cohesion by removing barriers to social interaction and increasing opportunities for gathering in shared community spaces.



The City of Bozeman can lead by example by siting and designing all future community facilities in a manner that demonstrates compact development best practices. Furthermore, the City has a distinct role to work with the development community to guide new development and redevelopment toward compact patterns.

This solution primarily addresses Bozeman's greenhouse gas mitigation goals, while also providing supporting resiliency benefits.



Related Solutions

- Solution B. Achieve Net Zero Energy New Construction
- Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards
- Solution I. Enhance Social Infrastructure and Community Preparedness
- Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit
- Solution P. Manage Land and Resources to Sequester Carbon

Focus Area 3. Vibrant & Resilient Neighborhoods

Solution G. Facilitate Compact Development Patterns

Action 3.G.1. Continue Regional Coordination on Compact Growth and Sustainable Development

The current land area of the City of Bozeman is approximately 20.4 square miles. However, the City's planning area is nearly 70.8 square miles. Much of the land in Bozeman's planning area lies within Gallatin County's jurisdiction. Though the 2020 Community Plan encourages development within the municipal boundaries, growth pressures will necessitate careful coordination between the City and County to ensure sustainable development patterns as Bozeman grows into its planning area.

Current projections estimate Bozeman may need to annex between 3,820 and 5,716 acres of land by 2040. Annexing additional land will necessitate significant investment in sewer, water, and other infrastructure. By working closely with regional partners to promote compact growth, primarily within existing city limits, Bozeman can limit the total acreage of land required to accommodate new growth. Regardless, promoting compact growth within and outside of city limits will require careful consideration and implementation of resource conservation efforts and maintenance and upgrade cycles to ensure existing and new infrastructure can accommodate new growth.

Aligning around shared sources of current and future data is foundational to coordinated land use planning. For instance, the City and County may agree to use the same scenario-based software to evaluate the economic and environmental impacts of new development. In addition to sharing data sources and design standards for infrastructure, City and County Departments should develop land use and infrastructure plans to help guide projected growth locations. Finally, the inclusion of safe, accessible, and diverse transportation options is paramount to achieving the goal of compact and sustainable development. Specific to this action item, the City and County will coordinate on regional multi-modal connections to ensure a high functioning network of compact development.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• City of Bozeman• City of Belgrade• Gallatin County	<ul style="list-style-type: none">• 4.1 Informed Conversation on Growth• 6.3 Climate Action	<ul style="list-style-type: none">• # of Education/Training Sessions or Engagement with City and Regional Elected Officials• # of Coordinated Efforts and Planning Efforts that Promote Consistency throughout the Region for Parks, Transportation, Transit Service, and Other Community Infrastructure

Focus Area 3. Vibrant & Resilient Neighborhoods

Solution G. Facilitate Compact Development Patterns

Action 3.G.2. Revise Development Code to Enhance Compact and Sustainable Development

At the local level, the Unified Development Code (UDC) is one of the most influential documents guiding the form and character of a community. This action is focused on ensuring the UDC, as well as other relevant City Code chapters, continue to support infill development, redevelopment, and high-quality mixed use development. As new areas are developed and existing areas redeveloped to sustainable code standards, Bozeman will continue to move toward a future where households are near the goods, services, and amenities essential to a high quality of life.

Already the City of Bozeman has taken substantial steps to facilitate compact development (e.g., by allowing Accessory Dwelling Units (ADUs) by right, by reducing minimum lot sizes by 60%, and by diversifying zoning districts to allow for a mix of uses). This action item seeks to build on activities to date.

To achieve this, the City can identify additional opportunities in the UDC to enhance compact development requirements (e.g., additional mixed use, reduced parking requirements with installed EV infrastructure, etc.). The City will explore options to encourage development above and beyond minimum requirements, such as incentive programs or performance policies. Though voluntary compliance and performance-based programs often require additional coordination with developers, if designed well, these systems can help push the envelope and ensure investment in desired amenities, such as multi-modal and transit infrastructure, low impact development, sustainable landscaping, and neighborhood gathering spaces. Neighborhood gathering spaces and other opportunities for social cohesion are a critical component of sustainable development.

Implementation activities within this action item will require coordination with utilities to better understand, accommodate, and plan for site constraints associated with compact development. This will include preparation for building and transportation electrification and ensuring adequate plans for maintaining and upgrading sewer, water, and other utilities.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• City of Bozeman• Downtown and Midtown Urban Renewal Districts	<ul style="list-style-type: none">• 4.1 Informed Conversation on Growth• 4.2 High Quality Urban Approach• 4.3 Strategic Infrastructure Choices• 6.3 Climate Action	<ul style="list-style-type: none">• UDC revisions that reflect density increases, such as maximum building height limits, minimum development intensity requirements, or elimination or reduction of minimum parking requirements• Number of new residential or commercial units built in existing neighborhoods or developed areas in City limits• Adopted land use management techniques and incentives that promote development within City limits

Focus Area 3. Vibrant & Resilient Neighborhoods

Solution G. Facilitate Compact Development Patterns

Action 3.G.3. Develop Sustainable Neighborhoods Outreach

While the City of Bozeman can establish regulations and policies to inform investment and guide decision-making, private property owners have important roles to play in shaping neighborhood vibrancy and advancing resiliency. This action focuses on empowering neighborhood partners to enact sustainable practices at the scale of the neighborhood, street, condo complex, or apartment building.

For this action, the City will partner with developers, neighborhood groups, and community members to develop and share education and engagement campaigns that allow neighborhoods to connect, participate in the sharing economy, and learn about sustainable housing options. Creating a recognition program for sustainable neighborhoods and developers will facilitate the sharing of best practices, while providing a competitive edge for developers. Homeowners' associations will be key partners in the development of shared community amenities, such as "thingery sheds" and lending libraries. The City will help promote successes and encourage the adoption of sustainable practices by creating and sharing case studies, promotional materials, and resources regarding the benefits of ADUs, co-housing and cottage developments, and local sharing economies.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	<ul style="list-style-type: none">• City of Bozeman• Inter Neighborhood Council• Bozeman Climate Partners Working Group• Homeowner's Associations• Montana State University	<ul style="list-style-type: none">• 1.1 Outreach• 4.1 Informed Conversation on Growth• 6.3 Climate Action	<ul style="list-style-type: none">• # of contacts with Neighborhood Associations, HOAs, and community leaders• # of trainings offered to Neighborhood Associations, neighborhoods, or community groups

Focus Area 3. Vibrant & Resilient Neighborhoods

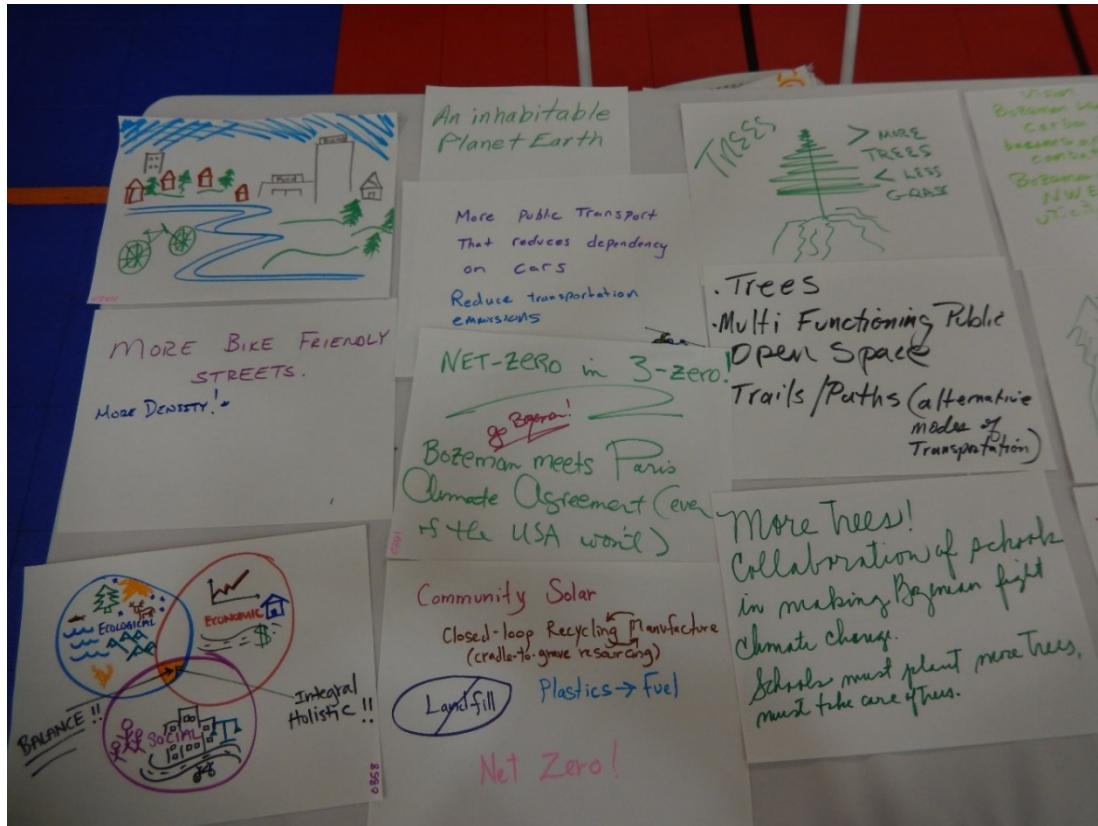
Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards

Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards

This solution focuses on improving the capacity of Bozeman to adapt to natural hazards, including wildfire, flooding, drought, extreme heat, and winter storms, through the lens of neighborhood and infrastructure design. Reducing the vulnerability of neighborhoods and infrastructure can be split into two key activities: siting and design.

To the extent practicable, neighborhoods and infrastructure should be sited in safe locations (i.e., away from floodplains or wildfire activity areas). In some instances, siting neighborhoods and infrastructure in vulnerable locations may be unavoidable; in these cases, additional measures may be necessary to bolster infrastructure against hazards. Design can play an important role in reducing vulnerability against all hazards. Sites can be designed using low impact development or green infrastructure techniques to mitigate runoff and reduce the risk of flooding. On a smaller scale, buildings can be designed to withstand extreme conditions and protect inhabitants. For example, insulating walls and pipes and designing roofs to withstand heavy snows and prevent ice dams can protect inhabitants in the event of a severe winter storm. Critical infrastructure, such as roads, bridges, power lines, water treatment plants, parking structures etc., should also be designed to withstand extreme conditions, such as flooding, wildfires, high winds, and winter storms.

The building code, UDC, and other City Code chapters are foundational to resilient neighborhood and infrastructure design. For example, overlay districts can serve to restrict development in the floodway, while building codes can require the incorporation of flood-resistant building design. Through partnerships with Gallatin County Emergency Management, the City develops the appropriate plans for



Focus Area 3. Vibrant & Resilient Neighborhoods

Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards

managing risk in hazardous areas, including the potential relocation process for damaged property and infrastructure.



When developing in a manner that reduces the vulnerability of neighborhoods and infrastructure to hazards, it is important to consider how different socio-economic characteristics may increase vulnerability. Older adults or persons with disabilities may be less mobile and therefore more vulnerable in the event of a disaster. Alternatively, immobility may stem from a person's or family's economic status. Low-income residents may be less able to move or recover from a disaster. In many cases, low-income neighborhoods are sited in less desirable locations, such as within floodplains, which can put community members especially at risk. Often, mobile home communities are some of the most vulnerable neighborhoods, due to a combination of construction quality, siting, and limited economic mobility of residents.



Resilient neighborhood and infrastructure design can dramatically improve public health and life-safety outcomes in the event of natural disasters. For instance, buildings designed to withstand flooding may reduce vulnerability to property damage while also protecting the public health and safety of residents.



The City of Bozeman can lead by example by continuing to implement the [Bozeman Climate Vulnerability Assessment and Resiliency Strategy](#) to bolster the resiliency of identified City assets.

This solution primarily addresses Bozeman's resiliency goals, with minimal impact on the greenhouse gas mitigation goals.



Resiliency Benefits

- Strengthen infrastructure to natural disaster
- Mitigate property and economic losses
- Protect human health

Related Solutions

- Solution B. Achieve Net Zero Energy New Construction
- Solution F. Increase Community-Based Distributed Renewable Energy Generation
- Solution G. Facilitate Compact Development Patterns
- Solution I. Enhance Social Infrastructure and Community Preparedness
- Solution O. Manage and Conserve Water Resources

Focus Area 3. Vibrant & Resilient Neighborhoods

Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards

Action 3.H.1. Plan for Resilience Hubs at Critical Facilities

The 2019 Climate Vulnerability Assessment & Resiliency Strategy included a vulnerability assessment of 24 municipal buildings and facilities, organized into three primary building functions: critical city facilities, community centers, and critical infrastructure. Together, critical facilities are the structures and services necessary to meet the daily needs of the community. This includes water and wastewater treatment plants, police and emergency services departments, municipal administration, and community centers, among others. Ensuring continuous operation of these facilities and services is paramount to the safety and well-being of Bozeman community members, especially in the event of shocks and stressors. Importantly, if designed appropriately, critical facilities can serve as resilience hubs during emergencies such as extreme heat, hazardous air quality, severe winter storms, and wildfire.

This action calls for the development of one or more resiliency hub demonstration project(s) at a critical facility that showcases structural and operational resiliency, renewable energy plus storage, energy and water efficient building design, and best practices in stormwater management. This will allow these facilities to function as hubs for coordinated emergency response and recovery during periods of community stress or crisis.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• City of Bozeman• Gallatin County Emergency Management• Greater Gallatin United Way• Human Resources Development Council	<ul style="list-style-type: none">• 1.3 Public Agencies Collaboration• 3.1 Informed Conversation on Growth• 6.3 Climate Action	<ul style="list-style-type: none">• Establish plan for resilience hubs based on community needs• Completion of a demonstration resilience hub

Focus Area 3. Vibrant & Resilient Neighborhoods

Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards

Action 3.H.2. Advance Resilience in Development Code and Development Review

The UDC is central to resilient neighborhood and building design. The UDC, in conjunction with the development review process, determines both where new development is located and how it is designed. Thus, ensuring the development process discourages growth near potential hazards (e.g., floodplains, the wildland urban interface) while encouraging resilient design can have a significant impact on public health and safety.

Ensuring pathways to advance low impact development (LID) will be crucial. Low impact development is essential to effectively manage stormwater, especially as the community promotes compact design and the intensity of storm events increases. Where the building code is hindered by State-level requirements, Bozeman will explore opportunities to require or provide incentives to encourage the use of sustainable (i.e., sturdy, fire-resistant, and efficient) building materials and practices, green infrastructure, and climate-adaptive landscapes, among other best practices.



Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• City of Bozeman	<ul style="list-style-type: none">• 1.1 Outreach• 3.2 Health & Safety Action• 6.3 Climate Action	<ul style="list-style-type: none">• GIS data mapping for environmentally sensitive and/or hazard-prone areas• # of LID or flood control infrastructure installations (e.g., permeable pavers, bioretention facilities, rain gardens, and infiltration galleries)

Focus Area 3. Vibrant & Resilient Neighborhoods

Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards

Action 3.H.3. Support Residential and Business Preparedness Outreach

Even as infrastructure evolves and improves, individual and neighborhood preparedness will be paramount to strengthening resiliency in the face of anticipated climate risks and hazards. This action focuses on supporting business, households, and neighborhood-scale emergency planning and preparedness.

Mapping areas of high risk and vulnerability (e.g., floodplains and wildland urban interface) is an important first step when developing a preparedness outreach campaign. Though some of these maps already exist, it will be important for the City to periodically update maps to reflect current and ever-changing conditions. [Neighborhoods at Risk](#), developed by Headwaters Economics, is an interactive data tool that provides neighborhood-level information about potentially vulnerable people and climate change. Maps can be used to help focus on vulnerable areas of the community and to communicate the importance of preparedness. Importantly, the preparedness campaign will identify actionable steps community members can take to mitigate and adapt to potential hazards. Additional implementation activities may include developing action plans in partnership with businesses and neighborhoods to further mitigate risk and improve resiliency.

The City Stormwater Division's education and outreach program can serve as a model and touchpoint for sharing information and best practices related to residential and business preparedness related to green infrastructure, and maintenance of public and private stormwater infrastructure for flood mitigation.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	<ul style="list-style-type: none">• City of Bozeman• Gallatin County Emergency Management• Montana State University• Greater Gallatin United Way• Human Resources Development Council• Southwest Montana Community Organizations Active in Disaster• Homeowners' Associations	<ul style="list-style-type: none">• 1.1 Outreach• 3.2 Health & Safety Action• 6.3 Climate Action	<ul style="list-style-type: none">• Development of outreach plan based on assessment of hazard• # of residential and business preparedness toolkits distributed• # of businesses or residents reached through outreach efforts• # of participants in the Stormwater Division's Adopt a Drain program

Focus Area 3. Vibrant & Resilient Neighborhoods

Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards

Action 3.H.4. Incorporate Resilience into Infrastructure Plans

The 2019 Climate Vulnerability Assessment and Resiliency Strategy includes a strategy focused on infrastructure and capital planning. The scope of the study was limited to city assets. While infrastructure and capacity outside of the city's purview was considered in the risk assessment, it was not a comprehensive evaluation of the community. The infrastructure and capital planning strategy emphasizes planning for critical facility infrastructure hardening and capital projects that limit damage to property, protect human health, and improve operational performance during and after hazard events. Supporting actions include the following:

- Continuing to build out back-up power, mobile back-up power, fuel storage, and communications redundancies for buildings and infrastructure.
- Increasing air filtration capabilities in critical facilities to cope with wildfire smoke.
- Providing covered parking for first responder vehicles and critical snow removal equipment to ensure reliable service and improve response time during extreme weather events.
- Evaluating the need for heat, air conditioning, or passive cooling within City facilities to protect the health and safety of employees and users
- Pursuing automated dam controls at Middle Creek Dam to improve operational flexibility and enhance our ability to respond to wildfire or flood events.
- Continuing to assess the feasibility of watershed or aquifer groundwater storage and recovery projects, including strategic water reserves.
- Continuing to pursue science-based forest restoration measures to protect the municipal watershed.
- Prioritize Continuity of Operations planning with Montana State University and other agencies.

This action reinforces the strategy and actions in that plan and emphasizes embedding resiliency considerations into all future capital improvement planning and design. Ultimately, this may involve establishing resiliency criteria into capital improvement prioritization processes or adopting resiliency standards for City infrastructure projects.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	• City of Bozeman	<ul style="list-style-type: none">• 3.1 Informed Conversation on Growth• 3.2 Health & Safety Action• 6.3 Climate Action	<ul style="list-style-type: none">• Adoption of resiliency guidelines or prioritization criteria for infrastructure plans

Focus Area 3. Vibrant & Resilient Neighborhoods
Solution I. Enhance Social Infrastructure and Community Preparedness

Solution I. Enhance Social Infrastructure and Community Preparedness

This solution focuses on building social capital to improve the capacity of Bozeman to adapt to natural hazards and find resiliency in times of crisis. Though hard infrastructure is critical to preserve function in the face of a disaster, social infrastructure and community preparedness can be invaluable when it comes to rebuilding the community and bouncing back quickly. This means expanding the ability for community members to be self-sufficient, while simultaneously building the capacity to support each other when faced with adversity. Recent events like the COVID-19 pandemic reveal how social norms and infrastructure, like social distancing practices, shape a community's ability to adapt and recover.

A strong social infrastructure is one that connects community members to the resources they need to remain resilient in the face of adversity. Enhancing social infrastructure includes encouraging and supporting authentic connections amongst neighbors and community members to support physical, mental, and emotional needs. This connection can occur virtually, through virtual neighborhood platforms and digital communications, as well as in-person, through block parties or community volunteer events.



Focus Area 3. Vibrant & Resilient Neighborhoods

Solution I. Enhance Social Infrastructure and Community Preparedness



Building strong social infrastructure is a key component of preparedness, especially since some community members may lack the ability to be self-sufficient when facing different types of challenges or crises. A strong social fabric can help ensure all community members are included and not forgotten. Education is a crucial component of cultivating community preparedness and social infrastructure. Instilling individual and shared responsibility for preparedness can greatly reduce overall community risk, while allowing preventative and recovery resources to be funneled toward community members least able to protect themselves or respond to crises or disasters.



Enhancing social infrastructure and community preparedness for a diverse community will require accommodating diverse needs. Educational materials should be made available in multiple languages and for the hearing impaired. Meetings intended to bring together a cross-section of the community should include consideration for free transportation, access for persons with disabilities, childcare, translators, and safe spaces for the LGBTQ community.

Connecting community members to their neighbors, community partners, and City resources may reduce the isolation and vulnerability of individual persons and families by creating a network of connected resources able to lend support in the event of a crisis or disaster. Additionally, ensuring community members are fully informed and prepared before a crisis or disaster can reduce risk and vulnerability.



The City of Bozeman can lead by example by siting and constructing community centers and neighborhood gathering spaces to foster social connections and build a sense of community. Community centers should cater to Bozeman's diverse population by including programming and communications in multiple languages, and by being accessible to persons with differing abilities. Finally, community and neighborhood centers should include spaces and programming to include and support Bozeman's most vulnerable community members, including older adults, racial minorities, economically disadvantaged families, persons with disabilities, and the LGBTQ community.

This solution primarily addresses Bozeman's resiliency goals, with minimal impact on the greenhouse gas mitigation goals.



Resiliency Benefits
<ul style="list-style-type: none">• Increase social cohesion• Mitigate property and economic losses• Protect human health

Related Solutions

- Solution G. Facilitate Compact Development Patterns
- Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards
- Solution M. Move Toward a Circular Economy and Zero Waste Community
- Solution N. Cultivate a Robust Local Food System

Action 3.I.1. Support Community and Neighborhood Resilience Programming

Resilience programs are place-based initiatives that empower community members to build connections, skills, and resources to be prepared, adaptable, and responsive in the face of adversity and challenges. Though grassroots efforts can be a highly effective means of change, response, and community support, they are even more impactful when well-aligned with City, regional, and State-level efforts. This action is focused on aligning neighborhood resilience programming with existing efforts such as Climate Smart Montana, the Montana Resilience Framework, and the Southwest Montana Community Organizations Active in Disaster (COAD) response, as well as expanding new resilience programming efforts.

The COVID-19 pandemic and resurgence of civil rights movements have highlighted the imperative of neighborhood-level resilience and social cohesion. Though the impacts of this pandemic have been far-reaching and severe, there are many lessons that Bozeman can carry forward to capture, build on, and leverage the change and connections formed in response to COVID-19. For instance, the City will explore the feasibility of institutionalizing mutual aid programs grown organically in response to COVID-19.

Other actions include hosting social infrastructure assessments and trainings, process debriefs and listening sessions to better understand successes and areas of opportunity in response to shocks and stressors, and community or neighborhood networking events to support social cohesion. The City will also work to connect residents with resources for mental health and personal resilience.

The City can support local resilience building activities by connecting community partners with resources, such as free meeting spaces or community-building grants to support small-scale cohesion activities and projects.

Priority	Lead & Implementing Partners	Strategic Alignment	Plan	Performance Measures
Level 1	<ul style="list-style-type: none"> • City of Bozeman • Greater Gallatin United Way • Inter Neighborhood Council • Community Organizations Active in Disaster (COAD) • Bozeman Mutual Aid Network • Bozeman Community Foundation • Bozeman Help Center • HRDC and Gallatin Valley Food Bank 	<ul style="list-style-type: none"> • 1.1 Outreach • 3.2 Health & Safety Action • 6.3 Climate Action 		<ul style="list-style-type: none"> • Development of a Resilient Neighborhoods Toolkit • Number of City-organized or Partnered Trainings or Events

Increasing Resiliency to Climate Hazards

The following opportunities and considerations summarize how the solutions in this chapter can help improve resiliency to future climate hazards.

Opportunities	Considerations
	Extreme Heat
<ul style="list-style-type: none"> Compact development can reduce distance needed to travel to access goods and services, which may be helpful during periods of extreme heat. Public facilities can be designed to provide community members a refuge from extreme heat. Development can be designed to reduce pavement and incorporate trees and green infrastructure to mitigate potential urban heat island impacts. 	<ul style="list-style-type: none"> Compact development without the incorporation of green infrastructure could increase in average urban temperatures
	Flooding
<ul style="list-style-type: none"> Green stormwater infrastructure can slow the influx of water and reduce vulnerability to flooding. Avoiding construction in flood prone areas will reduce risk posed to new development. 	<ul style="list-style-type: none"> Compact development and increased volumes of water during flooding events will increase demands on stormwater planning and infrastructure. Much of Bozeman's land area is located in areas with a high water table.
	Drought & Mountain Snowpack
<ul style="list-style-type: none"> Compact development can help reduce the water demands associated with outdoor landscaping. 	<ul style="list-style-type: none"> Frequent and intense periods of drought will impact the City's ability to accommodate growth, meet the needs of water users, and provide essential municipal services.
	Wildfire
<ul style="list-style-type: none"> Neighborhoods near WUI areas can be designed with wildfire considerations and emergency access in mind. 	<ul style="list-style-type: none"> Compact developments within or near WUI areas may put large populations at risk of smoke exposure or property loss if wildfire occurs.
	Winter Storms
<ul style="list-style-type: none"> Compact development decreases miles of streets that need to be plowed. Compact development can reduce distance needed to travel to access goods and services, which may be beneficial during winter storms. 	<ul style="list-style-type: none"> Compact development needs to accommodate snow removal equipment and snow storage.



Focus Area 4:

Diverse & Accessible TRANSPORTATION OPTIONS

In 2018, the transportation sector accounted for 38% of total emissions in Bozeman. Emissions from this sector are on the rise with total vehicle miles traveled (VMT) per person increasing and a large share of transportation emissions coming from light-duty gas and diesel vehicles. According to the [Bozeman Community Plan](#), 70% of Bozeman commuters drive alone, with an average commute time of 14.5 minutes. Reductions in VMT can be achieved through compact development patterns that reduce trip lengths or needs, as well as pedestrian-centered design that supports non-vehicular modes of travel such as bicycling and walking.

Telecommuting can lead to significant reductions in VMT, but when coupled with increased reliance on e-commerce activities and delivery services, those VMT reductions can be diminished. Emerging transportation and vehicle technologies such as drones, self-driving cars, and shared and autonomous fleets may also play a role in coming years in reducing trip volumes and overall VMT.

As the Bozeman community reaches a population greater than 50,000 residents (a likely milestone with the 2020 Census), federal law mandates the establishment of a Metropolitan Planning Organization (MPO). MPOs receive federal funds for carrying out transportation planning and programming in their metropolitan areas. The MPO will be a new tool to assist the greater Bozeman area in all facets of coordinated transportation planning and improvements.

As with the energy-related solutions, conservation and efficiency in the transportation system is essential to reduce emissions. Higher-efficiency transportation solutions include carpooling, hybrid electric and other fuel-efficient vehicles, and public transit. Streamline Transit, the Bozeman community bus service, provides free fixed-route bus service in and around Bozeman as well as commuter routes to Belgrade and Livingston. The highest conserving and least emitting transportation options include active and non-vehicular modes such as walking, bicycling, and other micro-mobility equipment like scooters and skateboards.

Just like the energy solutions that shift to more renewable energy sources, solutions to reduce transportation emissions also include shifting vehicles and equipment fuels from gasoline and diesel to electric and other alternative sources, such as biodiesel or hydrogen fuel cells. Solutions to address vehicle efficiency and fuel types are applicable to both personal vehicles as well as fleet vehicles and equipment.

Now the busiest airport in Montana, the Bozeman-Yellowstone International Airport is also a growing contributor to the community's transportation emissions. Few alternatives to traditional air travel

RELATED PLANS & STUDIES

- [2020 Bozeman Yellowstone International Airport Master Plan](#)
- [Midtown Action Plan](#)
- [Redesign Streamline 2020](#)
- [Triangle Community Plan](#)

Focus Area 4. Diverse & Accessible Transportation Options

Increasing Resiliency to Climate Hazards

currently exist, so the solutions in this chapter emphasize trip reduction and advocacy for new technologies.

Because transportation-related emissions are an increasing portion of the City's inventory, concerted efforts will need to be made to reduce overall VMT, as well as greatly enhancing the efficiency of all personal and fleet vehicles and equipment. To reduce VMT, enhance transportation efficiency, and reach GHG emissions and community resiliency goals, the Bozeman community will need to:

- **Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit**
Shift travel modes away from single-occupancy vehicles and grow the percentage of community members walking, bicycling, carpooling, avoiding or consolidating vehicle trips, and using transit.
- **Solution K. Decrease Direct Vehicle Emissions**
Promote and transition to more efficient vehicles, vehicles that use alternative fuels, and electric vehicles.
- **Solution L. Improve Air Travel Efficiency**
Support the development of alternatives to traditional air travel, as well as offering alternatives to air travel.

Detailed fuel and energy saving targets for each goal year are shown in Table 9: Projected transportation mitigation targets.

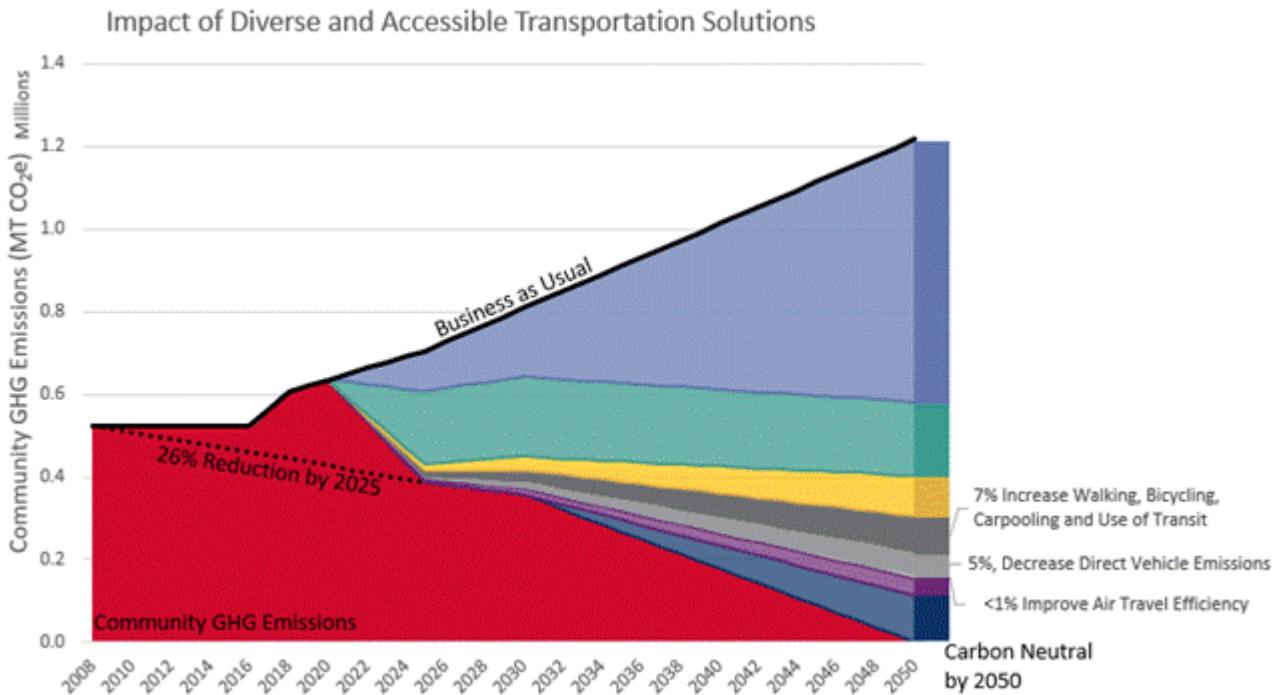


Figure 19. Projected transportation GHG emissions reduction by solution

Focus Area 4. Diverse & Accessible Transportation Options

Increasing Resiliency to Climate Hazards

Table 9. Projected transportation mitigation targets

Solution	Metric (annual savings)	Target	Target	Target
		2025 Paris Accord	2030 100% Net Clean Electricity	2050 Carbon Neutral
Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit	Gasoline Savings (gallon)	1.7 million	3.4 million	10.2 million
Solution K. Decrease Direct Vehicle Emissions	Gasoline Savings (gallon)	180 million	2.7 million	10.6 million
	Increased Electricity Use (kWh)	6 million	19 million	74 million
Solution L. Improve Air Travel Efficiency	GHG Emissions Reduction (MT CO ₂ e)	1,000	2,000	5,900



Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit

This solution focuses on increasing the percentage of community members walking, bicycling, carpooling, avoiding or consolidating vehicle trips, and using transit. As noted in the [Bozeman Community Plan](#), 16% of Bozeman commuters walk or ride a bike, 6% work from home and less than 1% use public transit. Influencing community members' mode choice can be extremely challenging, as most people choose their mode of transportation based first on convenience, and then on cost. In response to COVID-19 and resulting social distancing guidelines, working from home practices have become more prevalent in many workplaces. The widespread implementation of work from home practices, including the expansion of digital communication capabilities, may have a significant impact in the percent of employees working from home in the future.

Unfortunately, the cost of the private car and parking infrastructure is hidden and difficult to fully quantify. Many American cities have grown and developed around the easy mobility of the private car, resulting in expansive street miles with corresponding miles of water, sewer, gas, and electric infrastructure with public and private parking spaces—thus spreading infrastructure demands across a larger area and thinning the tax base needed to fund city services. Further, vehicle traffic violations and accidents require extensive parking and traffic patrol and contribute a large percent of ambulance calls, emergency room visits, and case load in the justice system. Cities may need to closely examine the full costs and benefits of all modes of transportation when making mobility infrastructure investments.

There are several mechanisms to facilitate the transition away from private cars, and especially cars moving a single driver. Building high-quality, accessible infrastructure is a primary means of encouraging active forms of transportation. Bike lanes physically separated from traffic can create a safer experience for bicyclists. Sidewalks should be wide enough to accommodate multiple users and should also be separated from vehicular traffic (i.e., setback from the road or lined with trees or planters to create a physical separation). Sidewalks that have degraded or were not constructed to meet ADA design requirements, should be rebuilt to meet these standards.

However, access to high-quality infrastructure is not enough to influence mode choice. Trip length is a major consideration when selecting a mode of transportation. Compact development can help to shorten trip lengths by reducing the distance between residents, employment opportunities, and goods and services. Parking can also play a factor in mode choice. If parking is widely available and inexpensive, community members may be incentivized to travel by car, given the extreme importance of convenience. Finally, education can play an important role in influencing mode choice. In some cases, community members may be unaware of transportation options or feel uncomfortable using those transportation options other than personal vehicles. Connecting residents with resources that will gain them confidence in the convenience, safety, and benefits of active modes of transportation and transit can help remove barriers that keep people from choosing alternatives to their cars.

The City and other community partners can help to increase the adoption of active modes of transportation by reducing financial barriers or even providing financial incentives. While transit in Bozeman is free, large businesses may provide a financial incentive for employees to use an active mode of transportation. However, infrastructure can still be very expensive and must be completed in conjunction with other measures, such as shortening trip lengths and education. Fortunately, various grant programs exist at the state and federal levels to support the development of active transportation infrastructure and education programs.

Focus Area 4. Diverse & Accessible Transportation Options

Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit



Removing barriers to active modes of transportation can enable community members to engage in more cost-effective means of travel. For example, improving access to public transit for low-income community members can reduce the transportation burden for those forced to live further from goods and services due to the cost of housing. Similarly, this solution expands mobility and accessibility for the portion of the community population that cannot drive due to physical abilities, age, and/or income.

Alternatively, some community members may maintain a need for car ownership and travel. Penalizing car trips through disincentives (i.e., restricting parking or increasing the cost of parking) may disproportionately impact residents who rely on car travel. One potential solution could be to increase the availability of affordable housing options near activity centers.



In addition to reducing pollution associated with car travel, participating in active modes of transportation can improve physical and mental health. Some emerging modes of efficient transportation, such as e-bikes and e-scooters can increase mobility options for some but may discourage more active forms of transportation and, without careful planning, may present a hazard to those with certain disabilities, such as persons with visual impairments. Finally, as on-demand transportation increases in popularity for first- and last-mile connections, excessive idling and circulating may offset air quality benefits of reducing car trips.



The City of Bozeman can lead by example by continuing to maintain its status as a Silver Bike Friendly Community by the League of American Bicyclists, implementing complete streets projects in neighborhoods underserved by alternative transportation infrastructure, and by continuing to use a complete streets model for the construction of new streets and street reconstruction efforts.

This solution primarily addresses Bozeman's greenhouse gas mitigation goals, while also providing supporting resiliency benefits.



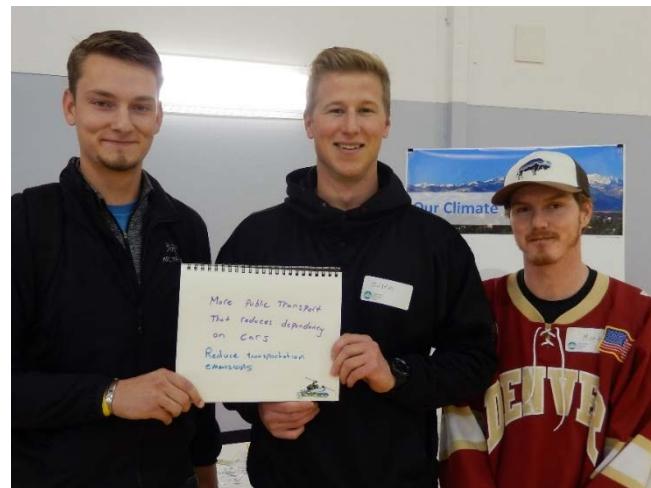
Related Solutions

- Solution G. Facilitate Compact Development Patterns
- Solution I. Enhance Social Infrastructure and Community Preparedness
- Solution K. Decrease Direct Vehicle Emissions
- Solution L. Improve Air Travel Efficiency

Focus Area 4. Diverse & Accessible Transportation Options
Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit

Action 4.J.1. Prioritize Regional Multi-modal Planning and Connectivity

Providing high quality, safe, and accessible infrastructure to support a diversity of transportation options is a foundational step toward reducing the percent of people who drive alone. Though providing connectivity within an activity area is critical, it is also important to provide safe, convenient access to and from destinations. Thus, ensuring the adoption of multi-modal forms of transportation will require a coordinated effort amongst existing and future agencies to prioritize inclusive and diverse options for transportation.



Environmental Data that is measured, verified, and reported is an important stepping stone to lower emissions in the longer term. The 2017 Transportation Master Plan references greenhouse gas emissions and health benefits to communicate the value of active transportation. Future transportation plans will incorporate targets for total and per capita Vehicle Miles Traveled and greenhouse gas emissions reductions.

The Gallatin Triangle Planning Study and the Bozeman Transportation Master Plan establish a foundation of planning for multi-modal infrastructure. The aim of this action is to work in conjunction with other solutions, such as “Facilitate Compact Development Patterns” and “Enhance Social Infrastructure and Community Preparedness” to provide a more inclusive and systemic view of the region’s transportation system. Future planning efforts should include a diversity of perspectives, including persons with disabilities, low-income households, City and County service partners, and City and County planning departments. Outcomes of future planning efforts might include a guiding policy document, which outlines a hierarchy of travel, deprioritizing travel by car, while elevating mobility for Bozeman’s most vulnerable community members.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• City of Bozeman• Gallatin County• City of Belgrade• Montana Department of Transportation• Bozeman Area Bicycle Advisory Board• Pedestrian Traffic Safety Committee• Bridger Bowl• Human Resource Development Council	<ul style="list-style-type: none">• 4.3 Strategic Infrastructure Choices• 4.5 Housing and Transportation Choices• 6.2 Protect Local Air Quality• 6.3 Climate Action	<ul style="list-style-type: none">• % increase in walking, biking, carpool, and transit commuting• Formation of and participation in regional planning entity such as a Metropolitan Planning Organization (MPO)

Focus Area 4. Diverse & Accessible Transportation Options
Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit

Action 4.J.2. Pursue Innovative Funding for Pedestrian and Bicycle Connections and Network

This action focuses on identifying options for implementing plans and physically expanding and bolstering Bozeman's bicycle and pedestrian network. Note, the term "bicycle and pedestrian" is intended to be all encompassing and includes e-bikes, e-scooters, mobility scooters, and other forms of non-car travel. The City of Bozeman continues to invest in bike and pedestrian infrastructure through a combination of local and private funding sources. Through the [City's Complete Streets](#) principles are applied on new City projects, privately funded development, and incrementally through a series of smaller improvements and activities over time. Examples of innovative funding efforts have included bonds and urban renewal districts.

Future bicycle and pedestrian projects should respond to existing and future gap analyses, such as those conducted in the Bozeman Transportation Master Plan or through walking audits. In conjunction with adding more miles of bicycle and pedestrian infrastructure, the City will explore opportunities to bolster existing infrastructure to better serve all needs. For example, making intersection improvements, adding signs to cue motorists to share the road, or narrowing travel lanes marginally to accommodate bicycle and pedestrian infrastructure are just a few ways to transform existing infrastructure to better meet the needs of bicyclists and pedestrians. Other actions the City will consider include mapping all bike routes classified by comfort level, implementing more robust wayfinding, and identifying funding sources for protected and/or grade separated trail infrastructure.

The City will also seek opportunities to partner with developers to encourage the addition of new multi-modal amenities as part of development and redevelopment projects (see Action 3.G.2.). Updating transportation design standards and policies to better reflect all needs and abilities, including e-bikes and emerging technologies, will be an important first step to provide clear direction to developers. To prepare for autonomous and low-speed modes that may compromise pedestrian safety, planning and defining appropriate non-car travel on sidewalks, bike lanes, and shared use paths will be part of this update.

As specified in the 2017 Transportation Master Plan, ensure that the Unified Development Ordinance is amended to require sidewalk construction as a basic component of subdivisions and should be installed with the streets and utilities before individual lots are developed.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• City of Bozeman• Montana State University• Gallatin Valley Land Trust• Bzmn Area Bicycle Advisory Board• Montana Dept. of Transportation• Pedestrian Traffic Safety Committee• Gallatin Valley Bicycle Club• Bridger Bowl	<ul style="list-style-type: none">• 4.5 Housing and Transportation Choices• 6.2 Protect Local Air Quality• 6.3 Climate Action• 6.5 Parks, Trails, and Open Space	<ul style="list-style-type: none">• % increase in walking, biking, carpool, and transit commuting• Reduction in per capita vehicle miles traveled• Increase in network size and connection (i.e., miles of new bike lanes or sidewalk)

Focus Area 4. Diverse & Accessible Transportation Options
Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit

Action 4.J.3. Improve Maintenance of Multi-Modal Infrastructure

Once multi-modal infrastructure is developed, maintenance is a critical process for ensuring the reliability and safety of that infrastructure. For instance, prioritizing shared-use, separated paths for plowing after a winter storm will ensure a safe path of travel for bicyclists and pedestrians who prefer or rely on these paths for travel.

Additionally, proper maintenance can sometimes avoid the need to expand or extend infrastructure. For instance, intersection improvements can improve traffic flow without adding vehicle lanes, and dedicating existing lanes for carpool, vanpool, or transit can help prioritize alternative modes without the need for an expansion project. Improving lighting and wayfinding is another way the City can enhance multi-modal infrastructure to improve safety and encourage use.

As part of this action, Bozeman will seek to identify funding mechanisms, funding sources, and implementation partners to dedicate to the development and implementation of a maintenance program for multi-modal infrastructure. Private properties can play an important role in maintenance as well, by actions such as shoveling snow immediately following a winter storm or parking off the street to accommodate for snow storage while still allowing bicycle access.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measure
Level 1	<ul style="list-style-type: none">• City of Bozeman• Montana State University• Gallatin Valley Land Trust• Bozeman Area Bicycle Board• Pedestrian Traffic Safety Committee• Montana Department of Transportation• Bridger Bowl	<ul style="list-style-type: none">• 4.5 Housing and Transportation Choices• 6.2 Protect Local Air Quality• 6.3 Climate Action• 6.5 Parks, Trails, and Open Space	<ul style="list-style-type: none">• Annual miles of bike lane and shared-use path sweeping, cleaning, and plowing

Focus Area 4. Diverse & Accessible Transportation Options
Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit

Action 4.J.4. Pursue Sustainable Transit Funding and Expansion

Accessible and reliable transit options are a critical component of a high-functioning multi-modal system. This action focuses on identifying a dedicated funding source to support and expand Bozeman's existing transit system. Streamline Transit provides Bozeman community members with fixed route bus service, campus shuttles, paratransit services, and transportation to and from Bridger Bowl.

Though funding is an important driver for establishing or expanding transit systems, a community must first, or at least concurrently, work toward developing in a manner that supports transit. For instance, it may be challenging to support transit in areas with fewer than 12 to 16 people per acre. In addition to ensuring zoning districts allow the right mix of land uses and number of units, the City can work with developers to incentivize transit-oriented development (TOD) along existing or planned transit routes. TODs are typically characterized as mixed-use districts, with enough jobs, residential units, and/or attractions and amenities to support transit. Other features of TODs include walkability and bikeability, to ensure commuters can connect to and from transit stops. Many of the other actions in this solution will be critical to providing first and final mile connections to and from transit stops.

Though reliable, fixed-route transit is often the backbone of a high-functioning transit system, many communities have identified significant need for on-demand microtransit (e.g., cars and vans) and micromobility (e.g., bikesharing and e-scooters) to act as an extension of regular transportation services. Enabled by transportation technology, these flexible solutions can provide curb-to-curb or stop-to-stop service. Sometimes referred to as Mobility as a Service, through integrated technology and public and private partnerships, microtransit can be crucial for helping connect the entire community to central transit lines, especially older adults or persons with a disability.

As Bozeman's transit system grows and evolves with an emphasis on Transit Oriented Development and Mobility as a Service, the City will work with partners to identify dedicated transit funding to help ensure the maintenance and expansion of Bozeman's transit system. Funding may come from several sources, such as the formation of a Metropolitan Planning Organization (MPO), Regional Transit Authority, transportation improvement district, or other avenues such as tolls or fees. As avenues for funding are identified, the City may conduct the following feasibility studies to inform investment of transit dollars: integration of transit signal priority, expansion of Park and Ride and routes, including circulator routes for downtown and the airport.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measure
Level 1	<ul style="list-style-type: none">• Streamline Transit• City of Bozeman• Gallatin County• City of Belgrade• Montana State University• Montana Department of Transportation• Bridger Bowl• Human Resource Development Council	<ul style="list-style-type: none">• 4.3 Strategic Infrastructure Choices• 4.5 Housing and Transportation Choices• 6.2 Protect Local Air Quality• 6.3 Climate Action	<ul style="list-style-type: none">• Increased transit ridership• Reduction in per capita vehicle miles traveled• # of new transit connections

Focus Area 4. Diverse & Accessible Transportation Options
Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit

Action 4.J.5. Support Employee Trip Reduction Programs and Transportation Demand Management

The majority of road congestion in the morning and afternoon is the result of employees commuting to and from work during the same time frame. This action focuses on reducing the total number of trips taken by employees and shifting those trips away from morning and afternoon rush hours whenever possible. Reducing the number of vehicles traveling during peak times is often referred to as Transportation Demand Management (TDM). Already, the City of Bozeman has a number of TDM strategies in place as part of the Bozeman Transportation Master Plan. The City plans to add a TDM coordinator in the 2021 fiscal year to lead the implementation of these efforts.

In addition to building and maintaining a more robust multi-modal network, TDM focuses on education, outreach, and partnerships. Efforts may include hosting workshops, webinars, or temporarily closing streets to cars for “Open Streets” events to provide resources to the community on the options, benefits, and “How Tos” of multi-modal transportation. Outreach efforts will promote new efforts and tools to help navigate transportation options, such as the commuter management and ridesharing platform “Ride Amigos” launched through the Bozeman Commuter Project. Additionally, the City will partner with large employers to encourage or require the adoption of company specific performance-based TDM programs. For instance, organizations can provide a transportation incentive for employees that walk, bike, carpool or use transit to get to work.

In addition to helping employees shift how they get to work, TDM strategies will help shift when employees go to work. Companies can lead by example by allowing flexible work schedules or instating more robust work from home policies. In response to the COVID-19 pandemic, many companies have been forced to adapt work flows to allow employees to work from home. Continuing to require and/or allow employees to work from home could have a significant and positive impact on transportation demand.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• Streamline Transit• City of Bozeman• Gallatin County• City of Belgrade• Montana State University• Montana Department of Transportation• Bridger Bowl• Major employers (e.g., Bozeman Health, Oracle, BSD7, Zoot, Simms)• Human Resource Development Council	<ul style="list-style-type: none">• 4.3 Strategic Infrastructure Choices• 4.5 Housing and Transportation Choices• 6.2 Protect Local Air Quality• 6.3 Climate Action	<ul style="list-style-type: none">• Increased transit ridership• Reduction in per capita vehicle miles traveled

Focus Area 4. Diverse & Accessible Transportation Options
Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit

Action 4.J.6. Support Regional Transit Service Coordination and Outreach

Beyond local transit service, connections to the greater region are a significant need in order to reduce vehicle trips and mitigate traffic congestion from tourism and population growth. While Streamline Transit provides Bozeman community members with fixed route bus service, campus shuttles, paratransit services, and transportation to and from Bridger Bowl, more can be done to connect Bozeman to other communities and regional destinations.

This action focuses on working with private and public transport operators to expand transit service between major regional cities and visitor destinations. It also includes exploring the feasibility of a train system to connect regional destinations, including showing support for restoring the North Coast Hiawatha Route passenger rail.



Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• City of Bozeman• Regional Cities• Streamline Transportation• Sky Line Transportation• Montana State University• Chamber of Commerce	<ul style="list-style-type: none">• 2.2 Infrastructure Investments• 6.2 Protect Local Air Quality• 6.3 Climate Action	<ul style="list-style-type: none">• Expansion of transit service within the region

Focus Area 4. Diverse & Accessible Transportation Options
Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit

Action 4.J.7. Leverage Parking Policies to Encourage Other Modes of Transportation

Parking infrastructure and policy play a significant role in vehicle use, vehicle miles traveled (VMT), and emissions. An abundance of free parking encourages and enables the decision to drive versus walking, biking, carpooling, or using transit.

Public and private parking inventory, Unified Development Code parking requirements, and parking management all influence mode choice. This action reinforces coordination with other transportation studies and plans to ensure that the community's parking paradigm and policies strengthen and support planned transit and bicycle and pedestrian infrastructure improvements.

Where expanded access to multi-modal transportation options are available, the City will pursue updates to the Unified Development Code that eliminate minimum parking requirements in commercial districts and affordable housing projects and reduce parking minimums elsewhere (see Community Plan M-1.12). Further, the City will proactively coordinate with Montana State University to ensure complementary parking management strategies that encourage multi-modal transportation options.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	<ul style="list-style-type: none">• City of Bozeman• Parking Commission• Montana State University• Chamber of Commerce	<ul style="list-style-type: none">• 2.2 Infrastructure Investments• 6.2 Protect Local Air Quality• 6.3 Climate Action	<ul style="list-style-type: none">• Increased transit ridership• Reduction in per capita vehicle miles traveled

Focus Area 4. Diverse & Accessible Transportation Options
Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit

Action 4.J.8. Develop Bike and Car Share Programs

Bike, scooter, and car share programs help to increase access to alternative modes of transportation without significant investment on behalf of users. Vehicle share programs can all be used to improve first- and last-mile connections to and from transit. Car share programs in particular can help reduce the need for a second vehicle for households. As part of this action, the City will explore the feasibility of a community vehicle share program. Implementation of this program (or programs) may be City-led, a public-private partnership, or a private system.

For bike and scooter share programs, electric options can help improve mobility for some participants. However, if electric options are considered, the City will look to peer communities to identify best practices and policies for enhancing safety and reducing pedestrian-vehicular traffic conflicts. Similarly, a car share program could also showcase electric vehicles. Many studies have shown that drivers exposed to electric vehicles are significantly more likely to purchase one. Thus, including electric vehicles as part of a car share program could complement efforts identified in Solution K.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 3	<ul style="list-style-type: none">• City of Bozeman• Downtown Bozeman Partnership• Montana State University• Bozeman Area Bicycle Advisory Board• Gallatin Valley Bicycle Club• High demand districts (e.g., Cannery District, Northeast Neighborhood)	<ul style="list-style-type: none">• 4.3 Strategic Infrastructure Choices• 4.5 Housing and Transportation Choices• 6.2 Protect Local Air Quality• 6.3 Climate Action	<ul style="list-style-type: none">• Increased transit ridership• Reduction in per capita vehicle miles traveled

Solution K. Decrease Direct Vehicle Emissions

Despite best efforts, some portion of community trips will always require a vehicle. Even though transit can be more efficient on a per-person basis, traditional diesel buses emit large amounts of pollutants and greenhouse gases. Thus, this solution focuses on promoting more efficient vehicles, vehicles that use alternative fuels, and electric vehicles.

Many barriers exist to the adoption of electric vehicles (EVs), including range anxiety, cost of procurement, and limited local availability. Some limited federal and state incentives are available to assist in the procurement of alternative fuel vehicles and electric vehicle supply infrastructure. Leading by example can be an important mechanism for spurring the private adoption of electric vehicles. Advertising electric fleet vehicles and making public charging stations visible and readily available can help build trust in community members. Public-private partnerships are another effective avenue for encouraging the expansion of electric vehicle supply infrastructure. Other ways to remove barriers can include requiring new construction to be pre-wired for electric vehicle charging or even requiring the provision of “preferred parking” for electric vehicles.



Focus Area 4. Diverse & Accessible Transportation Options

Solution K. Decrease Direct Vehicle Emissions



Ideally, all trips made via car, van, or public transit would do so using efficient, alternative fuel, and/or electric vehicles. Unfortunately, at this time, the price of these vehicles can be cost-prohibitive. For electric vehicles specifically, there is little to no market for used vehicles. One option to overcome this barrier is to support an electric vehicle car share, which would enable community members to access electric vehicles without the initial procurement costs. Electrifying transit fleets is another good means of providing access to cleaner means of transportation.



Human Health & Well-Being

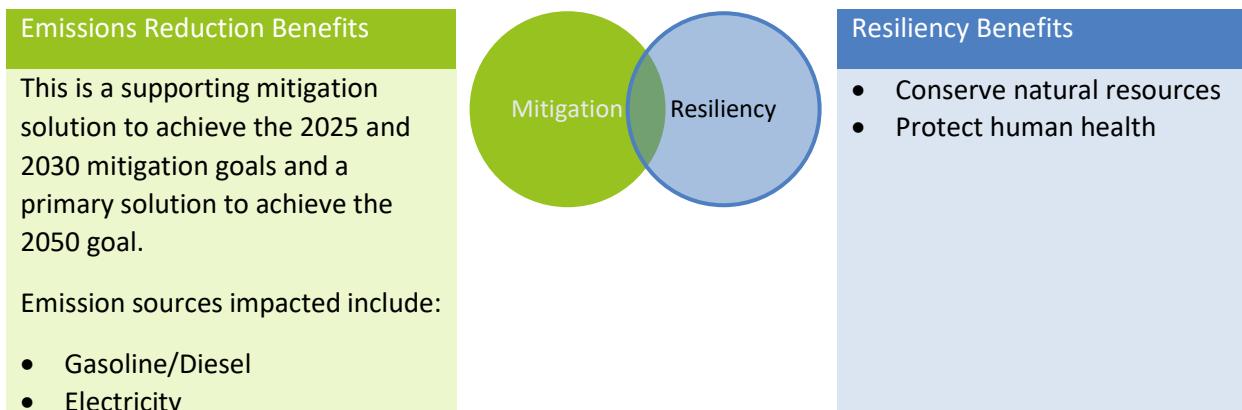
Decreasing direct vehicle emissions can improve air quality, which can reduce the risk of associated illnesses, such as respiratory and heart disease.



City Assets

The City of Bozeman can lead by example by electrifying its light and medium duty fleet and by installing public charging stations at City facilities. The City can continue to encourage the conversion of all transit fleet vehicles to electric or hybrid options.

This solution primarily addresses Bozeman's greenhouse gas mitigation goals, while also providing supporting resiliency benefits.



Related Solutions

- Solution D. Increase Utility Clean Energy Mix
- Solution F. Increase Community-Based Distributed Renewable Energy Generation
- Solution G. Facilitate Compact Development Patterns
- Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit
- Solution L. Improve Air Travel Efficiency

Focus Area 4. Diverse & Accessible Transportation Options

Solution K. Decrease Direct Vehicle Emissions

Action 4.K.1. Support Community EV Roadmap Development

An EV roadmap is a first step toward increasing the number of EVs in a community. An EV roadmap typically identifies a community vision, goal(s), and strategies to increase the total number of EVs on the road. This action seeks to build on the work completed to date by the Montana Solar Powered Community Transportation Initiative to draft a comprehensive EV roadmap for the City of Bozeman.

This roadmap will establish Bozeman's EV baseline, including approximate number of registered EVs in Bozeman and existing EV infrastructure. The roadmap will identify key steps the community can take to improve from that baseline.

Strategies within the roadmap would include an evaluation of actions, such as requiring a certain percentage of parking spaces be EV-ready for new construction and coordinated utility distribution system planning. Key community stakeholders will include utility representatives, City staff, MSU representatives, and others listed below.



Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• City of Bozeman• NorthWestern Energy• Downtown Bozeman Partnership• Montana State University• Chamber of Commerce• Montana Dept. of Environmental Quality• Yellowstone Teton Clean Cities	<ul style="list-style-type: none">• 4.3 Strategic Infrastructure Choices• 4.5 Housing and Transportation Choices• 6.2 Protect Local Air Quality• 6.3 Climate Action	<ul style="list-style-type: none">• Increase % of EVs and PHEVs registered in Gallatin County• Reduce emissions per vehicle mile traveled

Focus Area 4. Diverse & Accessible Transportation Options

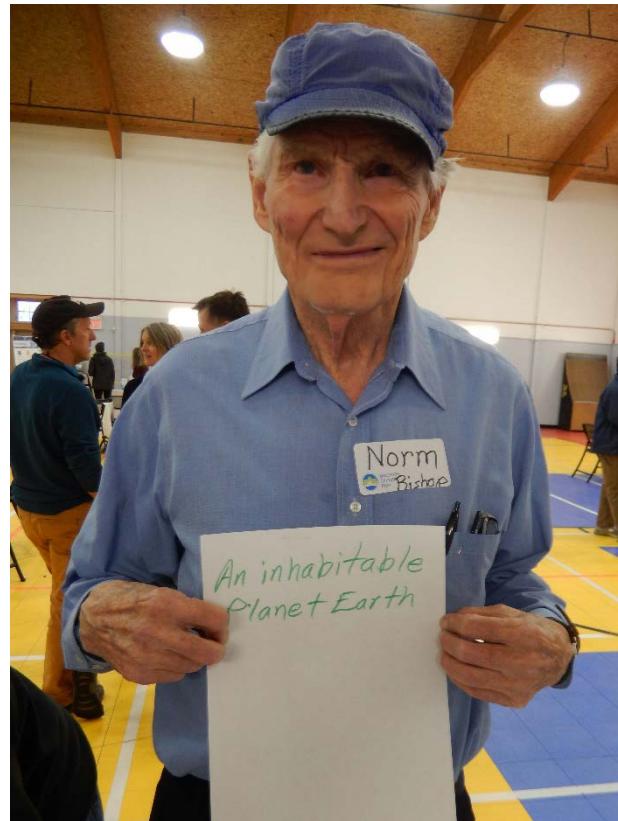
Solution K. Decrease Direct Vehicle Emissions

Action 4.K.2. Collaborate to Install Publicly Accessible EV Infrastructure

Though the majority of EV charging occurs at home, access to public EV charging infrastructure is still often cited as one of the biggest barriers to EV adoption. Providing publicly available charging infrastructure at City facilities, workplaces, and key destinations can significantly reduce barriers to adoption by signaling that EVs are a priority and that EV owners will always have access to charging infrastructure.

While the City may choose to provide some publicly available infrastructure, public-private partnerships and private investment will be crucial to sufficiently build out the necessary charging infrastructure. Charging stations should be right-sized to match the typical time spent in a location. For instance, Level 2 charging stations are appropriate for businesses or destinations where community members may typically spend 2-4 hours. Level 3, or DC fast chargers, are more appropriate for major travel corridors, such as I-90, to facilitate quick charging while travelers stop at rest stops, gas stations, etc. Montana State University will be a key partner as they embark on an EV charging station pilot in 2020.

As part of this action and in conjunction with Action 4.J.6., the City may explore charging stations for electric bikes, electric scooters, and EVs as part of a vehicle-sharing program.



Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none"> • City of Bozeman • NorthWestern Energy • Downtown Bozeman Partnership • Montana State University • Chamber of Commerce • Montana Dept. of Environmental Quality • Yellowstone Teton Clean Cities 	<ul style="list-style-type: none"> • 2.1 Business Growth • 4.3 Strategic Infrastructure Choices • 4.5 Housing and Transportation Choices • 6.2 Protect Local Air Quality • 6.3 Climate Action 	<ul style="list-style-type: none"> • Number of Public Charging Stations • Increase % of EVs and PHEVs registered in Gallatin County • Reduce emissions per vehicle mile traveled

Focus Area 4. Diverse & Accessible Transportation Options

Solution K. Decrease Direct Vehicle Emissions

Action 4.K.3. City Fleet and Transit EV Investment

One of the best ways Bozeman can lead by example is to invest in EVs for City fleet and Streamline Transit vehicles. As part of the EV roadmap, or under a separate effort, the City of Bozeman can identify a path for electrifying and modernizing the City's fleet. The first step in developing an action plan for fleet electrification is connecting with NorthWestern Energy. NorthWestern Energy can help the City identify areas with enough capacity to handle additional electricity demand and areas that may require additional investment. Once conversations with the utility have been initiated, the next step of fleet electrification is to consider a telematics study, which can help identify vehicles most eligible for EV replacement and the best EV models for the job. Following this step, the City may update their vehicle purchasing policy in conjunction with their vehicle replacement plan to meet electrification targets. Additional factors of fleet electrification include developing charging infrastructure and charging plans, conducting employee outreach and education, and coordinating training and maintenance. The Climate Mayor's EV Purchasing Collaborative may serve as a useful resource for preliminary efforts.

Preliminary fleet electrification activities should focus on the City's light-duty fleet, though the City may also consider and put policies in place to prepare for the electrification of heavy-duty vehicles as applicable. Where full electrification is not possible, the City may pursue other alternative fuel sources such as natural gas or biofuels.

Finally, the City will also work with Streamline Transit to conduct an updated feasibility analysis for electrifying transit vehicles.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	<ul style="list-style-type: none">• City of Bozeman• Streamline Transit• City of Belgrade• Gallatin County• Montana State University• Bozeman Health• Big Sky Resort• Bridger Bowl	<ul style="list-style-type: none">• 2.1 Business Growth• 4.3 Strategic Infrastructure Choices• 4.5 Housing and Transportation Choices• 6.2 Protect Local Air Quality• 6.3 Climate Action	<ul style="list-style-type: none">• Improve light-duty city fleet average MPG• Reduce emissions per vehicle mile traveled• % of fleet converted to EV

Focus Area 4. Diverse & Accessible Transportation Options

Solution K. Decrease Direct Vehicle Emissions

Action 4.K.4. Advocate for EV Utility Rates, Incentives, Infrastructure, and Efficiency Standards

Advocacy will be an important aspect of implementation for this plan and can have broad and meaningful impacts toward reducing direct vehicle emissions. This action focuses on connecting partners and building community support to lead a broad range of advocacy efforts. Topics for EV advocacy may be split broadly into two categories: vehicle emissions standards and support for alternative fuel vehicles.

This plan encourages local advocates to engage state and federal policy makers to continue improving vehicle emissions standards (for instance, through a State-wide zero emission vehicle standard). Zero emission vehicles require manufacturers to manufacture a certain percent of zero emission vehicles as part of their fleet. In addition to reducing the overall potential emissions of a manufacturer's fleet, this would also increase market availability of efficient and alternative fuel vehicles. Alternatively, or in conjunction, supporters might advocate for state and federal tax credits and financial incentives for fuel-efficient and alternative fuel vehicles. Tax credits and financial incentives may help provide greater access to efficient and alternative-fuel vehicles. Ultimately, an uptick in these vehicles is expected to lower production costs in the long run as manufacturers realize economies of scale and technology continues to advance.

Finally, City of Bozeman partners could work with NorthWestern Energy to advocate for the development of an EV infrastructure plan and innovative funding models. Currently, NorthWestern Energy is exploring the possibility of an off-peak charging rate. EVs hold a lot of potential for evening out demand curves if the majority of charging occurs during off-peak hours. Off-peak charging incentives could produce a win-win for the utility and customers.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	<ul style="list-style-type: none">• City of Bozeman• Streamline Transit• Montana Dept. of Environmental Quality• Montana Legislature• NorthWestern Energy• Public Service Commission	<ul style="list-style-type: none">• 2.1 Business Growth• 4.3 Strategic Infrastructure Choices• 4.5 Housing and Transportation Choices• 6.2 Protect Local Air Quality• 6.3 Climate Action	<ul style="list-style-type: none">• Improved state efficiency and emissions standards• Establishment of utility rate to incentivize off-peak EV charging

Focus Area 4. Diverse & Accessible Transportation Options

Solution K. Decrease Direct Vehicle Emissions

Action 4.K.5. Limit Wasteful Vehicle Emissions

Wasteful vehicle emissions occur when vehicles are circulating or idling unnecessarily. This action focuses on implementing policies and educational campaigns to reduce unnecessary emissions. Steps the City could take include establishing and enforcing an anti-idling policy. This policy could apply to semi-trucks, delivery trucks, transit buses, tour buses, construction equipment, and/or light-duty vehicles. The City might partner with local businesses to help enforce anti-idling policies. Adding signage in common locations, such as near pre-schools, can be another mechanism for encouraging drivers to turn off their vehicles.

Another common contributor to wasteful emissions is the result of circulating in search of parking. Installing smart parking signs, which tell travelers where spaces are available in a lot or garage, can reduce time spent circling for a spot. Of course, encouraging community members and visitors to rely on active modes and transit to destinations is another great way to avoid emissions associated with circulation. The City may also explore options to prohibit vehicles from driving exclusively for advertising.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	<ul style="list-style-type: none">• City of Bozeman• Montana State University• Streamline Transit• Montana Dept. of Environmental Quality• Yellowstone Teton Clean Cities	<ul style="list-style-type: none">• 6.2 Protect Local Air Quality• 6.3 Climate Action	<ul style="list-style-type: none">• Reduce Particulate Matter

Focus Area 4. Diverse & Accessible Transportation Options

Solution K. Decrease Direct Vehicle Emissions

Action 4.K.6. Support EV Group Buy and Outreach

This action focuses on providing EV outreach and education to help address adoption barriers related to misinformation. As part of this action, the City can partner with Yellowstone-Teton Clean Cities to develop an educational campaign, organize a ride-and-drive, or organize group buys. Group buys are typically orchestrated in partnership with local dealerships and can significantly reduce the cost of purchasing an electric vehicle by offering a discount when multiple parties agree to purchase at once. Other educational partners may include the Montana Department of Environmental Quality and Western Transportation Institute. Topics of educational materials should include the financial benefits of EV ownership, information about various types of charging infrastructure, how to pick the right vehicle to suit individual needs, and environmental benefits, among others.

While replacing conventional internal combustion engine vehicles with EVs can reduce direct tailpipe emissions, EV adoption will not reduce congestion. Thus, efforts promoting EV use should still occur in conjunction with efforts promoting the reduction of trips overall and replacement of trips with alternative modes of transportation whenever possible.

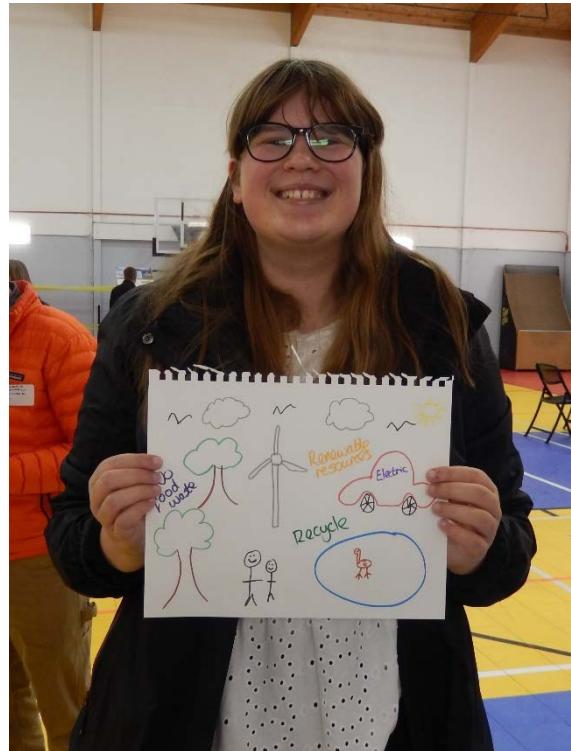
Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 3	<ul style="list-style-type: none">• City of Bozeman• Montana Dept. of Environmental Quality• Yellowstone-Teton Clean Cities• NorthWestern Energy• Car dealerships• Major employers	<ul style="list-style-type: none">• 2.1 Business Growth• 4.5 Housing and Transportation Choices• 6.2 Protect Local Air Quality• 6.3 Climate Action	<ul style="list-style-type: none">• Increase % of EVs and PHEVs registered in Gallatin County• Reduce emissions per vehicle mile traveled

Solution L. Improve Air Travel Efficiency

This solution is focused on supporting the development of alternatives to traditional air travel. It includes technology improvements to enhance the fuel efficiency of air fleets, as well as offering alternatives to air travel which could include shared rides and vehicles, shuttles and buses, rail transportation, and even more advanced technologies such as hyperloops.

Air travel and tourism provide tremendous economic benefits to the Bozeman community, and the Bozeman Yellowstone International Airport is the busiest in the state. This solution does not seek to eliminate or reduce visitation to Bozeman, but instead focuses on making travel to and from Bozeman more efficient and less impactful from an emissions perspective. Advancing this solution requires advocacy and standards for the airline industry to adopt new technologies and operate more efficiency.

In addition to more efficient air travel, this solution also includes the development of air travel alternatives at the regional scale. Alternatives like shuttles and buses necessitate collaboration with other regional partners including tourist destinations and attractions, such as nearby national and state parks, trailheads, ski areas, and Montana State University. Furthermore, such alternatives should also seek to provide alternatives to traditional vehicle travel and leverage electric or alternative fuel technology to create even further emissions reduction benefits.



Focus Area 4. Diverse & Accessible Transportation Options

Solution L. Improve Air Travel Efficiency



Though airline travel can have a big impact on greenhouse gas emissions, resources earmarked for mitigating air travel are only relevant to community members with means and access to airline travel. Thus, the resources spent reducing a very specific portion of emissions could have a much larger, positive impact on equity issues elsewhere.



Still, mitigating emissions from air travel could reduce noise and air pollution associated with plane travel. Since it is likely that members of the community living proximate to the airport do not have the resources to relocate, reducing noise and air pollution could have a positive equity impact on those community members.



The City of Bozeman does not have authority over the airport operations (the airport is owned by the Gallatin Airport Authority) or operate a local bus system. However, the City can continue to invest in the Streamline system (operated by the Human Resources Development Council) and support connections to other regional transit services to provide other alternatives to regional air travel.

This solution primarily addresses Bozeman's greenhouse gas mitigation goals, while also providing some supporting resiliency benefits.



Related Solutions

- Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit

Focus Area 4. Diverse & Accessible Transportation Options

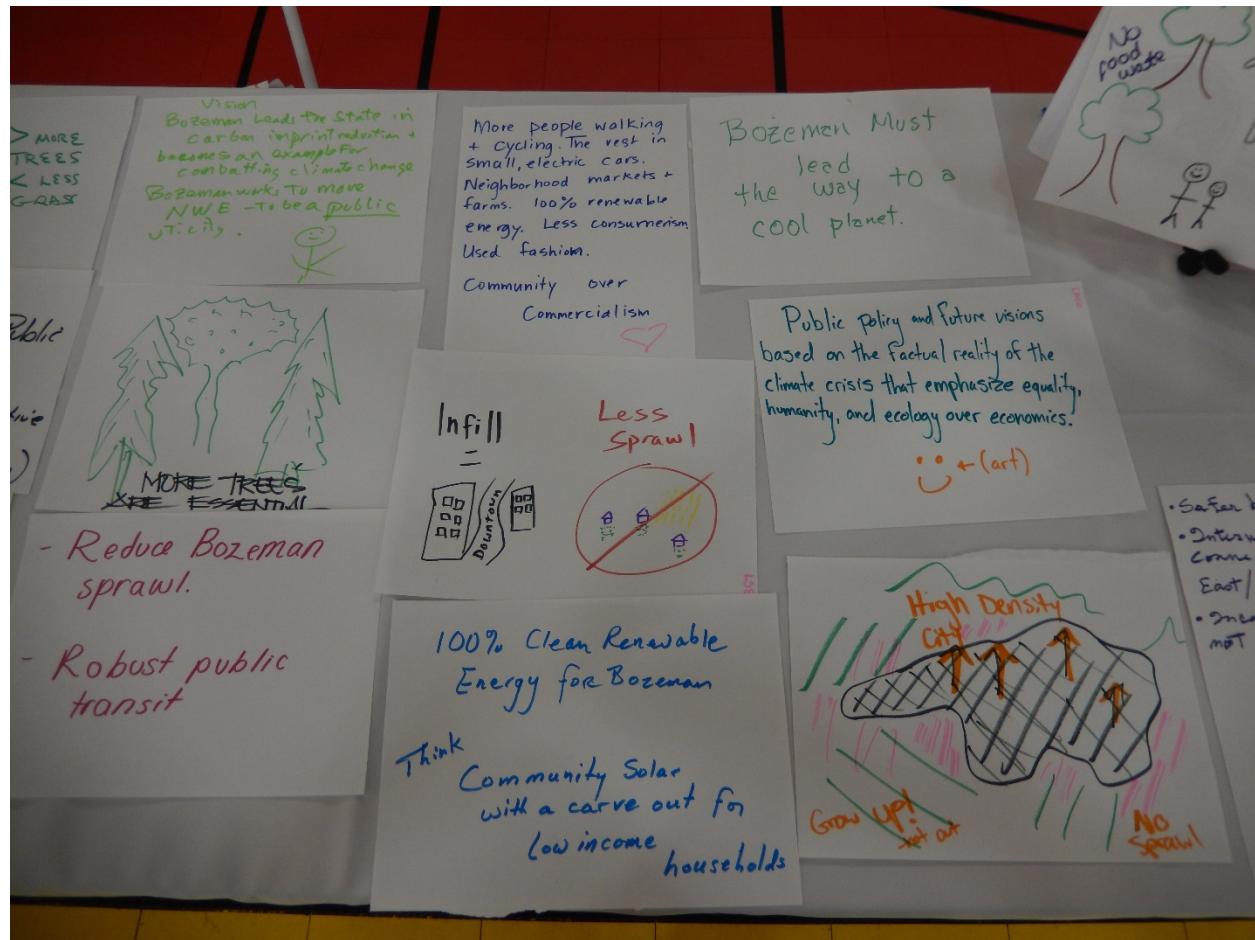
Solution L. Improve Air Travel Efficiency

Action 4.L.1. Build Awareness of Air Travel Impacts and Alternatives

This action focuses on promoting alternative modes of travel in place of air travel. In partnership with City departments and community organizations, implementation of this action will include development of educational materials to increase awareness of the impacts of flying, share alternative modes of transportation, and encourage community members to remain local. For instance, short airline trips can be replaced with car, bus, or train travel. Air travel for business can be avoided if meetings are replaced with teleconferencing and other remote communication and engagement tools.

In particular, the City of Bozeman can lead by example by limiting meetings for which City employees must fly and even by limiting instances that require contractors to fly into Bozeman. Finally, the City of Bozeman can partner with the Bozeman Yellowstone International Airport to encouraging passengers to offset carbon emissions or through signage at the airport or through the ticket purchasing process.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	<ul style="list-style-type: none"> • City of Bozeman • Montana State University 	<ul style="list-style-type: none"> • 6.2 Protect Local Air Quality • 6.3 Climate Action 	<ul style="list-style-type: none"> • Reduced annual employee air travel miles



Focus Area 4. Diverse & Accessible Transportation Options

Solution L. Improve Air Travel Efficiency

Action 4.L.2. Advocate for Increased Air Travel Efficiency

The carbon intensity of flying is significant, with varying levels of fuel efficiency and carbon intensity among commercial carriers. Currently, no local, state or federal fuel efficiency requirements exist for air travel in the United States.

This action is a call for the Bozeman community to advocate for stringent efficiency standards for air travel. City partners and community representatives can engage in state and federal-level advocacy to promote more fuel efficient and alternative-fuel air travel.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 3	<ul style="list-style-type: none">• City of Bozeman• Bozeman Yellowstone International Airport• Montana State University• Chamber of Commerce• Montana Dept. of Environmental Quality	<ul style="list-style-type: none">• 2.2 Infrastructure Investments• 6.2 Protect Local Air Quality• 6.3 Climate Action	<ul style="list-style-type: none">• Reduced emissions per passenger trip



Increasing Resiliency to Climate Hazards

The following opportunities and considerations summarize how the solutions in this chapter can help improve resiliency to future climate hazards.

Opportunities	Considerations
	Extreme Heat
<ul style="list-style-type: none"> Replacing or shading parking areas can mitigate urban heat island impacts. Mitigating vehicle emissions could improve air pollution typically worsened on hot days 	<ul style="list-style-type: none"> Active forms of transportation (such as biking and walking) can be dangerous in extreme heat. Active transportation routes should be designed with trees, shade structures, and with stations to refill water.
	Flooding
<ul style="list-style-type: none"> EVs could release fewer pollutants than internal combustion engine vehicles during flood events. A frequent and reliable transit system can provide community members with a safe mode of travel during flooding. 	<ul style="list-style-type: none"> Infrastructure built to support alternative modes of transportation must be designed to withstand flood events. Active forms of transportation may be difficult or dangerous in the event of flooding.
	Drought & Mountain Snowpack
<ul style="list-style-type: none"> Transit service to nearby ski areas may need to expand beyond winter months as ski resorts add activities in other seasons in anticipation of reduced snowpack. 	<ul style="list-style-type: none"> Severe droughts can lead to an increase in particulate matter, which can exacerbate respiratory issues for people walking and biking.
	Wildfire
<ul style="list-style-type: none"> A robust transit system could help evacuate residents in the event of a wildfire. 	<ul style="list-style-type: none"> Active transportation may be limited during periods of poor air quality. Severe wildfires can disrupt transit service and routes.
	Winter Storms
<ul style="list-style-type: none"> A transit system can provide a convenient, safe, and affordable mode of transportation when snow/ice make walking, biking, or driving difficult or dangerous. 	<ul style="list-style-type: none"> Active transportation (e.g., biking and walking) could be disrupted by deep snow. Active transportation infrastructure must be plowed regularly to maintain a diverse network of options. Electric vehicles and buses may lose range in extremely cold weather.



Focus Area 5:
**Comprehensive
& Sustainable
WASTE REDUCTION**

Emissions from landfilled waste accounted for 5% of Bozeman's emissions in 2016, and emissions from this sector are on the rise due to increases in construction waste and municipal solid waste. Despite these challenges, on a per-capita basis, total landfilled waste is declining, meaning that efforts to reduce, reuse, and recycle waste are showing signs of progress.

The solution in this chapter emphasizes a comprehensive and system-wide approach to address community waste. It takes into account the current realities of the waste industry and helps Bozeman reimagine a new type of economy which is circular in nature and that provides more sustainable long-term solutions for reducing and managing waste.

Emissions from the decomposition of waste make up a relatively small portion of the City's GHG emissions footprint, so the overall impact of these solutions on the City's emissions goals is limited. These solutions do however have strong impact on the regional and global emissions for the production and transportation of goods, which is not reflected in the City's inventory. In order to optimize the emission mitigation and resiliency potential, the Bozeman community will need to:

- **Solution M. Move Toward a Circular Economy and Zero Waste Community**
Manage solid waste through a hierarchy of source reduction, reuse, recycling, composting and anaerobic digestion, and waste to energy conversion, with landfilling waste as a last resort.

Detailed waste-related targets for each goal year are shown in Table 10.

**RELATED PROGRAMS
& RESOURCES**

- [City Compost Collection](#)
- [Single-Stream Recycling](#)
- [Cleanup Bozeman Program](#)

Focus Area 5. Comprehensive & Sustainable Waste Reduction

Increasing Resiliency to Climate Hazards

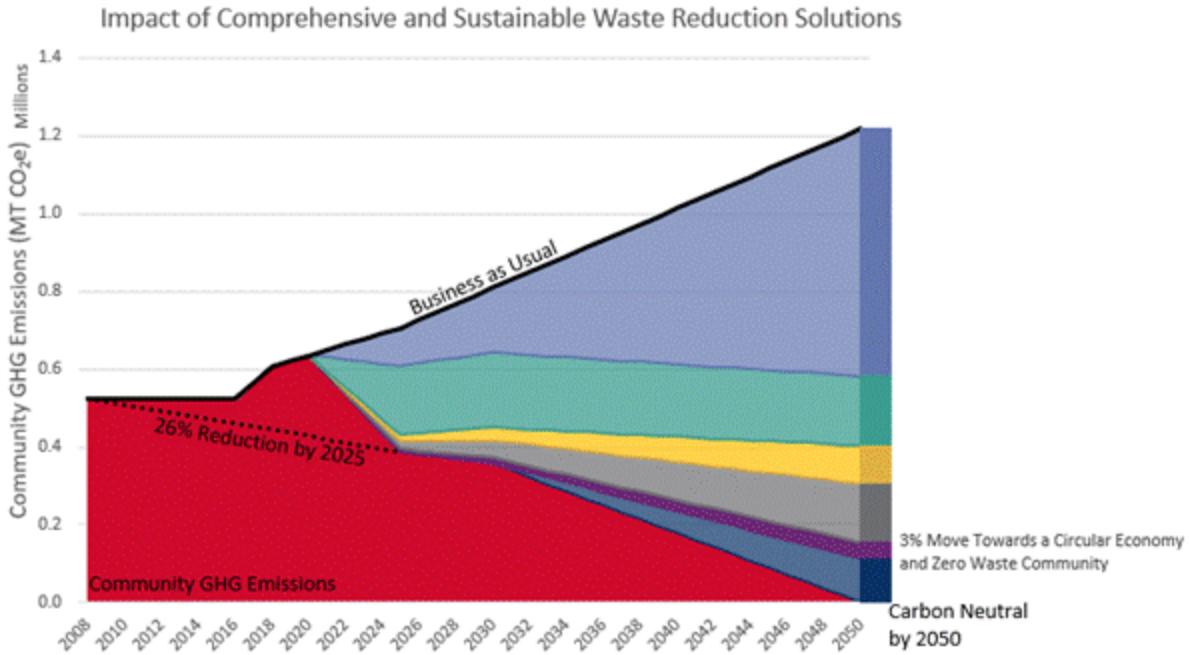


Figure 20. Projected waste GHG emissions reduction by solution

Table 10. Projected waste reduction mitigation targets

Solution	Metric (annual savings)	Target	Target	Target
		2025 Paris Accord	2030 100% Net Clean Electricity	2050 Carbon Neutral
Solution M. Move Toward a Circular Economy and Zero Waste Community	GHG Emissions Savings (MT CO ₂ e)	7,100	14,100	42,300

Focus Area 5. Comprehensive & Sustainable Waste Reduction

Solution M. Move Toward a Circular Economy and Zero Waste Community

Solution M. Move Toward a Circular Economy and Zero Waste Community

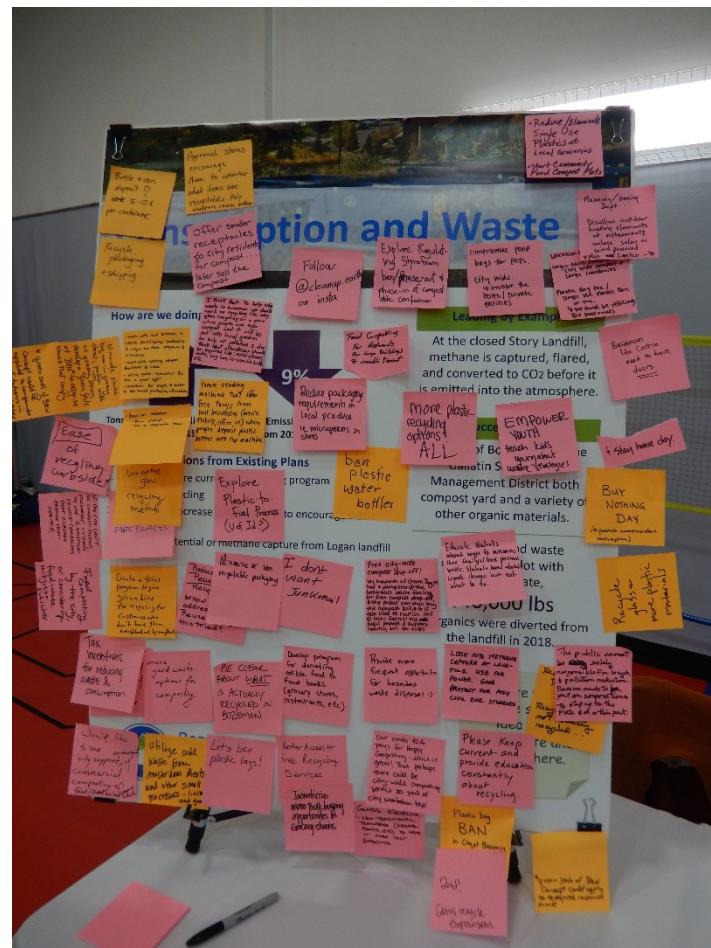
This solution focuses on the management of solid waste through a hierarchy of source reduction, reuse, recycling, composting and anaerobic digestion, and waste to energy conversion, with landfilling waste as a last resort. Waste reduction is strongly influenced by upstream production practices and the availability of services such as composting and recycling. As such, this solution requires an economy-wide effort—one that aims to eliminate waste and keep resources in use for as long as possible. This concept of a circular economy works in tandem with the goal of zero waste, which aims to prevent waste from being sent to landfills.

Source reduction is simply waste prevention, or the elimination of waste before it is created. This approach involves refining supply chain and purchasing practices to stop waste before it happens. A waste audit is a great way to begin to understand the amount and types of waste generated.

Reuse is the practice of using an item or product again, either for its originally intended use, or for a new use. Short of some resale shops and small-scale efforts, few comprehensive source reduction or reuse programs or community-scale activities currently exist in Bozeman.

In high-growth communities, total waste tonnage often tracks with increases in population and construction activities. Source reduction and reuse practices can help decouple trends in community growth from total landfilled waste trends.

The City of Bozeman offers single-stream curbside recycling services for customers. Recycling is more expensive than landfilling waste, and recent shifts in the global recycling market have resulted in changes at the local level in terms of what can be collected and effectively recycled. For comprehensive recycling services to be viable long-term, communities like Bozeman will need to work together to address recycling market imbalances and challenges. Reduction in waste is far more environmentally friendly, efficient, and cost-effective than relying heavily on recycling markets and services.



Focus Area 5. Comprehensive & Sustainable Waste Reduction
Solution M. Move Toward a Circular Economy and Zero Waste Community

Composting and anaerobic digestion are processes that decompose organic materials such as yard waste and food scraps to produce a nutrient-rich soil amendment that helps restore soil health. The City of Bozeman offers seasonal yard waste compost collection to solid waste customers. One recent success story is a food waste composting pilot with Montana State University, through which more than 540,000 pounds of organic materials were diverted from the landfill in 2018.

Decomposing organic waste releases methane, a potent greenhouse gas. Methane capture and recovery projects can help reduce the methane emissions from landfills. Methane at Logan Landfill is currently vented and released into the atmosphere. Methane from the closed Story Landfill is captured and flared.



There are many equity perspectives to examine when considering circular economy and zero waste solutions. For many people, reducing consumption can free up financial resources and support economic mobility. However, system-wide creation of more durable goods and products can result in higher initial costs, which can limit access. With respect to recycling and composting, residents of multi-family properties, visitors, and commercial properties often face significantly more barriers to accessing these services than traditional curbside residential waste customers. To make recycling and composting recycling services viable, changes in waste rate structures or other disincentives are often necessary, which can be onerous for lower income or cost-burdened community members. Similarly, lowering the cost of trash services below the cost of providing services might pull municipal resources away from other key programs.



Adequate sanitation services are critical to support community health and well-being. Beyond the immediate needs of proper waste collection and disposal, there are many other health and wellness benefits of a circular economy and zero waste practices, including but not limited to pollution reduction, portion control, fresh and local foods, and job creation.



The City of Bozeman can advance circular economy and zero waste practices within municipal buildings and operations by providing composting and recycling infrastructure at all City facilities, examining supply chain and purchasing policies to reduce packaging and buy in bulk, limiting new purchases or purchasing products made with recycled content, and offering surplus and outdated equipment for sale through a state-wide auction.

This solution primarily addresses Bozeman's greenhouse gas mitigation goals, while also providing supporting resiliency benefits.



Focus Area 5. Comprehensive & Sustainable Waste Reduction
Solution M. Move Toward a Circular Economy and Zero Waste Community

Related Solutions

- Solution G. Facilitate Compact Development Patterns
- Solution I. Enhance Social Infrastructure and Community Preparedness
- Solution N. Cultivate a Robust Local Food System

Action 5.M.1. Actively Promote Source Reduction, Recycling, and Repair

Providing source reduction, recycling, and repair resources and education to Bozeman citizens and businesses will be critical to achieving success in moving toward a Zero Waste Community and circular economy. Consumer purchasing decisions have a considerable impact on the community's overall waste stream.

The City of Bozeman has partnered with the Gallatin County Solid Waste Management District to host numerous "Fix-it Clinics" to extend the life of goods and encourage repair rather than disposal. The City will continue to partner with organizations, the business community, neighborhood groups, maker spaces, and homeowners' associations to promote and institute waste reduction and diversion best practices.

The City of Bozeman can increase awareness of zero waste practices by providing information and education to reduce residential and commercial waste and improve waste diversion practices. Additional ideas include promoting zero waste events, developing and piloting a quarterly or annual "Buy Nothing" day, encouraging neighborhood sponsored "community swaps," developing a program to reduce junk mail, and supporting the development of virtual or physical community "sharing sheds." The City will continue to partner with Montana State University to expand and promote programs that provide education and promote alternatives to disposable products and single use plastics. By promoting the use of resale stores, cooperative and bulk discount programs, and reuse/shared economy technology and services, the City of Bozeman can help consumers reduce their personal waste stream, and as a result, help build a circular economy and Zero Waste Community.

As of 2020, nearly 47% of City of Bozeman Solid Waste customers (blue bins) also had green recycling bins. The City will implement a recycling trial program to encourage the expansion of Bozeman's curbside recycling program. On a neighborhood-by-neighborhood basis, the City will provide all City of Bozeman curbside waste customers, who are not current curbside recycling customers, with a free trial of the program for 90 days. Offered on a rolling basis throughout the City, residences without green bins will have the opportunity to sample the convenience of single stream recycling and the City can expand the amount of recyclable material diverted from the landfill. The City can test the program in a few neighborhoods to determine the effectiveness and cost of a city-wide sampling program.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• Gallatin Solid Waste Management District• City of Bozeman• Montana State University• Inter Neighborhood Council• Bozeman Climate Partners Working Group• Home Owner Associations• Bozeman Makerspace	<ul style="list-style-type: none">• 1.1 Outreach• 6.3 Climate Action	<ul style="list-style-type: none">• # of Zero Waste events or programs

Focus Area 5. Comprehensive & Sustainable Waste Reduction
Solution M. Move Toward a Circular Economy and Zero Waste Community

Action 5.M.2. Expand Composting Services and Collection

When disposed of in a landfill, food waste and green waste create methane, a potent greenhouse gas. Expanding composting services and collection will enable the City to reduce the amount of compostable materials going into the landfill, thereby reducing methane production.

The City is currently expanding residential composting services from the existing yard waste collection to a community-wide curbside composting collection service that will include kitchen scraps and yard waste. There are several existing private composting businesses providing residential services; it is important that the City partner with private composters to expand capacity and collaborate with small businesses to craft programs. The City will provide information and education to reduce pesticide use, increasing the types of applications possible for finished compost. The City will explore requiring large food waste generators (e.g., restaurants and grocery stores) to compost and adopt updated development standards for commercial and multi-family recycling and composting infrastructure.

Biochar is a powerful soil amendment: it enhances plant growth and amplifies yields, which can increase food production, especially in areas with depleted soils or limited water resources. The City will partner with Montana State University to evaluate the waste stream inputs, operations, and application of biochar.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none">• City of Bozeman• Montana State University (e.g., Food Services, Facilities, Sustainability Office)• Bozeman Public School District• Private waste and composting companies• Restaurants• Grocers	<ul style="list-style-type: none">• 2.1 Business Growth• 6.3 Climate Action• 6.5 Parks, Trails, & Open Space	<ul style="list-style-type: none">• Tons of compost diverted from the landfill

Focus Area 5. Comprehensive & Sustainable Waste Reduction
Solution M. Move Toward a Circular Economy and Zero Waste Community

Action 5.M.3. Improve Waste Policies, Services, and Operations

The City of Bozeman's waste policies, services, and operations can help reduce the community's waste stream. The City of Bozeman provides curbside recycling as an opt-in service and diverted nearly 1,800 tons from the landfill in fiscal year 2018.

The City will review and consider adopting updated development standards for commercial and multi-family recycling and composting infrastructure. The City of Bozeman will explore options to review current trash and recycling fees and shift the recycling program and other waste diversion services to an "opt out" system (i.e., customers are automatically enrolled in these services unless they decline to participate) to increase participation. The City will coordinate with Gallatin Solid Waste Management District to explore increasing the frequency of Household Hazardous Waste (HHW) collection events to further reduce the volume of HHW going into the landfill.

Transportation emissions associated with transporting waste from City limits to the Logan Landfill account for a significant portion of waste emissions. The City will support Gallatin Solid Waste Management District to identify viable options for constructing a waste transfer station to properly sort and divert waste, or consider more efficient options for transport to the Logan Landfill. To reduce emissions at the landfill, the City will partner with Gallatin Solid Waste Management District to continue to study new opportunities for landfill gas to energy conversion infrastructure.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	<ul style="list-style-type: none">• Gallatin Solid Waste Management District• City of Bozeman	<ul style="list-style-type: none">• 6.3 Climate Action	<ul style="list-style-type: none">• Tons of recycling, compost, and HHW diverted from the landfill• Reduced transportation emissions from hauling waste and compost

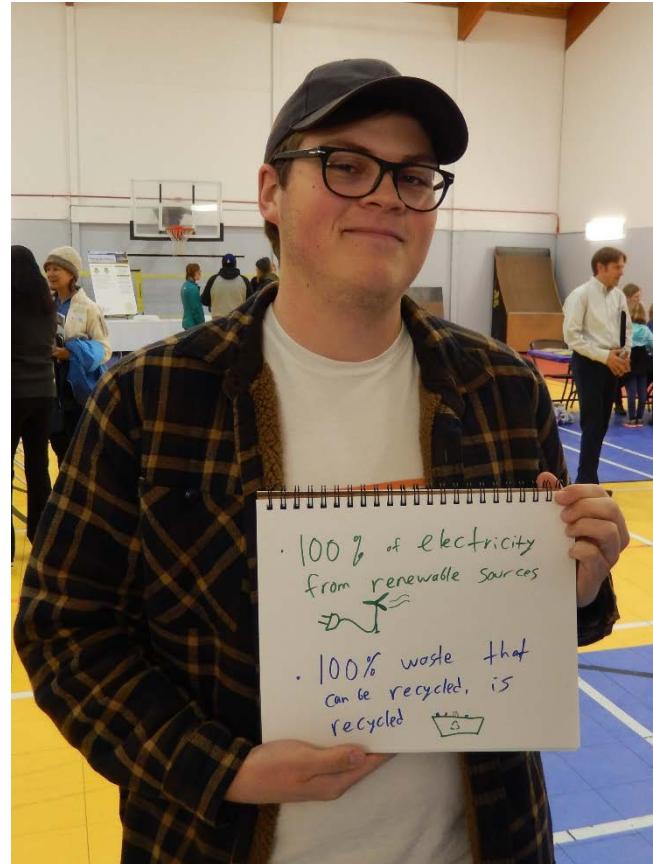
Focus Area 5. Comprehensive & Sustainable Waste Reduction
Solution M. Move Toward a Circular Economy and Zero Waste Community

Action 5.M.4. Support Construction Waste Diversion

While construction waste in itself does not generate a significant amount of greenhouse gases, the waste stream from construction sites need not take up valuable space in the landfill. Much of the material in construction waste is easily reusable or recyclable.

The City of Bozeman offers a comprehensive selection of roll-off containers for construction sites, including “wood only” recycling bins. The City will continue to educate and inform contractors of the economic benefits of separating out construction waste.

The City will develop guidelines and provide information and education to increase awareness in the development sector regarding construction waste reduction and diversion best practices (such as a “deconstruction handbook” that provides guidance on the benefits of deconstruction over demolition, available reuse and recycling resources, and local contractor information) and explore economic incentives for supporting demolition (deconstruction) businesses. The City will develop a recognition program for voluntary “green” construction and demolition practices and explore development incentives to achieve more sustainable construction and demolition waste management.



Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measure
Level 3	<ul style="list-style-type: none">• City of Bozeman• Montana State University• Southwest Montana Building Industry Association	<ul style="list-style-type: none">• 6.3 Climate Action	<ul style="list-style-type: none">• Tons of construction waste diverted from the landfill

Focus Area 5. Comprehensive & Sustainable Waste Reduction
Solution M. Move Toward a Circular Economy and Zero Waste Community

Action 5.M.5. Encourage the Development of Material Markets

A significant challenge with developing a circular economy is the lack of market demand and available infrastructure to properly and cost-effectively turn recycled materials into usable products and get them back into circulation. Some materials, such as plastic, cannot truly be recycled and can only be downcycled (i.e., re-manufactured into a lesser quality product) and can only be downcycled one or two times before losing integrity. Other materials can be recycled over and over, but there is a lack of market demand for products that contain recycled content.

To encourage the development of material markets, the City will partner with Montana State University or other research institutes to conduct a study to better understand full lifecycle economics of current household and construction waste practices, and identify ways to create new economic opportunities to move Bozeman toward a more circular economy. The City will also identify regional partners to engage in reuse, reduction, recycling, and other waste/purchasing/supply chain efforts. Related to Action 6.N.4., the City and its' partners will encourage local food production and food recovery programs, and identify partnerships between food processors and potential end users to utilize processing waste.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 3	<ul style="list-style-type: none">• City of Bozeman• Montana State University• Prospera Business Network• Gallatin Solid Waste Management District• City-County Local Food Council	<ul style="list-style-type: none">• 2.1 Business Growth• 6.3 Climate Action	<ul style="list-style-type: none">• Complete study of lifecycle economics of waste/recycling practices

Focus Area 5. Comprehensive & Sustainable Waste Reduction
Solution M. Move Toward a Circular Economy and Zero Waste Community

Action 5.M.6. Develop Plans for Green Purchasing and Zero Waste Events for City Operations

The City of Bozeman has the potential to generate unnecessary waste by using single use or non-recyclable/non-compostable products, both within its own operations and in hosting community events. Environmentally Preferable Purchasing (EPP) or Green Purchasing and guidelines for hosting Zero Waste events can help mitigate this impact. Environmentally Preferable products are products and services that have a lower negative impact on human health or the environment compared to similar conventional products.

The City will analyze its purchasing policy and develop a plan to integrate source reduction and green purchasing into its requirements. Green purchasing policies could include requiring the City to source products that:

- are reusable, recyclable, or recycled content products,
- conserve energy, water, or natural resources,
- are lower carbon content,
- are made from sustainable and renewable resources,
- prevent pollution or contain fewer hazardous chemicals or toxic substances, and
- minimize waste or have minimal packaging.

Local food procurement and best practices for printing and disposable paper products will also be addressed in the purchasing policy.

The City will also develop a plan for hosting Zero Waste events for City operations. Strategies for Zero Waste events could include prohibiting single use, disposable items, providing on-site composting and recycling, providing clear signage and trained staff to ensure proper disposal of waste, sourcing event materials and food locally, encouraging attendees to bring their own containers and utensils, or investing in reusable catering materials, such as dishes, cups, and utensils.

The City will continue to explore avenues to limit or ban single use plastics for municipal operations and activities. The City has already eliminated the use of plastic water bottles for everything but emergency situations.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 3	<ul style="list-style-type: none">• City of Bozeman• Montana State University• Southwest Montana Building Industry Association	<ul style="list-style-type: none">• 6.3 Climate Action• 7.3 Best Practices, Creativity, & Foresight	<ul style="list-style-type: none">• Updated Green Purchasing Guidelines• # of Zero Waste City Events

Focus Area 5. Comprehensive & Sustainable Waste Reduction

Increasing Resiliency to Climate Hazards

Increasing Resiliency to Climate Hazards

The following opportunities and considerations summarize how the solution in this chapter can help improve resiliency to future climate hazards.

Opportunities	Considerations
	Extreme Heat
<ul style="list-style-type: none">• Composting occurs more quickly in warmer temperatures.	<ul style="list-style-type: none">• A circular economy can reduce the need to transport goods in periods of extreme heat.
	Flooding
<ul style="list-style-type: none">• Adding compost and biochar to soils can increase water holding capacity, which can prevent runoff during flood events.	<ul style="list-style-type: none">• Flooding can cause high volumes of yard debris and organic materials that need disposal.
	Drought & Mountain Snowpack
<ul style="list-style-type: none">• Waste reduction can include water waste reduction (e.g., reliance on grey water systems, drought tolerant landscaping, etc.)• Soil amended with compost can hold more water and decrease water demand for plantings.	<ul style="list-style-type: none">• Water is essential to irrigate compost and clean/process recyclables.• Local production activities can be water-intensive.
	Wildfire
<ul style="list-style-type: none">• Compost and biochar additions to soil can increase water holding capacity, making landscape more resistant to wildfires.	<ul style="list-style-type: none">• A more localized economy could allow wildfire to disrupt wider sections of the Bozeman economy
	Winter Storms
<ul style="list-style-type: none">• Less waste to collect could reduce the impact if waste collection services were disrupted.	<ul style="list-style-type: none">• Composting can be challenging in cold or stormy weather.• Regular pick up of waste and recycling may still be necessary, and challenging, in event of severe winter storm.



Focus Area 6:

Regenerative Greenspace, Food Systems & NATURAL ENVIRONMENT

This chapter includes solutions that encompass the natural environment and systems, including land and water resources and food systems. While they present some opportunities for emissions mitigation through their connections to energy consumption, these solutions also provide emissions benefits in the form of carbon sequestration. Previous Bozeman greenhouse gas inventories have not accounted for carbon sequestration, but future inventories could aim to quantify their emission-related benefits.

Bozeman currently boasts 906 acres of City-owned parks, with most neighborhoods within a 10-minute walk to a park. Additionally, the City has more than 24,000 trees in public boulevards and parks. The 14-acre wetland in Story Mill Community Park is the community's largest wetland, and it is an award-winning project that is helping to build healthy streams and wetlands.

Like many of the other chapters, the solutions in this chapter emphasize conservation and efficiency in resource use. These solutions also emphasize regeneration, or the renewal, restoration, and regrowth of systems to make them healthier and more resilient to disturbance and future climate impacts.

The solutions in this chapter help advance Bozeman's resiliency goals. The emissions mitigation benefits are limited and are accounted for with other related solutions. To maximize resiliency and emissions mitigation potential, the Bozeman community will need to:

- **Solution N. Cultivate a Robust Local Food System**

Encourage and facilitate the development of all facets of a local food system, including but not limited to food production, access, processing, distribution, sales, resiliency, waste, education, and natural resources.

- **Solution O. Manage and Conserve Water Resources**

Utilize a comprehensive approach to manage water resources at the watershed scale.

- **Solution P. Manage Land and Resources to Sequester Carbon**

Encourage and implement practices that support the urban forest, strengthen carbon sinks, and improve carbon sequestration potential.

RELATED PLANS & STUDIES

- [Unified Development Code](#)
- [Bozeman Design Guidelines for Historic Preservation & Neighborhood Conservation Overlay District](#)
- [Triangle Community Plan](#)

Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment

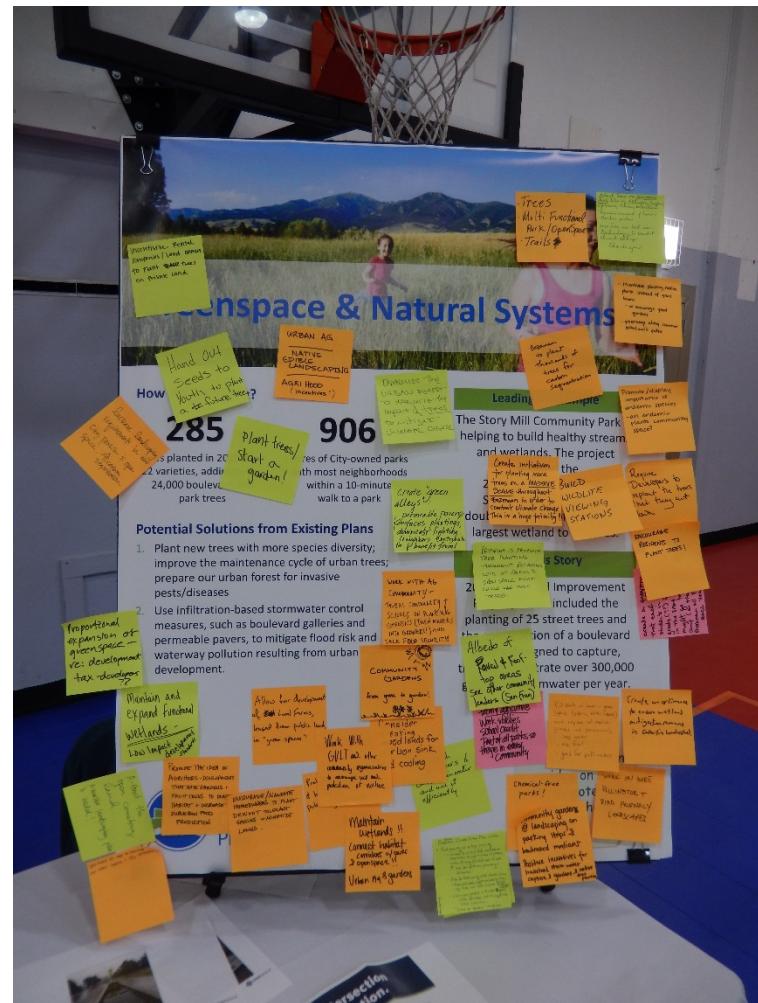
Solution N. Cultivate a Robust Local Food System

Solution N. Cultivate a Robust Local Food System

This solution recognizes that the natural system conversation is not complete without considering humans and our need to eat. This solution encourages the development of all facets of a local food system, including but not limited to food production, access, processing, distribution, sales, resiliency, waste, education, and natural resources. This complex web of processes required to get food from farm to table intersects with many other facets of this Climate Plan and brings to light the opportunity to address the food system holistically.

Food systems contribute heavily to greenhouse gas emissions. Retooling food systems presents many opportunities for emission reductions through improved agricultural practices, lower-carbon food products, production and transportation efficiency, and waste reduction. These approaches extend well beyond the typical urban farms and gardens, and necessitate transformations in economic, social, and environmental systems.

Climate change and the recent COVID-19 pandemic illuminate issues related to food system function and food security. In Montana, farmers are beginning to see climate change impacting productivity and nutritional quality, and their anxiety is increasing with this rise in uncertainty. Like communities across the country, Bozeman has an “on-demand” food supply that can be disrupted by events like a snowstorm that prevents truck deliveries. Similarly, the recent pandemic has transformed restaurant and food retail operations, interrupted agriculture production and harvesting, and increased food supply chain issues. A comprehensive food security assessment and plan could be a helpful next step to reduce food insecurity and improve food system resiliency.



Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment

Solution N. Cultivate a Robust Local Food System



A robust local food system is inherently a more equitable one, as it reduces food insecurity and improves food access and supply. It also creates a safety net in case of emergencies and supply chain disruptions.



From a health and well-being perspective, food stability and improved access to healthy food positively impacts health outcomes.



In terms of City assets, the City of Bozeman can facilitate food production on public properties, as well as support all aspects of a local food system through partnerships and its own purchasing practices.

This solution primarily addresses Bozeman's climate resiliency goals, while also providing limited (unquantified) greenhouse gas emissions reduction and carbon sequestration benefits.



Resiliency Benefits

- Conserve natural resources
- Increase social cohesion
- Mitigate property and economic losses
- Protect human health

Related Solutions

- Solution G. Facilitate Compact Development Patterns
- Solution I. Enhance Social Infrastructure and Community Preparedness
- Solution M. Move Toward a Circular Economy and Zero Waste Community
- Solution O. Manage and Conserve Water Resources
- Solution P. Manage Land and Resources to Sequester Carbon

Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment

Solution N. Cultivate a Robust Local Food System

Action 6.N.1. Support the Formation of a Local Food Council

To guide the process of cultivating a robust local food system in coordination and collaboration with our larger “foodshed”, the City of Bozeman will explore the formation of a City-County Local Food Council. The City will work with community partners to establish a resolution and form a Local Food Council to advise both city and county government on local agricultural and food-related policy issues, lead education, advocacy, and programs to grow and enhance a local food system.

The Local Food Council will provide education to the community about food systems, the benefits of local foods, the carbon intensity of various food sources, low water use food source options, individual food production efforts, community gardens, and home gardening, edible landscapes, and season extension practices. It will develop and launch a comprehensive educational campaign to share composting benefits and best practices and help residents improve home composting practices. The Council will promote soil-building and healthy soil practices on private property (e.g., soil amendments, limiting pesticides and herbicides, etc.), and the importance of water use efficiency.

The Local Food Council will partner with local institutions to support increased engagement with our local food economy and greater understanding of the multiple benefits of procuring local and regional foods. It will support and encourage farmers markets, farm to table opportunities, cottage food businesses, and agriculture/gardening in public green spaces.



Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	<ul style="list-style-type: none"> • Gallatin County • City of Bozeman • City of Belgrade • Open & Local • Montana State University & Extension • Greater Gallatin United Way • Gallatin Valley Land Trust • Gallatin Valley Food Bank • Local farms • Gallatin Valley Farm to school 	<ul style="list-style-type: none"> • 1.2 Community Engagement • 6.3 Climate Action • 6.6 Habitat 	<ul style="list-style-type: none"> • Creation of a City-County Food Council

Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment

Solution N. Cultivate a Robust Local Food System

Action 6.N.2. Help Develop a Food System Assessment and Security Plan

To cultivate a local food system, the City must have a clear understanding of current practices and conditions, systemic challenges, available resources, community partners and stakeholders, and a plan for implementation.

The City will partner with community stakeholders to develop a comprehensive food system plan to be led by the Local Food Council. The scope of the food assessment will include food emergency response policies to encourage quick and resilient action, a map of regional food suppliers, avenues for supporting local food production, and avenues to connect community gardens to food banks. Middle income earners currently have poor access to local food as they are challenged by the higher prices and are not likely to access emergency food security programs. The plan will include both low- and middle-income individuals and families in the assessment.

The City will partner with Human Resources Development Council and Greater Gallatin United Way to invest in emergency food system planning and distribution, and with local grocery stores and other food sector businesses to identify opportunities to bolster resilience, such as investing in backup generators and mapping infrastructure that can be prepared to assist during emergencies.

Through the Local Food Council, the City will work to strengthen relationships with farmers, ranchers, processors, and other food sector businesses outside of City limits and to identify mechanisms for encouraging more diverse agricultural production and food supply chains, while identifying mechanisms to protect existing agricultural activity through land use planning and development regulations.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measure
Level 2	<ul style="list-style-type: none">• Gallatin County• City of Bozeman• City of Belgrade• HRDC• Open & Local• Montana State University• Greater Gallatin United Way• Gallatin Valley Land Trust• Gallatin Valley Farm to School• Local farms	<ul style="list-style-type: none">• 3.2 Health and Safety Action• 6.3 Climate Action	<ul style="list-style-type: none">• Completion of Food Security Plan

Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment

Solution N. Cultivate a Robust Local Food System

Action 6.N.3 Encourage Local Agriculture and Preservation of Working Lands

A local food system is not possible without the preservation of agricultural land on which to grow food. As more and more agricultural land is converted to subdivisions in the Gallatin Valley, it is critical for the City of Bozeman to prioritize local agriculture and the preservation of working agriculture lands. The City of Bozeman, with input from the Local Food Council, will review existing land uses and the Community Plan, research effective metrics to evaluate urban agriculture, and consider targets to ensure that food production remains feasible within and near Bozeman. The City will encourage water use efficient appropriate and compatible new agricultural opportunities, such as incorporating garden pilot projects as part of City parks, supporting development design that integrates significant agricultural elements and opportunities (e.g., cluster development, community gardens, agricultural neighborhoods), and working with existing producers and land owners in the valley to encourage and support carbon sequestration practices on working lands.

The City will cultivate relationships with Montana State University, non-profits, and other local agencies to improve the management model for community gardens, emphasizing the need for responsible urban gardening, and organize community gardens in a manner conducive to re-investment in garden infrastructure.



Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	<ul style="list-style-type: none">• Gallatin County• City of Bozeman• City of Belgrade• Open & Local• Montana State University• Greater Gallatin United Way• Gallatin Valley Land Trust• Local farms• Gallatin Valley Farm to School	<ul style="list-style-type: none">• 2.1 Business Growth• 6.3 Climate Action• 6.6 Habitat	<ul style="list-style-type: none">• Establishment of urban agriculture and local food production targets

Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment

Solution N. Cultivate a Robust Local Food System

Action 6.N.4 Support Local Food Production, Processing, and Distribution

Disruption of supply chains is a threat to Bozeman's ability to access healthy, affordable food. Bozeman is vulnerable to both availability of imported food and impacts to the transportation network and supply chain. By focusing on enhancing capacity for local food production, processing, and distribution, Bozeman can expand food security and increase resilience.

The City will work with the Local Food Council to strengthen the food supply chain by supporting farmers, ranchers, processors and other food sector businesses through City Economic Development programs and supporting the development of food processing and distribution centers within or proximate to City limits. While continuing to focus on water use efficiency, the City will review City codes to identify barriers to local food production and distribution (e.g., yard production, light industrial agriculture, hydroponics, etc.), expand the narrative in current code allowing for garden use, and explore code changes to encourage new or larger commercial opportunities. The City-County Food Council may identify opportunities to advocate for agricultural subsidies for producers contributing to community food security. This supports the local producers to sell locally, makes food affordable for low- and middle-income individuals, and supports the local economy.

The City will establish best practices for food enterprises and expand opportunities for home-based or cottage food entrepreneurs, such as jams and jellies, baked goods, dry herbs and seasonings, granolas and trail mixes.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measure
Level 3	<ul style="list-style-type: none">• Gallatin County• City of Bozeman• City of Belgrade• Open & Local• Montana State University• Greater Gallatin United Way• Gallatin Valley Land Trust• Local farms• Gallatin Valley Farm to School	<ul style="list-style-type: none">• 2.1 Business Growth• 6.3 Climate Action• 6.6 Habitat	<ul style="list-style-type: none">• Completion of Food Security Plan

Solution O. Manage and Conserve Water Resources

This solution focuses on using a comprehensive approach to manage water resources at the watershed scale. This includes coordinating water resources across various sectors and applications, such as water supply, wastewater, reuse, stormwater, watersheds, wetlands, agriculture, and energy.

The production, conveyance, and treatment of water is highly energy intensive. Careful management and conservation of Bozeman's limited water resources helps reduce energy consumption and associated greenhouse gas emissions. Beyond this water-energy nexus, water conservation and management provide many other co-benefits, including supporting agricultural production, improving drought-preparedness and wildfire response, enhancing ecosystem function, extending the reach of current water supplies, generating utility cost savings, and reducing water bills for customers.

Water availability is limited as the City of Bozeman relies on snowpack for its water supply. Roughly 80% of the City's water comes from snowmelt in the Gallatin Range, which feeds Sourdough Creek and Hyalite Reservoir. The other 20% comes from a developed spring at the headwaters of Lyman Creek. As the community grows and climate patterns shift, water supplies will likely become less reliable, with more of the community's precipitation coming in the form of rain instead of snow. Water conservation is critical to ensure that the City has an adequate supply of water in the future. The City of Bozeman offers conservation-oriented water rates, including a tiered -block structure for single-family customers. The City of Bozeman utilizes a radio-read metering system, and proposed amendments to the landscaping code may require heavy water users to implement irrigation submetering. Use of water catchment and grey water systems in Montana are subject to state and county regulations. Both present additional water conservation opportunities, but regulatory considerations currently limit viability.

Bozeman has a history of collaborating with Montana State University, University of Montana, other jurisdictions, and various partners on climate and water research, modeling, and forecasting. To further support water supply planning and forecasting, the City of Bozeman will be developing a water supply optimization tool and water conservation plan. The optimization tool will examine current water rights and historical yield, providing staff with the means to track and project current and future supply availability. The water conservation plan will evaluate the benefit/cost for existing and future program measures to identify a volume of water the city can expect to save through demand management. Together, these initiatives will provide the city with a more detailed and comprehensive look into the city's future water supply reliability and water demand patterns.

Efforts to maintain and improve water quality are also critical in Bozeman's urbanized area and the greater watershed upstream and downstream of the community. The City has invested in infrastructure and technology to treat water and wastewater, as well as managing stormwater and agricultural runoff. Preservation and expansion of environmental features like wetlands and riparian buffers help manage runoff naturally. Low impact development techniques and green infrastructure development can mimic and support natural systems and provide water quality benefits.



Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment

Solution O. Manage and Conserve Water Resources



Measures to conserve water are more cost effective than securing additional water supplies, treatment, and/or building costly new infrastructure. There is a role for all Bozeman community members to implement water conservation practices. As with improvements for energy efficiency, some water conservation efforts are simple, low-cost opportunities, while others require more significant investments that may be out of reach for some community members. Likewise, modern urban water management techniques such as green infrastructure may prove to be costly investments that some cannot afford.



Pricing structures for customer water use should reflect the true cost of the water being used. The Water Treatment Plant must be built to accommodate high water use on the hottest, driest day in the summer when lawn irrigation is at its peak. Pricing structures should minimize the cost of water for essential uses and increase cost of water for non-essential uses such as irrigation. Access to clean and healthy water is vital for all community members. Comprehensive management of water resources across the watershed will help ensure that water is not only available, but of high quality.



The City of Bozeman can advance this solution by implementing energy-efficient practices in the production, conveyance, and treatment of water. The City can also continue to provide an integrated approach to water supply planning and management that includes water conservation as a primary strategy. Finally, the City of Bozeman can continue to lead by example in managing stormwater to protect water quality and can seek opportunities to incorporate Low Impact Development (LID) techniques with all City development projects.

This solution primarily addresses Bozeman's climate resiliency goals, while also providing limited (unquantified) greenhouse gas emissions reduction and carbon sequestration benefits.



Resiliency Benefits
<ul style="list-style-type: none">• Conserve natural resources• Strengthen infrastructure to natural disaster• Mitigate property and economic losses• Protect human health

Related Solutions

- Solution A. Improve Efficiency of Existing Buildings
- Solution G. Facilitate Compact Development Patterns
- Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards
- Solution N. Cultivate a Robust Local Food System
- Solution P. Manage Land and Resources to Sequester Carbon

Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment

Solution O. Manage and Conserve Water Resources

Action 6.O.1. Invest in Landscaping and Irrigation Upgrades at City Facilities

The City of Bozeman owns and manages 906 acres of City parks and numerous public facilities in the community. Investing in landscaping and irrigation upgrades at City parks and facilities will enable the City to lead by example with water conservation.

The City will update landscaping at City parks and facilities to be more drought tolerant, climate adaptive, and pollinator friendly, and update irrigation systems to include rain sensors, automatic controls, and high-efficiency equipment. The City will perform irrigation audits on City Facility and City Park irrigation systems to detect leaks and identify needed repairs, and program watering schedules and adjust programming seasonally for City properties to support water conservation goals. The City will also install drought tolerant landscaping in City medians to minimize or eliminate the need for irrigation systems.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measure
Level 1	• City of Bozeman	<ul style="list-style-type: none">• 4.3 Strategic Infrastructure Choices• 6.1 Clean Water Supplies• 6.3 Climate Action• 6.5 Parks, Trails, & Open Space	<ul style="list-style-type: none">• Reduced Water Consumption for City Facilities



Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment

Solution O. Manage and Conserve Water Resources

Action 6.O.2. Build on the Success of Water Conservation Education and Incentives

The City of Bozeman's Water Conservation program is well-established and offers education, water-wise and drought management resources, free sprinkler assessments, rebates/incentives for commercial and residential indoor and outdoor water conservation, and a [free online water use portal](#) for tracking home water use. The Bozeman Climate Plan builds on this success and expands programming to further educate the community and conserve our limited water resources.

The City will provide information and resources to support more water efficient and resilient landscapes to private property owners, property management companies, and homeowners' associations, and develop a water-efficient landscape recognition program for private properties and/or common neighborhood areas. The City will initiate a turf lawn-to-resilient-landscape conversion program (drought tolerant, climate adaptive, pollinator friendly) to encourage lawn retrofits.

The City will continue to share information about Bozeman's Drought Meter and Drought Management Plan, and partner with large water users to develop drought contingency plans. This effort will be supported by the energy and water benchmarking program for commercial buildings (Action 1.A.4).

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	<ul style="list-style-type: none">• City of Bozeman• Montana State University• Gallatin Watershed Council• MT Institute on Ecosystems• Gallatin Local Water Quality District	<ul style="list-style-type: none">• 1.1 Outreach• 6.1 Clean Water Supplies• 6.3 Climate Action	<ul style="list-style-type: none">• Reduced Gallons of Water Per Capita Per Day• Reduced residential outdoor water use

Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment

Solution O. Manage and Conserve Water Resources

Action 6.O.3. Evaluate Additional Water Conservation Code and Water Rate Structure Adjustments

In addition to programming and physical infrastructure, the City of Bozeman has influence over consumer behavior through regulatory and financial mechanisms. To maximize opportunities for water management and conservation, the City will evaluate additional water conservation code and water rate structure adjustments.

The City will review City codes to identify opportunities to encourage or require more resilient water systems (e.g., greywater use, efficient irrigation and landscaping practices, etc.), bolster requirements for resilient landscapes, and identify contradictions between water conservation and vegetation requirements. The City will evaluate current water and waste code ordinances to align with water conservation goals and evaluate the feasibility of seasonal time-of-use irrigation restrictions or pricing. The City will evaluate the feasibility of requiring new developments to offset projected water demand through water conservation projects.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	• City of Bozeman	<ul style="list-style-type: none">• 4.1 Informed Conversation on Growth• 6.1 Clean Water Supplies• 6.3 Climate Action	<ul style="list-style-type: none">• Reduced Gallons of Water Per Capita Per Day• Reduce outdoor water use

Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment

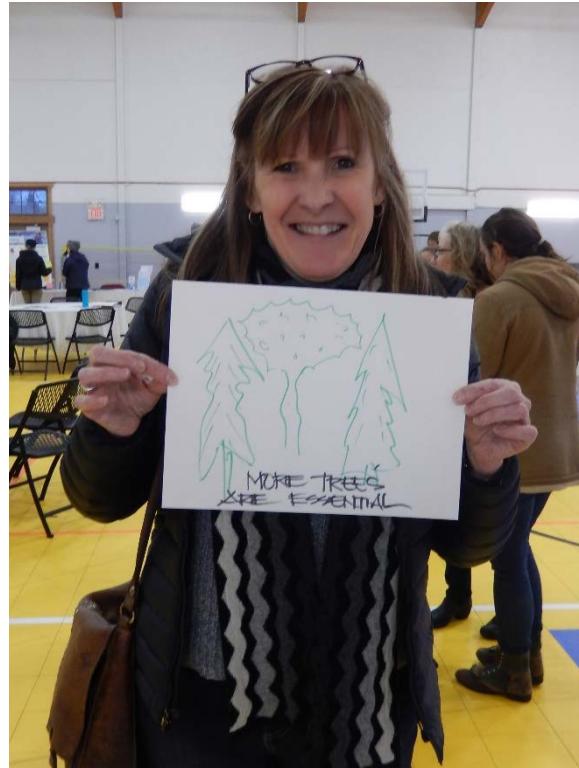
Solution P. Manage Land and Resources to Sequester Carbon

Solution P. Manage Land and Resources to Sequester Carbon

This solution encourages practices that support the urban forest, strengthen carbon sinks, and improve carbon sequestration potential. It includes management of land and resources on both public and private properties. This solution focuses on carbon sequestration and is closely related to other conservation and efficiency solutions.

Various land management practices and restoration techniques can support carbon sinks, the absorption of carbon dioxide from the atmosphere, and storage in natural systems like soil and plants. These opportunities include but are not limited to maintaining soil cover, minimizing soil disturbance and tilling, rotating crops, preserving natural and agricultural areas, protecting forests, managing grazing, restoring wetlands, reintroducing native species, removing invasive species, and implementing regenerative agriculture practices. Protecting existing trees, increasing the number of trees, and planning for tree replacement are all important practices to ensure a healthy and resilient urban forest.

In Bozeman's urban area, the tree canopy, public parks and open spaces, and private yards and properties all provide opportunities for carbon sinks and sequestration. At the community's edges, opportunities for carbon sequestration abound on agricultural properties and across nearby forests and open lands. Thoughtful stewardship of these lands and management of these resources provide many opportunities for Bozeman to naturally pull carbon emissions out of the atmosphere.



Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment

Solution P. Manage Land and Resources to Sequester Carbon



From an equity perspective, this solution needs careful consideration and implementation. Location and access by diverse segments of the community should be important drivers in the purchase of open space and/or development of other park or natural areas. Access needs to be balanced with the quality of the resources in order to maximize carbon sequestration benefits. Similarly, requirements for open space dedication within development projects could drive up development costs, making housing less affordable. With land and resource management on private property, renters may have less control over practices than owner-occupied properties, and some community members may be unable to afford investments into tree and yard maintenance.

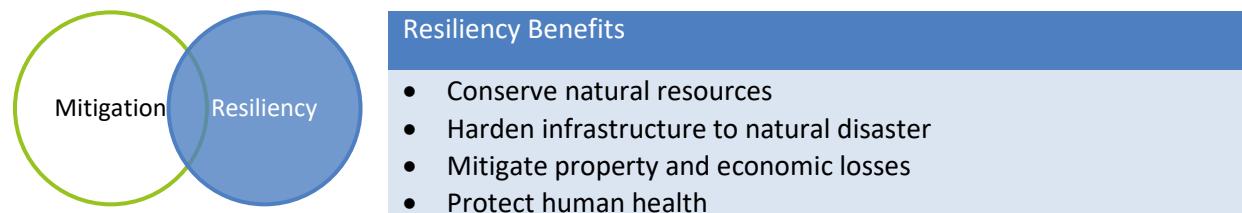


Enhancements to the urban tree canopy present significant opportunities to improve air quality and human health and increase resiliency through diversification of the tree canopy. Access to green spaces and the natural environment is important to physical and mental health.



The City of Bozeman can implement best-in-class land management practices across its many parks and open space assets so that they can create a robust network of carbon sinks. The City can also continue to provide healthy, safe, and resilient community forest public spaces.

This solution primarily addresses Bozeman's climate resiliency goals, while also providing limited (unquantified) carbon sequestration benefits.



Related Solutions

- Solution G. Facilitate Compact Development Patterns
- Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards
- Solution N. Cultivate a Robust Local Food System
- Solution O. Manage and Conserve Water Resources

Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment

Solution P. Manage Land and Resources to Sequester Carbon

Action 6.P.1. Protect Local Wetlands for Flood Resilience and Water Quality

Bozeman is predicted to experience increased urban flooding as a result of climate change. To mitigate this, the City can take actions to protect local wetlands for flood resilience and water quality.

The City will prioritize the protection, management, and restoration of wetlands. The City will enhance or construct wetlands to offset all losses and require that all wetland mitigation efforts are conducted within the impacted watershed. The City will study the wetland banking program and recommend reforms to encourage preservation of contiguous, high-value habitat and ecosystem services within the City of Bozeman.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measure
Level 1	<ul style="list-style-type: none">• City of Bozeman• Gallatin County	<ul style="list-style-type: none">• 4.1 Informed Conversation on Growth• 6.1 Clean Water Supplies• 6.3 Climate Action• 6.6 Habitat	<ul style="list-style-type: none">• Acres of Wetlands Preserved or Mitigated within Watershed



Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment

Solution P. Manage Land and Resources to Sequester Carbon

Action 6.P.2. Maintain and Expand the Urban Forest

Bozeman's urban forest is a valuable resource to the community, both aesthetically and from a public and environmental health standpoint. The Bozeman [Urban Forest Management Plan](#) (UFMP) aims to sustainably, holistically, and efficiently manage Bozeman's urban forest, and to illustrate the full expanse of benefits urban trees can provide. In public parks, open space, and rights of way, the City manages approximately 23,950 trees in the municipally owned urban forest (not including wild trees growing along stream banks and on private property or undeveloped City-owned property). The City is in the process of conducting a comprehensive inventory of Bozeman's urban forest. Bozeman's urban forest faces increasing threats from climate change and invasive pests. Addressing the health of the urban forest is among the highest priorities for the City.

The City of Bozeman will continue to grow the urban forest program to maintain and expand the urban forest on public and private property. The City will identify opportunities in City codes to promote the expansion, preservation, and maintenance of the urban forest, and prioritize planting low maintenance, drought tolerant tree species, and increasing species and age diversity. The City will explore the feasibility of launching and using an app to monitor tree health and carbon sequestration.

Education for the community on proper maintenance of the urban forest is critical. The City will increase public outreach related to proper tree care and maintenance, removal, and replacement on private property.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 1	• City of Bozeman	<ul style="list-style-type: none">• 4.1 Informed Conversation on Growth• 6.3 Climate Action• 6.5 Parks, Trails, & Open Space• 6.6 Habitat	<ul style="list-style-type: none">• Increased Species Diversity• Increased Proactive Tree Maintenance

Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment

Solution P. Manage Land and Resources to Sequester Carbon

Action 6.P.3. Enhance Greenspace and Carbon Sequestration for New Development

The City of Bozeman has the capacity to help guide new development, especially with regard to shared open space and vegetation requirements. Greenspaces throughout the community can either sequester carbon, if designed thoughtfully and with intention, or they can inadvertently contribute to increased carbon emissions, through increased energy- and water-intensive activities such as mowing, irrigation, and fertilizing.

The City already requires dedicated park lands and open space in new residential developments. The City will review existing parkland requirements and determine the role of parks in the preservation of greenspace and carbon sequestration. The City will emphasize native landscapes in greenspace development and incentivize developers to enhance or construct wetlands in new developments, where appropriate. Trees in greenspace can provide cooling spaces, further mitigating the impacts of climate change.

The City will promote the installation and maintenance of greenways along bike and walking paths and incentivize the connection of habitat corridors as development and redevelopment occurs. The City will review requirements for parking lot, median, and boulevard landscaping to require climate-friendly landscaping.



Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measure
Level 1	• City of Bozeman	<ul style="list-style-type: none">• 6.3 Climate Action• 6.5 Parks, Trails, & Open Space• 6.6 Habitat	<ul style="list-style-type: none">• Establish method to quantify urban carbon sequestration potential

Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment

Solution P. Manage Land and Resources to Sequester Carbon

Action 6.P.4. Provide Outreach on Water Pollution Prevention and Carbon Sequestration Strategies

Beyond the urban tree canopy, Bozeman's natural land and water resources have high potential for carbon sequestration and are at high risk for pollution. Management strategies that depend upon pesticides, herbicides, fungicides, and fertilizers can pollute water supplies and harm wildlife.

The City will partner with the Local Food Council, MSU, scientists, and other partners to explore the impacts of and alternatives to pesticides, herbicides, fungicides, and neonicotinoids on City properties and community wide. The City will emphasize best management practices and promote a phosphorous-free City. Whenever possible, the City will prioritize the installation of low maintenance landscapes to help reduce weed maintenance demands. The City will provide education and outreach to private property owners to minimize the use of or find alternatives to chemical applications where possible.

The City will provide information and education to help residents make improvements on private property related to carbon sequestration and land management and provide resources on investments into local/regional carbon offset programs. The City will quantify carbon sequestration potential and irrigation requirements of different types of vegetation, especially in evaluation of food production.

Producing biochar from agricultural wastes could sequester up to 12% of global carbon emissions (Woolf, D., Amonette, J., Stret-Perrott, F. et al., 2010). Biochar has myriad co-benefits: it improves soil health and crop yields and produces biogas as a by-product that could be refined into biodiesel for use in City vehicles. Biochar is an existing, low-tech technology that the City of Bozeman could utilize in addressing the community's agricultural and urban forest waste. The City will work with Gallatin County, the Local Food Council, and other partners, such as local farmers, to support production of biochar within Gallatin County. Additionally, the City could experiment with making its own biochar from municipal yard waste and sharing the process with local farmers. The City could also provide a market for purchasing biochar to incentivize local farmers to produce it.

Priority	Lead & Implementing Partners	Strategic Plan Alignment	Performance Measures
Level 2	<ul style="list-style-type: none">• City of Bozeman• Montana State University Extension• Local Farmers• MSU Engineering• MSU College of Agriculture• Non-profits (e.g., Gallatin Valley Land Trust, One Montana)• Western Sustainability Exchange	<ul style="list-style-type: none">• 6.3 Climate Action• 6.5 Parks, Trails, & Open Space• 6.6 Habitat	<ul style="list-style-type: none">• Reduction in Nitrogen and Phosphorous concentration in Water Reclamation Facility Effluent• Develop guidance on carbon sequestration and irrigation requirements for vegetation and food production.

Increasing Resiliency to Climate Hazards

The following opportunities and considerations summarize how the solutions in this chapter can help improve resiliency to future climate hazards.

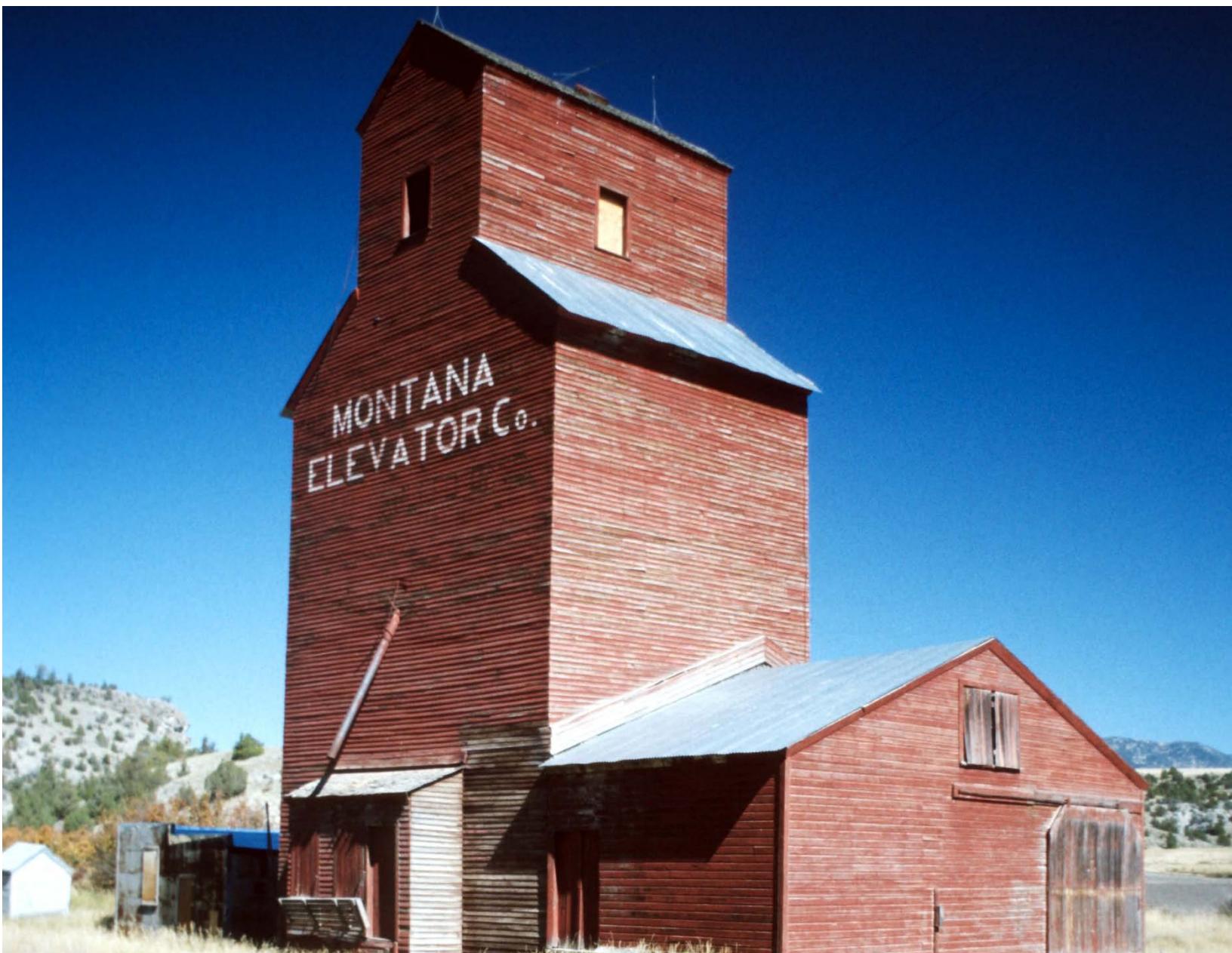
Opportunities	Considerations
Extreme Heat	<ul style="list-style-type: none"> • Robust greenspaces and urban forests provide cooling benefits and decrease urban heat island effect. • A robust tree canopy reduces water demand of shaded vegetation and turf grass. • Healthy soils can help protect plants during extreme heat events. • Conserving water resources will help to ensure adequate supplies. <ul style="list-style-type: none"> • Extreme heat could adversely affect agriculture productivity and food production. • Surface waters may experience losses due to evaporation.
Flooding	<ul style="list-style-type: none"> • Protecting and restoring wetlands and riparian areas will improve flood and erosion control. • Healthy soils can store additional water and are less prone to erosion. <ul style="list-style-type: none"> • Flooding could adversely affect agriculture productivity and food production.
Drought & Mountain Snowpack	<ul style="list-style-type: none"> • Protecting/conserving water resources and increasing soil health will improve water holding capacity of natural systems. • Native and drought tolerant landscapes require less water than turf. <ul style="list-style-type: none"> • Drought could adversely affect agriculture productivity and food production. • Increased tree canopy and greenspace could increase burnable fuel during drought.
Wildfire	<ul style="list-style-type: none"> • Developing a diverse supply of water resources can increase resilience if wildfires threaten quality of surface water. • Local food production could provide food security if wildfires impact food supply chain. • Conserving water resources can help ensure supplies necessary to fight fires. <ul style="list-style-type: none"> • Water may be limited for other critical uses, like local agriculture, if required for firefighting. • Water quality can be challenging to protect in the event of a wildfire.
Winter Storms	<ul style="list-style-type: none"> • Local food systems can provide food during times of limited distribution. • Greenspaces can help to absorb runoff when snow melts. • Winter storms could bolster snowpack and resulting water resources. <ul style="list-style-type: none"> • Severe winter storms could adversely affect agriculture productivity and food production.



Bozeman
Climate
Plan

CHAPTER 4:

IMPLEMENTATION GUIDE





This section provides a detail to guide implementation of this Climate Plan. The implementation guide includes three major sections: (1) implementation considerations, (2) activities to keep the plan on track, and (3) implementation playbook for strategies and actions.

IMPLEMENTATION CONSIDERATIONS

Forecasting and Risk

Implementing this Climate Action Plan is subject to conditions along the way that could affect progress toward goals. Some of these are large systemic conditions that the City and community can influence, but don't have direct control over. It's important to recognize these changing conditions in monitoring the plan's progress, adjusting course where needed along the way.

Population Growth

The business-as-usual forecast is based on constant per capita emissions, so variation in population growth has a significant impact on the projected community emission and therefore the amount of reductions needed to achieve the goals. Bozeman is a high-growth community and there is significant uncertainty in the future population projections as discussed in Chapter 2: Climate Trends & Goal Contributions.

All goals analyzed in this plan are based on the high-growth scenario to allow contingency planning for all growth scenarios.

Economic Conditions

- As shown in the next section, the solutions in this plan have a good financial performance as a whole, but many require upfront investment. Recessionary conditions can dampen the pace of investment and therefore progress toward the goal.
- Economic downturn may also slow the pace of new development reducing the overall community GHG emissions.
- Projected EV adoption rates may be slowed from current projections if there is a prolonged economic downturn.

Electric Utility Supply

- The plan relies heavily on NorthWestern Energy's ability to deliver significantly more clean energy to Bozeman. Spot market, short-term sales, market prices for renewable assets and state regulatory conditions all affect the utility-based clean energy solutions in this plan.
- The feasibility of distributed electricity generation projections may depend on local or national policy affecting net metering, allowed system size, and available incentives.
- Utility policy to support EV infrastructure may accelerate EV adoption.



Federal Policy and Investment

- Implementing a carbon tax or an emissions trading system will provide financial incentives for businesses to mitigate their emissions as well as provides governments financing for mitigation or adaptation programs. The implementation of a carbon tax could accelerate the implementation on many of the identified solutions.
- Production tax credits for large scale wind products are set to expire at the end of 2020 and it appears unlikely to be renewed. This may reduce investment in utility-scale wind programs.
- In 2018, the corporate average fuel economy (CAFÉ) standards were frozen at the 2021 level rather than continuing to improve fuel economy through 2025. The future of this program will likely influence auto maker incentives to continue to innovate and produce lower emissions vehicles.

To meet the community's 2050 goals, new emissions reduction or carbon sequestration solutions that are not currently commercially available must be developed. The development of these solutions will rely on consistent demand and support of research and innovation.

The above risks are illustrative and not exhaustive. Managing risks will require implementing all of the solutions in the plan which were built together as a system to achieve the goals. As a matter of best practice, new strategies should be considered during implementation to periodically freshen the solutions with the latest opportunities in cost-effective mitigation and resilience.





Economics of Climate Change

To reach the climate mitigation goals in this plan, significant investment will be required from both the City of Bozeman and the community's businesses and residents. Before determining the cost effectiveness of various mitigation solutions and supporting strategies, we must first understand the cost of doing nothing. Figure 21 shows the cost of energy use in the community for the 2016 baseline, as well as the projected cost for each of the goal years assuming business as usual. This is a combined cost of fuel use from City operations, businesses, and residents as well as the social cost of carbon from the resulting emissions. The social cost of carbon is a metric that shows the cumulative cost of the negative impacts of Bozeman's GHG emissions including increased frequency and severity of natural disasters as discussed above (US Environmental Protection Agency, 2020). As the City and residents consider various investments to reduce the community's GHG emissions, the investment should be compared against the cost of doing nothing in order to net costs and benefits, keeping in mind that the social cost of carbon is higher in later goal years as the effects of climate change are more pronounced.

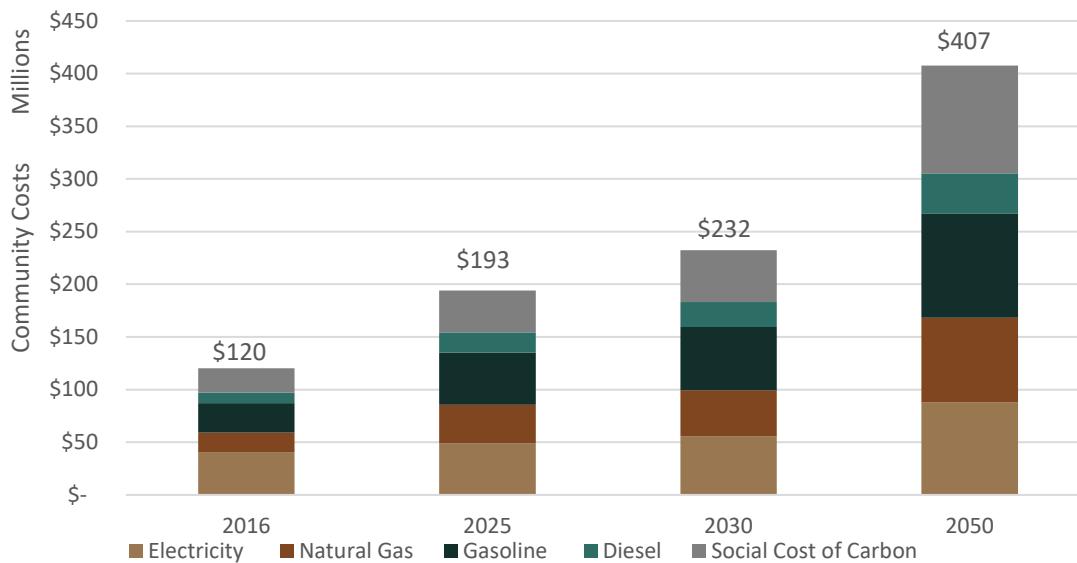


Figure 21. Projected cost of energy use and social cost of carbon under the business-as-usual high-growth scenario

The following table summarizes which solutions in this plan reduce each of the fuel components of the community GHG inventory shown in Figure 6. For each solution, total costs or cost savings are estimated, along with return on investment (ROI), through the year 2050. As shown in Table 11, the total estimated cost savings from these climate mitigation solutions is \$217.5 million by 2050 in addition to avoiding the projected social impacts of carbon emissions estimated at \$102 million in 2050.

In 2016 the cost of energy use in Bozeman was about \$2,200 per resident. Under the business as usual scenario in Figure 21, this cost would rise to about \$2,900 per resident in 2050 based on consistent energy consumption per person and the US Energy Information Administration's projections for energy costs in Montana (US Energy Information Administration, n.d.). By contrast, the average per person energy costs drops to \$850 per person in 2050 based on the goal scenario outlined in this plan, a 70% reduction. While Bozeman homes and businesses will need to invest significantly to reduce energy use and shift to renewable energy sources, the end result will be more affordable energy costs.



Table 11. Projected fuel savings and return on investment per mitigation solution

Mitigation Solution	Emissions Source Impacted	2050 Cost Savings and Return on Investment ⁸
A. Improve Efficiency of Existing Buildings	Electricity and Natural Gas	Cost Savings: \$71.4 Million ROI: 4% for deep energy retrofits; 5.9% for medium retrofits (Nadel, 2020)
B. Achieve Net-Zero Energy New Construction	Electricity and Natural Gas	Cost Savings: \$47.4 million ROI: 10-13% (Emerson & Sullivan, 2020)
C. Electrify Buildings	Natural Gas	Cost: \$9.3 million ROI: None – varies based on existing systems
D. Increase Utility Clean Energy Mix	Electricity	Cost Savings: unknown ROI: not applicable
E. Increase Community Participation in Utility Green Power Programs	Electricity	Cost: Variable based on green power agreement ROI: not applicable
F. Increase Community-Based Distributed Renewable Energy Generation	Electricity	Cost Savings: \$4.4 million ROI: 2.5%-5.6% for solar depending on net metering and electric TOU rates (Nadel, 2020)
G. Facilitate Compact Development Patterns	Gasoline and Diesel	Cost Savings: \$37.9 million ROI: public investment; High ROI to solution participants reducing trips
J. Increase Walking, Bicycling, Carpooling and Use of Transit	Gasoline and Diesel	Cost Savings: \$34.6 million ROI: public investment; High ROI to solution participants reducing trips
K. Decrease Direct Vehicle Emissions	Gasoline and Diesel	Cost Savings: \$29.8 million ROI: public investment; High ROI to solution participants reducing trips
TOTAL		TOTAL Cost Savings \$215.7 million

⁸ Projected energy prices based on US Energy Information Administration projections for Montana.

Building efficiency, NZE construction, and distributed renewable energy generation all have a positive return on investment to the institutions, businesses, and residents making capital improvements to their facilities. These solutions also tend to improve property values. With decreasing costs of utility-scale renewable energy, utility-based renewable energy solutions may have a direct economic benefit to the community in the future, particularly when considering the societal cost of carbon. Utility-based solutions are also essential to achieve deep carbon reduction goals. When evaluating potential rate impacts or possible premiums for electricity through tariffs, it's therefore important to evaluate cost effectiveness in conjunction with energy efficiency.

Three solutions in this plan tackle emissions associated with gasoline and diesel consumption. Two of the solutions reduce the number of trips and/or trip length in conventional vehicles. These strategies rely heavily on public investment in transit, compact land use development, and walking and biking infrastructure. On the other hand, cost savings from these public investments are realized by residents and visitors who choose to participate in these solutions. The third solution targets replacing conventional vehicles with zero emission electric vehicles. The vehicle or fleet owner bears the incremental investment cost and realizes the savings directly. However, similar to most of the other mitigation solutions, the actual return on investment can vary depending on public policies, utility rebates, and tax incentives. To address this, the solutions within this plan include dedicated advocacy and policy strategies that can improve financial performance and therefore participation in these solutions community wide.

Achieving the climate resiliency goals in this plan will also require significant investment from all facets of the Bozeman community, including the City of Bozeman, residents, businesses, and others. Unlike the mitigation solutions, many of which yield a positive ROI that can be estimated using fuel savings over time, the costs of resiliency solutions are more difficult to quantify. This is because resiliency solutions involve transforming complex physical, social, and economic systems and decision-making. In terms of ROI of resiliency, it is estimated that planning for resilience during normal times will yield \$6 in economic benefits for every \$1 spent (Multihazard Mitigation Council, 2017).



KEEPING THE PLAN ON TRACK

Plan Leadership

The **City of Bozeman Sustainability Program Manager** will continue to serve as the project manager for Climate Plan implementation. The Sustainability Program Manager will serve as a central coordinator of various implementation initiatives, establishing partnerships and delegating responsibility to others as necessary, and seeking approval from the City Commission as appropriate. The Sustainability Manager will also be responsible for continuing to convene stakeholder and leadership meetings, overseeing the Climate Plan monitoring and reporting activities, and initiating future Climate Plan amendments and updates.

A **Charter** will be developed within six months of plan adoption to further define specific actions and sub-actions needed to implement priority Level 1 items. The Charter will serve as a work plan with defined steps needed to accomplish action items with assigned responsible parties, timelines, budgets, and priorities. The Charter is intended to be a living document that changes over time to reflect subsequent changes and near term needs moving forward. Formation of a permanent **Climate Advisory Board** is recommended to guide annual implementation planning, support monitoring and reporting, and provide implementation leadership and assistance.

The **Bozeman City Commission** is responsible for adopting the Climate Plan and continuing to align City policies, decisions, and funding to support its implementation.

Monitoring and Reporting

Ongoing monitoring of progress and reporting of achievements is essential in keeping the Climate Plan current and on track to achieve the climate goals. Technology platforms such as Smartsheet and ArcGIS Hub will be used to create a real-time **Dashboard** to measure progress over time. Significant potential exists for developing informative public outreach solutions using modern tools to effectively engage the community. Monitoring and reporting activities will include the following:

- **Performance Monitoring:** updating and reporting on the community's GHG emissions every two years (i.e., 2020, 2022, 2024, etc.).
- **Implementation Monitoring:** providing an annual memorandum or report summarizing the status of each solution and associated implementation strategies (including achievements, challenges, and general progress). Where feasible, a triple bottom line analysis of activities, including environmental, social, and economic benefits will be included.

Amendments and Updates

Finally, because this Climate Plan is intended to provide a framework for emissions reduction for the next three decades through 2050, it is likely that amendments and updates to the Plan will be necessary. Every two years, the GHG emissions inventory will be updated, which may necessitate changes to interim emissions reduction targets or refinements climate solutions.

Similarly, the implementation strategies identified in the implementation playbook will need to be updated as actions are completed, and new ideas and priorities emerge. On an annual basis, the implementation playbook will be reviewed and updated to reflect emerging or changing priorities, modifications in timelines and sequencing, updates to partners or resources, and removal of completed activities.



IMPLEMENTATION PLAYBOOK

The following table provides a summary of actions, organized by focus area and solution. Actions listed in *italic* text indicate that another entity beyond the City of Bozeman is responsible for leading implementation, with the City of Bozeman as a supporting implementation partner. See the detailed action narratives in Chapter 3 for more details about implementation roles for each action.

Actions listed in **bold** text indicate that they may require amendments to the City of Bozeman Unified Development Code (Chapter 38 of the City Code). The City Commission has established a twice-yearly cycle for UDC updates. It is recommended that implementation of these code-related amendments follow the established update cycle, to the extent practical and feasible.

Table 12. Summary of actions by focus area and priority level

Focus Area	Action	Priority Level
Focus Area 1. Healthy, Adaptive & Efficient Buildings	Solution A. Improve Efficiency of Existing Buildings	
	1.A.1. Increase Energy Efficiency at City Facilities	1
	1.A.2. <i>Use Data and Price Signals to Advance Energy Efficiency</i>	1
	1.A.3. Expand Energy Efficiency Information and Resources for Private Property	1
	1.A.4. Establish an Energy and Water Benchmarking Standard for Commercial Buildings	1
	1.A.5. Require Home Energy Labeling at Time of Listing	2
	1.A.6. Promote Energy Efficiency Financing and Investment	2
	1.A.7. Create a Rental Registry Program to Advance Renter Safety and Energy Efficiency	3
	Solution B. Achieve Net Zero Energy New Construction	
	1.B.1. Support High Performance Building Resources and Training for the Development Community	1
	1.B.2. Advocate for Adoption of State-Wide Net Zero Energy Code	1
	1.B.3. Encourage High Performance Construction for All Publicly Funded Buildings	2
	1.B.4. Analyze and Support Opportunities for District Energy	2
	1.B.5. Offer a Voluntary Pathway & Incentives for Above-Code Construction	3
	Solution C. Electrify Buildings	
	1.C.1. Advance Electrification Upgrades and Conversion Projects for City Facilities	2
	1.C.2. Include an Electrification Component for Above-Code Construction	3
	1.C.3. Support Outreach and Incentives for Electric Appliances and Equipment	3



Focus Area	Action	Priority Level
Focus Area 2: Responsible & Reliable Clean Energy Supply	Solution D. Increase Utility Clean Energy Mix	
	2.D.1. Complete a 100% Net Clean Electricity Community Feasibility Study	2
	2.D.2. Collaborative and Innovate Utility-Scale Solutions with Utility Provider	1
	2.D.3. Support Policies to Expand Renewable Energy and Just Transition Initiatives	1
	2.D.4. Encourage Philosophical Shift for Utility Provider	1
	Solution E. Develop and Promote Utility Green Power Programs	
	2.E.1. Advance Green Tariff Program Development and Participation	1
	Solution F. Increase Community-Based Distributed Renewable Energy Generation	
	2.F.1. Plan and Install Renewable Energy Projects for City Facilities	1
	2.F.2. Streamline Solar Permitting and Adopt Solar-Ready Code Provisions	1
Focus Area 3: Vibrant & Resilient Neighborhoods	2.F.3. Advance Distributed Solar Policies	2
	2.F.4. Promote Education and Incentives for Distributed Renewable Energy Storage	3
	Solution G. Facilitate Compact Development Patterns	
	3.G.1. Continue Regional Coordination on Compact Growth and Sustainable Development	1
	3.G.2. Review Development Code to Enhance Compact and Sustainable Development	1
	3.G.3. Develop Sustainable Neighborhoods Outreach	2
	Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards	
	3.H.1. Plan for Resilience Hubs at Critical Facilities	1
	3.H.2. Advance Resilience in Development Code and Development Review	1
	3.H.3. Support Business and Residential Preparedness Outreach	2
	3.H.4. Incorporate Resilience into Infrastructure Plans	2
	Solution I. Enhance Social Infrastructure and Community Preparedness	
	3.I.1. Support Community and Neighborhood Resilience Programming	1



Focus Area	Action	Priority Level
Focus Area 4. Diverse & Accessible Transportation Options	<p>Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit</p> <p>4.J.1. Prioritize Regional Multi-modal Planning and Connectivity</p> <p>4.J.2. Pursue Innovative Funding for Pedestrian and Bicycle Connections and Network</p> <p>4.J.3. Improve Maintenance of Multi-Modal Infrastructure</p> <p><i>4.J.4. Pursue Sustainable Transit Funding and Expansion</i></p> <p>4.J.5. Support Employee Trip Reduction Programs and Transportation Demand Management</p> <p><i>4.J.6. Support Regional Transit Service Coordination and Outreach</i></p> <p>4.J.7. Leverage Parking Policies to Encourage Other Modes of Transportation</p> <p>4.J.8. Develop Bike and Car Share Programs</p>	1 1 1 1 1 1 2 3
	<p>Solution K. Decrease Direct Vehicle Emissions</p> <p>4.K.1. Support Community EV Roadmap Development</p> <p>4.K.2. Collaborate to Install Publicly Accessible EV Infrastructure</p> <p>4.K.3. City Fleet and Transit EV Investment</p> <p>4.K.4. Advocate for EV Utility Rates, Incentives, Infrastructure, and Efficiency Standards</p> <p>4.K.5. Limit Wasteful Vehicle Emissions</p> <p>4.K.6. Support EV Group Buy and Outreach</p>	1 1 2 2 2 3
Focus Area 5. Comprehensive & Sustainable Waste Reduction	<p>Solution L. Improve Air Travel Efficiency</p> <p>4.L.1. Build Awareness of Air Travel Impacts and Alternatives</p> <p>4.L.2. Advocate for Increased Air Travel Efficiency</p> <p>Solution M. Move Toward a Circular Economy and Zero Waste Community</p> <p><i>5.M.1. Actively Promote Source Reduction, Recycling, and Repair</i></p> <p>5.M.2. Expand Composting Services and Collection</p> <p>5.M.3. Improve Waste Policies, Services, and Operations</p> <p>5.M.4. Support Construction Waste Diversion</p> <p>5.M.5. Encourage the Development of Material Markets</p> <p>5.M.6. Develop Plans for Green Purchasing and Zero Waste Events for City Operations</p>	2 3 1 1 2 2 3 3



Focus Area	Action	Priority Level
Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environments	Solution N. Cultivate a Robust Local Food System	
	6.N.1. Support the Formation of a Local Food Council	1
	6.N.2. Help Develop a Food System Assessment and Security Plan	2
	6.N.3. Encourage Local Agriculture and Preservation of Working Lands	2
	6.N.4. Support Local Food Production, Processing, and Distribution	3
	Solution O. Manage and Conserve Water Resources	
	6.O.1. Invest in Landscaping and Irrigation Upgrades at City Facilities	1
	6.O.2. Build on the Success of Water Conservation Education and Incentives	2
	6.O.3. Evaluate Additional Water Conservation Code and Water Rate Structure Adjustments	2
	Solution P. Manage Land and Resources to Sequester Carbon	
	6.P.1. Protect Local Wetlands for Flood Resilience and Water Quality	1
	6.P.2. Maintain and Expand the Urban Forest	1
	6.P.3. Enhance Greenspace and Carbon Sequestration for New Development	1
	6.P.4. Provide Outreach on Water Pollution Prevention and Carbon Sequestration Strategies	2

COMMUNITY GUIDE TO IMPLEMENTATION

As the City and its partners create climate action policies, programs, and services, Bozeman residents and businesses can do their part by learning about their contribution to Bozeman's greenhouse gas emissions and becoming supportive adopters of new climate actions as they become available. Example action items that invite all Bozeman residents, businesses, and community organizations to get involved are outlined on the following pages.



Inviting Bozeman Residents to Join the Climate Effort!

Bozeman residents are encouraged to print a copy of this page and the next as a quick reference guide for how you can do your part in supporting the Climate Plan. See the more detailed action descriptions in the Climate Plan to learn more about how each action contributes to Bozeman's climate goals. Check off actions as you complete them!

Action 1.A.2.

Reduce energy usage during peak energy demand (4pm to 8pm)

Healthy, Adaptive &
EFFICIENT BUILDINGS

Action 1.A.3.

Learn about and begin to make changes to your energy behaviors

Healthy, Adaptive &
EFFICIENT BUILDINGS

Action 1.A.3.

Contact NorthWestern Energy, or other qualified auditor, to schedule a home energy audit and make efficiency improvements to your home

Healthy, Adaptive &
EFFICIENT BUILDINGS

Action 1.B.2.

Advocate for more stringent state-wide energy and water efficiency regulations

Healthy, Adaptive &
EFFICIENT BUILDINGS

Action 2.F.4.

Explore opportunities to install on-site renewable energy and storage on your property

Responsible & Reliable
CLEAN ENERGY SUPPLY

Action 3.G.3.

Plan a neighborhood activity to help build social connections and improve community cohesion

Vibrant & Resilient
NEIGHBORHOODS

Action 3.H.3.

Get to know your neighbors and swap contact information for times of need or emergency

Vibrant & Resilient
NEIGHBORHOODS

Action 3.H.3.

Review City maps to understand if you are in a location that is vulnerable to flooding, fires, or other hazards and develop an emergency plan if a hazard event occurs

Vibrant & Resilient
NEIGHBORHOODS

Actions 4.J.2. & 4.J.6.

Walk, bike, carpool, or take transit to destinations instead of driving alone

Diverse & Accessible
TRANSPORTATION OPTIONS

Action 4.K.1.

Limit idling and combine trips when using a vehicle for transportation

Diverse & Accessible
TRANSPORTATION OPTIONS

Action 4.K.6.

Consider investing in an electric vehicle for your next vehicle purchase

Diverse & Accessible
TRANSPORTATION OPTIONS

Action 4.L.1.

Find alternatives to air travel, avoid binge flying, and/or purchase offsets for your next airline trip

Diverse & Accessible
TRANSPORTATION OPTIONS

Action 5.M.1.

Review your waste and consumption practices and look for opportunities to reduce, reuse, or share products

Comprehensive & Sustainable
WASTE REDUCTION

Action 6.N.2.

Volunteer at or donate to a local food bank

Regenerative Greenspace, Food Systems &
NATURAL ENVIRONMENT

Action 6.N.3.

Learn to garden and grow your own food

Regenerative Greenspace, Food Systems &
NATURAL ENVIRONMENT

Action 6.P.2.

Plant and maintain a tree

Regenerative Greenspace, Food Systems &
NATURAL ENVIRONMENT

Action 6.O.2.

Update irrigation equipment and landscaping to use less water

Regenerative Greenspace, Food Systems &
NATURAL ENVIRONMENT

Action 6.P.4.

Reduce pesticide and herbicide use

Regenerative Greenspace, Food Systems &
NATURAL ENVIRONMENT

Inviting Bozeman Businesses and Community Organizations to Join the Climate Effort!

- Reduce energy usage during peak energy demand (4pm to 8pm) (Action 1.A.2.)
- Become a City of [Bozeman Energy Project](#) Partner (Action 1.A.3.)
- Contact NorthWestern Energy to schedule an energy appraisal and implement appraisal recommendations (Action 1.A.3.)
- Monitor and benchmark your building's energy performance (Action 1.A.4.)
- Explore opportunities to install on-site renewable energy and storage on your property (Action 2.F.4.)
- Review City maps to understand if you are in a location that is vulnerable to flooding, fires, or other hazards and develop an emergency and continuity of operations plan if a hazard event occurs (Action 3.H.3.)
- Engage your employees or constituents in emergency preparedness planning, drills, and protocols (Action 3.H.3.)
- Provide options and incentives for employee telecommuting and alternatives to single-occupancy vehicle travel (e.g., bike to work days, preferred parking spots, carpool matching, bicycle racks, wellness programs, etc.) (Actions 4.J.2. and 4.J.5.)
- Install electric vehicle charging infrastructure for fleet, employee, and potentially public use (Action 4.K.2.)
- Convert fleet vehicles and equipment to electric or alternative fuel models (Action 4.K.3.)
- Establish and enforce employee idling policies when using personal or fleet vehicles for business use (Action 4.K.5.).
- Limit non-essential airline travel and/or purchase carbon offsets for airline trips (Action 4.L.1.)
- Review your supply chain and consumption practices and look for opportunities to use less packaging, reuse or recycle materials, and compost organic waste (Action 5.M.1.)
- Provide markets for recycled products by supporting suppliers and businesses that use recycled materials (Action 5.M.1.)
- Reuse or donate used equipment and goods (Action 5.M.1.)
- Donate unused food and right-size large catering orders (Action 5.M.1.)
- Plant and maintain trees (Action 6.P.2.)
- Purchase products that support growth of the local food system (Action 6.N.3.).
- Update irrigation equipment and landscaping to use less water (Action 6.O.2.)
- Reduce pesticide and herbicide use (Action 6.P.4.)

REFERENCES



REFERENCES

- American Community Survey. (2019). *American Community Survey 5-Year Estimates*. American Community Survey.
- American Council for an Energy-Efficient Economy. (2012). *The Long-Term Energy Efficiency Potential: What the Evidence Suggests*. Washington, D.C.: ACEEE. Retrieved May 207, 2020, from https://www.garrisoninstitute.org/downloads/ecology/cmb/Laitner_Long-Term_E_E_Potential.pdf
- American Council for an Energy-Efficient Economy. (2017). *Natural Gas Energy Efficiency: Progress and Opportunities*. Washington, DC: American Council for an Energy-Efficient Economy. Retrieved April 24, 2020, from <https://www.aceee.org/research-report/u1708>
- Auto Alliance. (2018). *data provided by IHS Markit*. Auto Alliance. Retrieved April 30, 2020, from <https://autoalliance.org/in-your-state/MT>
- Billimoria, S., Guccione, L., Henchen, M., & Louis-Prescott, L. (2018). *The Economics of Electrifying Buildings: How Electric Space and Water Heating Supports Decarbonization of Residential Buildings*. Basalt, CO: Rocky Mountain Institute. Retrieved April 24, 2020, from <https://rmi.org/insight/the-economics-of-electrifying-buildings/#:~:text=In%20Rocky%20Mountain%20Institute's%20new,time%20to%20support%20grid%20needs.>
- City of Bozeman. (2017). *2017 Bozeman Community Greenhouse Gas Emissions Report*. Bozeman, MT: City of Bozeman. Retrieved April 30, 2020, from <https://www.bozeman.net/home/showdocument?id=5418>
- City of Bozeman. (n.d.). *ICLEI Data Workbook*. Bozeman, MT: City of Bozeman. Retrieved April 30, 2020
- Climate Change Impacts in the United States: The Third National Climate Assessment*. (2014). Washington DC: U.S. Global Change Research Program. Retrieved from National Climate Assessment: <https://nca2014.globalchange.gov/>
- Brownstone, D. UNC Irvine. (2008). *Key Relationships Between the Built Environment and VMT*. University of California, Irvine. DAVID BROWNSTONE, UNC Irvine. Retrieved April 30, 2020, from <https://onlinepubs.trb.org/Onlinepubs/sr/sr298brownstone.pdf>
- Emerson, J., & Sullivan, B. (2020, May 12). *Zero Energy Homes – A Financial Win for Homeowners*. Retrieved from Zero Energy Project: <https://zeroenergyproject.org/2019/03/23/everybody-profits-with-zero-energy-homes/>
- Florida, R. (2017, April 6). *What Drove the Driving Downturn?* Retrieved April 30, 2020, from Citylab: <https://www.citylab.com/transportation/2017/04/what-drove-the-driving-downturn/518601/>
- Gary Liss & Associates. (2008). *Zero Waste Strategic Plan*. Austin, TX: City of Austin. Retrieved May 27, 2020, from http://austintexas.gov/sites/default/files/files/Trash_and_Recycling/Zero_Waste_Plan_-_full_version_-_Council_Adopted_w-resolution.pdf

Gold, R. W. (2020). *Leveraging Advanced Metering Infrastructure to Save Energy*. Washington DC: American Council for an Energy-Efficient Economy. Retrieved from <https://www.aceee.org/sites/default/files/publications/researchreports/u2001.pdf>

Hauer, M. E. (2017). Migration induced by sea-level rise could reshape the US population landscape. *Nature Climate Change*, 321-325.

Lawrence Berkeley Laboratory. (2015). *The Total Cost of Saving Electricity through Utility Customer-Funded Energy Efficiency Programs: Estimates at the National, State, Sector and Program Level*. Lawrence Berkeley Laboratory. Retrieved April 24, 2020, from <https://emp.lbl.gov/sites/all/files/total-cost-of-saved-energy.pdf>

MJB&A. (2019). *Electric Vehicle Market Status*. MJB&A. Retrieved April 30, 2020, from <https://www.mjbradley.com/sites/default/files/ElectricVehicleMarketStatus05072019.pdf>

Multihazard Mitigation Council. (2017). *National Hazard Mitigation Saves 2017 Interim Report: An Independent Study - Summary of Findings*. Waschington D.C.: National Institute of Building Sciences.

Nadel, S. (2020, May 12). *For existing homes, energy efficiency often has a better return on investment than solar*. Retrieved from American Council for an Energy Efficient Economy: <https://www.aceee.org/blog/2019/05/existing-homes-energy-efficiency>

National Renewable Enegy Laboratory. (2017). *Status and Trends in the U.S. Voluntary Green Power Market (2016 Data)*. Golden, CO: National Renewable Enegy Labratory. Retrieved May 5, 2020, from <https://www.nrel.gov/docs/fy18osti/70174.pdf>

National Renewable Energy Laboratory. (2017). Electrification Futures Study Technology Data. US Department of Energy. Retrieved April 24, 2020, from <https://data.nrel.gov/submissions/78>

National Renewable Energy Laboratory. (2019). Community Choice Aggregation. Challenges, Opportunities, and Impacts on Renewable Energy Markets. Golden, CO: National Renewable Energy Laboratory. Retrieved December 1, 2020, from <https://www.nrel.gov/docs/fy19osti/72195.pdf>

National Renewable Energy Laboratory. (2020). A Guide to Energy Master Planning of High-Performance Districts and Communities. Golden, CO: National Renewable Energy Laboratory. Retrieved December 3, 2020, from <https://www.nrel.gov/docs/fy21osti/78495.pdf>

NorthWestern Energy. (2018). *Universal System Benefits Activities 2017 Annual Report*. NorthWestern Energy. Retrieved April 30, 2020, from <https://leg.mt.gov/content/Committees/Interim/2017-2018/Energy-and-Telecommunications/Meetings/July-2018/NWEUSB.pdf>

NorthWestern Energy. (2019). *2019 Electricity Supply Resource Procurement Plan*. NorthWestern Energy. Retrieved April 30, 2020, from <http://www.northwesternenergy.com/docs/default-source/documents/environment/draft-2019-electricity-supply-resource-procurement-plan.pdf>

NorthWestern Energy. (2019). *Environmental Stewardship Report*. Retrieved from http://www.northwesternenergy.com/docs/default-source/documents/environment/environmental_report_2019_v2_5-25x8_web.pdf



NorthWestern Energy. (n.d.). *Our Vision for Montana*. NorthWestern Energy. Retrieved April 30, 2020, from http://www.northwesternenergy.com/docs/default-source/documents/colstrip/carbon_statement_2019-12-10.pdf

NREL. (2017). *Electrification & Decarbonization: Exploring U.S. Energy Use and Greenhouse Gas Emissions in Scenarios with Widespread Electrification and Power Sector Decarbonization*. Golden: NREL. Retrieved April 30, 2020, from <https://www.nrel.gov/docs/fy17osti/68214.pdf>

NREL. (2017). *Top Ten Utility Green Pricing Programs Report*. NREL. Retrieved April 30, 2020, from <https://www.nrel.gov/analysis/assets/pdfs/utility-green-power-ranking.pdf>

Oak Ridge National Laboratory. (2019). *TRANSPORTATION ENERGY DATA BOOK: EDITION 37.2—2019*. Oak Ridge National Laboratory. Retrieved April 30, 2020, from https://tedb.ornl.gov/wp-content/uploads/2019/03/TEDB_37-2.pdf#page=82

Project Drawdown. (n.d.). *Transport: Airlines*. Retrieved April 30, 2020, from <https://www.drawdown.org/solutions/transport/airplanes>

Rails-to-Trails Conservancy. (n.d.). *Active Transportation Beyond Urban Centers*. Rails-to-Trails Conservancy. Retrieved April 30, 2020, from <https://www.railstotrails.org/resourcehandler.ashx?id=4141>

Rocky Mountain Institute. (2019). *The Economics of Zero-Energy Homes*. Boulder, CO: Rocky Mountain Institute. Retrieved April 24, 2020, from <https://rmi.org/insight/economics-of-zero-energy-homes/>

SBW Consulting, Inc. (2013). *Impact and Process Evaluation of NorthWestern Energy 2007–2011 DSM Programs*. SBW Consulting, Inc. Retrieved April 30, 2020, from <https://puc.sd.gov/commission/dockets/gaselectric/2012/ge12-001/vol1.pdf>

US Department of Energy. (n.d.). *Cities LEAP*. Retrieved April 30, 2020, from Energy Efficiency & Renewable Energy: <https://www.eere.energy.gov/sled/#/results/buildingsandindustry?city=Bozeman&abv=MT§ion=electricity¤tState=Montana&lat=45.6769979&lng=-111.04293389999998>

US Department of Energy. (n.d.). *Guidelines for Participating in the DOE Zero Energy Ready Home Program*. Retrieved April 30, 2020, from Energy: <https://www.energy.gov/eere/buildings/guidelines-participating-doe-zero-energy-ready-home-program>

US Energy Information Administration. (n.d.). *EIA API Query Browser*. Retrieved April 30, 2020, from <https://www.eia.gov/opendata/qb.php?category=711246&sdid=TOTAL.PCFRRUS.A>

US Energy Information Administration. (2020). *Montana State Profile and Energy Estimates*. Retrieved December 1, 2020 from <https://www.eia.gov/state/analysis.php?sid=MT#:~:text=Montana%20has%20the%20largest%20estimated,coal%20from%20six%20operating%20mines>

US Environmental Protection Agency. (2018). *Emission Factors for Greenhouse Gas Inventories March 2018*. US Environmental Protection Agency. Retrieved April 30, 2020, from



https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf

US Environmental Protection Agency. (2020, April 30). *The Social Cost of Carbon*. Retrieved from Climate Change: https://19january2017snapshot.epa.gov/climatechange/social-cost-carbon_.html

Woolf, D., Amonette, J., Stret-Perrott, F. et al. Sustainable biochar to mitigate global climate change. Nature Communications 1, 56 (2010). <https://doi.org/10.1038/ncomms1053>



Bozeman
Climate
Plan

APPENDICES





APPENDIX A: MITIGATION ANALYSIS SUMMARY

The anticipated impact of each solution on the business-as-usual fuel use and emissions for each goal year are shown in Table 13. Descriptions of assumptions made developing these scenarios are described in the sections below. Note that potential emissions reductions were not calculated for solutions that primarily present resiliency or carbon sequestration benefits.

Table 13: Contribution of each mitigation solution to Bozeman's mitigation goals based on pathway B

Solutions		Target		
		2025 <i>Paris Accord</i>	2030 100% Net Clean Electricity	2050 Carbon Neutral
Healthy, Adaptive and Efficient Buildings				
A. Improve Efficiency of Existing Buildings	Electricity Savings (kWh)	75,000,000	149,000,000	447,000,000
	Natural Gas Savings (therms)	4,200,000	8,400,000	25,000,000
B. Achieve Net-Zero New Construction	Electricity Savings (kWh)	51,000,000	64,000,000	303,000,000
	Natural Gas Savings (therms)	2,700,000	3,400,000	16,200,000
C. Electrify Buildings	Natural Gas Savings (therms)	0	0	9,200,000
	Increased Electricity Use (kWh)	0	0	269,000,000
Responsible and Reliable Clean Energy Supply				
D. Increase Utility Clean Energy Mix	Increased Clean Electricity Production (kWh)	80,000,000	100,000,000	306,000,000
E. Develop and Promote Utility Green Power Programs	Increased Clean Electricity Production (kWh)	124,000,000	98,000,000	0
F. Increase Community-Based Distributed Renewable Energy	Increased Clean Electricity Production (kWh)	16,000,000	40,000,000	80,000,000
Vibrant and Resilient Neighborhoods				
G. Facilitate Compact Development Patterns	Gasoline Savings (gallons)	1,900,000	3,800,000	11,200,000



Solutions		2025 Paris Accord	Target	
			2030 100% Net Clean Electricity	2050 Carbon Neutral
Diverse and Accessible Transportation Options				
J. Increase Walking, Bicycling, Carpooling and Use of Transit	Gasoline Savings (gallons)	1,700,000	3,400,000	10,200,000
K. Decrease Direct Vehicle Emissions	Gasoline Savings (gallons)	800,000	2,700,000	10,600,000
	Increased Electricity Use (kWh)	6,000,000	19,000,000	74,000,000
L. Improve Air Travel Efficiency	GHG Emissions Reduction (MT CO ₂ e)	1,000	2,000	5,900
Comprehensive and Sustainable Waste Reduction				
M. Move Toward a Circular Economy and Zero Waste Community	GHG Emissions Reduction (MT CO ₂ e)	7,100	14,100	42,300
Future Technologies				
Future Solutions	GHG Emissions Reduction (MT CO ₂ e)	0	0	113,000
Summary by Fuel				
Electricity Savings (kWh)		126,000,000	213,000,000	750,000,000
Additional Clean Energy Production (kWh)		220,000,000	238,000,000	386,000,000
Natural Gas Savings (therms)		6,900,000	11,800,000	50,400,000
Gasoline Savings (gallons)		4,400,000	9,900,000	32,000,000
Other Emissions Reductions		8,100	16,100	161,200
Total GHG Emissions Reduction (MT CO₂e)		319,000	451,000	1,218,000



QUANTITATIVE ANALYSIS METHODOLOGY

The sections below provide basic information on the methodology used to calculate the impact of the mitigation solutions outlined in this plan.

Baseline & Forecast

The 2016 GHG inventory detailed in the [2017 Bozeman Community Greenhouse Gas Emissions Report](#) was used to establish a baseline GHG emissions inventory for the community. This is also the data, along with the baseline 2008 inventory, on which the council made the decisions about the mitigation goals for the community. To understand what the emissions in 2050 were likely to be if no action was taken, we took the per capita emissions from the 2016 inventory, and applied to the likely population range for 2050. To estimate community population in 2050, we reviewed the population projections from a variety of community planning efforts outlined in Figure 22 as well as the more recent population projections in the [Demographic and Real Estate Marketing Assessment](#).

Estimate or Projection Source	2010	2014	2015	2020	2024	2025	2030	2034	2035	2040
U.S. Census Bureau/CEIC Estimate	37,280	41,660	--	--	--	--	--	--	--	--
Bozeman Community Plan	42,700	--	54,500	69,500	--	88,700	--	--	--	--
Bozeman Wastewater Collection Facilities Plan Update	--	41,056	--	--	55,176	--	--	63,964	--	--
Bozeman Integrated Water Resource Plan										
Moderate Projection (2% annual growth)	--	--	41,160	45,444	--	50,174	55,396	--	61,161	67,527
High Projection(3% annual growth)	--	--	42,383	49,133	--	56,959	66,031	--	76,548	88,740
Bozeman Water Facility Plan	42,700	--	54,500	69,500	--	88,700	--	--	--	--
Wastewater Facilities Plan/Bozeman Community Plan (2008)	44,500	--	56,500	72,500	--	92,500	--	--	--	--
Bozeman Fire Protection Master Plan										
Census Based Projection	--	34,029	--	--	37,747	--	--	--	--	--
Development Based Projection	--	42,400	--	--	49,400	--	--	--	--	--
Bozeman 20/20 Community Plan, 2001	39,600		43,120	46,600	--	--	--	--	--	--
RPA Projection @2.49%/yr (1970-2010 rate)			42,697	48,285		54,603	61,748		69,828	78,066

Figure 22. Various population projections for the City of Bozeman

These population estimates were graphed and a high and low growth scenario were established to encompass the majority of the data points as shown in Figure 23.

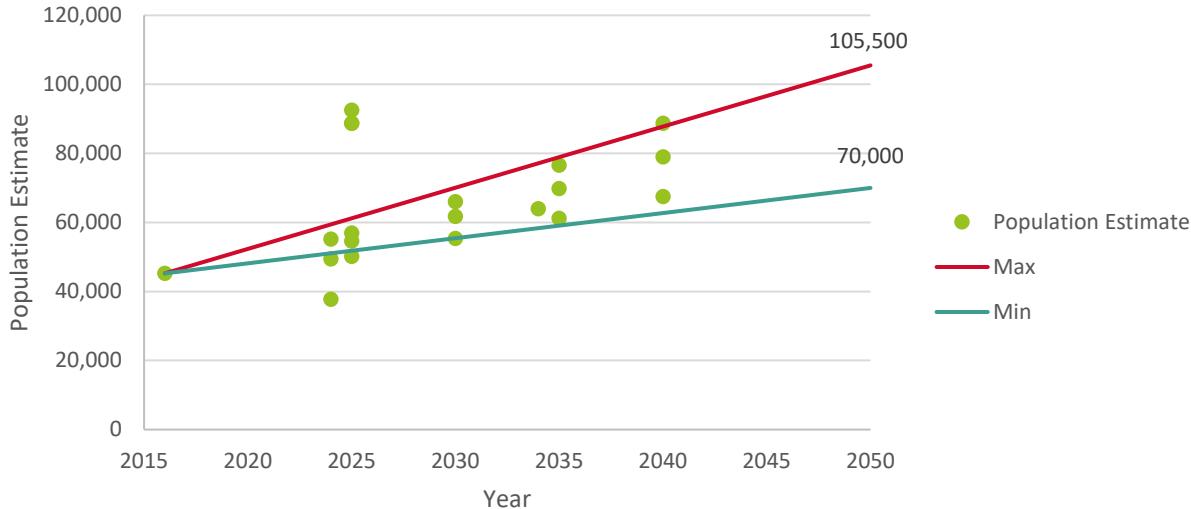


Figure 23. Estimated population growth scenarios

These growth scenarios estimate that the 2050 population will be between 70,000 and 105,500 people in 2050. These population estimates were multiplied by the 2016 per capita GHG emissions to calculate the business as usual emission between 1.2 million and 0.8 million MT CO₂e. To plan for worst case scenario, all calculations used to determine the required contribution of each solution to meet the City's goals were based on the high growth scenario.

Note: NorthWestern Energy provided revised emissions factors for the 2008 and 2016 electricity use in 2020. The impact of the updated emissions factor changes were reviewed and did not result in a material change in the total reported emissions for the 2008 and 2016 inventories. Based on guidance from the [Global Protocol for Community-scale Greenhouse Gas Inventories](#), the baseline inventory was not recalculated. The projected 2050 business as usual GHG emissions estimates were updated to reflect the revised emissions factors.



Identifying and Prioritizing Solutions

To meet the City's ambitious carbon neutral by 2050 goal, solutions must be identified to address all sources of GHG emissions within the City including residential and commercial buildings, on-road transportation, aviation emissions, and waste. The solutions identified through stakeholder engagement are listed below and the solutions with significant or measurable mitigation potential for the sources noted are in bold:

- **Solution A. Improve Efficiency of Existing Buildings**
- **Solution B. Achieve Net Zero Energy New Construction**
- **Solution C. Electrify Buildings**
- **Solution D. Increase Utility Clean Energy Mix**
- **Solution E. Develop and Promote Utility Green Power Programs**
- **Solution F. Increase Community-Based Distributed Renewable Energy Generation**
- **Solution G. Facilitate Compact Development Patterns**
- Solution H. Reduce Vulnerability of Neighborhoods and Infrastructure to Natural Hazards
- Solution I. Enhance Social Infrastructure and Community Preparedness
- **Solution J. Increase Walking, Bicycling, Carpooling, and Use of Transit**
- **Solution K. Decrease Direct Vehicle Emissions**
- **Solution L. Improve Air Travel Efficiency**
- **Solution M. Move Toward a Circular Economy and Zero Waste Community**
- Solution N. Cultivate a Robust Local Food System
- Solution O. Manage and Conserve Water Resources
- Solution P. Manage Land and Resources to Sequester Carbon

Potential Impact by Solution

To understand the potential greenhouse gas emissions impact of each mitigation solution, a best in class estimate of potential impact was calculated from leading communities around the country. This was compared to the current efforts in Bozeman to provide a solution baseline. Recognizing that best in class examples are rapidly evolving as cities and states innovate and adopt new policies and technologies, using existing examples of best practices helps demonstrate the viability of the proposed solutions. The methodology is described below by solution including assumptions made and resources referenced. The potential emissions reduction based on the best in class scenarios described below were presented to the Climate Team during Workshop 2 to get their feedback on the potential emissions savings from each solution applied to Bozeman. Through a keypad polling exercise, the stakeholders were asked to consider climate, political will, and existing momentum to determine the emissions potential for each solution in Bozeman expressed as a percentage of the best in class scenario. This is expressed in a percentage of the best in class emissions reduction by scenario below and shown in Figure 24. Note that interactions between solutions has not been taken into account at this phase of analysis. This was considered in the scenarios and goal modeling.

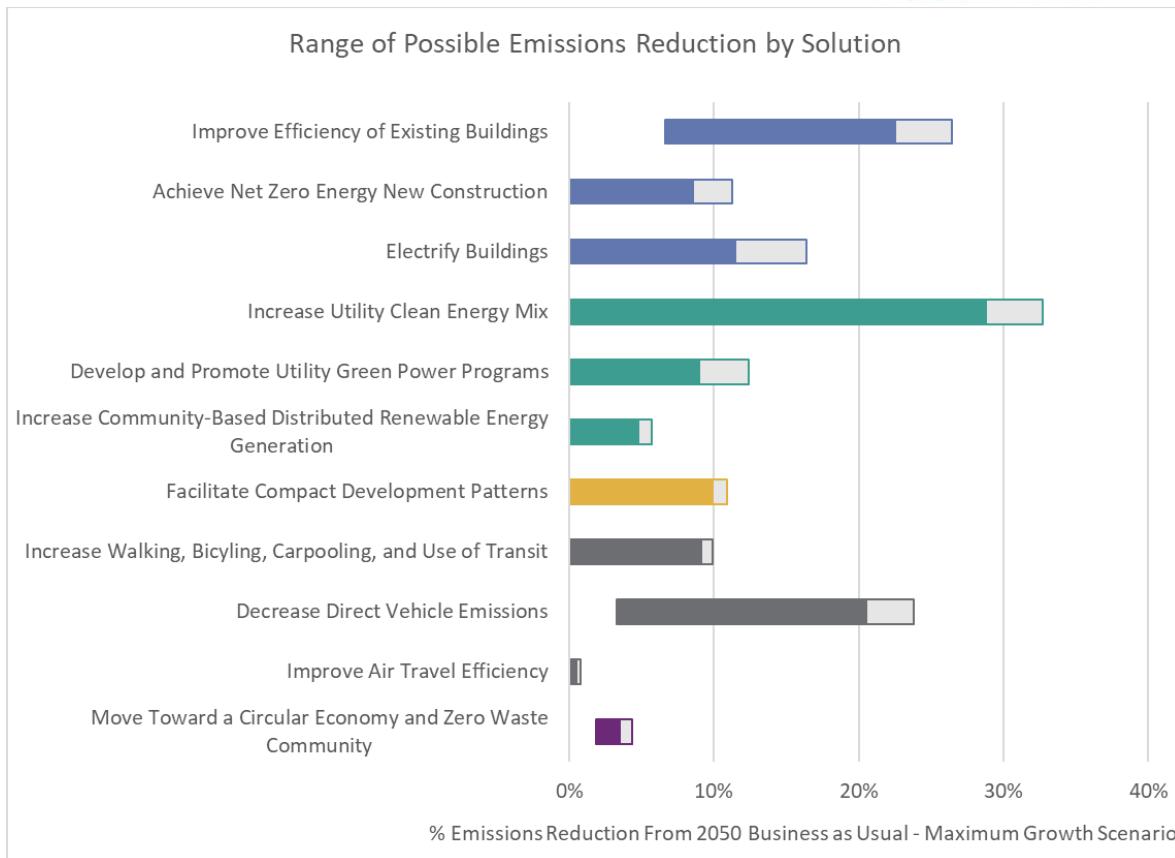


Figure 24. Estimated emissions reduction potential by solution

Note that Solutions H, I, N, O, and P were not analyzed in terms of greenhouse gas emissions reduction potential as they are primary resiliency and/or carbon sequestration solutions that cannot be modeled in this analysis.

Solution A. Improve Efficiency of Existing Buildings

Current Efforts

As part of [NorthWestern Energy's 2019 Resource Procurement Plan](#), they evaluated the potential electricity savings from the current rebate program between 2015 and 2034 to be 7% of total use. This estimate was extrapolated to 2050 (NorthWestern Energy, 2019). Similar data were not readily available for natural gas savings, so the same level of savings was assumed for natural gas efficiency.

Best in Class

Arizona's second largest utility, Salt River Project, has the best in class energy efficiency programs in the mountain west with 2.1% energy savings in 2013 and reached similar levels in 2014, 2015, and 2018. Arizona was identified as the top performing state outside of California by the American Council for an Energy-Efficient Economy (Southwest Energy Efficiency Project, 2019). This annual savings estimate was projected to 2050. The total estimated energy reduction was compared to the expected electricity savings under the advanced energy efficiency scenario in an ACEEE study which considers the impact of deep penetration of existing energy efficiency technologies in 2050 (American Council for an Energy-Efficient Economy, 2012). Based on this study, the total energy efficiency savings was capped at 51% of baseline energy use.



Bozeman's Best

Based on feedback from stakeholders in workshop 2, the potential reduction of electricity and natural gas use from energy efficiency was assumed to be 85% of the best in class scenario.

Solution B. Achieve Net-Zero New Construction

Current Efforts

The number of new homes built to net-zero ready construction standards in 2019 was considered to be negligible.

Best in Class

The C40 Cities initiative to encourage cities to commit to work toward net zero construction by 2030 was considered to be best in class performance in this emerging field. To evaluate the impact of this commitment, the increase in electricity and natural gas use due to new buildings anticipated before and after 2030 based on the max growth scenario was estimated. Using the DOE definition of net zero ready home, the energy use of net zero buildings was estimated to be 50% of baseline energy use (US Department of Energy, n.d.). The adjusted energy use of new buildings was calculated assuming that 50% of buildings built between now and 2030 will be net zero energy ready (i.e., 50% energy use reduction) and after 2030, 100% of all buildings constructed will be net zero ready (i.e., 50% energy use reduction).

Bozeman's Best

Based on feedback from workshop participants, Bozeman's Best was analyzed as 76% of the best in class scenario. This means that 76% of all new buildings built after 2030 would be built to net zero standards (i.e., 50% energy use reduction) or that in effect all new construction achieves an overall average of 38% energy use reduction (76% of 50%). In addition, 38% (76% of 50%) of the buildings built between now and 2030 will be built to net zero standards (50% reduction) or that in effect all new construction achieves an overall average of 19% energy use reduction.

Solution C. Electrify Buildings

Current Efforts

It was assumed there are not currently any significant efforts to electrify building energy loads in Bozeman.

Best in Class

A report by the National Renewable Energy Laboratory (NREL) shows that 80% of commercial and residential natural gas loads could be electrified (National Renewable Energy Laboratory, 2017). Based on the GHG inventory energy use data, there are no significant industrial loads in Bozeman to consider. The total potential savings assumes that the City reaches its 100% renewable electricity goal.

Bozeman's Best

The potential for electrification of residential and commercial loads in Bozeman was assumed to be 70% of the best in class scenario based on stakeholder feedback.

Solution D. Increase Utility Renewable Energy Resource Mix

Current Efforts

At workshop 2, NorthWestern Energy's carbon reduction plan presented in [Our Vision for Montana](#) was used as the baseline scenario. This report projects emissions factor reductions through 2045. It was assumed no significant changes would be implemented between 2045 and 2050.



Best in Class

Several utilities including Platte River Power Authority in Colorado, Idaho Power, and Xcel Energy have made public pledges to eliminate carbon from their generation mix by 2050 or sooner. The total potential GHG savings assumes business as usual growth in electric energy use from residential and commercial buildings. Additional electric load from building or transportation was not considered. The interdependencies between strategies was taken into account during scenario modeling (Figure 13).

Bozeman's Best

Based on stakeholder feedback, it was assumed by 2050 the carbon free generation sources for NorthWestern Energy will be 88% of its total energy generation.

Solution E. Develop and Promote Utility Green Power Programs

Current Efforts

NorthWestern Energy financial reports from E+ Green program were used to estimate the amount of electricity purchased through this program (NorthWestern Energy, 2018). The total was scaled to the city based on the total electricity generated by NorthWestern Energy compared to the electricity used by Bozeman.

Best in class:

Current green tariff programs from across the country were evaluated to understand the potential size of the program. The largest programs could serve the entire City, so the City is likely not limited by the amount of electricity they could procure by the mechanism. It was assumed that all of electricity from MSU (based on FY19 campus electricity use) and municipal operations (estimated as % of total community electricity) would be included. For the rest of the community energy use, it was estimated that 20% of homes and businesses would participate based on an NREL study on best in class green power program participation (National Renewable Energy Laboratory, 2017).

Bozeman's Best

It was assumed Bozeman could attain 72% of the best in class scenario based on stakeholder input.

Solution F. Increase Community-Based Distributed Renewable Energy Generation

Current Efforts

The program participation rates in NorthWestern Energy's E+ Renewable rebate program from the program evaluation report were used to estimate the number of community and rooftop solar systems in NorthWestern Energy's service territory (SBW Consulting, Inc., 2013). This estimate was scaled to Bozeman based on electricity use of the city compared to NorthWestern Energy generation.

Best in Class

Based on a 2017 NREL study of the potential behind the meter renewable energy generation potential was modeled on three different scenarios. In the central scenario modeled there a total of 850 MW of installed behind the meter in 2050 with incremental estimates of 250 MW in 2030 and 100 MW in 2025 (National Renewable Energy Laboratory, 2017). These estimates were scaled to Bozeman based on the percentage of NorthWestern's electricity generation delivered to Bozeman to calculate the best in class scenario. In addition to rooftop solar, 50 MW of community solar was used to estimate the community solar garden potential based on 100% Net Clean Energy goals set by the City of Fort Collins. For context, the median community solar installation in 2020 based on an NREL database was 2.1 MW (National



Renewable Energy Laboratory, 2020). This means that best in class performance is installing one community garden of similar size nearly every year between now and 2050.

Bozeman's Best

Based on stakeholder input it was assumed that distributed generation could reach 83% of the best in class scenario for community solar generation. For rooftop solar generation, the estimated production was not scaled because the central scenario from the 2017 NREL study was chosen rather than the high adoption scenario.

Solution G. Facilitate Compact Development Patterns

Current Efforts

While Bozeman has made considerable efforts to promote compact development patterns, there has been significant growth outside of City boundaries making it difficult to attribute significant reductions in vehicles miles traveled to compact development initiatives. Note that energy efficiency benefits from compact developments are captured in solution B.

Best in Class

Based on a study examining the effects of density on driving patterns there were a handful of top performing cities. The mean density increase from these cities was used to estimate the change in population density that could reasonably be expected in Bozeman over the 30-year planning horizon (DAVID BROWNSTONE, UNC Irvine, 2008). Based on the factors for density and proximity to downtown (or other commercial nodes), a separate study that evaluates the effect of various factors on Vehicle Miles Traveled (VMT) was used to estimate the reduction in miles traveled (Florida, 2017)

Bozeman's Best

Based on stakeholder feedback, we assumed that Bozeman could achieve 91% of the VMT reduction in the best in class scenario.

Solution J. Increase Walking, Bicycling, Carpooling and Use of Transit

Current Efforts

Based on US Census data, the percentage of Bozeman residents commuting using transit and active modes of transportation decreased between 2012 and 2016.

Best in Class

A study of the best performing cities as a percentage of citizens using public transit was reviewed to find a high performing city with similar characteristics. Ithaca, NY was chosen since it is a similar sized college town (rails-to-trails conservancy). At the time of the study, 28.8% chose to commute using transit and active modes of transportation.

Bozeman's Best

Based on workshop feedback it was assumed that Bozeman would be able to achieve 92% of best in class transit and active commuting or 26% of residents choosing to walk, bike, carpool, or use transit.

Solution K. Decrease Direct Vehicle Emissions

Current efforts

The increase in fuel efficiency from the Bozeman GHG inventory between 2012 and 2016 was extrapolated to 2050 at half the rate to account for changes in fuel efficiency regulations. The rate of fuel efficiency



increase seen in Bozeman was similar to the national change, so it is likely due to fuel standards for vehicles. The percentage of EVs registered in MT in 2018 was <1%, so it was assumed to be negligible in Bozeman (Auto Alliance, 2018).

Best in Class

It was assumed that by 2050, vehicle fuel efficiency gains would be from EVs rather than more efficient Internal Combustion Vehicles (ICE). To understand best in class EV adoption, manufacturer predictions on the percentage of sales that would be EV were reviewed (MJB&A, 2019). Then the national vehicle replacement rate was used to understand what percent of the Bozeman vehicle fleet would likely be replaced by 2050 (Oak Ridge National Laboratory, 2019). Based on national EV sales projections to 2050 and the vehicle turnover rate, 70% of vehicles will be EVs by 2050 nationwide. Based on this, we assume that best in class cities will be nearly all EV, so best in class performance was set at 95% of light duty fleet being replaced by EVs. It is assumed that the City has reached its 100% renewable electricity goal to realize maximum benefit from EVs by 2050.

While technology is changing rapidly, it was assumed that the EV conversion is limited to light-duty vehicles since there is limited technology currently available for heavy duty applications and no commercially viable options for semi-trucks. Any improvements in this area between now and 2050 will be captured in the future solutions bucket.

Bozeman's Best

It was assumed that the community could reach 86% of the best in class scenario or about 82% of light duty vehicles converted to EVs based on stakeholder input during workshop 2.

Solution L. Improve Air Travel Efficiency

Current Efforts

There was a significant increase in airline emissions between 2012 and 2016 identified in the Bozeman GHG Inventory.

Best in Class

Based on Project Drawdown, there is the potential to increase airline fuel efficiency by 11% through installation of existing technologies (Project Drawdown, n.d.).

Bozeman's Best

Based on stakeholder feedback it was assumed that Bozeman would be able to reach about 62% of the best in class scenario or a 7% increase in fuel efficiency.

Solution M. Move Toward a Circular Economy and Zero Waste Community

Current efforts

The landfilled waste per person went down by 9% between 2012 and 2016. This rate of reduction was projected through 2050. Since recycling rates are starting to plateau across the country this projected waste reduction estimate was de-rated by 50%.

Best in Class

Austin, TX has developed a plan to reach 90% waste reduction by 2040 (Gary Liss & Associates, 2008).



Bozeman's Best

Based on stakeholder feedback, it was estimated that Bozeman could reach 80% of the best in class scenario or about 72% reduction in landfilled waste.

Scenarios & Goal Modeling

Next, a top-down analysis was done based on the business-as-usual projections, to create emissions reduction scenarios that allow the City to meet its emission reduction and clean electricity goals. The business as usual scenario was built using fuel use and emissions estimates from the 2016 GHG inventory scaled by population using the maximum population growth scenario. The scenarios in each of the goal years are detailed below.

2025: Paris Accord

To develop a scenario allowing the City to meet their 2025 commitment, it was assumed that all efficiency and electrification strategies are on pace to meet Bozeman's best scenario in 2050 with the following exceptions:

1. No meaningful building electrification is expected until after 2030.
2. EV transition for the community's light-duty fleet is assumed to have a more exponential uptake curve rather than the linear progression assumed for other strategies based on national sales trends over the last 10 years.

Next, the amount of clean electricity generation that would be required for Bozeman to meet its carbon reduction goal was calculated. For this report, we modeled two potential scenarios for generating the necessary clean electricity.

No Additional Utility Renewable Energy Generation - Pathway A: This pathway shows how the City can generate the amount of required clean electricity without any additional clean energy added to NorthWestern Energy's electricity generation mix. As of 2019, NorthWestern Energy delivered approximately 280 million kWh of clean electricity to Bozeman or about 56% of the projected clean electricity required in 2025. The amount of renewable electricity generated through distributed generation within the city remains unchanged at 3%, and the remaining 40% of required clean electricity is purchased through utility-scale green tariff or other procurement mechanism. This level of participation is slightly higher than the modeled best in class scenario, 40% vs. 38%. This means that success in meeting the 2025 goal without additional clean electricity from the utility will require significant community support for the green tariff or for other efficiency measures to outperform what has been projected.

Additional Utility Renewable Energy Generation - Pathway B: Under this pathway, NorthWestern Energy is able to leverage new clean energy generation opportunities to meet their stated carbon intensity goal. Assuming that the carbon intensity of the fossil fuel electricity generation mix remains constant, the utility mix will include 72% clean electricity. Based on the distributed generation installed capacity curve described in the Bozeman's Best Scenario, distributed generation can provide about 3% of the required clean electricity. This means that the City must work with NorthWestern Energy to establish an agreement to provide about 25% of the City's electricity needs through a green tariff. It is assumed that this green tariff agreement allows subscribers to replace a portion of NorthWestern's fossil fuel generation with clean electricity sources.



2030: 100% Net Clean Electricity

To meet this goal, only scenarios impacting electricity use were considered. Bozeman's best scenario was first applied for energy efficiency and net zero new construction solutions using a maximum annual implementation rate. This was used to determine the maximum energy use reduction that might be expected from these efficiency measures by 2030. It was assumed that there would be no significant building electrification efforts until the City is able to reach their 100% clean electricity goal to maximize the benefit from these efforts and give the technologies some time to mature. Next, the expected increase to electricity use from the electrification of the light duty vehicles in the Bozeman community was considered to determine the total amount of clean energy generation that would be required to meet Bozeman's projected electricity use.

The required clean electricity to meet the City's goal of 100% net clean electricity will be provided through the generation from the three renewable energy solutions (D-F). Again, we modeled two potential scenarios for generating the necessary clean electricity.

No Additional Utility Renewable Energy Generation - Pathway A: This pathway shows how the City can generate the amount of required clean electricity without any additional clean energy added to NorthWestern's electricity generation mix. As of 2019, NorthWestern Energy delivered about 280 million kWh of clean electricity to Bozeman or about 54% of the projected clean electricity required in 2030. The amount of renewable electricity generated through distributed generation within the city remains unchanged at 8%, and the remaining 38% of required clean electricity is purchased through utility-scale green tariff or other procurement mechanism. This level of participation is in line with the percentage participants in the community described in the Best in Class scenario.

Note: Other solutions shown in Table 13 not described above show the level of impact required to be on pace to achieve the City's 2050 goal.

Additional Utility Renewable Energy Generation - Pathway B: Under this pathway, NorthWestern Energy leverages new clean energy generation opportunities to meet their stated 2030 carbon intensity reduction goal. Assuming that the carbon intensity of the remaining fossil fuel generation remains constant, the utility mix will include 73% clean electricity. Based on the distributed generation installed capacity curve described in the Bozeman's Best Scenario, distributed generation can provide about 8% of the required clean electricity. The remaining 19% clean electricity will be purchased through utility-scale green tariff programs.

2050: Carbon Neutrality

For the 2050 scenario, the maximum expected savings from each energy efficiency and electrification solution (A-C, G, J-L, and M) shown above were applied to the projected business as usual (BAU) energy use and emissions from each GHG emissions source. This allowed the anticipated total energy requirements of the City to be determined.

The required clean electricity will be provided through the generation from the three clean energy solutions (D-F). The City is expected to have reached 100% net clean electricity by 2030 and will need to continue to add clean energy generation to meet growing electricity demand from building and



transportation electrification as well as City growth. For this report, we modeled two potential scenarios for generating the necessary clean electricity.

Additional Utility Renewable Energy Generation - Pathway B: This pathway shows how the City can generate the amount of required clean electricity without any additional clean energy added to NorthWestern Energy's electricity generation mix. As of 2019, NorthWestern Energy delivered about 280 million kWh of clean electricity to Bozeman or about 42% of the projected clean electricity required in 2050. The amount of renewable electricity generated through distributed generation within the city produces an additional 20% of the required clean electricity. This leaves the remaining 38% of required clean electricity to be purchased through utility-scale green tariff or other procurement mechanism. While this scenario doesn't rely on the utility to add additional clean electricity generation, it does require the City and the Utility to work together to contract clean electricity through the green tariff solution.

The remaining fuel use and GHG emissions required will need to be addressed through future opportunities or technologies that will likely arise between the writing of this report and 2050. The remaining energy use and emissions that will need to be addressed by future opportunities include:

1. Natural gas use from existing facilities that cannot be electrified
2. Heavy duty vehicle emissions
3. Remaining landfill emissions
4. Aviation transportation emissions

These future opportunities may include local carbon sequestration and/or biofuels.

Additional Utility Renewable Energy Generation - Pathway B: Under this pathway, NorthWestern Energy leverages new clean energy generation opportunities to reach 88% clean energy by 2050, which exceeds their stated carbon intensity reduction goal. Distributed generation in the City generates the remaining 12% of the required renewable energy. It should be noted that the defined Bozeman's Best distributed generation, about 60 MW of rooftop solar and 40 MW of community solar gardens, could generate more than the required clean energy. This leaves some redundancy in case efficiency solutions do not perform as well as currently modeled. Community solar development is dependent upon a change in state-law and/or a new tariff for utility-owned community solar (as specified in Action 2.F.3).

APPENDIX B: EXISTING PLAN SUMMARY

2020 BOZEMAN YELLOWSTONE INTERNATIONAL AIRPORT MASTER PLAN

The Master Plan for the Bozeman Yellowstone International Airport (BZN) was undertaken by the Gallatin Airport Authority to outline a 20-year long range, orderly direction for airport development to yield a safe, efficient, economical, and environmentally acceptable air transportation facility.

<https://bozemanairport.com/reports-and-statistics>

BOZEMAN COMMUNITY PLAN (2020 – DRAFT UNDERWAY)

The Community Plan will serve as a document to help guide the City on how to grow and develop within the context of rapidly changing land development and economic conditions. The Community Plan is oriented around seven themes: a city of neighborhoods, a city bolstered by downtown and complementary districts, a city influenced by our natural environment, parks, and open lands, a city that prioritizes accessibility and mobility choices, a city powered by its creative, innovative, and entrepreneurial economy, and a city engaged in regional coordination.

<https://www.bozeman.net/city-projects/bozeman-community-plan-update>

BOZEMAN DROUGHT MANAGEMENT PLAN (2017)

The Bozeman Drought Management Plan focuses primarily on short- and long-term actions to help mitigate potential drought. Uniquely, the plan recognizes the potential impacts of climate change on Bozeman's water system and the importance of planning for the additional uncertainty associated with this future change. Bozeman is expected to experience longer and more frequent drought periods in the future, partially associated with decreased snowpack.

<https://www.bozeman.net/Home>ShowDocument?id=4791>

BOZEMAN GUIDELINES FOR HISTORIC PRESERVATION & THE NEIGHBORHOOD CONSERVATION OVERLAY DISTRICT

The City of Bozeman adopted the Neighborhood Conservation Overlay District (NCOD) in 1991. The goal of the zoning overlay is to conserve neighborhood character, protect the integrity of historic structures and provide public notice to adjoining property owners of potential changes. The Bozeman Design Guidelines for Historic Preservation & Neighborhood Conservation Overlay District provide guidelines for appropriate work within the NCOD, Historic Districts and Individually Listed Properties. The guidelines address topics such as commercial and residential building height, materials, and utilities.

https://library.municode.com/mt/bozeman/codes/code_of_ordinances?nodeId=PTIICOOR_CH38UNDEC_O_ART3ZODILAUS_DIV38.340OVDIST_PT1NECOVDIHIPR

BOZEMAN PARKS, RECREATION, OPEN SPACE, AND TRAILS PLAN (2007)

The Parks, Recreation, Open Space, and Trails Plan presents a roadmap for providing an equitable, well maintained park system to serve all of Bozeman's residents. While the plan does not include any mention of climate change, the implementation of this plan may be seen as a mitigation tool by encouraging the protection and creation of greenspace and natural systems and encouraging the use of multi-modal trail systems.

<https://www.bozeman.net/home/showdocument?id=3284>

CITY OF BOZEMAN AND MSU STORMWATER MANAGEMENT PLAN (2019)

The Stormwater Management Plan describes the plans and programs in place to improve water quality, comply with environmental regulations, and improve urban flood resiliency and climate change preparedness.

<https://www.bozeman.net/home/showdocument?id=5681>

CITY OF BOZEMAN STRATEGIC PLAN (2018)

With a shorter implementation horizon than the Community Plan, the interactive City of Bozeman Strategic plan puts many of the high-level ideas of broader community and area plans into an actionable format. The Bozeman Strategic Plan provides several actionable strategies oriented around community safety and risk abatement, well-planned growth, and a sustainable environment, among others. While many of these strategies relate to Climate Plan focus areas, including City Assets, Transportation, and Greenspace, the Strategic Plan also includes one goal explicitly linked to Climate Change: “Reduce community and municipal Greenhouse Gas (GHG) emissions, increase the supply of clean and renewable energy; foster related businesses.”

<https://strategic-plan-bozeman.opendata.arcgis.com/>

CLIMATE VULNERABILITY ASSESSMENT AND RESILIENCE STRATEGY (2019)

This plan inventoried key City infrastructure to evaluate Bozeman’s climate-induced municipal vulnerability and identified key actions to maintain and enhance resilience. Heat, flooding, drought, declining snowpack, wildfire, and winter storms were the top climate hazards against which vulnerability was assessed.

<https://www.bozeman.net/home/showdocument?id=8958>

COMMUNITY CLIMATE ACTION PLAN (2011)

The Community Climate Action Plan extends beyond municipal stewardship and action to identify climate goals and objectives for all of Bozeman. This plan establishes a goal of “reducing community-wide greenhouse gas emissions 10% below 2008 levels by 2025.” The 2011 Climate Action Plan includes a list of strategies oriented toward mitigating climate impacts through more efficient transportation, energy, buildings, and waste systems. This Climate Plan effort is an update to the Community Climate Action Plan.

<https://www.bozeman.net/home/showdocument?id=3130>

COMMUNITY GREENHOUSE GAS EMISSIONS REPORT (2017)

The Community Greenhouse Gas Emissions Report is primarily an inventory of Bozeman’s emissions, focused on transportation, buildings, waste, and water/wastewater. However, the end of this report includes a brief recommendations section. Recommendations include pursuing electrification of the vehicle fleet, commercial and residential building efficiency, and the completion of a vulnerability assessment and Climate Plan. The vulnerability assessment was completed in 2019 and the Climate Plan is currently underway.

<https://www.bozeman.net/home/showdocument?id=5418>

DOWNTOWN BOZEMAN IMPROVEMENT PLAN (2019)

The Downtown Bozeman Improvement Plan identifies climate change as an important backdrop for community planning efforts. Several focus areas of the plan, such as Heart of a Thriving Bozeman, Walkable and Accessible, and Connected to Nature & Culture, include recommendations that tie directly into the framework of the Bozeman Climate Plan (e.g., Community Development, Transportation, and Greenspace and Natural Systems).

https://downtownbozeman.org/uploads/Pdfs/2019_DBIP_with_Appendix_FINAL_ADOPTED_4-15-19.pdf

ECONOMIC DEVELOPMENT STRATEGY (2017)

Though the Economic Development Strategy does not explicitly consider climate change, several of the plan's objectives and recommended actions fit into the Climate Plan's focus areas. Climate-related strategies include efficient density and community development and a focus on multi-modal transportation. The Economic Development Strategy also elevates the need to protect and enhance the outdoor and tourism industry, which is one of Bozeman's most climate-vulnerable economic drivers.

<http://weblink.bozeman.net/WebLink8/0/doc/120846/Electronic.aspx>

GALLATIN COUNTY HAZARD MITIGATION PLAN (2018)

Similar to the Climate Vulnerability Assessment and Resilience Strategy (2019), the Gallatin County Hazard Mitigation Plan focuses on preparedness for hazards, including wildfire, earthquakes, and flooding. While the plan is not focused specifically on climate-induced hazards, it does recognize the role of climate change in exacerbating hazards in the future, especially wildfires.

https://www.readygallatin.com/wp-content/uploads/2019/06/FINAL-DRAFT-Gallatin-County-Hazard-Mit-Plan_05-30-2019_plus-MSU-Annex-CWPP_low_res.pdf

INTEGRATED WATER RESOURCES PLAN (2013)

The Integrated Water Resource Plan serves to "guide water supply and water use policy for the next fifty years." Strategies focus primarily on demand reduction and supply diversification. While the Plan is primarily a technical document to ensure the provision of water for Bozeman into the future, it recognizes the potential impact of climate change on water systems in the future.

<https://www.bozeman.net/home/showdocument?id=836>

MIDTOWN ACTION PLAN

The Midtown Action Plan aims to attract targeted private investment to the Midtown Urban Renewal District by removing barriers to development through strategic infrastructure investments and incentives. The objective of the Midtown Urban Renewal District is to promote economic development, multimodal transportation, support innovative infrastructure, promote unified human scale urban design, and support compatible urban density mixed land uses through infill, increased building density, retail, housing, and multimodal amenities.

<https://midtownbozeman.org/uploads/Documents/Action-Plan-V10.pdf>

DOWNTOWN BOZEMAN IMPROVEMENT PLAN (2019)

The Downtown Bozeman Improvement Plan identifies climate change as an important backdrop for community planning efforts. Several focus areas of the plan, such as Heart of a Thriving Bozeman, Walkable and Accessible, and Connected to Nature & Culture, include recommendations that tie directly into the framework of the Bozeman Climate Plan (e.g., Community Development, Transportation, and Greenspace and Natural Systems).

https://downtownbozeman.org/uploads/Pdfs/2019_DBIP_with_Appendix_FINAL_ADOPTED_4-15-19.pdf

ECONOMIC DEVELOPMENT STRATEGY (2017)

Though the Economic Development Strategy does not explicitly consider climate change, several of the plan's objectives and recommended actions fit into the Climate Plan's focus areas. Climate-related strategies include efficient density and community development and a focus on multi-modal transportation. The Economic Development Strategy also elevates the need to protect and enhance the outdoor and tourism industry, which is one of Bozeman's most climate-vulnerable economic drivers.

<http://weblink.bozeman.net/WebLink8/0/doc/120846/Electronic.aspx>

GALLATIN COUNTY HAZARD MITIGATION PLAN (2018)

Similar to the Climate Vulnerability Assessment and Resilience Strategy (2019), the Gallatin County Hazard Mitigation Plan focuses on preparedness for hazards, including wildfire, earthquakes, and flooding. While the plan is not focused specifically on climate-induced hazards, it does recognize the role of climate change in exacerbating hazards in the future, especially wildfires.

https://www.readygallatin.com/wp-content/uploads/2019/06/FINAL-DRAFT-Gallatin-County-Hazard-Mit-Plan_05-30-2019_plus-MSU-Annex-CWPP_low_res.pdf

INTEGRATED WATER RESOURCES PLAN (2013)

The Integrated Water Resource Plan serves to "guide water supply and water use policy for the next fifty years." Strategies focus primarily on demand reduction and supply diversification. While the Plan is primarily a technical document to ensure the provision of water for Bozeman into the future, it recognizes the potential impact of climate change on water systems in the future.

<https://www.bozeman.net/home/showdocument?id=836>

MIDTOWN ACTION PLAN

The Midtown Action Plan aims to attract targeted private investment to the Midtown Urban Renewal District by removing barriers to development through strategic infrastructure investments and incentives. The objective of the Midtown Urban Renewal District is to promote economic development, multimodal transportation, support innovative infrastructure, promote unified human scale urban design, and support compatible urban density mixed land uses through infill, increased building density, retail, housing, and multimodal amenities.

<https://midtownbozeman.org/uploads/Documents/Action-Plan-V10.pdf>

MUNICIPAL CLIMATE ACTION PLAN (2008)

The Municipal Climate Action Plan establishes a city-operations climate goal of “reducing municipal greenhouse gas emissions 15% below 2008 levels by 2020.” Similar to the Community Climate Action Plan, the Municipal Climate Action Plan includes a list of strategies oriented toward mitigating climate impacts through efficient land use, energy, wastewater, and transportation planning.

<https://www.bozeman.net/home/showdocument?id=3140>

MUNICIPAL GREENHOUSE GAS EMISSIONS (2012)

The Municipal Greenhouse Gas Emissions is an inventory of transportation, building, water/wastewater, and waste emission. The inventory concludes with an actionable framework with the following three priorities for municipal operations: energy efficiency and conservation, high energy performance standards for all new facilities and infrastructure, and a renewable energy plan.

<https://www.bozeman.net/home/showdocument?id=4857>

NORTHWESTERN ENERGY ELECTRIC SUPPLY RESOURCE PROCUREMENT PLAN (2019)

In this plan, Bozeman’s electricity provider, NorthWestern Energy (NWE), summarized its current power supply, future needs and its strategy for procuring additional resources to address supply needs. Concurrent with Bozeman’s Climate Planning timeline, NWE will be conducting an independent competitive procurement process to secure up to 400 MW of peaking capacity. NWE analysis indicates that thermal resources are the lowest-cost resource but notes that renewable resources and energy storage costs are declining. The procurement process will consider all resources – natural gas, renewable energy and even “demand side” resources that reduce supply needs through energy efficiency.

<http://www.NWEenergy.com/our-company/regulatory-environment/2019-electricity-supply-resource-procurement-plan>

REDESIGN STREAMLINE 2020

Bozeman’s fare-free transit system, Streamline, launched the Redesign Streamline planning process in November 2019. The project involves a comprehensive study of Streamline service and operations, culminating in a Transit Development Plan that details recommendations and implementation strategies for near-and long-term service changes to meet the growing community needs.

<https://streamlinebus.com/about/redesign-streamline-2020/>

TRANSPORTATION MASTER PLAN (2017)

The Transportation Master Plan recognizes the importance of reducing transportation-related carbon emissions as part of a triple bottom line approach to evaluating transportation decisions. While the Plan focuses holistically on Bozeman’s mobility, which includes options for vehicle mobility, the Transportation Master Plan includes several strategies and recommendations focused on Transportation Demand Management (TDM) and encourages the use of alternative modes of transportation, such as biking, walking, and taking transit.

<http://weblink.bozeman.net/WebLink8/0/doc/122828/Electronic.aspx>

TRIANGLE COMMUNITY PLAN

With population growth and fast-paced land development, the Triangle area of Gallatin County, which is loosely described as the areas between Bozeman, Four corners, and Belgrade, is experiencing change. The Planning Coordination Committee (PCC) developed the Triangle Community Plan to coordinate land use development patterns, deliver community services, and infrastructure, and protect important environmental resources, all in a manner that supports community values and vision while responding to rapid growth pressures.

https://gallatincountymt.st7.civic-cms.com/sites/gallatincountymt/files/uploads/triangle_community_plan_final.pdf

UNIFIED DEVELOPMENT CODE

The Unified Development Code (commonly called the "UDC") is a set of regulations aimed to protect the public health, safety and general welfare. These regulations recognize and balance the various rights and responsibilities relating to land ownership, use and development. The UDC is just one chapter of the Bozeman Municipal Code but it covers a wide range of topics such as setbacks, building height, allowed uses, landscaping, affordable housing and parking. Some regulations apply city-wide while others are district-specific.

https://library.municode.com/mt/bozeman/codes/code_of_ordinances?nodeId=PTIICOOR_CH38UNDEC_O

<https://www.bozeman.net/home/showdocument?id=8932>

URBAN FORESTRY MANAGEMENT PLAN (2016)

One of the foundational goals of the Urban Forestry Management Plan is to “develop [an] urban forest resilient to climate change and invasive pests.” The plan also recognizes the increasing threats associated with a changing climate and iterates the importance of a healthy urban forest to combat climate change. Plan strategies include building Bozeman’s urban canopy infrastructure, bolstering maintenance protocol, and focusing on outreach and education.

<https://www.bozeman.net/home/showdocument?id=3621>

APPENDIX C: CLIMATE TEAM WORKSHOP SUMMARIES



BOZEMAN CLIMATE PLAN – Climate Team Workshop 1 Summary

October 22, 2019

1:00 – 3:30 p.m.

Commission Room, Bozeman City Hall, 21 N Rouse Ave, Bozeman, MT

Workshop Objectives

- Meet the Climate Team members
- Develop an understanding of the project purpose and process
- Explore a climate vision and potential climate goals
- Brainstorm potential climate solutions

Agenda

1:00 p.m.	Welcome from the Mayor
1:05	Introductions & 3 Vision Words Activity
1:25	Project Grounding
2:00	Short Break
2:10	Vision Themes
2:15	Exploring Goals & Climate Solutions Group Activity
3:20	Wrap-up and Next Steps

Participants

Name (last, first)	Affiliation
Climate Team Members	
Bellamy, Heather	NorthWestern Energy
Blackler, Kristin	Montana State University
Blessing, Sara	Bozeman Sunrise Movement
Bode, Emma	Forward Montana
Boyer, Jennifer	Farm 51
Bushnell, John	NorthWestern Energy
Carpenter, Randy	Future West
Christenson, Lori	Gallatin County Health Department (alternate for Matt Kelley)
Cunningham, Terry	Bozeman City Commission
Dorsi, Chris	Montana Weatherization Center-MSU Extension
Drake, Robert	Bridger Bowl (alternate for Bonnie Hickey)
Fox, Jeff	Renewable Northwest (via phone)
Frandsen, Eli	Montana State University-Student Body
Giannetti, Danae	Western Transportation Institute (for David Kack)
Grenier, Heather	Human Resources Development Council
Jackson, Erin	Gallatin Valley Farm to School

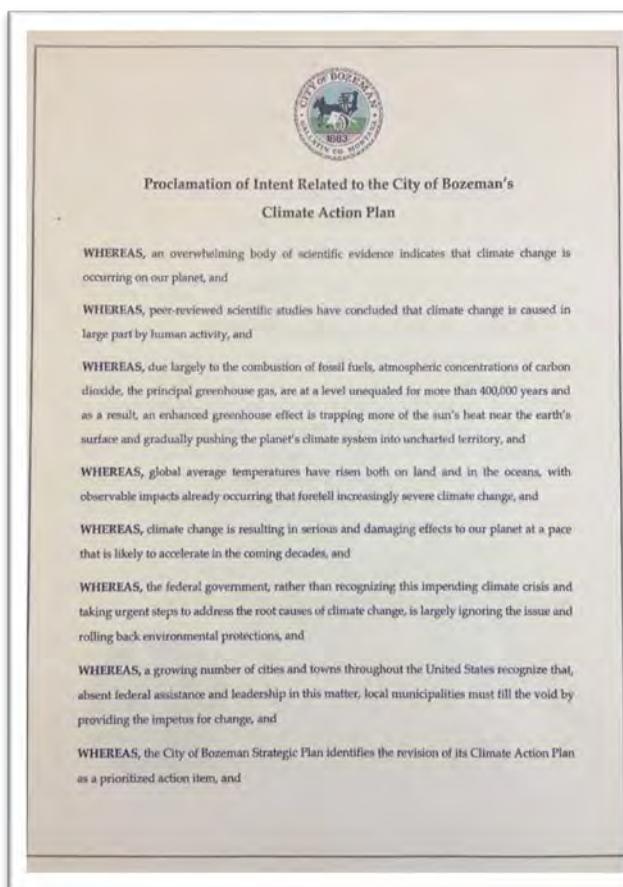
Name (last, first)	Affiliation
Jamison, Danica	United Way
Khumalo, Libby	World Wildlife Fund
Kirk, Karin	Freelance Writing, Science Education
Klimpke, Jason	Mystery Ranch
Lewendal, Anders	Southwest Montana Building Industry Association
Mastel, Candace	Bozeman Area Bicycle Board, MSU Planning
Melvin, Addie	JM Engineering
Mitchell, Owen	Bozeman High School-Student Body
Nash Wanzek, Riley	Montana State University-Student Body
Naumann, Chris	Downtown Bozeman Partnership
Pope, Chris	Montana Legislature-HD 65
Rowley, Nicole	Gallatin County
Schack, Lindsey	Love Schack Architects
Sinnott, Jay	Bozeman Climate Partners
Vlases, Claire	Bozeman High School-Student Body
Wilkinson, Bridget	Bozeman Community Foundation
Willey, Edie	Bozeman Health
City of Bozeman Staff	
Meyer, Natalie	Climate Plan Project Manager, City of Bozeman Sustainability
Andreasen, Tanya	City of Bozeman Neighborhoods
Handelin, Kevin	City of Bozeman Solid Waste, Recycling & Compost
Henderson, Jon	City of Bozeman Strategic Services
Higinbotham, Heather	City of Bozeman Sustainability
Jadin, Addi	City of Bozeman Parks
Lonsdale, Taylor	City of Bozeman Transportation
Mehrens, Kyle	City of Bozeman Stormwater
Nordquest, Alex	City of Bozeman Forestry
Rosenberg, Sarah	City of Bozeman Community Development
Consulting Team	
Dorsey, Judy	Executive Project Manager, Brendle Group
Ide, Britt	Energy Expert, Ide Energy
Sommer, Shelby	Project Manager, Brendle Group

Mayor Welcome

Mayor Cyndy Andrus welcomed everyone to the first Climate Team workshop. Highlights of her remarks include:

- Thanks for being here to address one of the most serious issues of our time
- The Mayor and City of Bozeman has been working on climate issues for some time
 - Supported City Commission, worked on our resiliency plan
 - Looked at own habits
 - Can do more and better work
- A couple weeks ago, went to Mountain Towns 2030 in Park City
 - Coalition of 34 mountain communities
 - To discuss setting ambitious goals for carbon reduction by 2030

- Quite sobering, but inspiring at end of day
- 3 things thinking about differently
 - Need to change the language and rethink how we talk about climate solutions and leaving world in better place
 - Been on commission for 10 years dangling the carrot for behavior change; believe it's time to put a little hammer to this issue
 - Not everyone will be comfortable with that
 - We need to take some bold steps; which requires partnerships and community buy-in
 - Forging ground with partners we don't always think of as traditional partners
- In spirit of that - a proclamation to you as you embark on this work
 - Proclamation of intent related to the City of Bozeman's Climate Action Plan (*see photos below and attached file for full proclamation*)
 - Whereas statements
 - Strategic plan calls for Climate Action plan as a prioritized action item
 - Therefore
 - Bozeman shall be a leader that identifies bold targets for carbon reduction and climate change mitigation
 - Will create a policy document that leads to city's policies, capital planning and city budgets
 - Will pursue partnerships with other municipalities and our utility provider to reach a goal of 100% net renewable energy for the City of Bozeman by 2030
 - Call upon all the important partners to join us
 - Signed 10/22/19 (with movement to tears)
 - Bought a book - Drawdown, Paul Hawken
 - Quote from Park City - Our ancestors were innocent, makes us believe we are victims, if change our mindset that climate change is happening *for* us – it's an opportunity for an innovation to build and affect change for creativity, compassion, and genius



Introductions & 3 Vision Words Activity

Natalie, Sustainability Program Manager and Bozeman Climate Team Project Manager for the City of Bozeman, welcomed everyone, provided an overview of the agenda and workshop objectives.

Judy Dorsey, President of Brendle Group, introduced Brendle Group as a sustainability consulting firm based out of Fort Collins, Colorado (slide 5). She introduced the project team (slide 6).

Shelby Sommer, Project Manager for the consulting team, facilitated climate team introductions and the three vision words activity. See the list on page 1 for all workshop participants names and organizations.

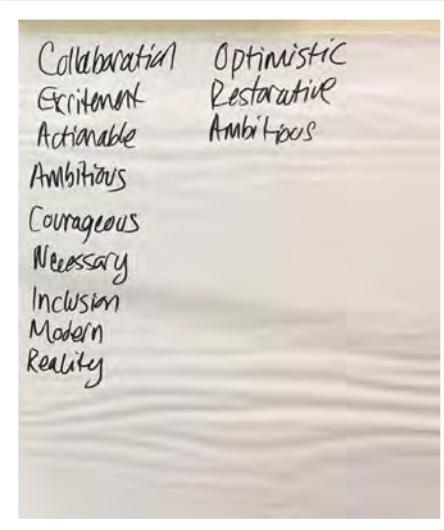
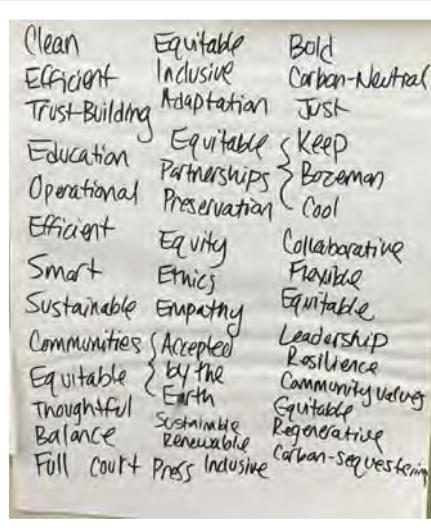
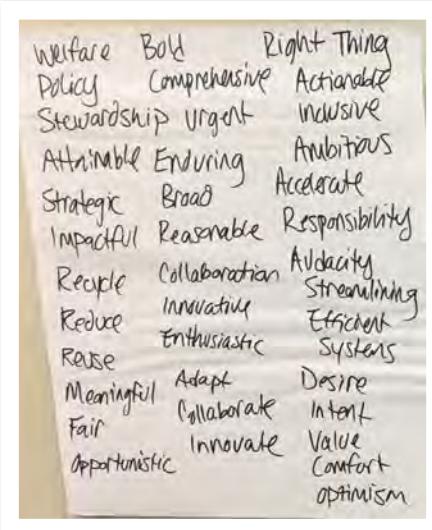
Meet the Project Team!



In preparation for the workshop, team members were asked to think about what the Bozeman Climate Plan means to them and the greater community. They asked themselves questions like:

- What do you hope the plan will address?
- What should we not lose sight of?
- What is most important to you as it relates to Bozeman's climate future?

Each person identified **three words that represent his/her/their vision** for the Bozeman Climate Plan. Team members shared their three "vision words" during their introductions during Workshop 1. The words are illustrated in the photos of the flip chart notes below. A word cloud was generated during the workshop break and is included in the Vision Themes section of this summary.



Project Grounding

Karin Kirk, geologist, freelance writer and Yale Climate Connections expert, presented "Everything you need to know about climate change...in 10 minutes" (see slides 9-35). Highlights of her remarks include the following (numbers correspond to slide numbers):

- 10 - NOAA average temperature chart, pulled data for Gallatin County
- 12 - We know what's causing the warming. We're taking 'fossil' carbon out of deep geologic storage and burning it.
- 13 - The amount of CO₂ in the atmosphere has steadily been rising – adding ever more insulation to the planet. It's like wearing an extra puffy coat. All the time!
- 15 - If you look at today's CO₂ trend over a longer time scale, it's really astonishing. Here you can see the rhythm of the last 4 ice ages. Followed by a HUGE spike in CO₂. That's us. But hey – isn't it just a natural cycle? That's the #1 myth about climate change. Does this spike look natural to you?
- 16 - Here's an example. A science textbook put out by a political lobbying organization.
- 18 - But the good thing is that we know the answers too! Burn less fossil fuels.
- 19 - We kinda sorta know how to roll out the solutions, but it's not exactly straightforward and all the people who want to fight about climate change should take their fight right here. So, how should we go about doing this? What choices should we make?
- 22 - And here's how fast, and how dramatically we need to stop it to stay in the 'safe' zone. The sooner we do it. The less drastic the dropoff. This graph is called the ski slope. The longer we wait, the gnarlier the slope.
- 24 - Lots of places where we disagree and if you feel yourself getting into hot water, it's not gonna work. Find another avenue, or another person.
- 25 - Anytime you get into the back and forth – stop. It never works.
- 26 - You're just back to the bull elk.
- 27 - Instead, try this. Be open to what the other person is going to say. Be ready. Be responsive.
- 31 - So, what do you say.

Next, Natalie provided an overview of the project including the following points (see slides 36-39):

- The City of Bozeman has already agreed to upholding Paris Climate Agreement, this process will explore more specifically what this means for Bozeman.
- 7 focus areas and two cross-cutting themes will be addressed.
- This effort builds on various related efforts:
 - 2008 Municipal Climate Action Plan
 - 2011 Community Climate Action Plan
 - 2019 Climate Vulnerability & Resiliency Assessment
- NOAA indicated that 2017 was the costliest on record for natural disasters.
- There are already many local climate action success stories to report - see the display boards for a few examples.



Judy shared highlights from the Climate Profile and summarized "where are we now?" and "where do we want to go" with respect to existing goals and commitments that provide a foundation for this planning effort. Highlighted included the following (see slides 40-49):

- Running start at climate action
- Inventory numbers are based on the 2016 Emissions Inventory
- 88% of emissions come from transportation and buildings
- Electricity, natural gas, and gasoline are the three big sources of emissions (~80% of emissions)
- 25-50% reduction reflects the spirit of the Paris Climate Agreement applied to Bozeman

- As the US backs out of the Paris Agreement, US Mayors stepped up and created the Mayors Climate Agreement
 - At the statewide level, a Climate Solutions Plan is running concurrently with this plan - provisional goals to test through this process
 - Carbon neutral electricity by 2035
 - Net zero GHG emissions economy-wide by a date TBD
 - This process will involve setting some provisional goals to test and vet.

Vision Themes

Words from the 3 Vision Words activity were pulled into Word Cloud software to generate the following vision image. Note that in general, the words that appear in larger text were mentioned more frequently than words in smaller text.



Exploring Goals & Climate Solutions Group Activity

Participants were assigned to one of 6 focus areas for breakout group discussions:

- Buildings
 - Community Development
 - Consumption & Waste
 - Energy & Utilities
 - Greenspace & Natural Systems
 - Transportation

The breakout group instructions included:

1. Each table has a facilitator and discussion guide.

2. Facilitator notes group participants on discussion guide.
3. Facilitator guides the conversation using the following prompts and time guidelines.
4. Facilitator takes notes and helps identify common themes for report outs.

Discussion topics included:

- Goal Alignment (20 min)
 - What would success look like?
 - Relationship to Paris Climate Agreement? Goal ambition?
 - Equity issues to consider?
- Solution Exploration (30 min)

Brainstorm & Categorize Solutions

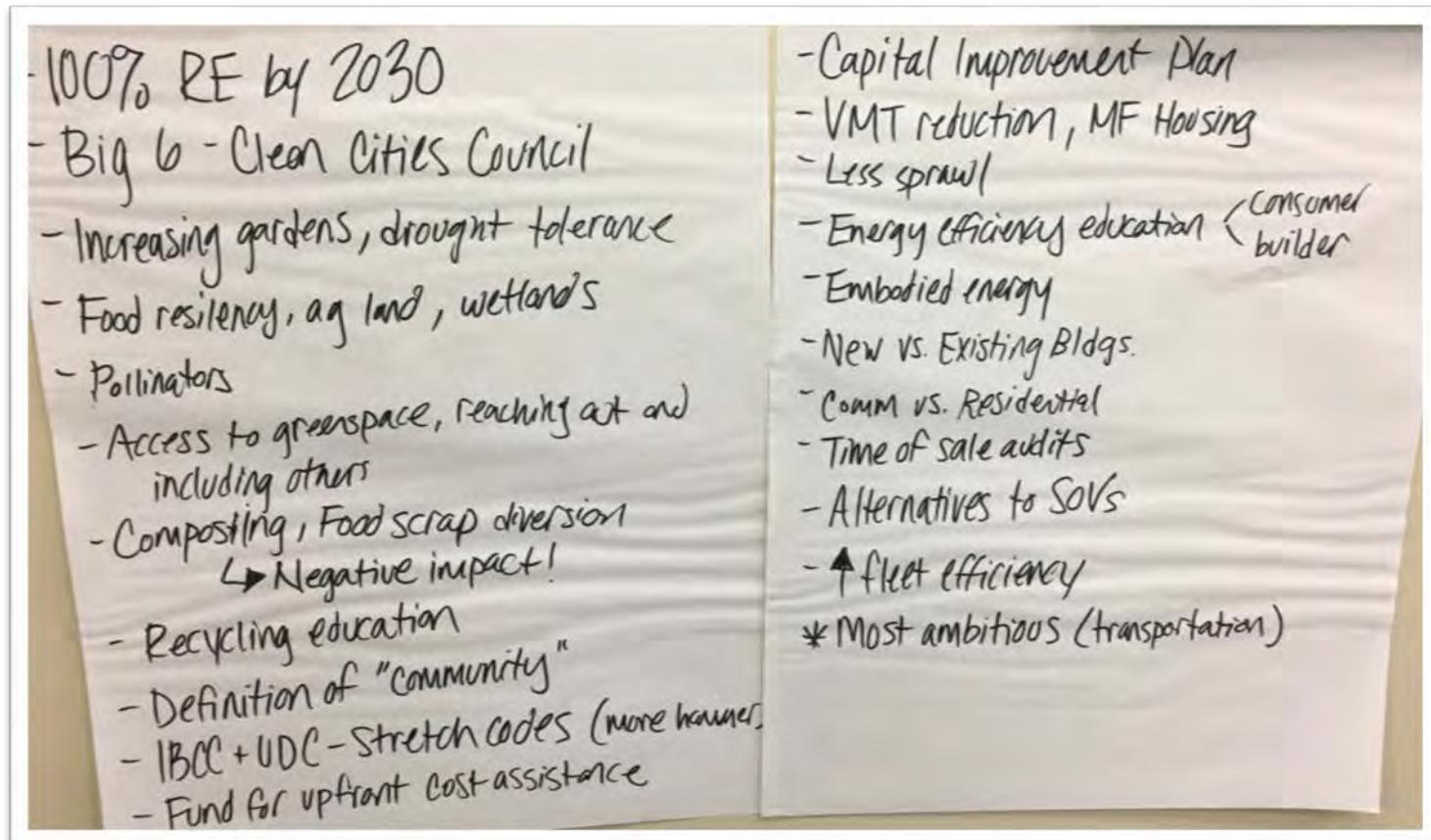
 - Mitigation Solutions: Lead to direct GHG emissions reductions
 - Resiliency Solutions: Help the community prevent, withstand, respond to, or recover from a disruption
 - Mitigation & Resiliency Solutions: Do both!

What solutions address cross-cutting themes like climate equity and human health and well-being?

What city assets should be considered?



Detailed notes from each focus are discussion are provided as an appendix. Photos of summary notes from the report-outs are provided below, followed by photos of the Climate Team discussing goals and brainstorming solutions.



Wrap-up & Next Steps

Shelby concluded the meeting with a summary of upcoming meetings and next steps (slide 57):

- Attend the Community Forum
Wednesday, October 23
4:30 to 6:30 pm
Story Mill Community Center
- Take note of the City Commission briefing
 - Monday, December 16
Project orientation & direction
 - Vision statement
 - Provisional goal
- Anticipate a homework assignment (in the form of an online survey) the week of Nov. 18 (due Dec. 1)
- Keep an eye out for the Workshop #2 date (tentatively Tuesday, December 17 or Wednesday, December 18, time to be determined)

Please contact Natalie Meyer if you have any questions or concerns, especially if you are aware of any major conflicts with either of the potential Workshop #2 dates. Thanks for a productive workshop and for being an essential part of this planning process!



Buildings

Facilitator: Heather Higinbotham Davies

Group Members: Chris Dorsi, Judy Dorsey, Addie Melvin, Lindsey Schack, Claire Vlases, Riley Wanzek



Goal Alignment

What would success look like for this focus area? (explore and discuss both quantitative and qualitative measures of success)	What is the relationship of this focus area to the overall Paris Climate Agreement? How ambitious would goals and impacts from this focus area need to be to achieve deep carbon reductions?	What are the equity issues we should be considering in this focus area?
<ul style="list-style-type: none">The value of building efficiency is recognized by consumer/buyers, realtors – education that shifts the marketMore passive homes (rated at 90% emissions reduction) – audacious solutions, showing we can make any structure net zeroLanguage/education clarifying NZE vs carbon neutral; embodied energy and construction waster vs operational energy; and flow chart matching communications to audience and decision points in building ownershipAddress the fiscal impacts of energy solutions and seek to achieve revenue neutral solutionsConsumers/appraisers/lenders understand the value of smaller homesThe mis-perception of cost premium for higher performing buildings is debunked	<ul style="list-style-type: none">Vastly reduced emissions from both commercial and residential buildingsElectrification of thermal loads as electricity supply approaches 100% renewable energyDevelop separate sub-targets for residential/commercial, new/existing buildings, efficiency/renewable supplySmaller homes	<ul style="list-style-type: none">The homes we expect to create with these efforts are universally more healthy

Solution Exploration

What ideas do you have for Bozeman to make progress on this focus area to achieve your definition of success?

Try to define whether your solutions address greenhouse gas mitigation, climate resiliency/adaption, or both.

- Mitigation solutions lead to direct greenhouse gas emissions reductions*
- Resiliency solutions help the community prevent, withstand, respond to, or recover from a disruption*

Mitigation Solutions	Mitigation & Resiliency Solutions	Resiliency Solutions
<ul style="list-style-type: none"> Recycling to lower embodied energy building materials such as glass as engineered fill under slabs and tilled sheet rock as soil amendment Tax rebates Identify which older buildings are least efficient through thermal imaging/drone technology or other methods App that shows electrical usage to affect behavior change in neighborhoods; feedback loops Reduced fee incentives for large commercial buildings Green features on MLS for residential point of sale, appraisals Charge higher fees for larger homes Charge more further from city center 	<ul style="list-style-type: none"> Net zero for new commercial buildings with public funding Code reviews with incentives (or required) on older, existing buildings Public education campaigns with case studies Smart grid/smart metering technologies Sustainable materials management Retro commissioning commercial buildings PACE/WPACE financing Incentives for 3rd party green building certifications – Passive, Living Building Challenge, LEED, etc Multi-use live/work and density; more dense multi-family Yard signs on energy performance – positive examples Stretch code – advertise you're a better builder Funding for builder training Contractor network for retrofits Split incentive for renters 	<ul style="list-style-type: none"> Fire, drought resistance in buildings Low energy cooling systems Distributed generation Solar ready Incentives for orientation and south facing roof pitches
<p>What solutions will address cross-cutting themes like climate equity and human health and well-being?</p> <ul style="list-style-type: none"> The poorest of the poor live in the worst of the worst buildings in town Low-income housing stock is often poor-quality, hard to justify putting more money into them 55% mobile homes in Montana – low income Encourage more support for low income weatherization programs Gap between energy audit and implementation Fund blower door testing (concerns with asbestos in older homes) Low energy cooling systems – even if well sealed, people with health issues, elderly, etc need cooling during wildfires (air filtration) 		<p>What City Assets should be considered?</p>

Community Development

Facilitator: Sarah Rosenberg

Group Members: Chris Naumann, Randy Carpenter, Jay Sinnott, Eli Frandsen, Nicole Rowley, Shelby Sommer



Goal Alignment

What would success look like for this focus area? (explore and discuss both quantitative and qualitative measures of success)	What is the relationship of this focus area to the overall Paris Climate Agreement? How ambitious would goals and impacts from this focus area need to be to achieve deep carbon reductions?	What are the equity issues we should be considering in this focus area?
<ul style="list-style-type: none">• Alternative transportation – reduce VMT• Housing affordability in town (people are moving further out and commuting more)• Housing diversity/density – mix of housing types to support population and commercial uses• Commercial nodes and mix of land uses in/near residential neighborhoods• Metropolitan Planning Organization (MPO) that prioritizes transit and VMT reductions• Incentives to increase residential development in town• Reduction in sprawl	<ul style="list-style-type: none">• Code and growth policy doesn't have aggressive enough goals and standards to achieve deep carbon reductions, just maintain or potentially slight decreases• Close relationship between land use and transportation and emissions reductions• Regional scale issues and approach needed• Potential to incrementally reduce vehicle trips through land use patterns• Ability to incrementally encourage electric vehicle and energy efficiency through code requirements	<ul style="list-style-type: none">• Housing prices (the further away you live, lower housing prices but higher transportation costs)• Scarcity mindset influencing housing costs (not taking into consideration other factors like transportation or utilities)• Public health (more mixed use development and walkability)• Access to greenspace and parks and other community amenities

Solution Exploration

What ideas do you have for Bozeman to make progress on this focus area to achieve your definition of success?

Try to define whether your solutions address greenhouse gas mitigation, climate resiliency/adaption, or both.

- *Mitigation solutions lead to direct greenhouse gas emissions reductions*
- *Resiliency solutions help the community prevent, withstand, respond to, or recover from a disruption*

Mitigation Solutions	Mitigation & Resiliency Solutions	Resiliency Solutions
<ul style="list-style-type: none"> Optional stretch code for new construction/major remodels that builds on International Building Code and Development Code Labeling/certifying new buildings for energy efficiency or other green ratings (e.g., LEED) Provide incentives for energy efficiency improvements and renewable energy installations during building retrofits/upgrades Offer funding to offset upfront energy efficiency improvement costs Extend bus routes Parking reductions to increase transit use Annexation and growth strategy to focus and shape development in urban area 	<ul style="list-style-type: none"> Develop/encourage forested carbon sinks (more trees in urban area) Relax design standards for solar photovoltaic installations Update/review the Unified Development Code to better integrate climate mitigation/resiliency requirements and/or incentives Coordinate regionally and with Gallatin County to focus growth in city/urban area Explore a sister cities program with Missoula to compare and share mitigation and resiliency best practices Offer priority/expedited development review for projects that commit to certain levels of green requirements (e.g., LEED ND or similar) Encourage/incentivize more dwelling units in existing neighborhoods (accessory dwelling units) Link all City plans and regulations with climate priorities and growth policy, including the Capital Improvement Plan and Unified Development Ordinance Right-size street infrastructure (don't overbuild) and accommodate multiple modes and green infrastructure Provide development bonuses (e.g., additional height, parking reductions, etc.) in exchange for density, alternative energy, high efficiency construction, etc. 	<ul style="list-style-type: none"> Natural resource protection
What solutions will address cross-cutting themes like climate equity and human health and well-being?	What City Assets should be considered?	<ul style="list-style-type: none"> Fund that can go towards those who cannot afford changes Give alternatives and make sure pieces are in place before enacting sweeping change (e.g., reduce/eliminate parking count requirements and/or charge for parking but also make sure transit and other mode options are available) Grow bus systems and service areas

Consumption & Waste

Facilitator: Kevin Handelin, Tanya Andreasen

Group Members: Kristin Blackler, Emma Bode, Jason Klimpke



Bozeman
Climate
Plan

Goal Alignment

What would success look like for this focus area? (explore and discuss both quantitative and qualitative measures of success)	What is the relationship of this focus area to the overall Paris Climate Agreement? How ambitious would goals and impacts from this focus area need to be to achieve deep carbon reductions?	What are the equity issues we should be considering in this focus area?
<ul style="list-style-type: none">• Negative CO₂ emissions from waste• Regulation: discourage• Target numbers (incentivize)• Compostable waste: postconsumer food waste• Residential compost• Commercial compost• Diverting food waste – humans & grocery stores• Decreasing barriers for commercial kitchens to divert food waste to feeding livestock• Buy-in by county members• Communication• Problems:<ul style="list-style-type: none">◦ Confusion about what is recyclable◦ 35% of City of Bozeman customers have mixed stream recycling totes◦ Curbside compost & yard waste◦ What do you do with compost once you have it• Scope 3 emissions – 25% decrease from 2009 levels by 2020 (Have hit 32% in 2018)	<ul style="list-style-type: none">• Goal is to be carbon negative by 2035• Negative CO₂ emissions from waste• Preferred purchasing/procurement<ul style="list-style-type: none">◦ Compostable products◦ Decrease in waste products• Provider/consumer coalition to drive education and create pervasive culture change and shift norms across populations (e.g., tourists, visitors, students)<ul style="list-style-type: none">◦ 0-100◦ Schools◦ Private industry◦ Agriculture◦ MSU◦ Recycling and solid waste services	<ul style="list-style-type: none">• Ban on single use plastic (burden on small businesses)• Cost of recycling bin/activity of recycling• Assess to information about what is recyclable

Solution Exploration

What ideas do you have for Bozeman to make progress on this focus area to achieve your definition of success?

Try to define whether your solutions address greenhouse gas mitigation, climate resiliency/adaption, or both.

- Mitigation solutions lead to direct greenhouse gas emissions reductions
- Resiliency solutions help the community prevent, withstand, respond to, or recover from a disruption

Mitigation Solutions	Mitigation & Resiliency Solutions	Resiliency Solutions
<ul style="list-style-type: none">• MSU waste audit of community<ul style="list-style-type: none">◦ Point in time numbers to drive target numbers• Trucks – weigh waste• Opt out of opt in for recycling service (and compost?)• Incentivize (communicate recycling and compost opportunities)• Empower consumer information• Commercial: “this is recyclable” signage• Reuse of glass in Bozeman (concrete) or reduce consumption)	<ul style="list-style-type: none">• Food diversion to livestock• Compost to agriculture• Collection vehicles – convert diesel to CNG, electric, or biodiesel	<ul style="list-style-type: none">• Empower people – information and decision making about “the right thing”• Expanded recycling and compost programs• Landfill – methane capture and power at Logan• Mining landfills
What solutions will address cross-cutting themes like climate equity and human health and well-being?		What City Assets should be considered? <ul style="list-style-type: none">• Solid Waste Department is an asset.• Goal is to be carbon negative by 2035.• We will use our resources to educate public about individual steps they can take to make a difference.

Energy & Utilities

Facilitator: Natalie Meyer, Britt Ide

Group Members: Heather Bellamy, John Bushnell, Terry Cunningham, Jeff Fox, Karin Kirk, Owen Mitchell, Chris Pope



Goal Alignment

What would success look like for this focus area? (explore and discuss both quantitative and qualitative measures of success)	What is the relationship of this focus area to the overall Paris Climate Agreement? How ambitious would goals and impacts from this focus area need to be to achieve deep carbon reductions?	What are the equity issues we should be considering in this focus area?
<ul style="list-style-type: none">• Today – 62% renewable energy• 100% clean energy (CO₂ free) within city limits by 2030• 70% by 2022• First city procurement options in 2022• Bozeman coop with NorthWest Energy (NWE) (identify sources)• Bozeman City – MSU & NWE storage (public safety building – storage ready)• By 2021 develop City communication plan• Partner with “sister” cities• Electrify the fleet• Incent behavior (top 10 things to save energy today)• Geothermal• Solutions needed related to gas heating and load balancing• Collaboration with stakeholders	<ul style="list-style-type: none">• On track• Partner with MSU and Oracle• Bozeman leads MT Clean Cities Alliance by (Date TBD) and Clean Energy Caucus (PSC) legislature	<ul style="list-style-type: none">• Cost• Cross-subsidization

Solution Exploration

What ideas do you have for Bozeman to make progress on this focus area to achieve your definition of success?

Try to define whether your solutions address greenhouse gas mitigation, climate resiliency/adaption, or both.

- Mitigation solutions lead to direct greenhouse gas emissions reductions
- Resiliency solutions help the community prevent, withstand, respond to, or recover from a disruption

Mitigation Solutions	Mitigation & Resiliency Solutions	Resiliency Solutions
<ul style="list-style-type: none">• Efficiency – buildings & water• Demand side management• Education• Communication• Grid modernization – advanced metering• Time of use rate	<ul style="list-style-type: none">• Weatherization• Co-gen (wastewater treatment)• Landfill• Micro-transport nuclear	<ul style="list-style-type: none">• Address power outages• Storage
What solutions will address cross-cutting themes like climate equity and human health and well-being?	What City Assets should be considered? <ul style="list-style-type: none">• Commission lead request for smart meters• Incentivize electric vehicles (storage, demand side, etc. – put charging stations everywhere)• Collaborate with rural communities to build aggregated community solar and wind in other areas (cheaper land)• Building codes – new buildings electric and solar ready• Address renters	

Greenslace & Natural Systems

Facilitator: Addi Jadin, Alex Nordquest, Kyle Mehrens

Group Members: Libby Khumalo, Jennifer Boyer, Bridget Wilkinson, Danica Jamison



Goal Alignment

What would success look like for this focus area? (explore and discuss both quantitative and qualitative measures of success)	What is the relationship of this focus area to the overall Paris Climate Agreement? How ambitious would goals and impacts from this focus area need to be to achieve deep carbon reductions?	What are the equity issues we should be considering in this focus area?
<ul style="list-style-type: none">• Water<ul style="list-style-type: none">◦ Drought tolerant◦ Increase pipe capacity◦ Increase flood resiliency◦ Increase infiltration system◦ Increase permeability (sponge city)◦ Decrease residential water consumption◦ Increase water quality (decrease runoff & toxins, increase phosphorous-free)◦ Low Impact development (LID)◦ Protect and restore wetlands, keep mitigation in our watershed◦ Green Roofs• Agriculture/Land<ul style="list-style-type: none">◦ Retaining productive farmland◦ Integrate food into neighborhoods<ul style="list-style-type: none">▪ Agrihoods▪ Community Gardens▪ Urban Farming▪ 1000 new gardens▪ Grass to gardens◦ % locally-generated food◦ Redefining beauty	•	<ul style="list-style-type: none">• Proximity to parks & greenspace for all• Who has access to local food production systems• Safe & welcoming, inclusive community• Acknowledge the privilege to be in a stable environment to be discussing and planning for climate changes• Safe havens, shelter, refuge• Greenspace to reduce mental health

- Increase resiliency of plant species
- Increase regenerative species/soil?
- Pollinator, bird & small mammals/wildlife
- Increase number of trees per capita
- Increase carbon sequestration
- Increase natural playgrounds
- Increase bicycle commuter routes

Solution Exploration

What ideas do you have for Bozeman to make progress on this focus area to achieve your definition of success?

Try to define whether your solutions address greenhouse gas mitigation, climate resiliency/adaption, or both.

- *Mitigation solutions lead to direct greenhouse gas emissions reductions*
- *Resiliency solutions help the community prevent, withstand, respond to, or recover from a disruption*

Mitigation Solutions	Mitigation & Resiliency Solutions	Resiliency Solutions
<ul style="list-style-type: none"> • Natural weed mitigation • Encourage gardening and carbon farming • Trees, trees, trees • Community agreements to meet milestones 	<ul style="list-style-type: none"> • Acknowledge the privilege to be at the table – connect to sister cities • Explore homeowner association influence and ability to support city goals & education 	<ul style="list-style-type: none"> •

Transportation

Facilitator: Taylor Lonsdale

Group Members: Danae Gianetti, Edie Willey, Lori Christenson, Robert Drake, Heather Grenier, Candace Mastel, Jon Henderson



Bozeman
Climate
Plan

Goal Alignment

What would success look like for this focus area? (explore and discuss both quantitative and qualitative measures of success)	What is the relationship of this focus area to the overall Paris Climate Agreement? How ambitious would goals and impacts from this focus area need to be to achieve deep carbon reductions?	What are the equity issues we should be considering in this focus area?
<ul style="list-style-type: none">• Mode share – qualify, set goals• Design decisions• Funding allocation• Encourage safe active transportation• Mindset relating to public transportation• Decrease in emissions <p>More people riding bus Increase in auto efficiency Increase in carpooling Comfort level of choices Land use choices Reframe the conversation</p>	<ul style="list-style-type: none">• Ambitious – the most ambitious• Have significant influence• Be tenacious• Keep momentum• Be leaders• Could make the majority of the goal just with transportation	<ul style="list-style-type: none">• Where are investments being made• Options for all ages and abilities• Get out of silos• Can we be inconvenienced• Generally adding choice improves equity; careful with details

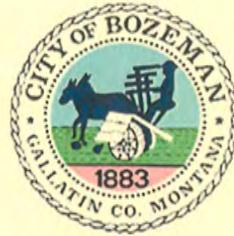
Solution Exploration

What ideas do you have for Bozeman to make progress on this focus area to achieve your definition of success?

Try to define whether your solutions address greenhouse gas mitigation, climate resiliency/adaption, or both.

- Mitigation solutions lead to direct greenhouse gas emissions reductions
- Resiliency solutions help the community prevent, withstand, respond to, or recover from a disruption

Mitigation Solutions	Mitigation & Resiliency Solutions	Resiliency Solutions
<ul style="list-style-type: none">• Framing message to reach all groups (deniers)• Electrify buses• EV charging locations• Identify at risk populations and locations• Limit growth• Revise design standards• Frame message in relatable terms• Give information at decision points (relocation)• Raise awareness• Incentivize less convenient choice• Target populations (who do we want do what?)• Target health/mental health• Engage large organizations• Publicize• Incentivize	<ul style="list-style-type: none">• Expand options• Land use pattern changes	<ul style="list-style-type: none">• Public transportation can help with evacuations, to appointments, etc.• Options to add resiliency
What solutions will address cross-cutting themes like climate equity and human health and well-being? <ul style="list-style-type: none">• Disincentivize (charge to park)		What City Assets should be considered?



Proclamation of Intent Related to the City of Bozeman's Climate Action Plan

WHEREAS, an overwhelming body of scientific evidence indicates that climate change is occurring on our planet, and

WHEREAS, peer-reviewed scientific studies have concluded that climate change is caused in large part by human activity, and

WHEREAS, due largely to the combustion of fossil fuels, atmospheric concentrations of carbon dioxide, the principal greenhouse gas, are at a level unequaled for more than 400,000 years and as a result, an enhanced greenhouse effect is trapping more of the sun's heat near the earth's surface and gradually pushing the planet's climate system into uncharted territory, and

WHEREAS, global average temperatures have risen both on land and in the oceans, with observable impacts already occurring that foretell increasingly severe climate change, and

WHEREAS, climate change is resulting in serious and damaging effects to our planet at a pace that is likely to accelerate in the coming decades, and

WHEREAS, the federal government, rather than recognizing this impending climate crisis and taking urgent steps to address the root causes of climate change, is largely ignoring the issue and rolling back environmental protections, and

WHEREAS, a growing number of cities and towns throughout the United States recognize that, absent federal assistance and leadership in this matter, local municipalities must fill the void by providing the impetus for change, and

WHEREAS, the City of Bozeman Strategic Plan identifies the revision of its Climate Action Plan as a prioritized action item, and

WHEREAS, the City of Bozeman has convened a diverse consortium of talented and passionate citizens to develop a draft Climate Action Plan to serve as a comprehensive strategy for addressing climate change in Bozeman, and

WHEREAS, the plan will identify strategies and actions to reduce our community's greenhouse gas emissions and build resiliency to the impacts of climate change.

NOW, THEREFORE, AS THE MAYOR OF BOZEMAN, I PROCLAIM THAT;

- Bozeman shall be a leader in addressing climate change by developing a climate action plan that identifies bold targets for carbon reduction and climate change mitigation, and
- We will create a policy document that will weave sustainability and climate change resilience into the City of Bozeman's decision-making processes, capital planning and city budgets, and
- Bozeman will pursue partnerships with other municipalities and our utility provider to reach a goal of 100% net renewable energy for the City of Bozeman by 2030 and
- We call upon the Montana governor's office, state agencies, the state legislature, the Public Service Commission, Gallatin County, Northwestern Energy and all Bozeman residents to join us as we seek bold, actionable climate solutions to reverse global warming and leave a better world for future generations.

Signed and Proclaimed this 22nd day of October, 2019.

Cynthia L. Andrus
Mayor
Bozeman, Montana





Bozeman
Climate
Plan

Bozeman Climate Plan

Climate Team Workshop #1

October 22, 2019



WELCOME

Mayor Cyndy Andrus

Agenda



Bozeman
Climate
Plan

Time	Agenda Item
1:00 p.m.	Welcome from Mayor Cyndy Andrus
1:05 p.m.	Introductions & 3 Vision Words
1:25 p.m.	Project Grounding
2:00 p.m.	Break
2:10 p.m.	Vision Themes
2:15 p.m.	Exploring Goals & Climate Solutions
3:20 p.m.	Wrap-up & Next Steps



Bozeman
Climate
Plan

INTRODUCTIONS

Brendle Group by the Numbers



**Hundreds of Projects
+ 150 Clients Served**



Engaged 1 000s



**in sustainability
planning**



370 million
gallons of water
savings proposed

12 million Metric Tons
of greenhouse gas reductions
identified

2,000+
energy assessments
completed

Currently featured in the Smithsonian Places of Invention Exhibit

Appendix C - Page 27

Meet the Project Team!



Bozeman
Climate
Plan



Natalie Meyer
Sustainability
Program Manager
City of Bozeman



Jon Henderson
Strategic Services
Director
City of Bozeman



**Heather
Higinbotham**
Energy Conservation
Technician
City of Bozeman



Shelby Sommer
Project Manager
Brendle Group



Judy Dorsey
Executive Project
Manager
Brendle Group



Britt Ide
Energy Expert
Ide Energy



Sarah Martin
Resiliency Planner
Brendle Group



Becca Stock
Lead Engineer
Brendle Group



Katie Kershman
Document
Dev. & Design
Brendle Group



Megan Moore
Engagement
Coordinator
Logan Simpson



Bruce Meighen
Plan Integrator
Logan Simpson

Introductions

- ▶ Name
- ▶ Organization & role
- ▶ Share your 3 vision words for the climate plan



Bozeman
Climate
Plan



Bozeman
Climate
Plan

Why are we all here?

PROJECT GROUNDING

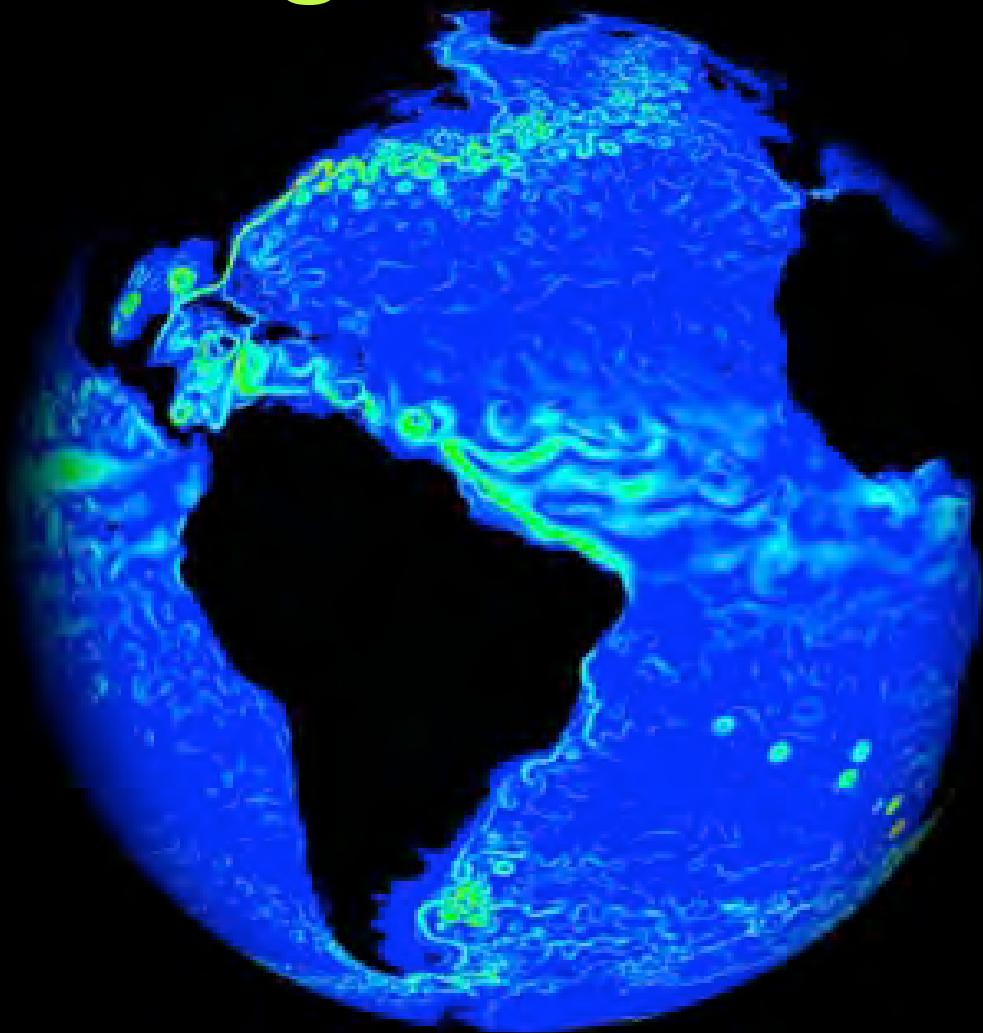
Everything you need to know about climate change

... in 10 minutes

Karin Kirk

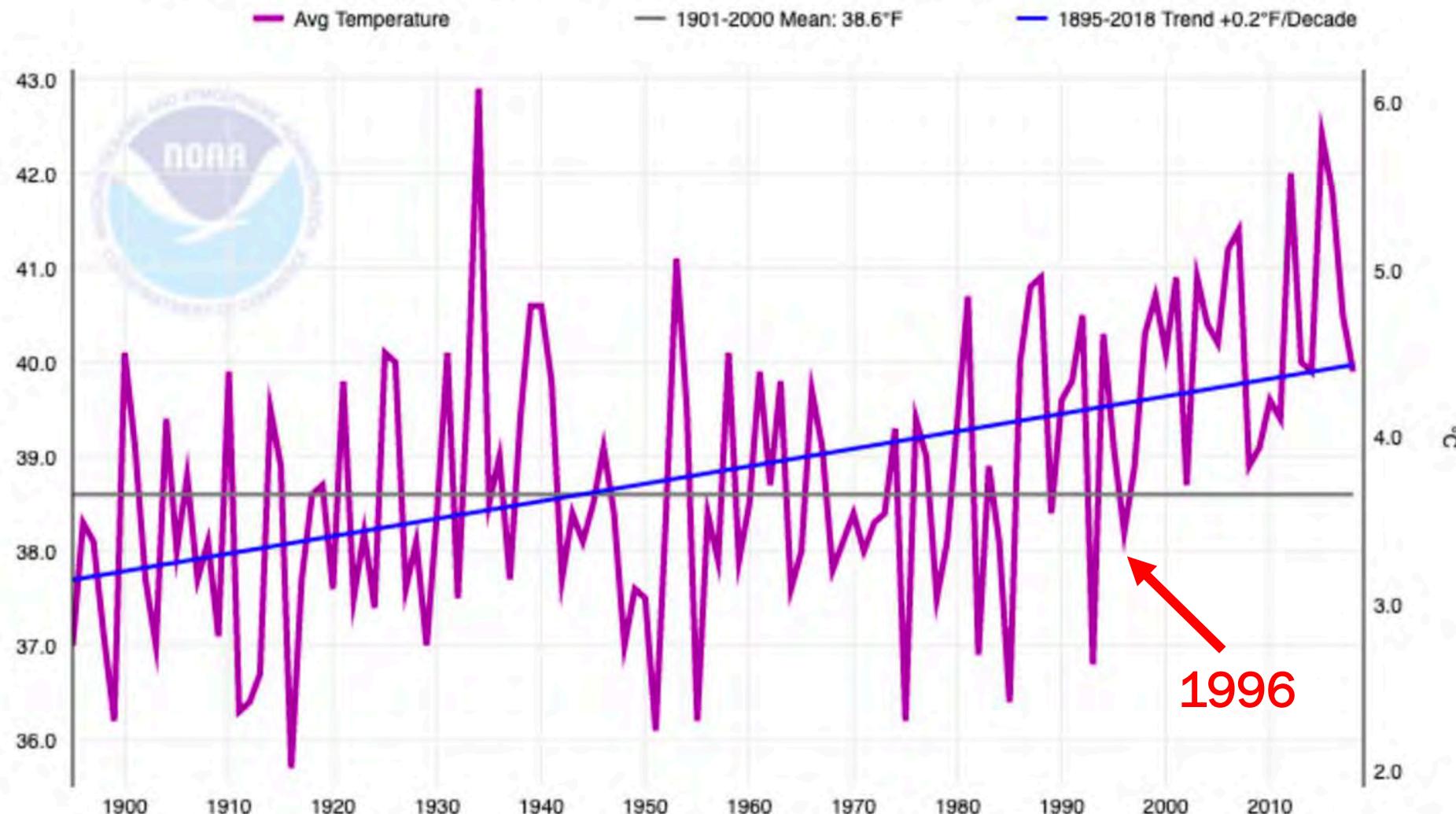
Yale Climate Connections

Bridger Bowl

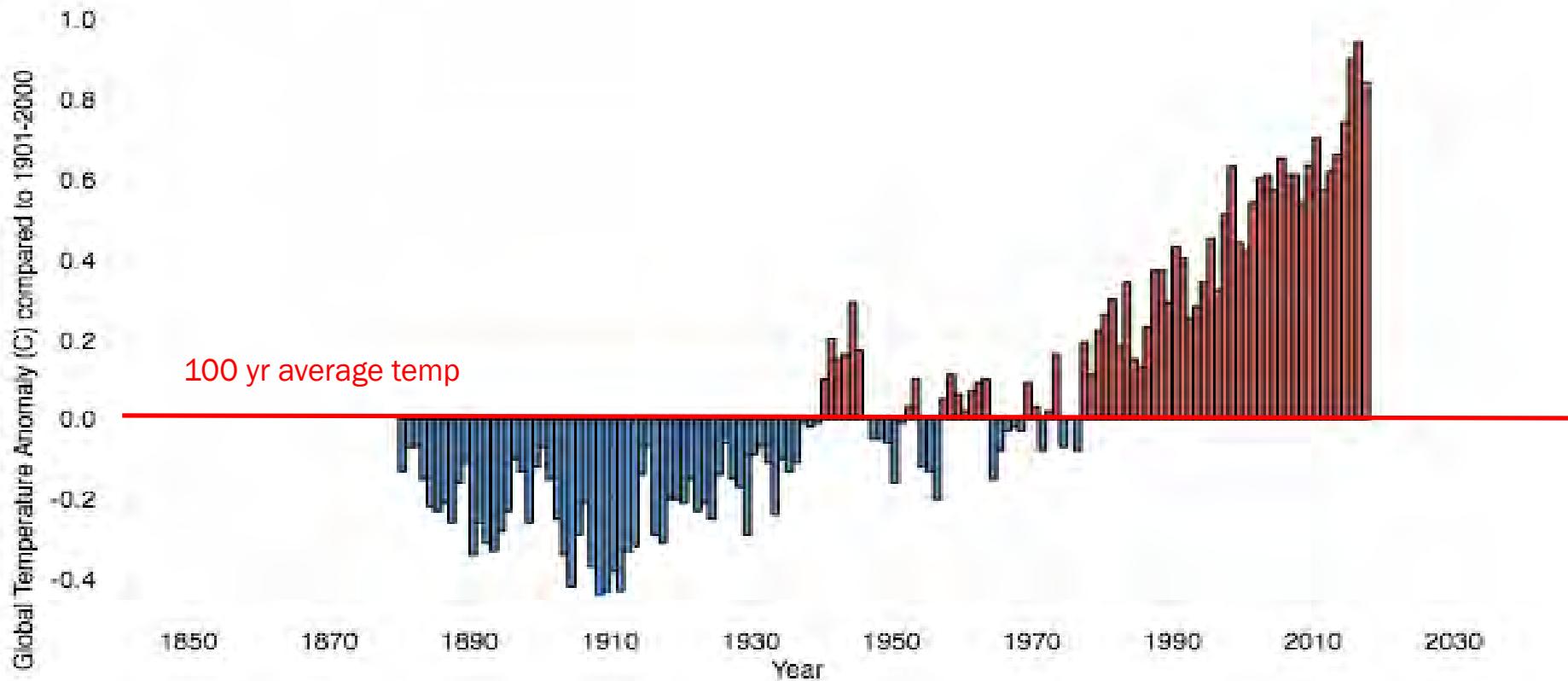


Climate change is real

Gallatin County, Montana, Average Temperature, January-December



Climate change is real



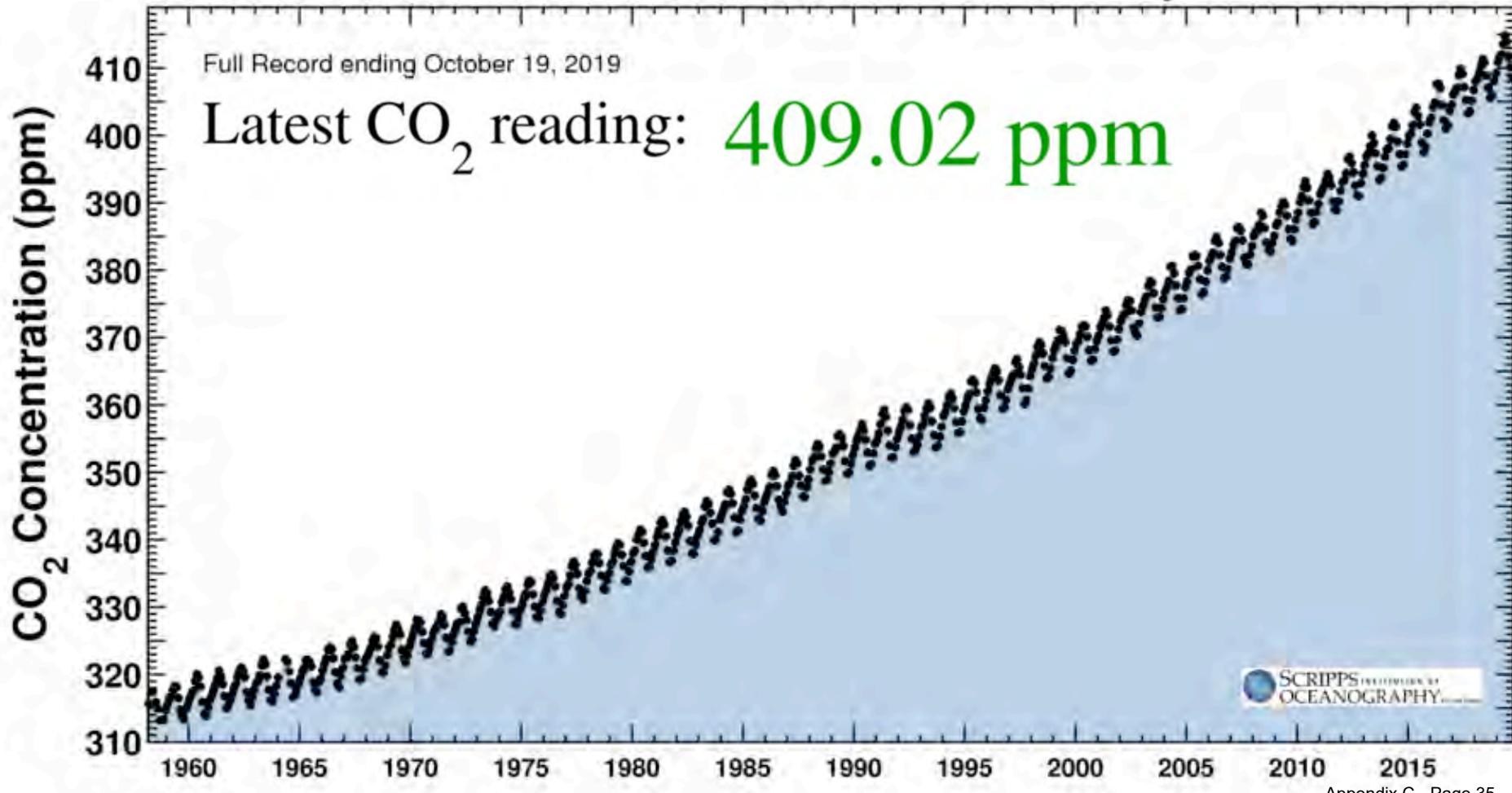
We know the causes



We know the causes

October 18, 2019

Carbon dioxide concentration at Mauna Loa Observatory



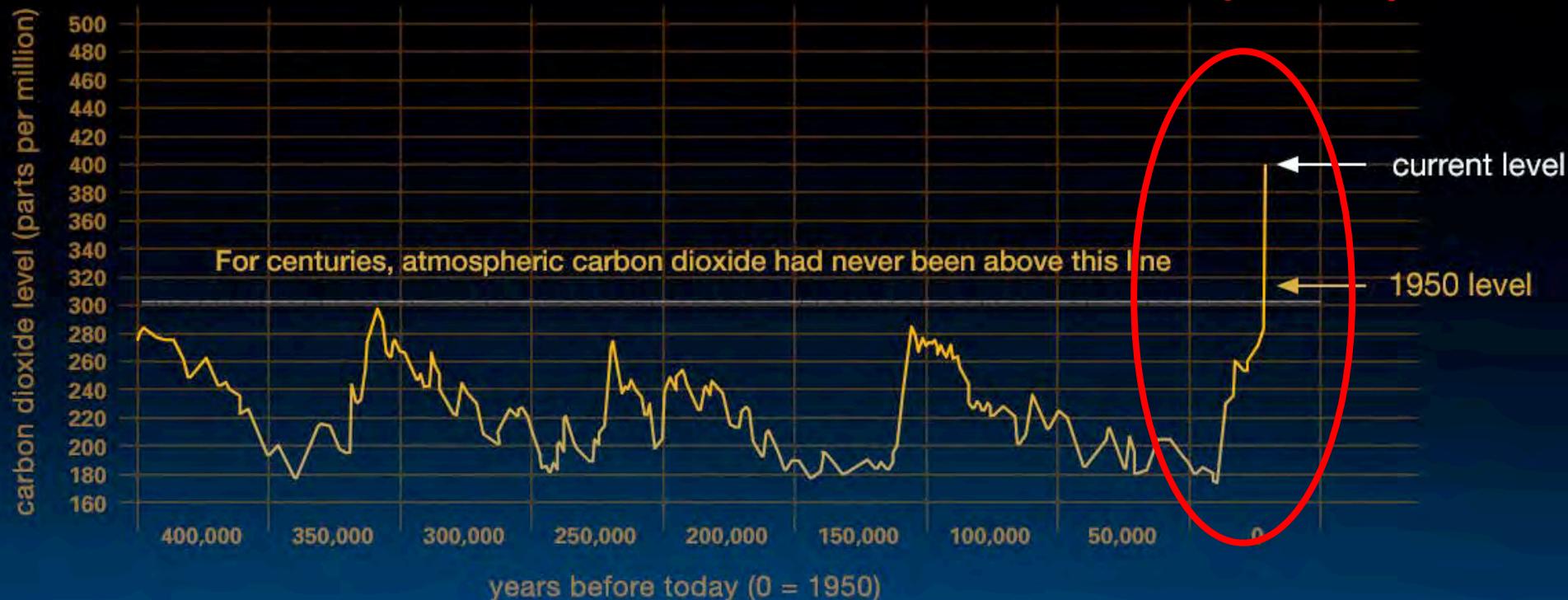


greenhouse
gases trap
heat

43% more
insulation
since 1750

We know the causes

“But.... it's just a cycle!



Experts agree

MAKING GOVERNMENT OPERATIONS MORE OPEN



madspartan (@madspartan)
9 years ago

3,178 Scientist Say Global Warming Is A Hoax

There is no convincing scientific evidence that human release of carbon dioxide, methane, or other green house gases is causing or will in the foreseeable future, cause catastrophic heating of the Earth's atmosphere and disruption of the Earth's climate. Moreover, there is substantial scientific evidence that increases in atmospheric carbon dioxide produces many beneficial effects upon the natural plant and animal environments of the Earth.

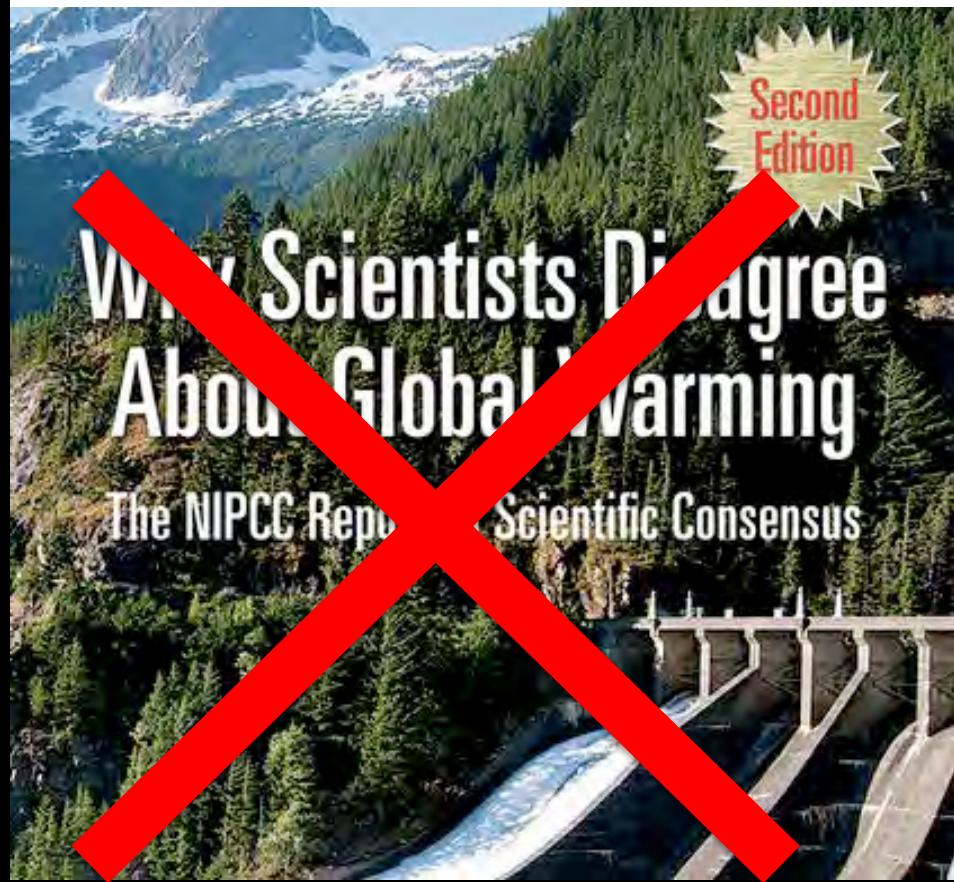


THE HEARTLAND INSTITUTE
FREEDOM RISING

Second
Edition

Why Scientists Disagree About Global Warming

The NIPCC Report Scientific Consensus



What percentage of experts agree?

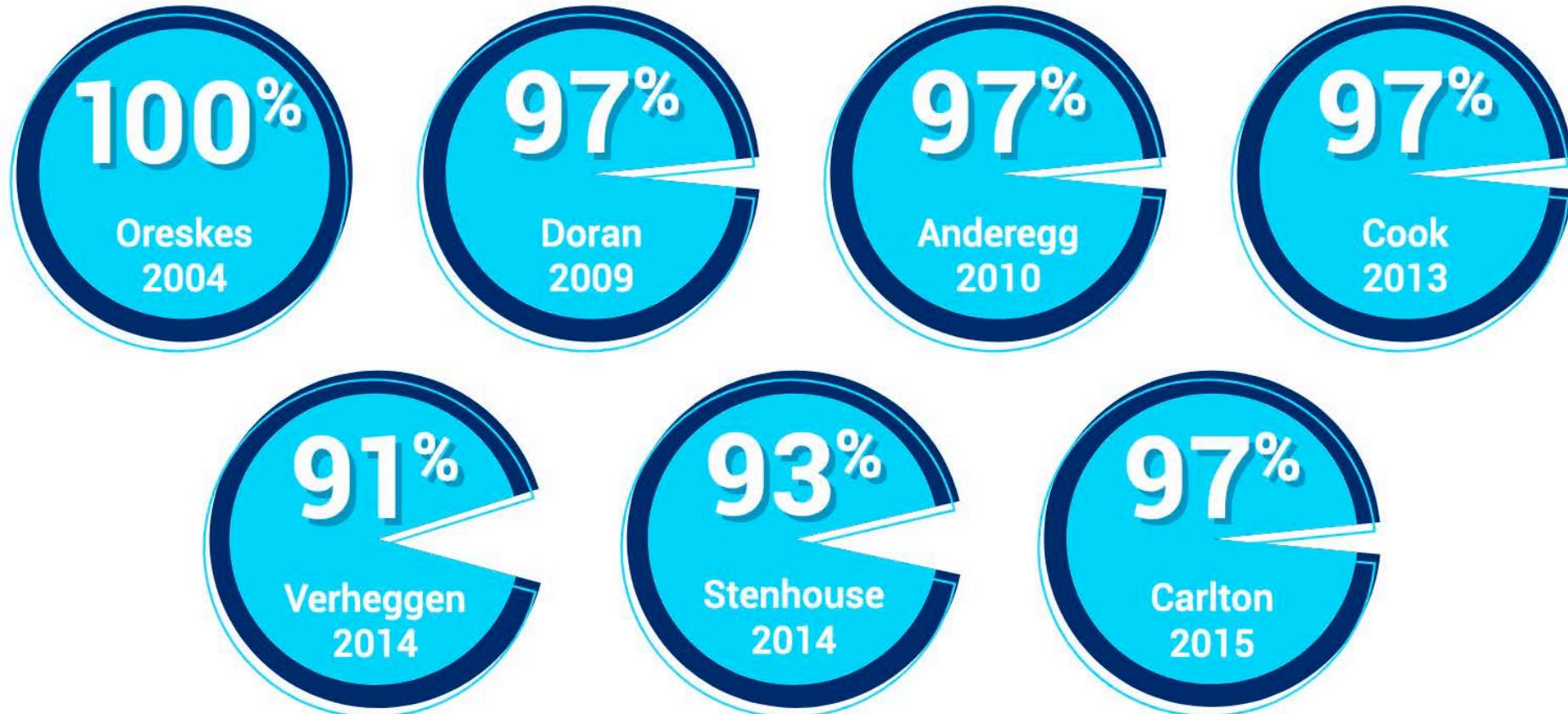


Figure 1: Studies quantifying the consensus on human-caused global warming¹⁷.

We know the solutions

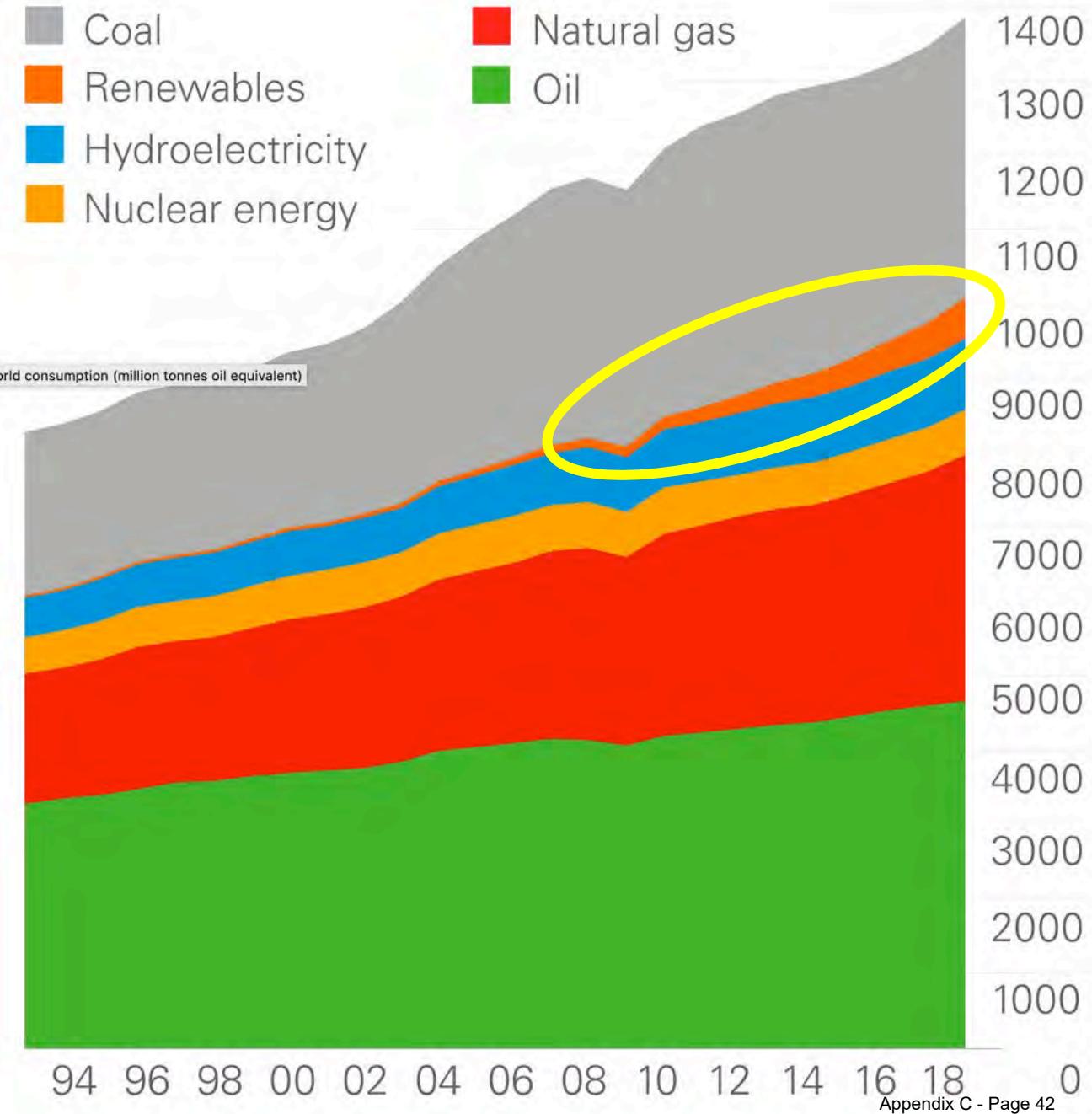


We even know (mostly) how to implement them

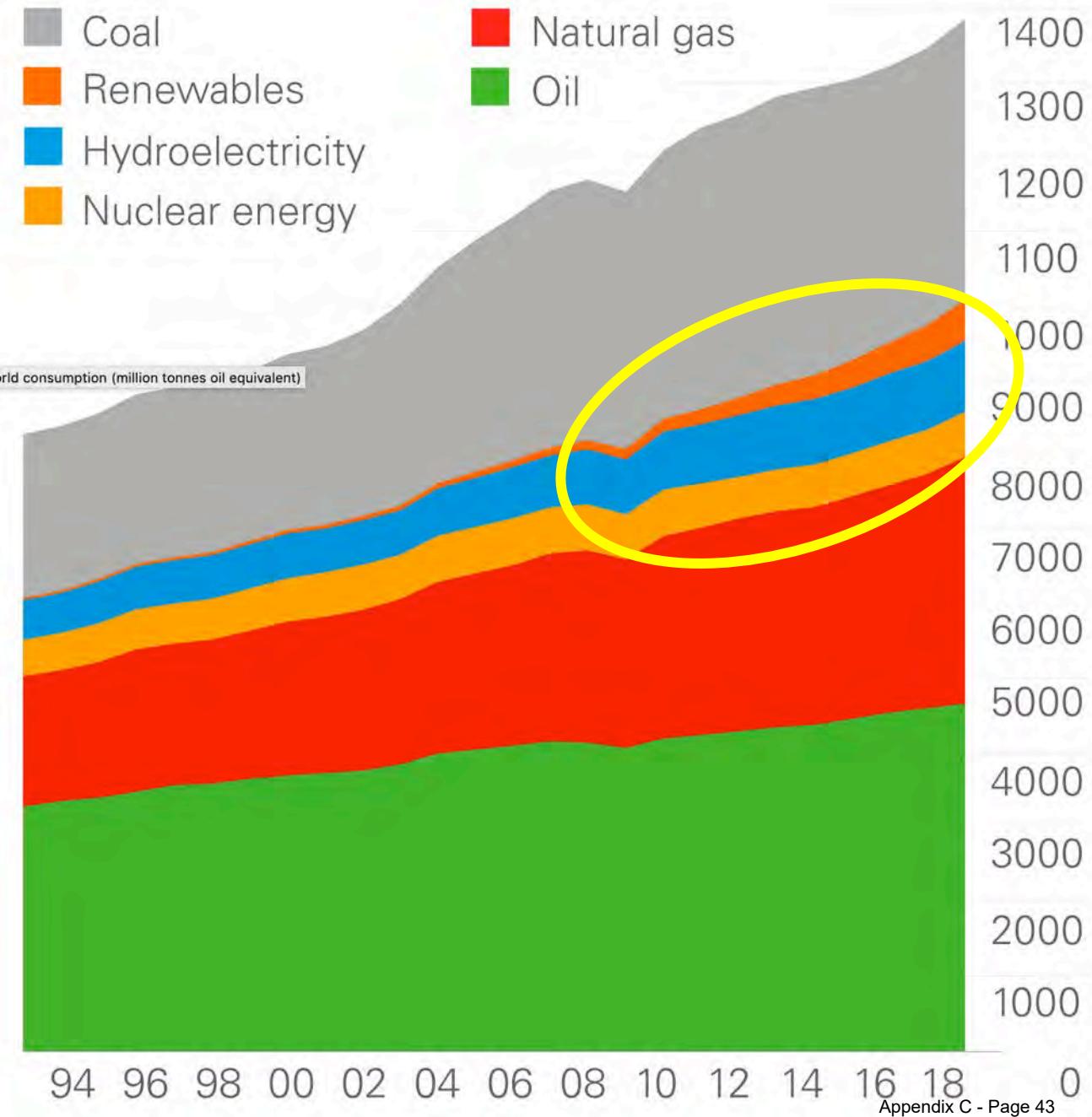
But HERE is the place for debate



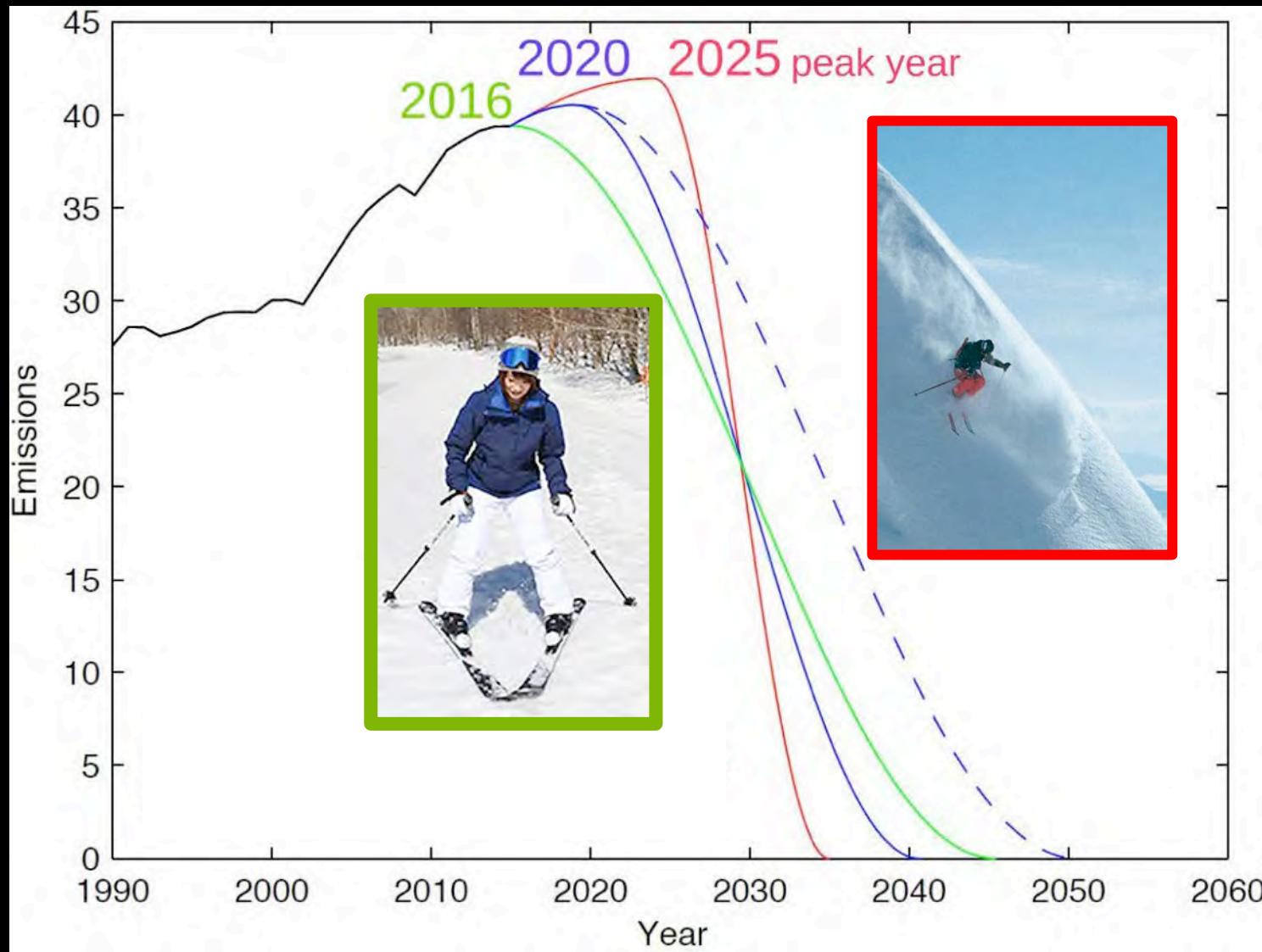
World energy use



World energy use



But can we change... quickly?



How to talk about climate change

Places of disagreement

- Taxes
- Al Gore
- Political anything



CAPS LOCK

Not necessary all the time

Get away from talking points



Don't do this



photo by Linda Tanner
Appendix C - Page 48

Try this instead



**Tell me more
about why you
think that?**

Or better yet, this



Places of easy agreement

- Jobs
- American competitiveness in the world
- Energy efficiency
- Saving money
- Public health/pollution
- Reduce influence of corporations



“Americans are proven innovators and problem solvers...”

Strategies that often work

- Be nice!
- Appreciate where your audience is coming from.
- Respect their intelligence and their values.
- Frame your argument to match the values of your audience.
- Be factual. Use facts that are relevant to your audience.
- Use stories. A personal angle can be more convincing than data.
- Make sure they can ‘save face’ while also, maybe changing their mind.
- Offer a path forward. (motivate, inspire, lead by example, make it easy for others to follow)
- Be nice.

Public opinion

Estimated % of adults who think global warming is mostly caused by human activities (53%), 2019

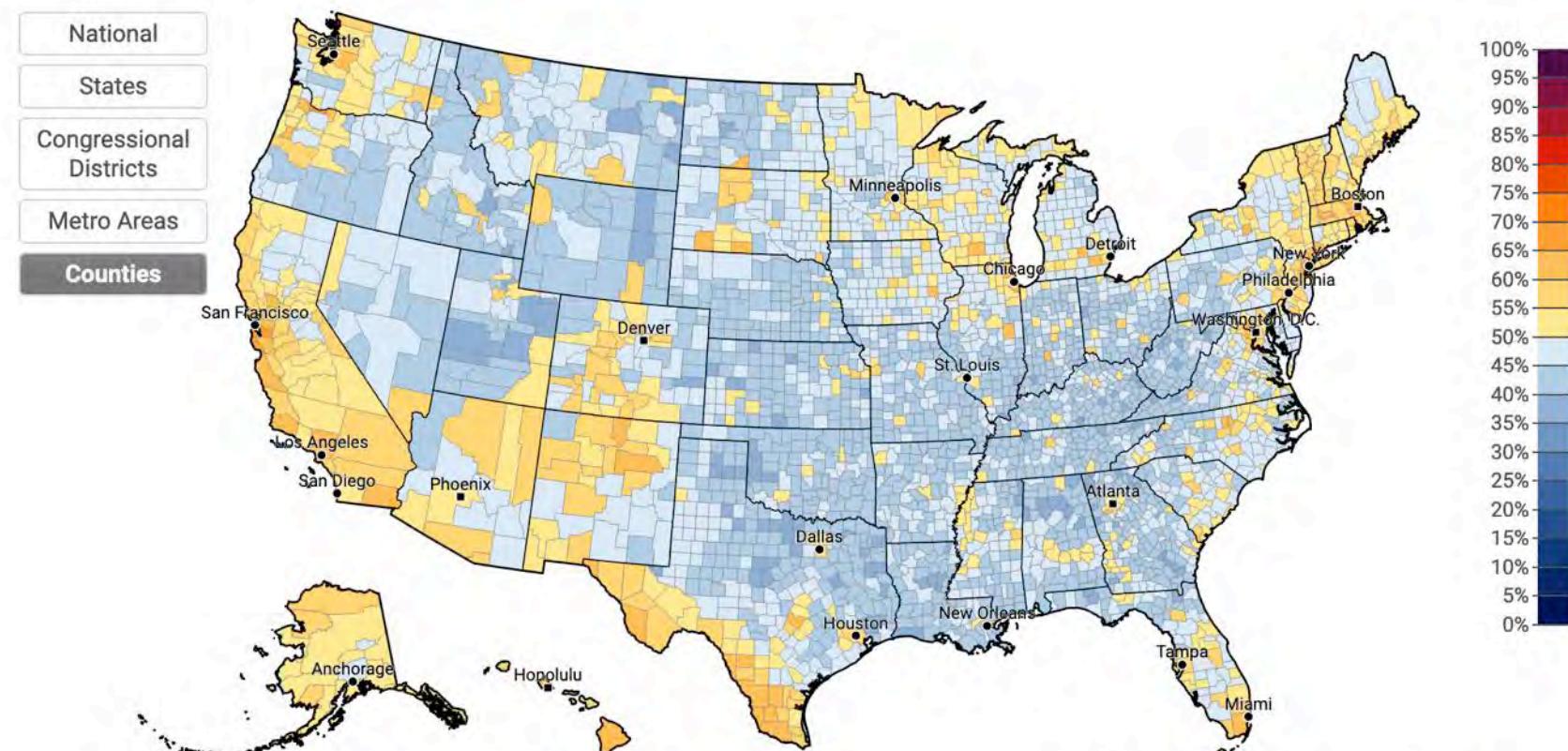
Select Question: Global warming is caused mostly by human activities

Absolute Value

Click on map to select geography, or:

Select a State

Select a County



Public opinion in Gallatin County

Is it warming? 68% US avg 67%

Are humans causing it? 52% US avg 53%

Do most scientists
think that humans are
causing climate
change ? 55% US avg 52%

Are you worried? 59% US avg 60%

Public opinion in Gallatin County

Should we regulate CO₂?

70% US avg 72%

Carbon tax paid by fossil fuel companies?

64% US avg 66%

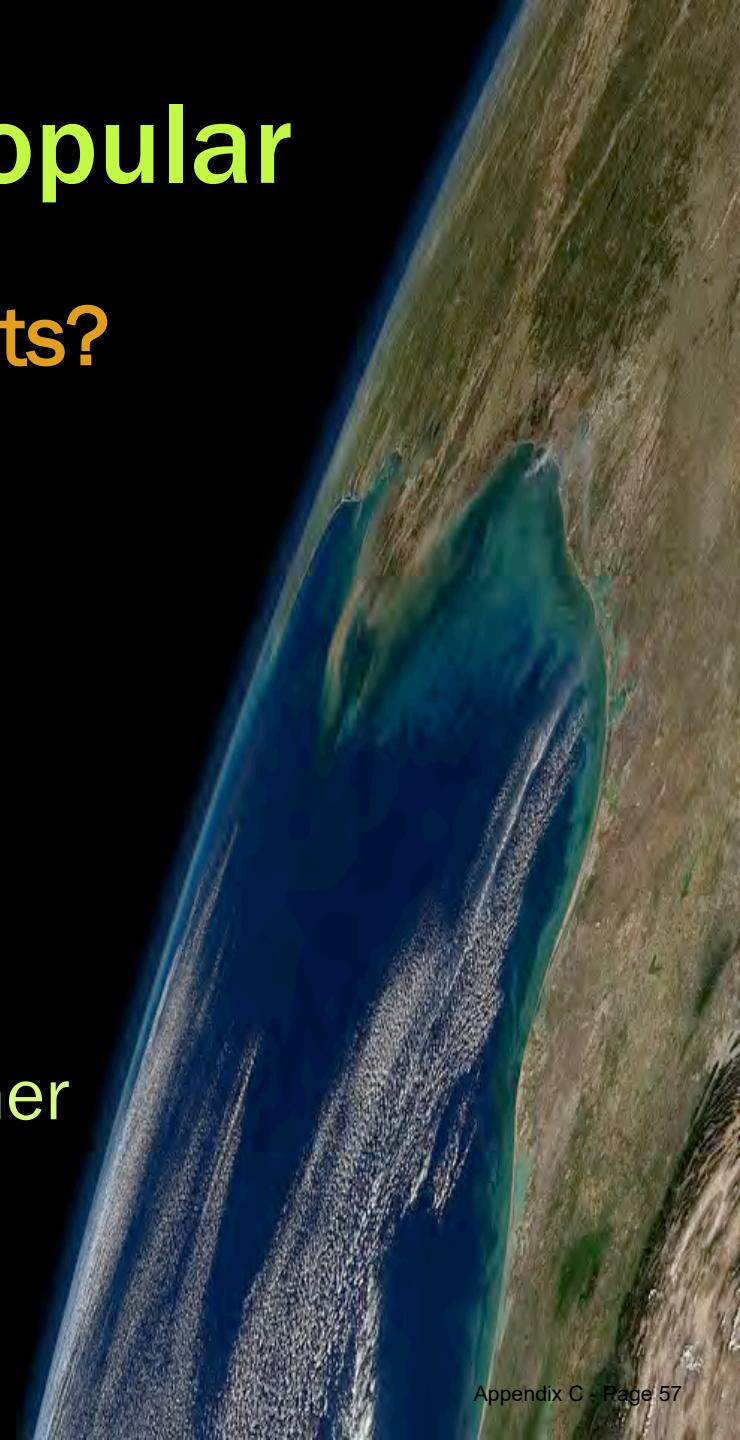
Require 20% renewables from utilities?

62% US avg 62%

Solutions can be popular

What are our immediate benefits?

- Public health
- Efficiency
- Saving money
- Less traffic
- Less pollution
- Resilient agriculture
- More prepared for extreme weather
- And so on!



Project Overview



Bozeman
Climate
Plan

Define an emissions reduction target while adding climate resilience with an emphasis on our communities most vulnerable members.

Goals

1. Align the City's emissions reduction goals in accordance with the Paris Climate Agreement.
2. Create an actionable project implementation and policy-making guide.
3. Include a diverse group of stakeholders in shaping Bozeman's response to climate change.



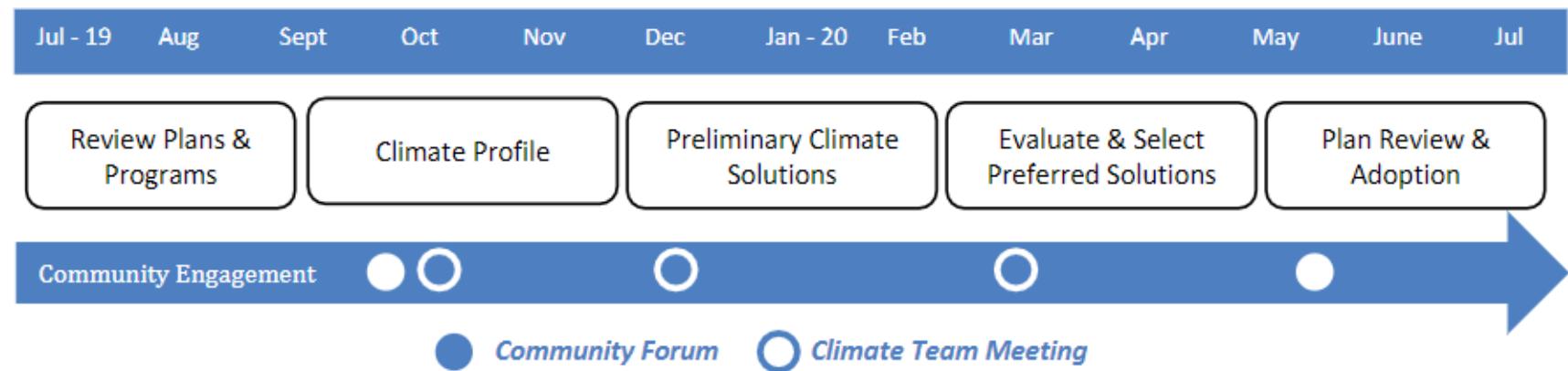
Climate Team Roles & Responsibilities



Bozeman
Climate
Plan

1. Attending three 2-3 hour facilitated workshops.
2. Actively participate and engage during workshops by providing input, ideas, and feedback.
3. Represent your department, organization, and community.
4. Be a critical eye for credibility, transparency, and accuracy.
5. Review documents and solution analysis as needed.
6. Help generate public engagement and enthusiasm for the planning process, providing input to public forums and project communications and outreach efforts.

Timeline



Bozeman Community Climate Action Plan 2011



Photo Source MSU: Hyalite Reservoir

BOZEMAN CLIMATE PROTECTION TASK FORCE

Bozeman Climate Action Plan

Municipal CAP



Scott Bistline, Co-Chair
Otto Pohl, Co-Chair
Peter Brischwender
David Boggeman
Steve Bruner
Molly Cross
Mark Johnson
Martin Knight
Mel Kotur
Matthew Madden
Pat McCown
Colin Moore
Greg Pederson

Bozeman Sustainability
Coordinator Hattie Baker

June 2008

Printed on recycled paper



Craig Herget

Climate Vulnerability Assessment & Resiliency Strategy

APRIL 2019

Previous Efforts

Success Stories

From 2012-2019, Municipal energy efficiency upgrades saved **3,583 MWh** and **\$371,440**

Bozeman Energy Project business partner savings from 2015-2019 equaled **522 MWh** and **\$54,882**

From 2009-2019, Solar PV on city property generated **1,390 MWh** of electricity



Equivalent to avoiding the emissions of **538** Subaru Foresters driven for a year



Equivalent to the carbon sequestered by **6,104** tree seedlings grown for **10 years**



Equivalent to avoiding the emissions from burning **13** tanker trucks of gasoline





Bozeman
Climate
Plan

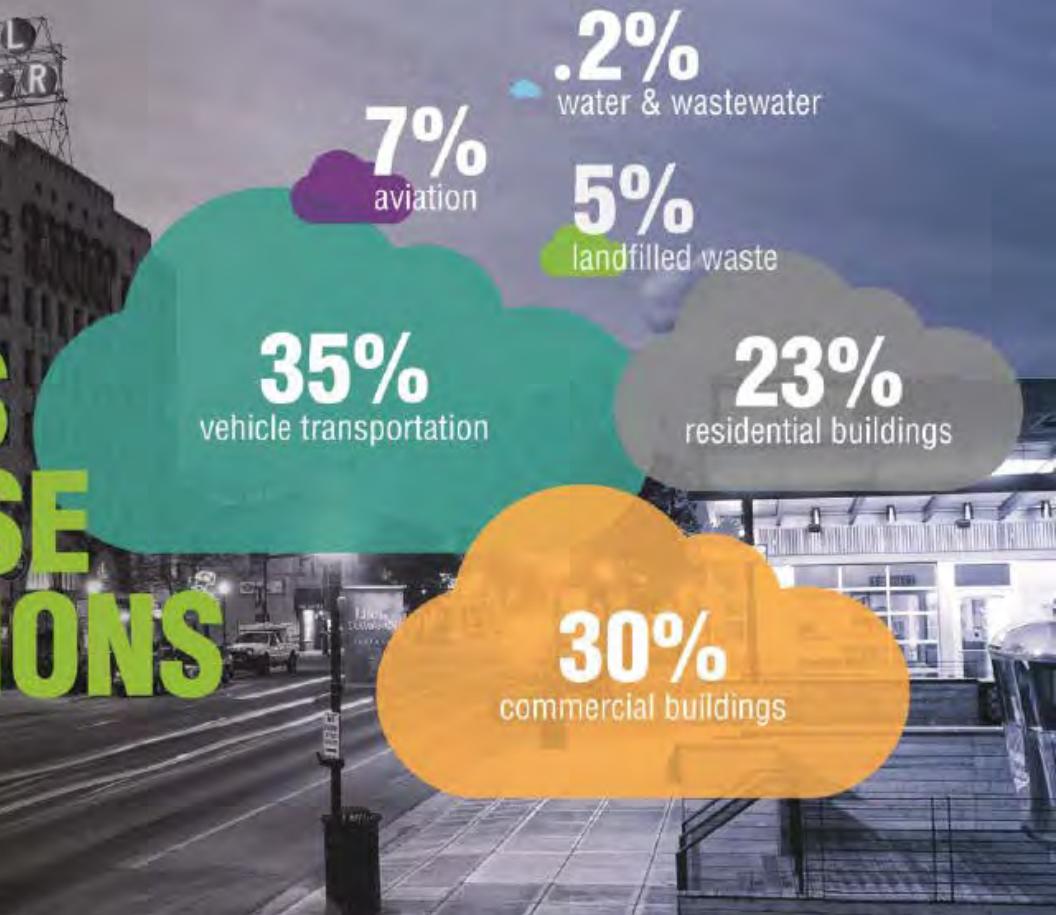
Climate Profile

WHERE ARE WE NOW?



Bozeman
Climate
Plan

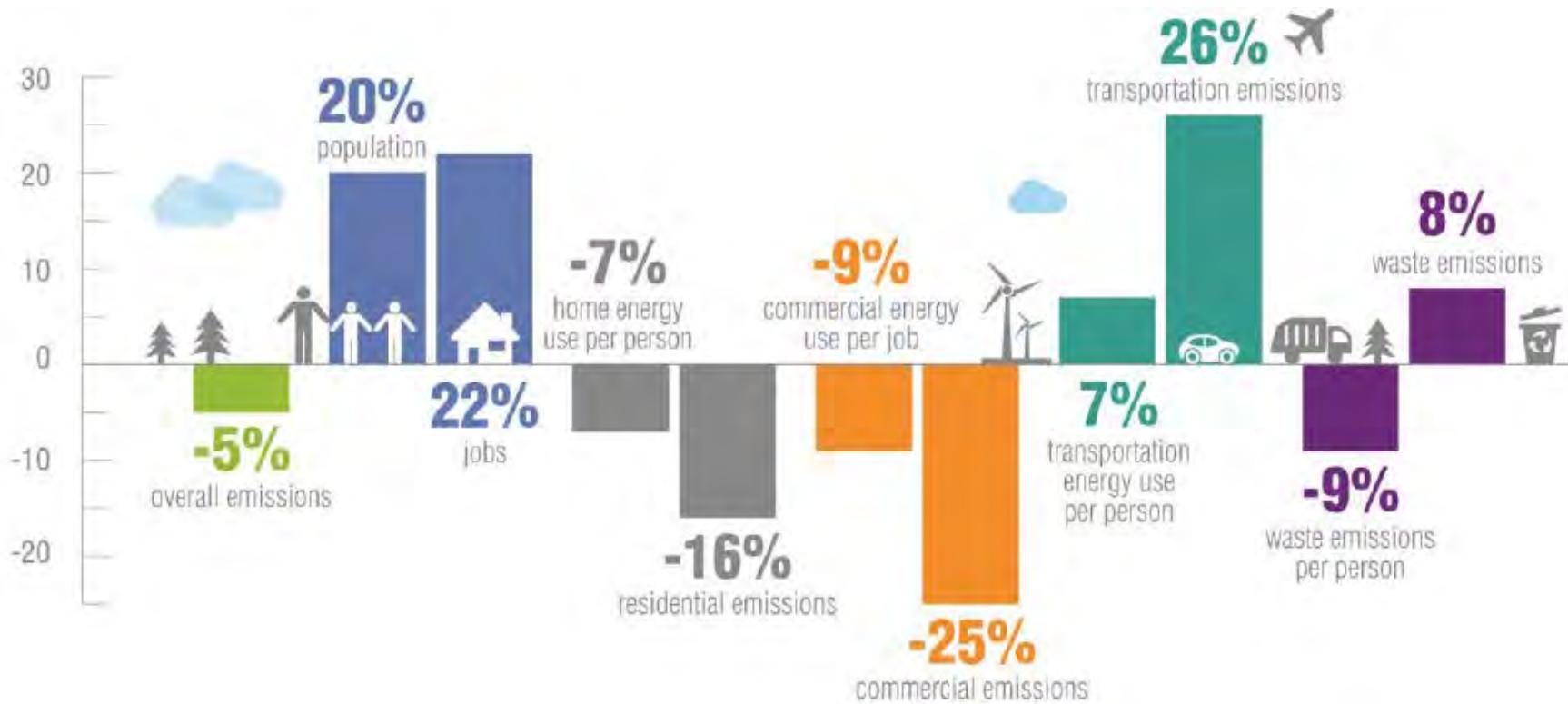
WHERE DO BOZEMAN'S GREENHOUSE GAS EMISSIONS COME FROM?



GHG Emissions trends 2012 to 2016



Bozeman
Climate
Plan



Impacts of Climate Change in Bozeman



Bozeman
Climate
Plan



More Extreme Heat



More Flood Events



Longer & More Intense Drought



Reduced Mountain Snowpack



More Severe Wildfire

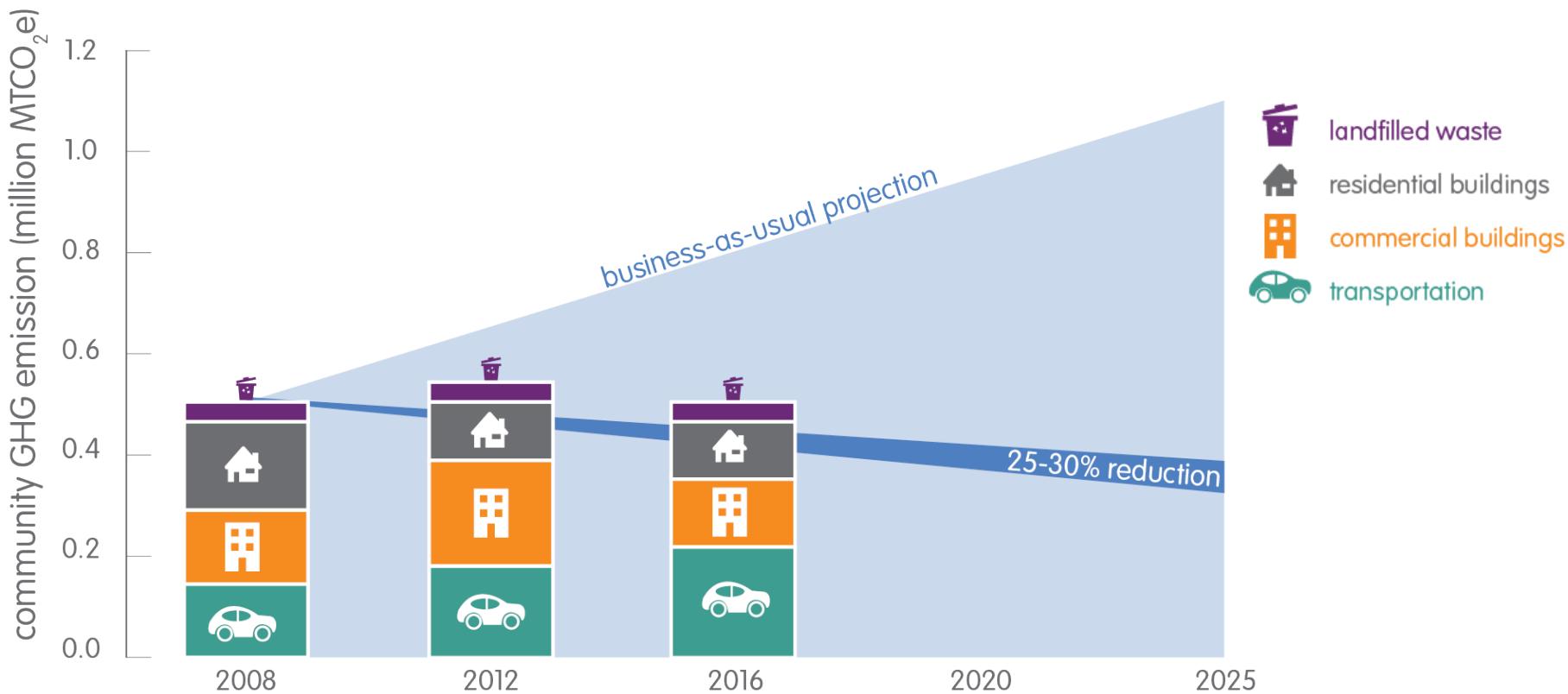


More Severe Winter Storms

Where are we heading?



Bozeman
Climate
Plan





Bozeman
Climate
Plan

Climate Profile

WHERE DO WE WANT TO GO?

Paris Climate Agreement



Bozeman
Climate
Plan

2015 International Agreement

- Aims to limit the global temperature increase to 1.5 degrees Celsius.
- Requires all Parties to put forward their best efforts through nationally determined contributions (NDCs) and to strengthen these efforts in the years ahead.
- This includes requirements that all Parties report regularly on their emissions and on their implementation efforts.

US Targets & Status

- March 2016: First NDC submission from US
 - Committed to 26% GHG emissions reduction below 2005 levels by 2025
 - Intention to make best efforts to reduce emissions by 28%
- June 2017: US to cease all participation on climate change mitigation
 - Agreement specifies a 4-year exit process
 - Exit will be complete on November 4, 2020

Mayor's Climate Protection Agreement

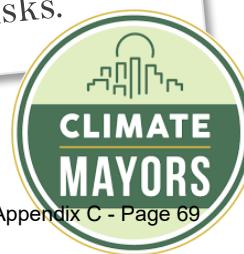


Bozeman
Climate
Plan

- Bozeman joined the Climate Mayor’s Agreement in 2017
- Commits Bozeman to adopt, honor, and uphold commitments to the Paris Agreement goals

As 407 US Mayors representing 70 million Americans, we will adopt, honor, and uphold the commitments to the goals enshrined in the Paris Agreement. We will intensify efforts to meet each of our cities' current climate goals, push for new action to meet the 1.5 degrees Celsius target, and work together to create a 21st century clean energy economy.

We will continue to lead. We are increasing investments in renewable energy and energy efficiency. We will buy and create more demand for electric cars and trucks. We will increase our efforts to cut greenhouse gas emissions, create a clean energy economy, and stand for environmental justice. And if the President wants to break the promises made to our allies enshrined in the historic Paris Agreement, we'll build and strengthen relationships around the world to protect the planet from devastating climate risks.



State of Montana Context



Bozeman
Climate
Plan

Executive Order

- Joins US Climate Alliance
- Establishes Climate Solutions Council
- Commits to issuing a Montana Climate Solutions Plan by June 1, 2020

Interim Goals

- Net greenhouse gas neutrality for average annual electric loads in the state by no later than 2035
- Net-zero greenhouse gas emissions economy-wide at a date to be determined by the Council

Goal Setting: Provisional Goals to Test

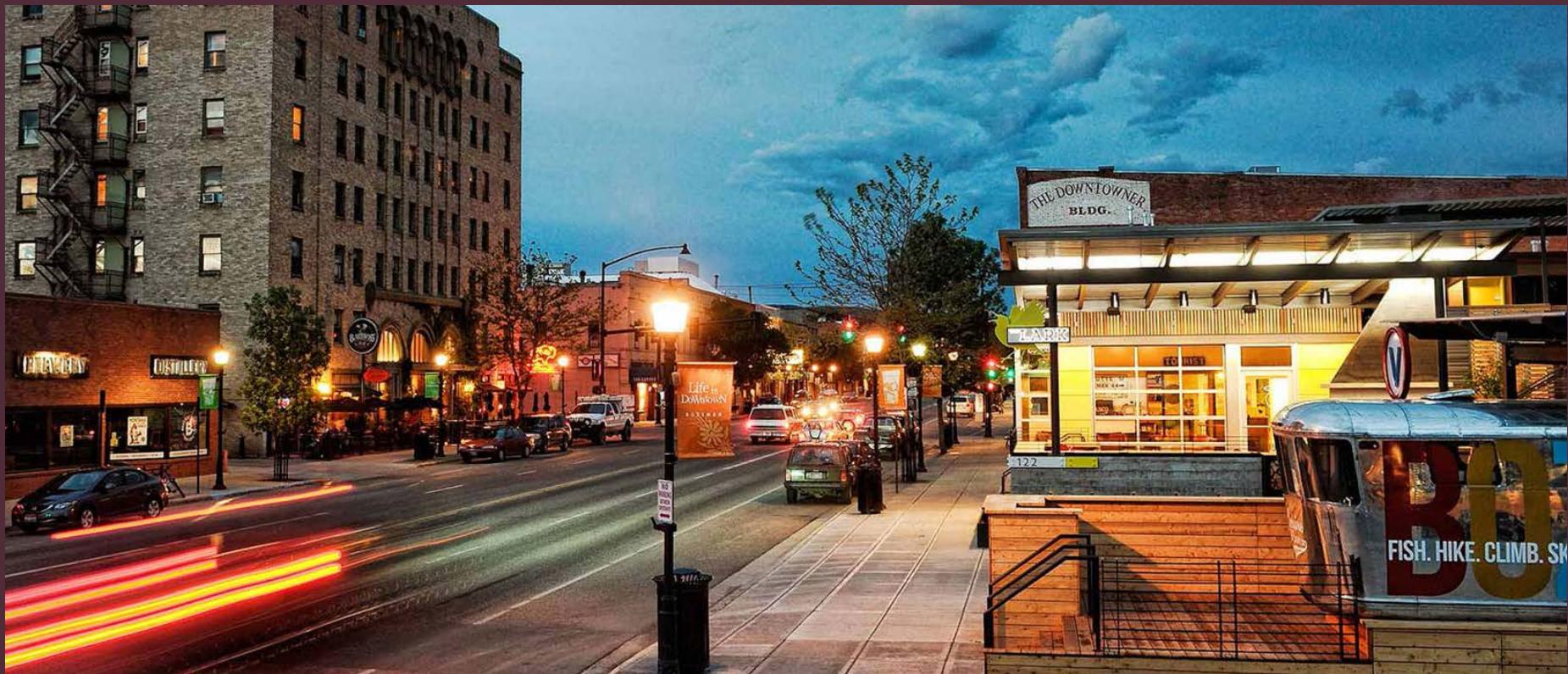


Bozeman
Climate
Plan

25-30% GHG
emissions reduction
below 2008 levels by
2025 (spirit of Paris)

Net zero GHG
emissions by 2050

Net zero electricity by
2035



BREAK

10 minutes

Vision Themes



Bozeman Climate Plan





Bozeman
Climate
Plan

Strategy Brainstorming

POTENTIAL SOLUTIONS

Small Group Instructions



Bozeman
Climate
Plan

Buildings

Community Development

Consumption & Waste

Energy & Utilities

Greenspace & Natural Systems

Transportation

Climate
Equity

Human
Health &
Well-Being

City Assets

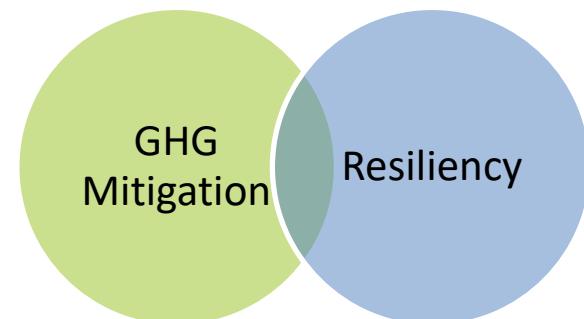
1. Each table has a facilitator and discussion guide.
2. Facilitator notes group participants on discussion guide.
3. Facilitator guides the conversation using the following prompts and time guidelines.
4. Facilitator takes notes and helps identify common themes for report outs.

Discussion Guide



Bozeman
Climate
Plan

- ▶ Goal Alignment (20 min)
 - What would success look like?
 - Relationship to Paris Climate Agreement? Goal ambition?
 - Equity issues to consider?
- ▶ Solution Exploration (30 min)
 - Brainstorm & Categorize Solutions
 - **Mitigation Solutions:** Lead to direct GHG emissions reductions
 - **Resiliency Solutions:** Help the community prevent, withstand, respond to, or recover from a disruption
 - **Mitigation & Resiliency Solutions:** Do both!
 - What solutions address cross-cutting themes like climate equity and human health and well-being?
 - What city assets should be considered?



Report Out (3:10 pm)

In 2 minutes or less, please share:

- ▶ Goals
 - What would success look like?
 - How ambitious would goals in this focus area need to be to achieve deep carbon reductions?

- ▶ Solutions
 - What are a few of the climate solutions that you identified?
 - Are they mitigation or resiliency solutions, or both?



Bozeman
Climate
Plan



Bozeman
Climate
Plan

What's next?

WRAP UP & NEXT STEPS

Next Steps



Bozeman
Climate
Plan

Community Activities

Community Forum

Wednesday, October 23

4:30 to 6:30 pm

Story Mill Community Center

City Commission Briefing

- Monday, December 16

- Project orientation & direction

- Vision statement

- Provisional goal

Climate Team

Post-workshop 1 homework

- Vision statement

- Provisional goal feedback

Workshop 2

- Tuesday, December 17



Bozeman Climate Plan

BOZEMAN CLIMATE PLAN – Climate Team Workshop 2 Summary

December 18, 2019

12:30 – 3:30 p.m.

Commission Room, Bozeman City Hall, 21 N Rouse Ave, Bozeman, MT

Workshop Objectives

- Recap outcomes from last Climate Team Meeting, Community Forum, and City Commission
- Develop a shared understanding of scenario planning
- Explore alternative pathways to achieve provisional goals
- Brainstorm greatest risks by focus area and identify potential solutions

Agenda

12:30 p.m.	Welcome & Project Updates
1:00	Emissions Reduction Scenarios – Part 1
2:00	Break
2:15	Emissions Reduction Scenarios – Part 2
3:00	Vulnerability Assessment and Resiliency
3:20	Wrap up and Next Steps

Participants

Name (last, first)	Affiliation
Climate Team Members	
Bellamy, Heather	NorthWestern Energy
Blackler, Kristin	Montana State University
Blessing, Sara	Bozeman Sunrise Movement
Bode, Emma	Forward Montana
Boyer, Jennifer	Farm 51
Bushnell, John	NorthWestern Energy
Carpenter, Randy	Future West
Catron, Wyatt	Montana Weatherization Center
Christenson, Lori	Gallatin County Health Department
Cunningham, Terry	Bozeman City Commission
Dorsi, Chris	Montana Weatherization Center-MSU Extension
Fischer, Douglas	Bozeman School District
Fox, Jeff	Renewable Northwest
Frandsen, Eli	Montana State University-Student Body
Giannetti, Danae	Western Transportation Institute
Hickey, Bonnie	Bridger Bowl
Jackson, Erin	Gallatin Valley Farm to School

Name (last, first)	Affiliation
Jamison, Danica	United Way
Khumalo, Libby	World Wildlife Fund
Kirk, Karin	Freelance Writing, Science Education
Klimpke, Jason	Mystery Ranch
Lewendal, Anders	Southwest Montana Building Industry Association
Mastel, Candace	Bozeman Area Bicycle Board, MSU Planning
Melvin, Addie	JM Engineering
Mitchell, Owen	Bozeman High School-Student Body
Nash Wanzek, Riley	Montana State University-Student Body
Rowley, Nicole	Gallatin County
Schack, Lindsey	Love Schack Architects
Sinnott, Jay	Bozeman Climate Partners
Stoddart, Bill	NorthFork Financial
Vlases, Claire	Bozeman High School-Student Body
Willey, Edie	Bozeman Health
City of Bozeman Staff	
Andreasen, Tanya	City of Bozeman Neighborhoods
Greenhill, Frank	City of Bozeman Stormwater
Henderson, Jon	City of Bozeman Strategic Services
Higinbotham, Heather	City of Bozeman Sustainability
Jadin, Addi	City of Bozeman Parks
Lonsdale, Taylor	City of Bozeman Transportation
Meyer, Natalie	City of Bozeman Sustainability
Nordquest, Alex	City of Bozeman Forestry
Rosenberg, Sarah	City of Bozeman Community Development
Saunders, Chris	City of Bozeman Community Development
Consulting Team	
Dorsey, Judy	Executive Project Manager, Brendle Group
Sommer, Shelby	Project Manager, Brendle Group

Welcome & Project Updates

Natalie welcomed everyone to the second workshop and shared an overview of the project and Climate Team roles and responsibilities (see slides 1-7).

Shelby shared a recap of the process to-date, including a brief summary of the first Climate Team workshop, October Community Forum, Climate Team vision and goals survey, and the December 16 City Commission meeting (see slides 8 – 17).

At their December 16 meeting, the City Commission voted to adopt Resolution 5118, establishing the draft vision statement and provisional goals for the Bozeman Climate Plan. At the workshop, Commissioner Cunningham provided a summary of the public comments and the Commission's discussion. The meeting can be viewed online at: <https://www.bozeman.net/services/city-tv-and-streaming-audio>.

The adopted vision and goals are as follows:

Position Statement

The position statement establishes the overall intentions and direction for the City of Bozeman in the development and implementation of its Climate Plan. The words in the position statement reflect the themes from a three vision words activity shared by the Climate Team members at the workshop. The most commonly shared words were equitable, collaborative, inclusive, innovative, and ambitious.

Through leadership and collaboration, the City of Bozeman will advance innovative solutions to cultivate a more equitable and resilient, low-carbon community for current and future generations.

Guiding Principles

The guiding principles help inform and direct City of Bozeman decision-making. The guiding principles summarize the [Proclamation](#) made by Mayor Andrus during the Climate Team workshop.

Bozeman will be a leader in addressing climate change by:

- ***Adopting bold targets for emissions reductions and renewable energy.***
- ***Weaving sustainability and resilience into the decision-making process.***
- ***Pursuing partnerships with other municipalities and our utility provider.***
- ***Seeking innovative, actionable solutions to mitigate climate change.***
- ***Inviting all Bozeman residents to join us, including current and future leaders.***

Vision Themes

The vision themes will serve as the organizing chapters of the Climate Plan. The climate solutions will be organized under these theme-based chapters. The words in the vision themes reflect the focus area topics, blended with the vision word ideas from the Climate Team workshop and ideas shared by the public at the community forum.

- ***Responsible and reliable renewable energy supply***
- ***Healthy, adaptive, and efficient buildings***
- ***Vibrant and resilient neighborhoods***
- ***Diverse and accessible transportation options***
- ***Comprehensive and sustainable waste reduction***
- ***Regenerative greenspace, food systems, and natural environment***

Note that equity, mental health and wellness, and City assets are cross-cutting topics that will be addressed in each of the theme-based chapters.

Goals

The Climate Plan will establish near and long-term goals for community greenhouse gas emissions reductions and climate resiliency. The following provisional goals are based on the results of the Climate Team survey and input from City staff. Targets specific to municipal operations will be developed once provisional goals are adopted.

- ***26% Reduction in Greenhouse Gas Emissions by 2025***
*compared to 2008
- ***100% Net Clean Electricity by 2030***
- ***Carbon Neutral by 2050***

Emissions Reduction Solutions

Overview

Judy provided an overview of the emissions reduction scenarios purpose and development process (see slides 18 – 23). Highlights from her remarks include the following:

- Emissions from building comprise 53% of total emissions. Buildings use both electricity and natural gas.
- What does 2050 look like?
 - If we do nothing (Business as Usual), that's what we need to be planning for.
 - GHG forecasting is largely tied to population projections.
 - Forecast is informed by various City of Bozeman population growth estimates.
- Potential Solutions by Focus Area
 - We are attempting to create a combination of emissions reduction solutions that add up to 100% by 2050.
 - The solutions proposed are a first attempt to lump and split, but definitely not inclusive of all solutions. These are common solutions that have some emissions reduction potential.
 - The color of each bar corresponds to vision theme/focus area.
 - The width of bar is an estimate of where Bozeman is today (minimum, continuation of current trend) and extends to a best in class scenario based on what we have seen in other communities (maximum, based on other communities and research).
 - Some of the bars are not starting at zero progress because there are already some existing activities and emissions reductions to take credit for.
 - Solutions include a mix of ideas ranging from requirements to incentives.
- Polling questions focus on level of feasibility and likelihood based on what you know and have experienced.

The group discussed clarifying questions and considerations related to the analysis, as follows:

- Is neighborhood resiliency embedded within community development?
 - Yes - we're treating them as more or less the same things.
- Do some of the bars actually start below zero? Are there places that we're losing ground?
 - Possibly, but for purposes of this analysis, we are starting assumptions at zero.
- Why are there no color-coded options related to greenspace, food systems, and natural environment?
 - Will cover that qualitatively rather than quantitatively today because they represent more of a carbon sequestration opportunity than direct emissions reduction. Note that the quantified solutions discussed today are more directly tied to the current emissions inventory.
- Current practices look to add up to approximately 35% of the goal. Is that accurate?
 - Yes, and more reductions are needed to reach 100%.
 - Also, these solutions are currently isolated for purposes of the analysis. A next step in the process will be to layer and combine them into scenarios and eliminate double counting where there are inter-relationships.
- Is this plan looking at Bozeman City limits or taking more of a regional approach?
 - The inventory boundary is aligned with City boundaries.
 - Discussion that a large portion of the emissions are commuters currently outside of the community and concern that we not inadvertently push emissions outside of the inventory boundary.
- How much of the information will be provided afterwards?
 - Will provide copies of these slides for detailed review. Today's focus should be on group learning and sharing rather than detailed note-taking or analysis.

Next, Judy presented an assortment of emissions reduction solutions (see slides 25 – 57). Each started with an overview of what the solution means, followed by a quick summary of existing efforts. Then she shared examples of “best-in-class” potential for that solution, based on other community examples and research findings. After discussion, the Climate Team used keypad polling to share their feedback regarding the level of emissions reduction that Bozeman should target for each solution. The average (mean) polling score for each solution is provided in the notes below; detailed results are provided on the slides. Highlights from the presentation and group discussion are summarized below.

Solution 1 - Energy Efficiency in Existing Buildings

- Impact on electricity and natural gas portion of GHG inventory.
- Most cost-effective approach to climate planning is to address efficiency of existing buildings first.
- Other cross-cutting benefits include comfort, safety, equity, etc.
- Solutions are not additive; emphasis on existing buildings for this solution under current electricity and natural gas.
- Mean polling result = 8.46

Solution 2 - Net-Zero Energy New Construction

- Impact on electricity and natural gas portion of GHG inventory.
- City must adhere with state building code but can incentivize beyond-code construction.
- Some examples in the community of net-zero construction, but not a significant amount to show up in inventory.
- Would require some ramping up over the next decade as new construction occurs; will not happen overnight.
- What is net zero new construction?
 - On an annual basis, building produces all of the energy it consumes.
 - Does not include emissions or energy associated with consumption.
- Does best in class include an endpoint of no new natural gas?
 - Perhaps, but the actual pathway is not prescribed at this level of analysis.
- Net-zero energy is challenging - doesn't take into account efficiency of the existing building.
 - Does not do anything to address embodied emissions associated with construction or materials.
 - Net zero only focuses on zeroing out annually, not considering the overall energy load of the building.
 - Need to qualify what a net zero energy standard is; term “net” is challenging.
- Mean polling result = 7.61

Solution 3 - Electrify Buildings

- Impact on electricity and natural gas portion of GHG inventory.
- Instead of using natural gas for heating, cooking, and other systems/appliances if the electricity supply is cleaner than natural gas.
- Recommendation to separate out existing and new buildings. Easier to address with new construction than convert existing buildings and systems.
- Beneficial electrification is a newer approach.
- Electric heating is currently more expensive than natural gas heating in Bozeman.
 - On the carbon ledger, electric heating is more beneficial.
 - On the financial ledger, electric heating is currently more costly.
- At some stage efficiency needs to come well before net-zero and electrification.
- Does this relate to Smart Grid technologies?
 - Yes, somewhat related to grid impacts and advancing demand response technologies.

- Many consequences associated with many of these things - e.g., more above ground utility lines, more visible heat pumps, etc. Important to document impacts and co-benefits of various solutions.
- Analysis focused on current electric supply, not future supply - benefits are more than additive when solutions are coordinated together.
- Mean polling result = 7.07

Solution 4 - Increase Renewable Energy Mix

- Impact on electricity portion of GHG inventory.
- 2016 electricity supply is 22% coal.
- 2019 - 61% renewable energy delivered.
- Solution is more systemic than others as it touches all electric utility customers.
- No capital purchase from end-user.
- Is NorthWestern Energy's plan a reduction in emissions overall or just in MT?
 - Timeline for 90% reduction by 2045 for Montana portfolio.
 - This is a separate goal, not related to Colstrip purchase.
 - With the new acquisition, NorthWestern goes to 56% carbon free.
- NorthWestern's plan isn't required, but a voluntary commitment - hope that it is followed through.
 - MSU example - very careful about committing to goals, not something to be taken lightly once a goal is announced publicly so expect that there is a serious commitment to achieve it.
 - This is a "no BS" carbon goal - actually something that NorthWestern can achieve with current technologies (no asterisk that says hoping that future technologies will be developed to get there).
- What is in front of the Public Service Commission (PSC) right now? What is the plan for investing in renewable energy as opposed to coal or natural gas?
 - 20-year Supply Plan - planning horizon is 20 years but plan is updated every 2-3 years - plan for what they want not what they currently have. Can impact how resources are dispatched.
 - Going out for a Request for Proposals to meet resource capacity needs.
 - Currently limited to focus on lowest cost.
 - Is cost just fiscal, or could it also include social, environmental, etc.
- With the utility resource mix, the cost to achieve the last 10% increment could be significant.
 - It might result in passing along costs to consumers who already face a high economic burden.
 - Would it be better to increase rooftop solar for that remaining increment to make it more equitable from a cost perspective?
 - Utility resource mix is typically the lowest cost resource.
- Not doing any cost analysis today focusing on emissions impact only as we consider "what it might take" to achieve Bozeman's goals.
- Mean polling result = 8.75

Solution 5 - Increase Participation in Green Power Program or Tariff

- Impact on electricity portion of GHG inventory.
- Customers opt-in to clean energy through a slight premium on electric bill.
- Are the percentage numbers the same between solution 4 and 5?
 - Some slight differences between participation rate since one is mandatory and one is voluntary.
- In general, the programs do green up the entire portfolio instead of shifting it elsewhere.
- What accountability measures exist in these programs?
 - Benefits tracked with the environmental credits.
 - PSC charged with tariff design.

- How does this impact lower-income households?
 - Consumer chooses to pay a premium above their current rate.
 - Precludes certain groups from participating if they choose not to pay.
- REC - environmental benefits are dependent upon the grid it's connected to and the power it is replacing (most benefit on an all-coal system).
- Green tariff is a bundled REC solution - cannot track the individual electrons; know the generation is linked to the system where you are taking power.
- Mean polling result = 7.24

Solution 6 - Distributed Generation through Community and Rooftop Solar

- Impact on electricity portion of GHG inventory.
- More visible, can be more expensive than utility-scale development.
- Some installations and momentum in the community but pretty minor impacts.
- How much electricity consumption in Bozeman currently? 339,894 MWh, 100MW demand in 2018
- Mean polling result = 8.25

Solution 7 - Move towards a Zero Waste Community

- Impact on the methane portion of GHG inventory.
- Very visible part of environmental practice.
- Does this category include a human behavior change campaign around reducing consumption overall?
 - Current goals do not include accounting for a consumption-based inventory
- Landfill methane reduction - no follow-up with landfill since recent workshop, need to make sure they are included.
- Emissions from closed Story Mill landfill are included in current inventory.
- Durable hardgoods - things like toys, clothes, furniture, blankets, pillows, etc. are problematic. Currently there is nowhere to take this stuff so it often ends up in the landfill. Solutions might need to include activities like sales, swaps, etc.
- Mean polling result = 8.0

Solution 8 - Compact Development Patterns

- Impact on the diesel and gasoline portion of GHG inventory.
- Not only reduces number of trips, also results in more multi-family development that translates into greater energy efficiency.
- With people who commute into Bozeman for work, are their emissions calculated into community inventory?
 - Yes, Bozeman's share of those total emissions within the City boundary.
 - Vehicle Miles Traveled (VMT) in Bozeman (trips on City roads) counted in inventory.
- Walkable neighborhoods and more activity centers are vital to achieve these patterns (e.g., like the Union Development)
- Note that numerous activity centers are distributed across the land use plan but often take decades to develop.
- Mean polling result = 9.07

Solution 9 - Increase use of alternative transportation

- Impact on the diesel and gasoline portion of GHG inventory.
- Transit becomes more viable with higher density development.

- Current trend is a slight decrease in transit usage.
- Transportation is 42% of inventory (includes airport emissions).
- Is a public transportation link between Bozeman - Belgrade and Livingston viable?
 - Streamline system does provide limited service (1-3 routes daily) - busses are packed.
- Some issues with nomenclature around "alternative transportation"
 - Use active transportation and transit instead as more specific options
- Have Bozeman looked at light rail for a transportation solution?
 - Can put a lot of busses on the road for the cost of light rail
- Are there opportunities to convert to electric busses?
 - At least double the costs (currently). Yes, a viable long-term alternative as costs come down.
 - WTI-HRDC-MSU put together a grant application for bus conversion – was not selected for grant award.
 - Potential funding through VW settlement?
 - Matching requirement for grant funds still steep.
 - Conditions required destruction of the old busses, but cannot currently meet currently demand for service so this was not practical for MSU to pursue.
 - Initial costs for electric busses are more expensive, but total costs are starting to be more even; also health and quality of life impacts from diesel busses
 - Economies of scale - significant opportunity long-term.
- Why no transportation district in Bozeman?
 - Driven by population - has to go on the ballot at the County level?
 - Commission can vote to put it on the ballot as a Commission, or pushed to a petition; measure needs a petition of at least 25% of citizens to go on ballot.
 - Upcoming Census - if area population hits 50,000 or above, then new transportation requirements for federal funding apply.
 - Political support for transportation and transportation district has changed significantly in recent years.
- Mean polling result = 9.18

Solution 10 - Decrease Direct Vehicle Emissions

- Impact on the gasoline portion of GHG inventory.
- MT is one of 4 states in the nation that does not have emissions standards.
- Focus on light duty vehicles for this solution.
- Equity needs to be a lens through which these solutions are viewed - not everyone can shift to an electric vehicle, especially considering large student impacts.
- How can the City of Bozeman influence this type of solution?
 - Working with car dealerships - workshops, test drives
 - Lead by example with fleet purchases conversions
 - Charging infrastructure coordination
 - City of Boulder EV adoption as a good example - group buys
- City fleet light duty vehicles - already purchase a lot of hybrid vehicles, could also make efficiency gains through enforcing anti-idling policies, conversion to low-sulfur diesel, upgrading to newer/modern vehicles
- Planning horizon for this is quite long - hydrogen fuel cell alternatives potentially more viable during this period
- Mean polling result = 8.64

Solution 11 - Advocate for Increased Airline Fuel Efficiency

- Impact on the diesel portion of GHG inventory.
- Significant increase in airline emissions between 2012-2015.
- Advocate for reduced air travel consumption as a community as one part of this solution.
- How much of Bozeman's air travel is from out-of-state tourism? We do not know, the inventory accounts for Bozeman's share of flights that originate from the airport.
- Purchasing of carbon offsets from airline trips is very inexpensive.
- Does this include private flights from Gallatin Field? Yes
- Mean polling result = 6.24

Land Use Carbon Sequestration Opportunities

- Carbon sequestration can occur through activities such as regenerative agriculture, managed grazing, afforestation, and urban forest.
- These are not accounted for in the recent GHG inventories, but are also important elements to consider.

Drawdown Scenario

The project management team will be working to consolidate the polling results and feedback from the workshop into a more comprehensive scenario that shows potential contributions towards the emissions reduction goals. See slide 59 for an example of what this might look like when complete.

Vulnerability Assessment and Resiliency

Shelby presented a quick overview of key climate vulnerability and resiliency terms (see slides 60-72). Key points from the discussion are provided below.

- Suggested community elements that appear to be missing from the Climate Vulnerability Assessment & Resiliency Strategy:
 - snow storage facility vulnerable if it reaches capacity
 - public and private schools
 - emergency preparedness steps for food/shelter
 - preparedness for the human elements, such as fear and anger during a shock or stress

Next Steps

If interested, Climate Team members should contact Natalie Meyer to sign up for one or more topical focus groups to be conducted in early 2020.

Save the date for a community climate event the evening of February 18, 2020.

Workshop 3 is tentatively scheduled for March 24 (time TBD).



Bozeman
Climate
Plan

Bozeman Climate Plan

Climate Team Workshop #2

December 18, 2019

Agenda



Bozeman
Climate
Plan

Time	Agenda Item
12:30 pm	Welcome & Project Updates
1:00 pm	Emissions Reduction Planning – Part 1
2:00 pm	Break
2:15 pm	Emissions Reduction Planning – Part 2
3:00 pm	Vulnerability Assessment and Resiliency
3:20 pm	Wrap-Up & Next Steps



Bozeman
Climate
Plan

Re-introductions and Project Updates

WELCOME!

Re-Meet the Project Team!



Bozeman
Climate
Plan



Natalie Meyer
Sustainability
Program Manager
City of Bozeman



Jon Henderson
Strategic Services
Director
City of Bozeman



**Heather
Higinbotham**
Energy Conservation
Technician
City of Bozeman



Shelby Sommer
Project Manager
Brendle Group



Judy Dorsey
Executive Project
Manager
Brendle Group



Britt Ide
Energy Expert
Ide Energy



Sarah Martin
Resiliency Planner
Brendle Group



Becca Stock
Lead Engineer
Brendle Group



Katie Kershman
Document
Dev. & Design
Brendle Group



Megan Moore
Engagement
Coordinator
Logan Simpson



Bruce Meighen
Plan Integrator
Logan Simpson

Project Overview



Bozeman
Climate
Plan

Define an emissions reduction target while adding climate resilience with an emphasis on our communities most vulnerable members.

Goals

1. Align the City's emissions reduction goals in accordance with the Paris Climate Agreement.
2. Create an actionable project implementation and policy-making guide.
3. Include a diverse group of stakeholders in shaping Bozeman's response to climate change.

Climate Plan Focus Areas



Cross-Cutting Topics



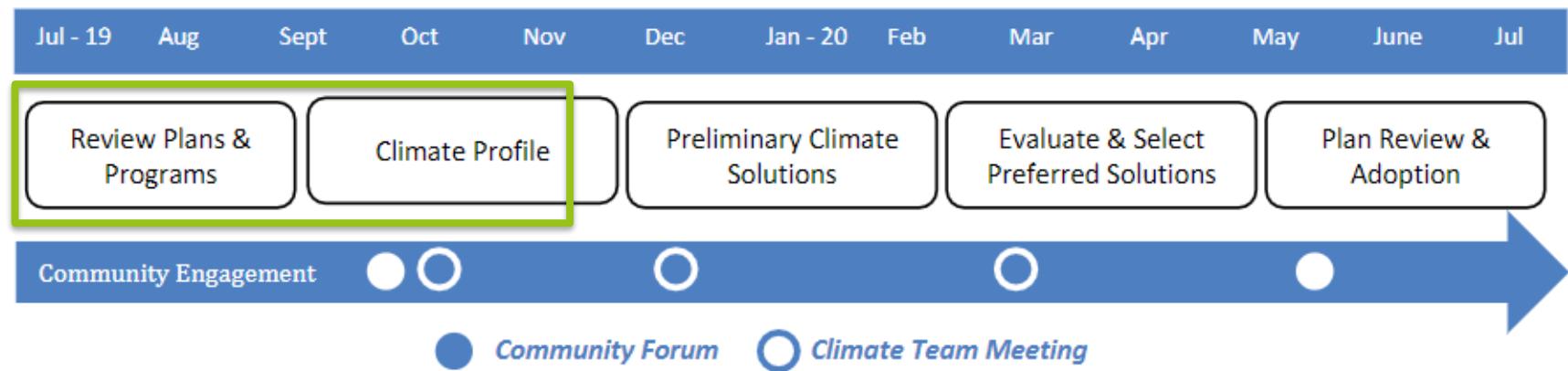
Climate Team Roles & Responsibilities



Bozeman
Climate
Plan

1. Attending three 2-3 hour facilitated workshops.
2. Actively participate and engage during workshops by providing input, ideas, and feedback.
3. Represent your department, organization, and community.
4. Be a critical eye for credibility, transparency, and accuracy.
5. Review documents and solution analysis as needed.
6. Help generate public engagement and enthusiasm for the planning process, providing input to public forums and project communications and outreach efforts.

Timeline



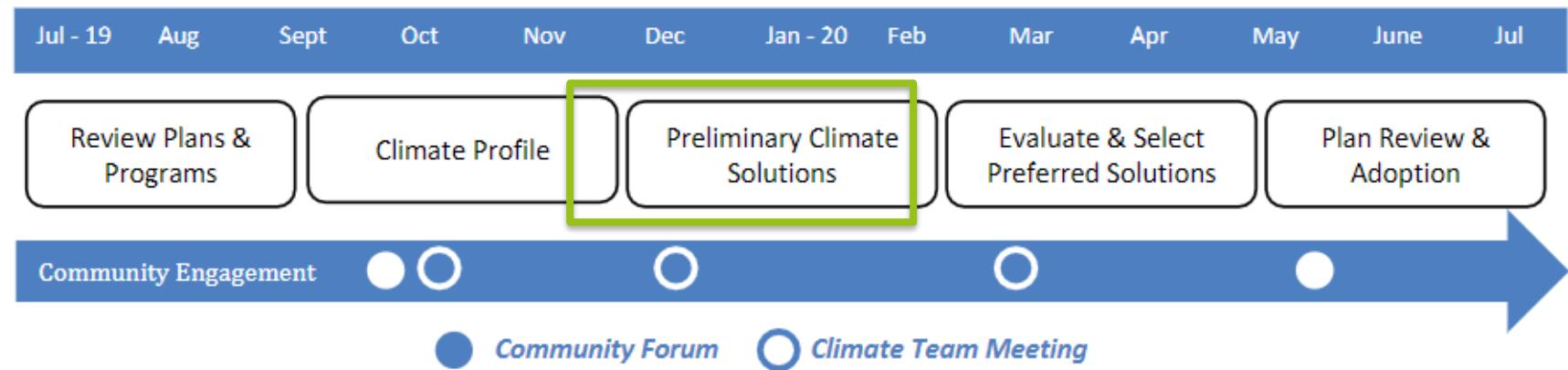
Climate Team Roles & Responsibilities



Bozeman
Climate
Plan

1. Attending three 2-3 hour facilitated workshops.
2. Actively participate and engage during workshops by providing input, ideas, and feedback.
3. Represent your department, organization, and community.
4. Be a critical eye for credibility, transparency, and accuracy.
5. Review documents and solution analysis as needed.
6. Help generate public engagement and enthusiasm for the planning process, providing input to public forums and project communications and outreach efforts.

Timeline



Climate Team Workshop #1



Bozeman
Climate
Plan

- Mayor Andrus proclamation: bold City action
- Project grounding and overview of existing efforts
- Vision themes: 3 Vision Words activity
- Exploring goals and climate solutions by focus area



Oct. 23 Community Forum

- Nearly 100 attendees
- Strong representation from population under 35 years of age
- Presentations from
 - Bruce Maxwell – Montana Climate Assessment
 - Clare Vlases – Bozeman High School Student
 - Terry Cunningham – Bozeman City Commissioner
- Climate vision illustrations and ideas
- Over 250 potential climate solutions

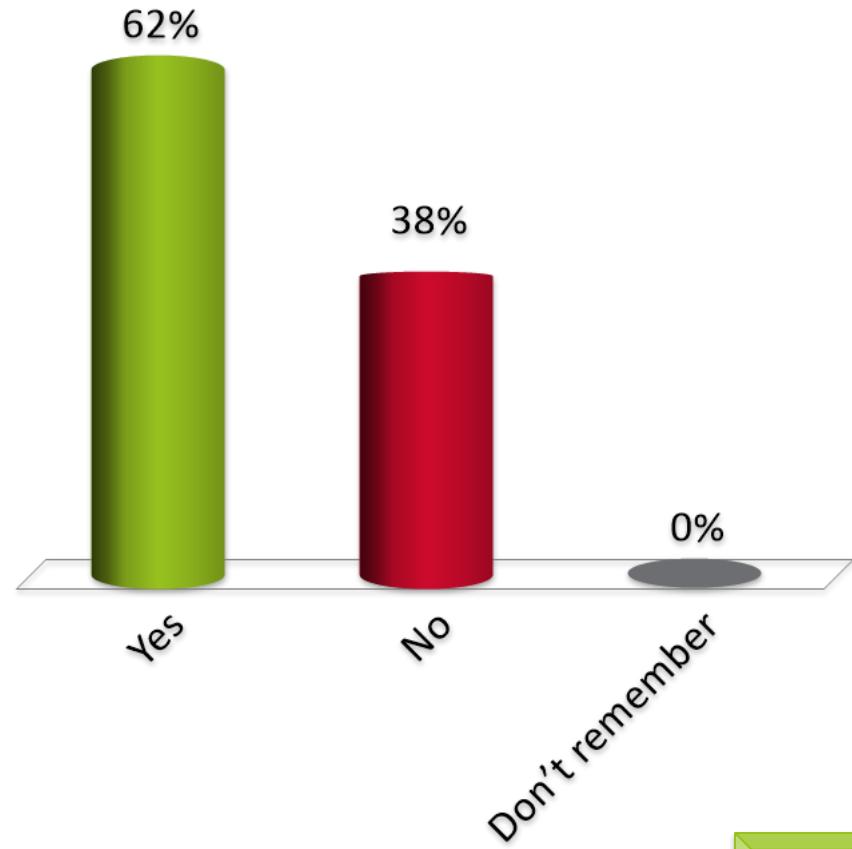


Warm Up : Did you attend the October Community Forum?



Bozeman
Climate
Plan

1. Yes
2. No
3. Don't remember

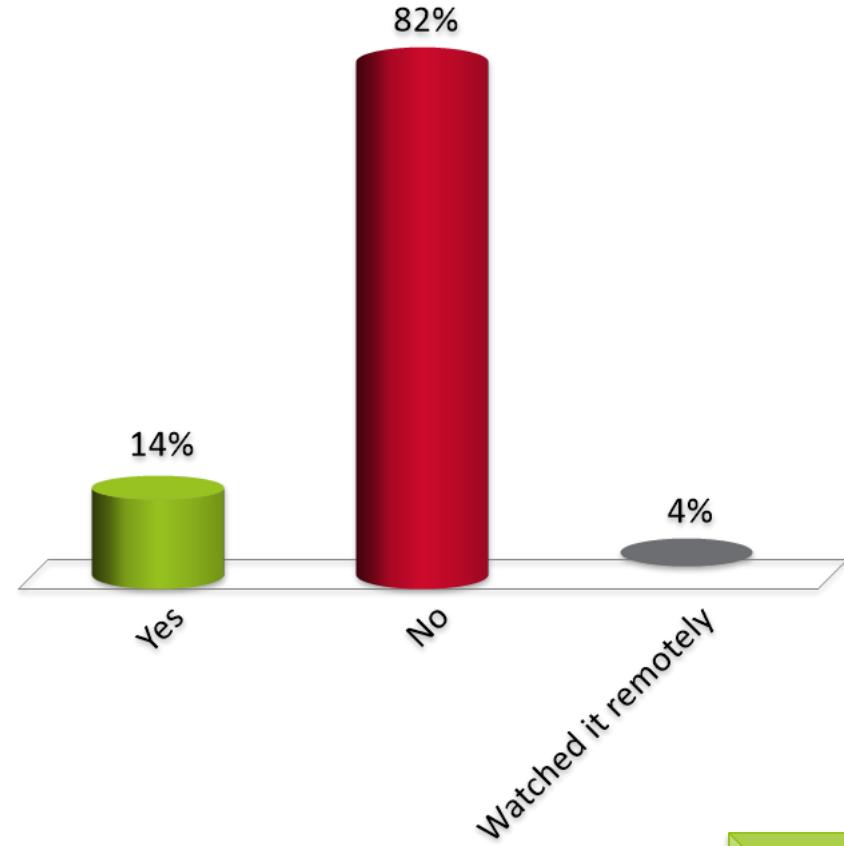


Warm Up : Did you attend the City Commission meeting on Monday evening?



Bozeman
Climate
Plan

1. Yes
2. No
3. Watched it remotely



Climate Team Vision & Goals Survey



Bozeman
Climate
Plan

- 21 survey participants
- General support for the vision components and goals
- Overall feedback
 - Maintain lens of “climate change”
 - Include current and future generations
 - Keep language concise, specific, and relevant

Climate Vision: Position Statement



Bozeman
Climate
Plan

Through leadership and collaboration, the City of Bozeman will advance innovative solutions to cultivate a more equitable and resilient, low-carbon community for current and future generations.

Climate Vision: Guiding Principles



Bozeman
Climate
Plan

Bozeman will be a leader in addressing climate change by:

- Adopting bold targets for emissions reduction and renewable energy.
- Weaving sustainability and resilience into decision-making processes.
- Pursuing partnerships with other municipalities and our utility provider.
- Seeking innovative, actionable solutions to mitigate climate change.
- Inviting all Bozeman residents to join us, including current and future leaders.

The image shows a scanned document titled "Proclamation of Intent Related to the City of Bozeman's Climate Action Plan". At the top right is the official seal of the City of Bozeman, Montana, featuring a bison and the year 1883. The document begins with a series of "WHEREAS" clauses, each describing a different aspect of the climate crisis and its impact. It concludes with a final "WHEREAS" clause stating that the city's strategic plan identifies the revision of its Climate Action Plan as a prioritized action item.

Proclamation of Intent Related to the City of Bozeman's
Climate Action Plan

WHEREAS, an overwhelming body of scientific evidence indicates that climate change is occurring on our planet, and

WHEREAS, peer-reviewed scientific studies have concluded that climate change is caused in large part by human activity, and

WHEREAS, due largely to the combustion of fossil fuels, atmospheric concentrations of carbon dioxide, the principal greenhouse gas, are at a level unequaled for more than 400,000 years and as a result, an enhanced greenhouse effect is trapping more of the sun's heat near the earth's surface and gradually pushing the planet's climate system into uncharted territory, and

WHEREAS, global average temperatures have risen both on land and in the oceans, with observable impacts already occurring that foretell increasingly severe climate change, and

WHEREAS, climate change is resulting in serious and damaging effects to our planet at a pace that is likely to accelerate in the coming decades, and

WHEREAS, the federal government, rather than recognizing this impending climate crisis and taking urgent steps to address the root causes of climate change, is largely ignoring the issue and rolling back environmental protections, and

WHEREAS, a growing number of cities and towns throughout the United States recognize that, absent federal assistance and leadership in this matter, local municipalities must fill the void by providing the impetus for change, and

WHEREAS, the City of Bozeman Strategic Plan identifies the revision of its Climate Action Plan as a prioritized action item, and

Climate Vision: Vision Themes



Bozeman
Climate
Plan

- Responsible and reliable renewable **energy** supply
- Healthy, adaptive, and efficient **buildings**
- Vibrant and resilient **neighborhoods**
- Diverse and accessible **transportation** options
- Comprehensive and sustainable **waste** reduction
- Regenerative **greenspace**, **food systems**, and **natural environment**

Provisional Goals



Bozeman
Climate
Plan

26% reduction in GHG
emissions by 2025
(compared to 2008)

Carbon neutral
by 2050

100% net clean
electricity by 2030



14.7 MT CO₂e
per person



11.5 MT CO₂e
per person

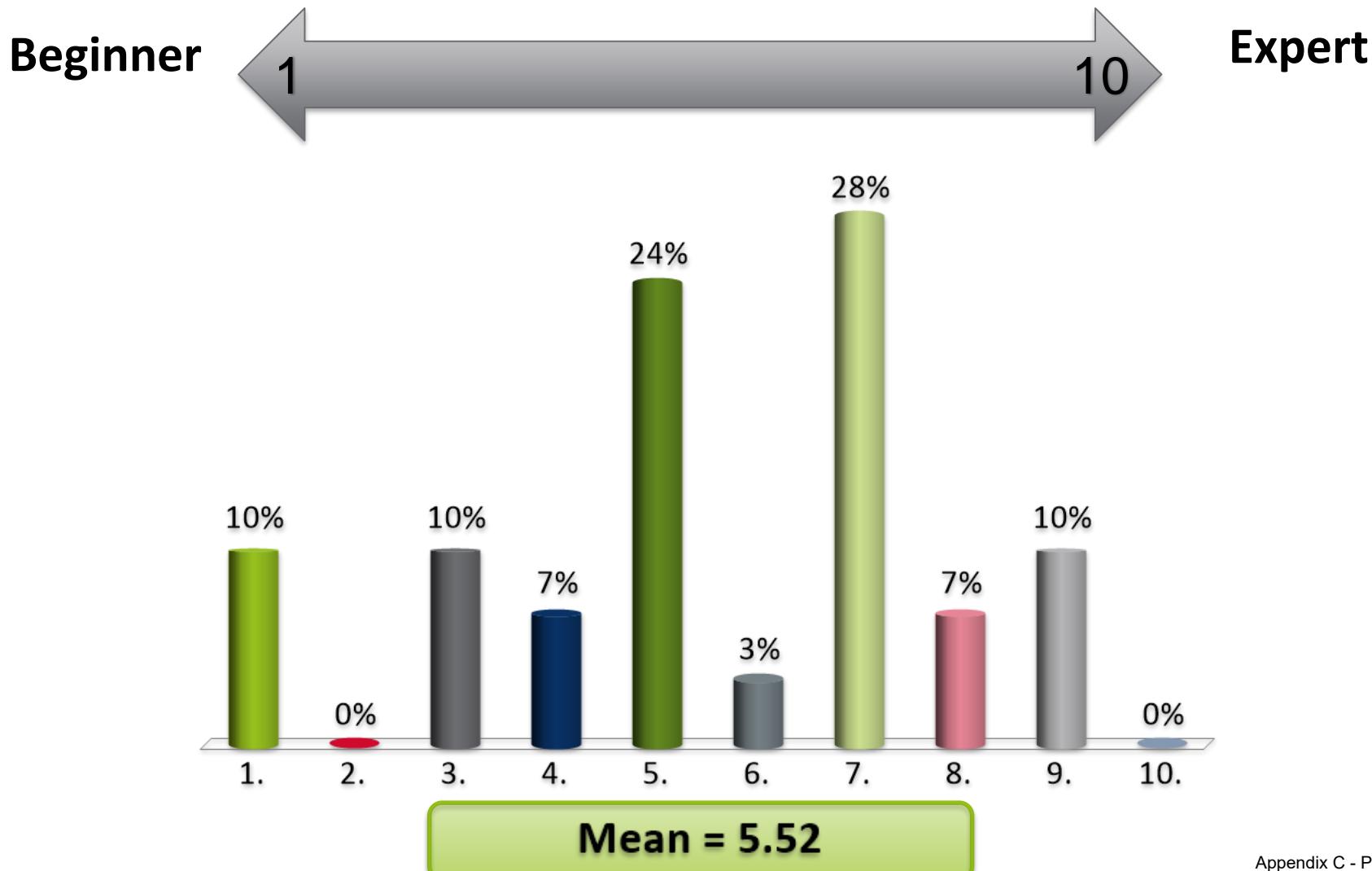


7.2 to 4.3
MT CO₂e per person

Warm Up: On scale of 1-10 how would you rank your climate mitigation expertise?



Bozeman
Climate
Plan





Bozeman
Climate
Plan

Possible Paths Toward Achieving Our Climate Goals

EMISSIONS REDUCTIONS SOLUTIONS

2016 GHG Emissions Summary by Sector



Bozeman
Climate
Plan

- Transportation (42%)
 - Includes on-road vehicles and aviation
- Buildings (commercial 30%; residential 23%)
 - Electricity and natural gas emission from commercial and residential buildings
- Waste (7%)
 - Landfilled waste and wastewater methane and nitrous oxide emissions

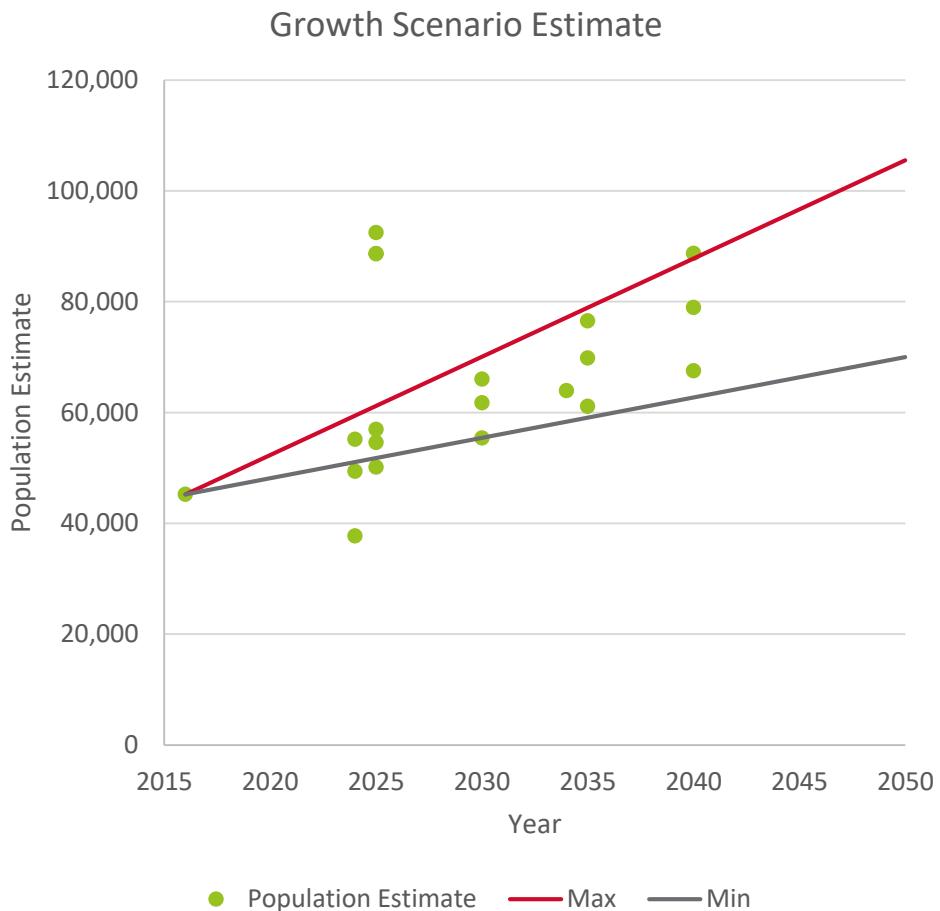


What does 2050 look like?



Bozeman
Climate
Plan

- Estimate city population in 2050 based on previous projections from various plans including:
 - Community Plan
 - Wastewater Facilities Update
 - Water Resource Plan
- Used range of population estimates to establish a range of growth likely

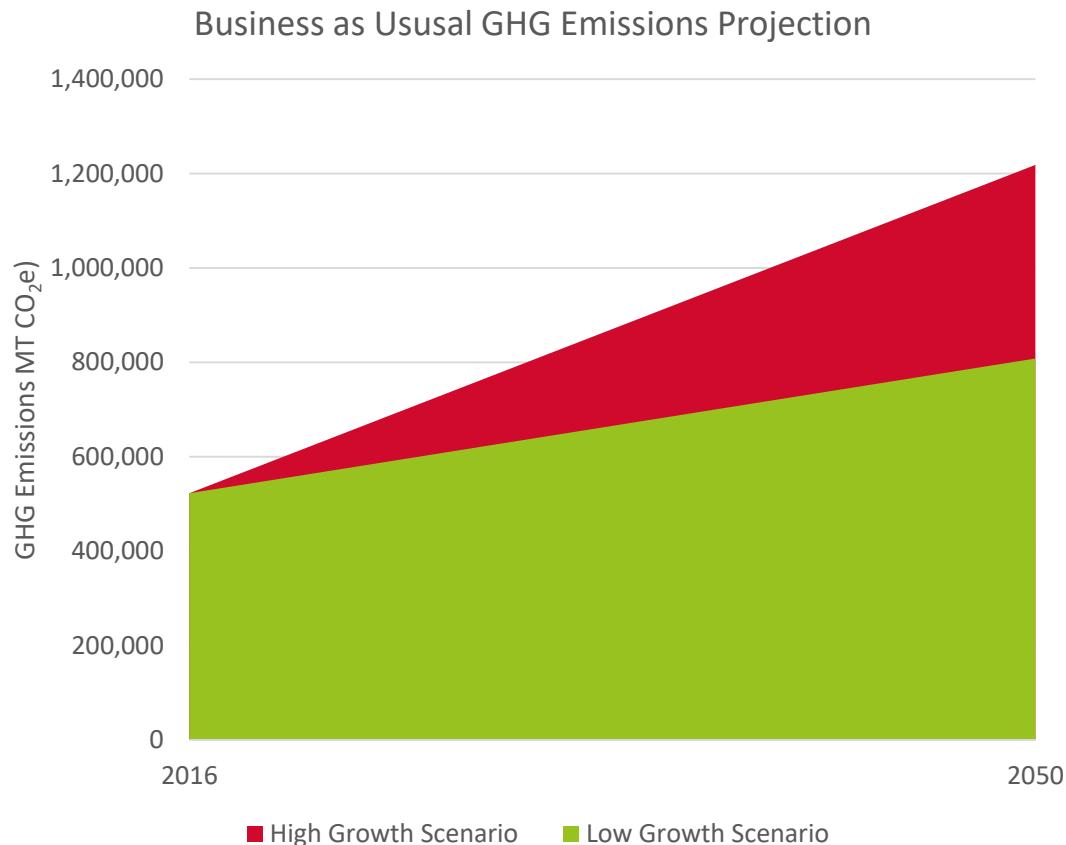


2050 Business-as-usual Forecast



Bozeman
Climate
Plan

- Use 2016 inventory for current conditions
 - This is the most recent year we have inventory data
- Project business as usual (BAU) emissions to 2050
 - Start with 2016 per capita emissions
 - Used range of growth scenarios
 - Estimate BAU emissions by keeping per capita emissions constant
- Solutions impact will be examined as a percentage of max 2050 BAU emissions



Potential Solutions by Focus Area



Bozeman
Climate
Plan

Buildings

- Solution #1: Improve energy efficiency in existing buildings.
- Solution #2: Invest in net-zero energy ready new construction.
- Solution #3: Electrify buildings.

Energy & Utilities

- Solution #4: Increase renewable energy in electric utility resource mix.
- Solution #5: Increase participation in green power program or tariff.
- Solution #6: Increase distributed energy generation through community and rooftop solar.

Consumption & Waste

- Solution #7: Move towards a zero waste community.

Community Development

- Solution #8: Facilitate compact development patterns.

Transportation

- Solution #9: Increase use of alternative transportation
- Solution #10: Decrease direct vehicle emissions
- Solution #11: Advocate for increased airline fuel efficiency.

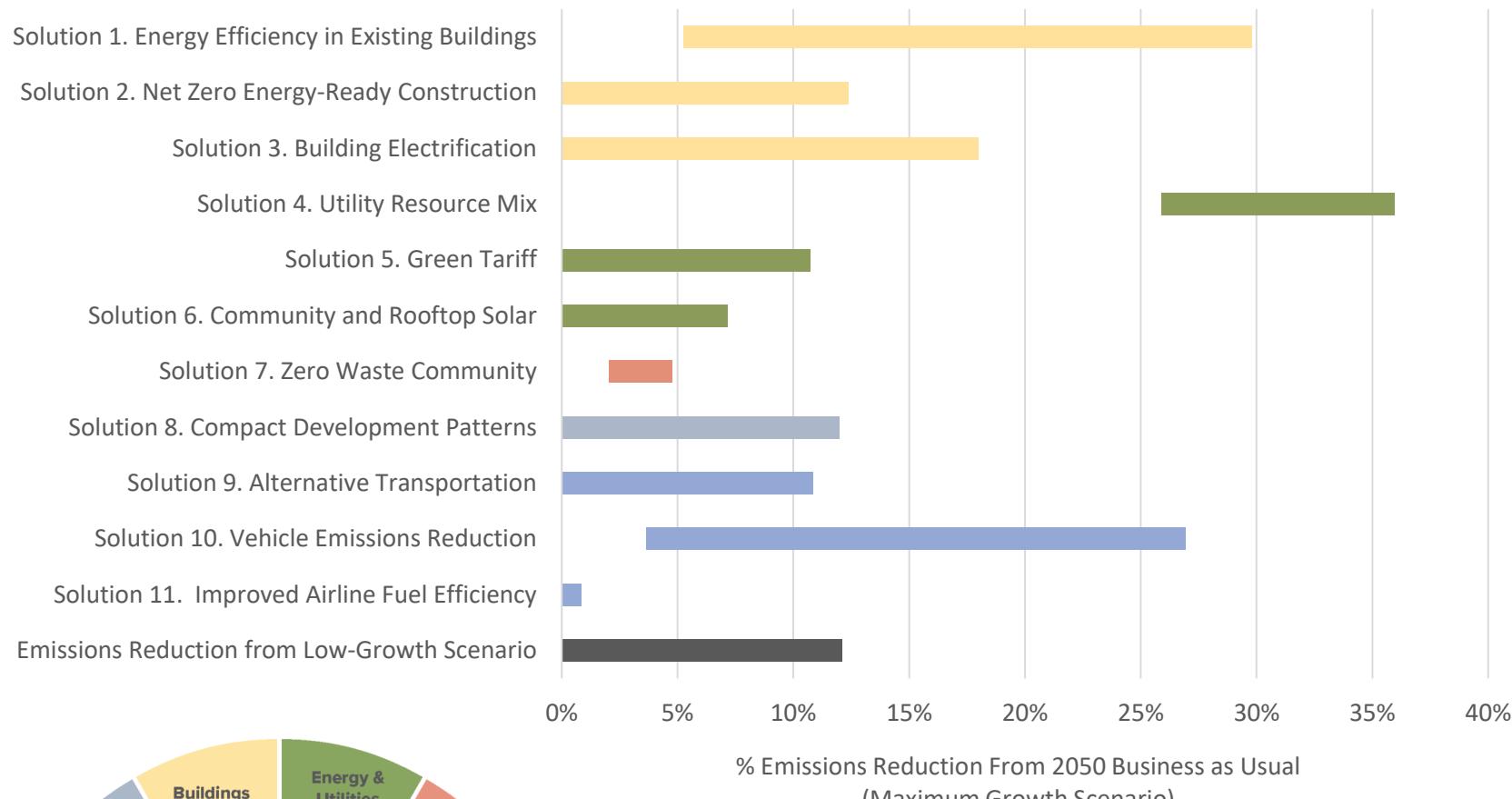
Greenspace, Food Systems & Natural Environment

- Carbon sequestration opportunities to use as community emissions offsets (land use emissions outside the scope of current inventory)

Relative Impact Potential by Solution



Bozeman
Climate
Plan



Note: The same GHG emissions can be addressed through multiple strategies, so the percentages are not additive. For example, electricity emissions could be addressed through utility resource mix changes or green tariff or a combination of the two.

Solution 1. Improve Energy Efficiency in Existing Buildings



Bozeman
Climate
Plan

Invest in energy efficiency upgrades in existing commercial and residential buildings.

- Positive cash flow in most cases. Many projects have simple payback of less than 5-years.
- Can improve comfort and reliability of buildings.
- Can result in significant cost savings reducing utility bills. This can alleviate the burden on low-income homes and improving profitability of local businesses.



Solution 1. Improve Energy Efficiency in Existing Buildings



Bozeman
Climate
Plan

Current Efforts

- 13% electricity and natural gas emissions reduction (6% of projected 2050 emissions)
 - From NorthWestern Energy rebate program evaluation estimated energy efficiency potential to be 7% between 2015 and 2034 for existing efficiency programs.
 - Extrapolated this savings rate to 2050.

Best in Class

- 51% electricity and natural gas emissions reduction (30% of projected 2050 emissions)
 - Based on a study by American Council for Energy-efficient Economy (ACEEE)
 - Used the advanced scenario that assumed a high penetration rate of known technologies
- Considerations:
 - This is a national study. Savings potential varies by climate zone.

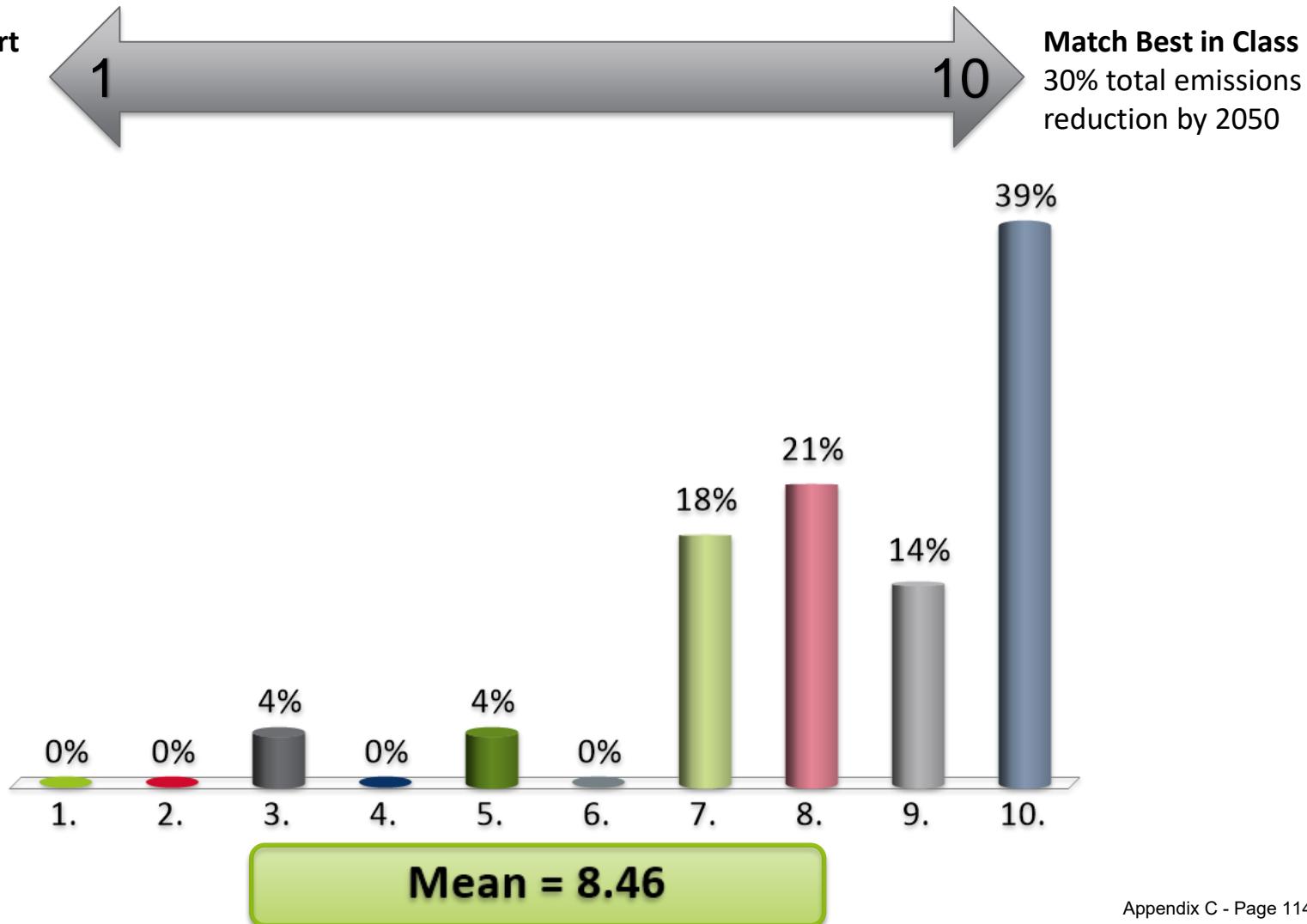
On scale of 1-10 what level of emissions reduction do you think Bozeman should target through this strategy?



Bozeman
Climate
Plan

Current Level of Effort
6% total emissions reduction by 2050

Match Best in Class
30% total emissions reduction by 2050



Solution 2. Invest in Net-zero Energy Ready New Construction



Bozeman
Climate
Plan

Use building codes or incentives to ensure new homes and businesses in Bozeman are built to net-zero energy standards.

- US Department of Energy has developed a Zero Energy Ready Certification Program for homes and businesses.
- Leading edge building techniques.
- Higher upfront costs, but low or no monthly utility costs. Often lower lifetime costs.
- Buildings more resilient to power loss.



Solution 2. Invest in Net-zero Energy Ready New Construction



Bozeman
Climate
Plan

Current Efforts

- Negligible
 - Assume not a significant number of net-zero buildings in Bozeman

Best in Class

- 22% electricity and natural gas emissions reduction (13% of projected 2050 emissions)
 - 8 US Cities have pledged that all new construction will be net zero by 2030 through C40 Cities
 - Uses anticipated growth rate and assumes 50% energy use reduction for all buildings built after 2030 and 50% of buildings before 2030
- Considerations:
 - Currently required to adopt state-wide code; could incentivize beyond code performance.

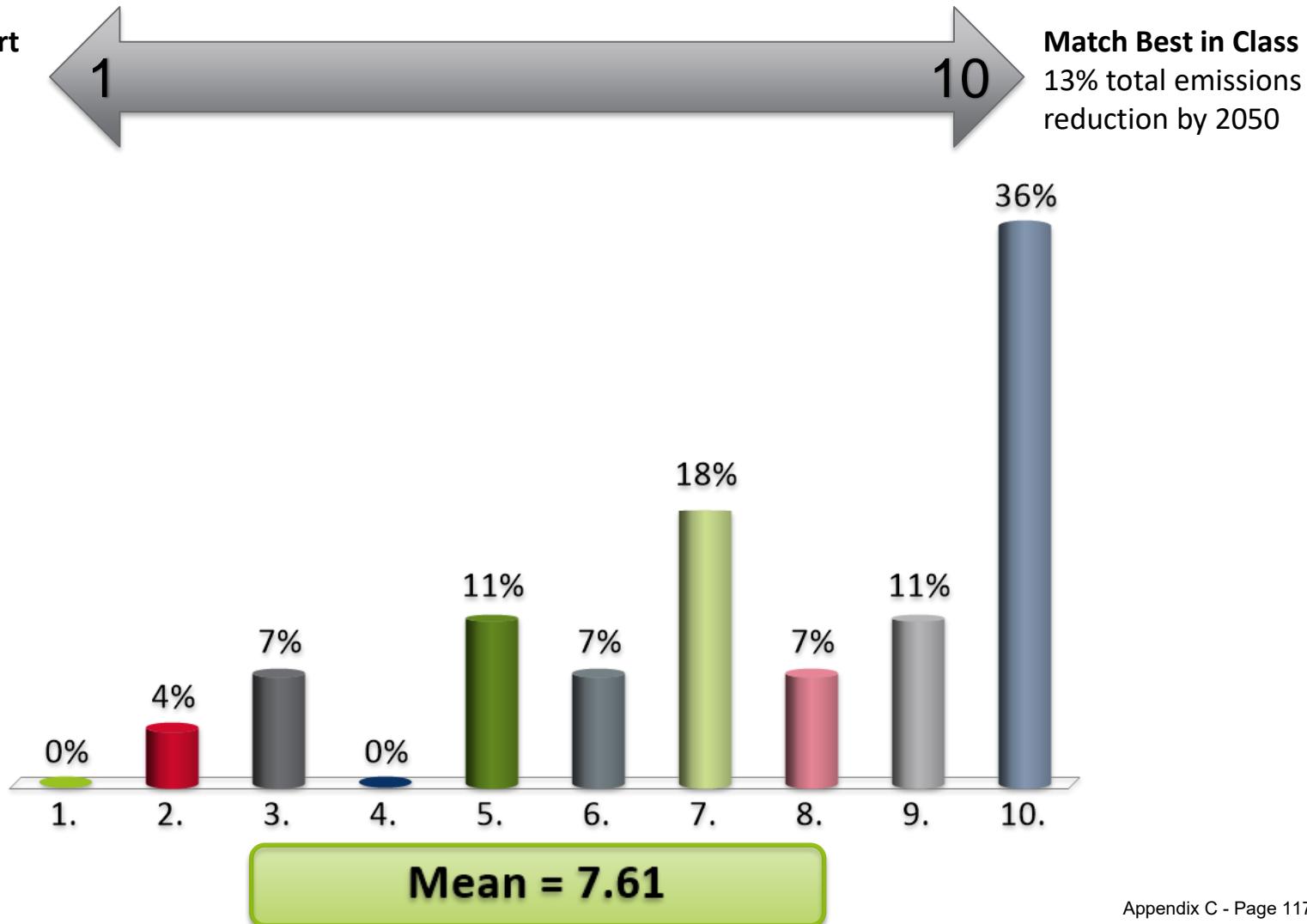
On scale of 1-10 what level of emissions reduction do you think Bozeman should target through this strategy?



Bozeman
Climate
Plan

Current Level of Effort
0% total emissions reduction by 2050

Match Best in Class
13% total emissions reduction by 2050



Solution 3. Electrify Buildings



Bozeman
Climate
Plan

Convert heating and cooking appliances in homes and businesses from natural gas to electricity.

- Allows energy needs to be met by renewable energy generation.
- Requires replacement of major gas appliances.
- Currently a higher fuel cost for electricity.
- Electric heating is more efficient than natural gas options.
- Rocky Mountain Institute recommends prioritizing:
 - Propane or heating oil conversion
 - New construction



By Kristoferb at English Wikipedia, CC BY-SA 3.0,
<https://commons.wikimedia.org/w/index.php?curid=10795550>

Solution 4. Electrify Buildings



Bozeman
Climate
Plan

Current Efforts

- Negligible
 - Assume no significant effort to electrify building energy loads in Bozeman

Best in Class

- 80% natural gas emissions reduction (18% of projected 2050 emissions)
 - National Renewable Energy Laboratory study showed 80% of residential and commercial loads could be electrified.
- Considerations:
 - At scale, requires market transformation and workforce development.
 - Requires coordination with electric utility on grid impacts.

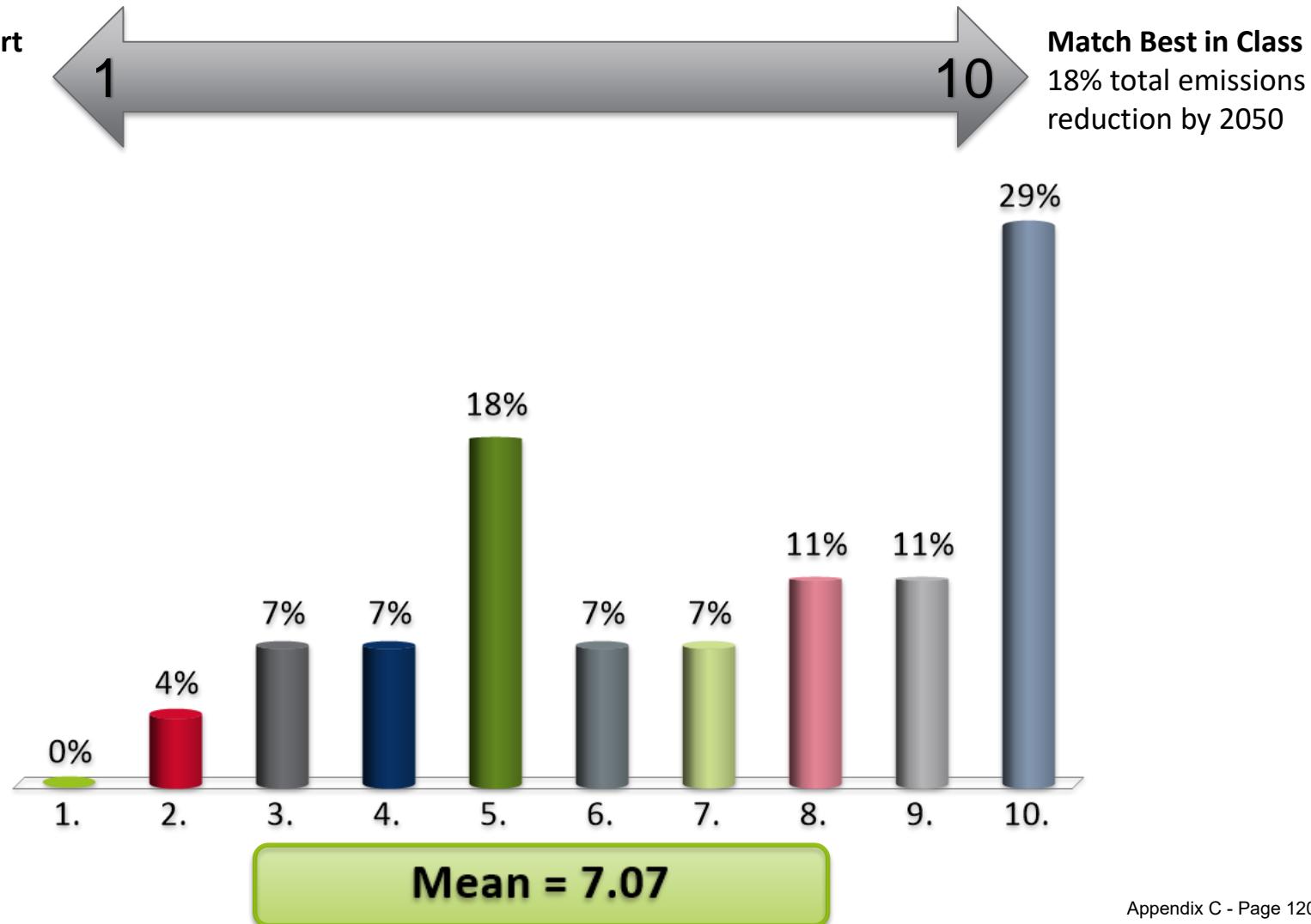
On scale of 1-10 what level of emissions reduction do you think Bozeman should target through this strategy?



Bozeman
Climate
Plan

Current Level of Effort
0% total emissions reduction by 2050

Match Best in Class
18% total emissions reduction by 2050



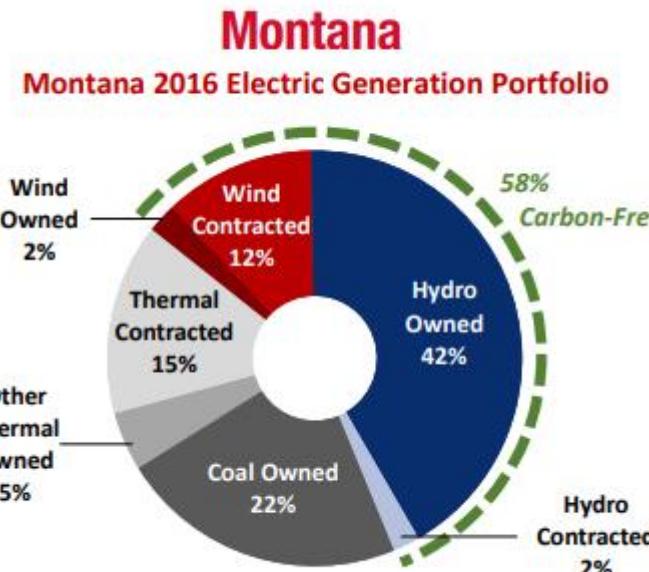
Solution #4: Increase Renewable Energy in Electric Utility Resource Mix



Bozeman
Climate
Plan

Work with the utility to support transition to less carbon intense or carbon-free generation sources

- Benefits reach all residents
- Consumers don't need to purchase new equipment
- Utility scale renewable energy projects are often the most cost effective
- May be associated with rate increases which can disproportionately affect low-income residents
- Utility still needs a dispatchable (can be turned up or down on demand) resource for grid stability



Based on MWH of owned & long-term contracted resources

NorthWestern Energy
2017 Environmental Stewardship: Our commitment to action

http://www.northwesternenergy.com/docs/default-source/documents/environment/nwe_envioreport_2017_web.pdf

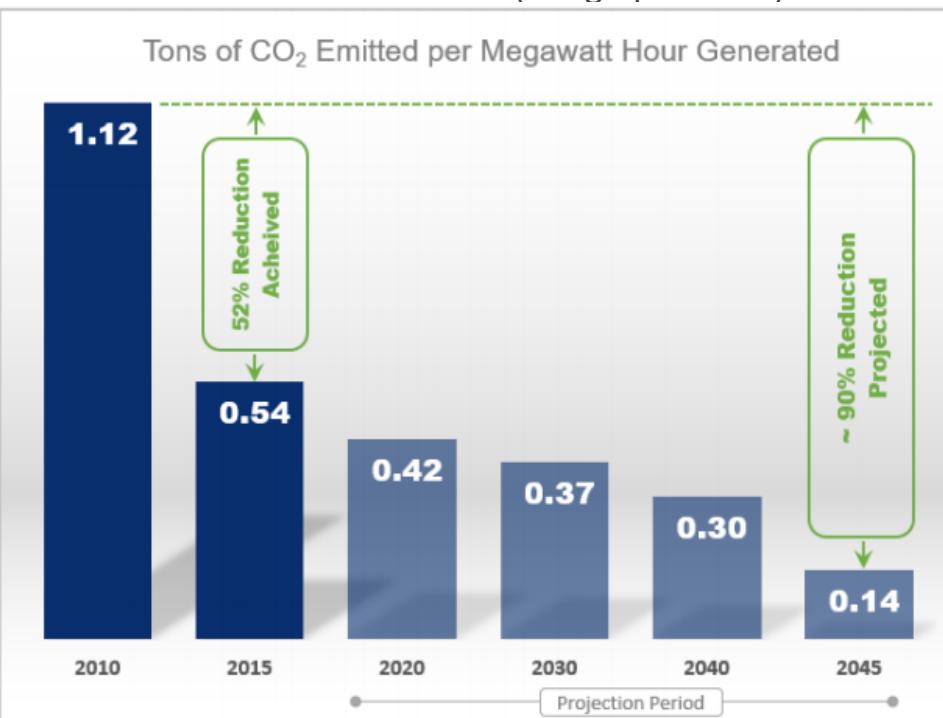
Solution #4: Increase Renewable Energy in Electric Utility Resource Mix



Bozeman
Climate
Plan

Current Efforts

- 72% reduction in electricity emissions (26% of projected 2050 emissions)
 - Compares 2016 emissions factor to projected 2050 emissions factor From the NorthWestern Energy's Supply Resource Procurement Plan (see graph below)



Best in Class

- 100% electricity emissions reduction (36% of projected 2050 emissions)
 - Based on pledges from Platte River Power Authority in Colorado, Idaho Power, and Xcel Energy

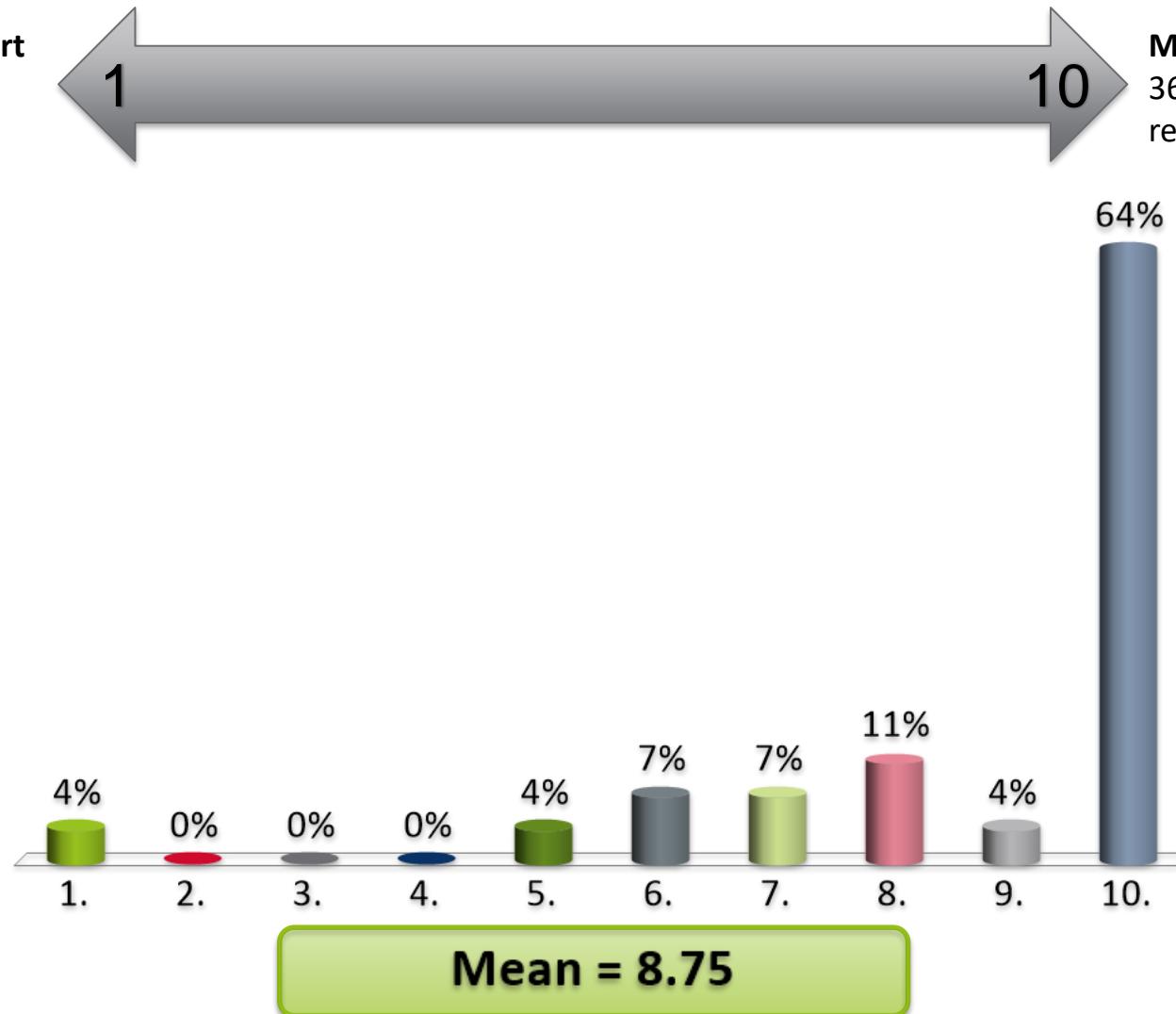
On scale of 1-10 what level of emissions reduction do you think Bozeman should target through this strategy?



Bozeman
Climate
Plan

Current Level of Effort
26% total emissions reduction by 2050

Match Best in Class
36% total emissions reduction by 2050



Solution #5: Increase Participation in Green Power Program or Tariff



Bozeman
Climate
Plan

Use one of two market mechanisms increase the percentage of the electricity used in Bozeman that is carbon-free. Options outlined below.

Green Power Purchase Program

- Allow customers to buy renewable energy credits (RECs) through your utility for your energy use.
- Short term or no commitment.
- These RECs are often purchased off the REC market and not tied to a local projects, so ensuring impact is difficult.
- Example: NorthWestern E+ Green Program (\$2/100kWh)

Green Tariff

- Allows customers to buy bundled renewable electricity from a specific project through a special utility tariff rate. Customers retail the RECs from energy generation (bundled RECs).
- Generally utilized by large business or industrial customers.
- Encourages local renewable energy projects.
- Often requires a long term commitment, but may allow customers to lock in a fixed price for the term of the commitment.

REC: Certificate that represents the property rights to the environmental, social and other non-power attributes of renewable electricity generation. Can be retained by the energy consumer (bundled RECs) or sold on the market (unbundled RECs).

Solution #5: Increase Participation in Green Power Program or Tariff



Bozeman
Climate
Plan

Current Efforts

- <1% electricity emissions reduction (negligible impact on projected 2050 emissions)
 - Looks at current income from the E+ Green Program through NorthWestern Energy
 - Consistent over the last 5 years
 - Estimate energy purchased using rate of \$2/100 kWh
 - Scale the total energy purchased by the percentage of energy generated by NorthWestern delivered to Bozeman

Best in Class

- 30% electricity emissions reduction (11% of projected 2050 emissions)
 - The largest green tariff program in Michigan is 412 MW of wind
 - This is more than enough to supply the entire City of Bozeman, so limited by number of subscribers
 - Assume municipal operations, MSU electricity, and 19% of community.
 - Community percentage is based on best performing green power program in the country.

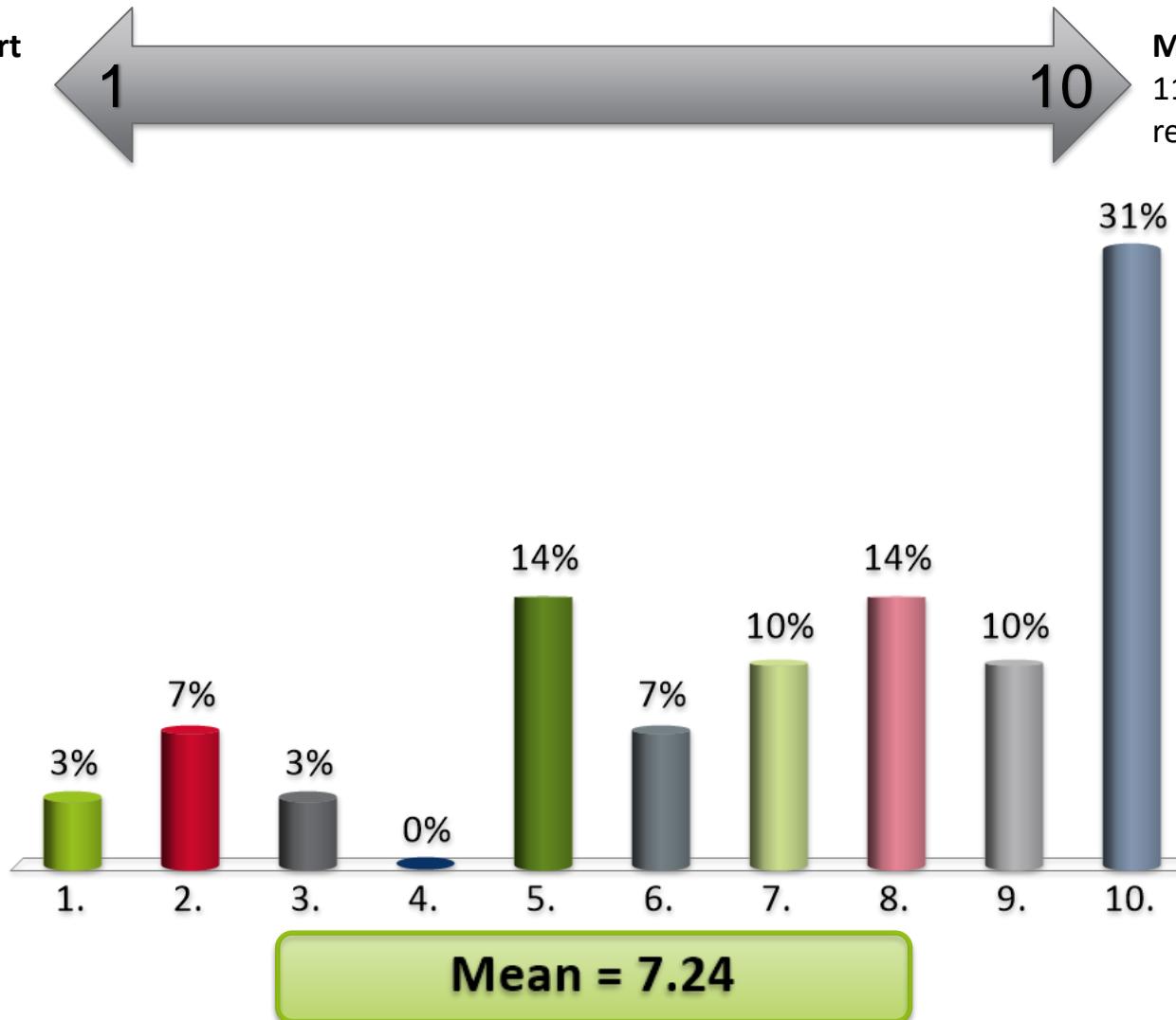
On scale of 1-10 what level of emissions reduction do you think Bozeman should target through this strategy?



Bozeman
Climate
Plan

Current Level of Effort
<1% total emissions reduction by 2050

Match Best in Class
11% total emissions reduction by 2050



Solution #6: Increase Distributed Energy Generation through Community and Rooftop Solar



Encourage residents and businesses to install solar generation on-site or install community solar gardens.

- Showcases local commitment to sustainability.
- Generally more expensive than utility scale projects.
- Can have resiliency benefits if combined with storage.



Solution #6: Increase Distributed Energy Generation through Community and Rooftop Solar



Bozeman
Climate
Plan

Current Efforts

- <1% electricity emissions reduction (negligible impact on projected 2050 emissions)
 - Potential for community solar through utility
 - 50kW net-metering cap

Best in Class

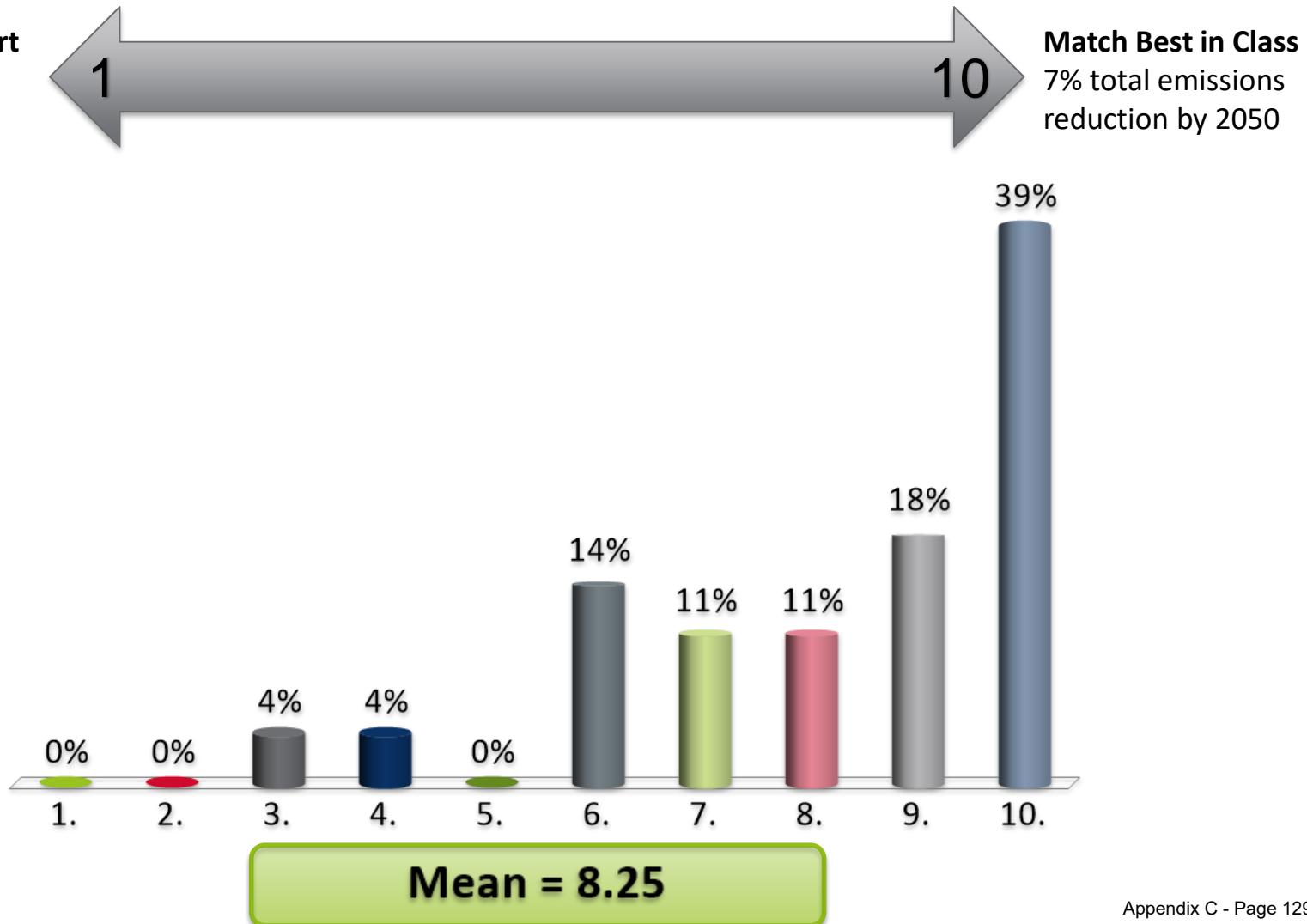
- 20% electricity emissions reduction (7% of projected 2050 emissions)
 - Small building solar potential from Cities LEAP
 - Add 50 MW community solar based on stated goal in Fort Collins, CO
- Considerations:
 - Rooftop solar potential does not consider growth
 - Federal rebates for solar are expiring
 - Price of rooftop solar has been steadily declining

On scale of 1-10 what level of emissions reduction do you think Bozeman should target through this strategy?



Bozeman
Climate
Plan

Current Level of Effort
<1% total emissions reduction by 2050





15 MINUTE BREAK

Sign up for Focus Group discussions!

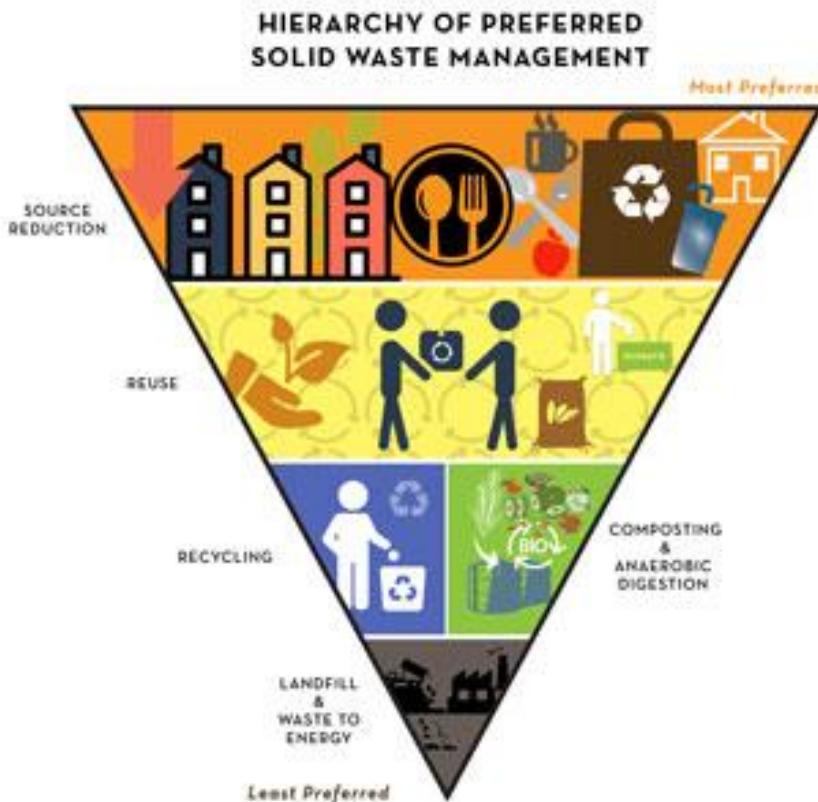
Solution 7. Move Towards a Zero Waste Community



Bozeman
Climate
Plan

Through waste reduction and recycling efforts reduce the total landfilled waste.

- Decomposing organic waste releases methane (a GHG 21 times more potent than CO₂) .
- Limited GHG emissions benefits from landfill methane reduction.
- Significant upstream emissions benefits not reflected in Bozeman's GHG inventory.
- Requires economy wide effort.



Waste Hierarchy from Zero Waste DC
<https://zerowaste.dc.gov/about-zero-waste-dc>

Solution 7. Move Towards a Zero Waste Community



Bozeman
Climate
Plan

Current Efforts

- 38% landfill methane emissions reduction (2% of projected 2050 emissions)
 - Landfilled waste per person decreased by 9% between 2012 and 2016
 - Tons of Recycling Collected increased 40% from 2015-2019
 - Rate of recycling plateauing across the country, so estimate half the rate of reduction out to 2050

Considerations:

- Waste reduction is strongly influenced by upstream production practices and availability of recycling
- Population growth influences construction waste

Best in Class

- 90% landfill methane emissions reduction (5% of projected 2050 emissions)
 - Austin, TX has a plan to reach 90% waste reduction by 2040

On scale of 1-10 what level of emissions reduction do you think Bozeman should target through this strategy?



Bozeman
Climate
Plan

Current Level of Effort

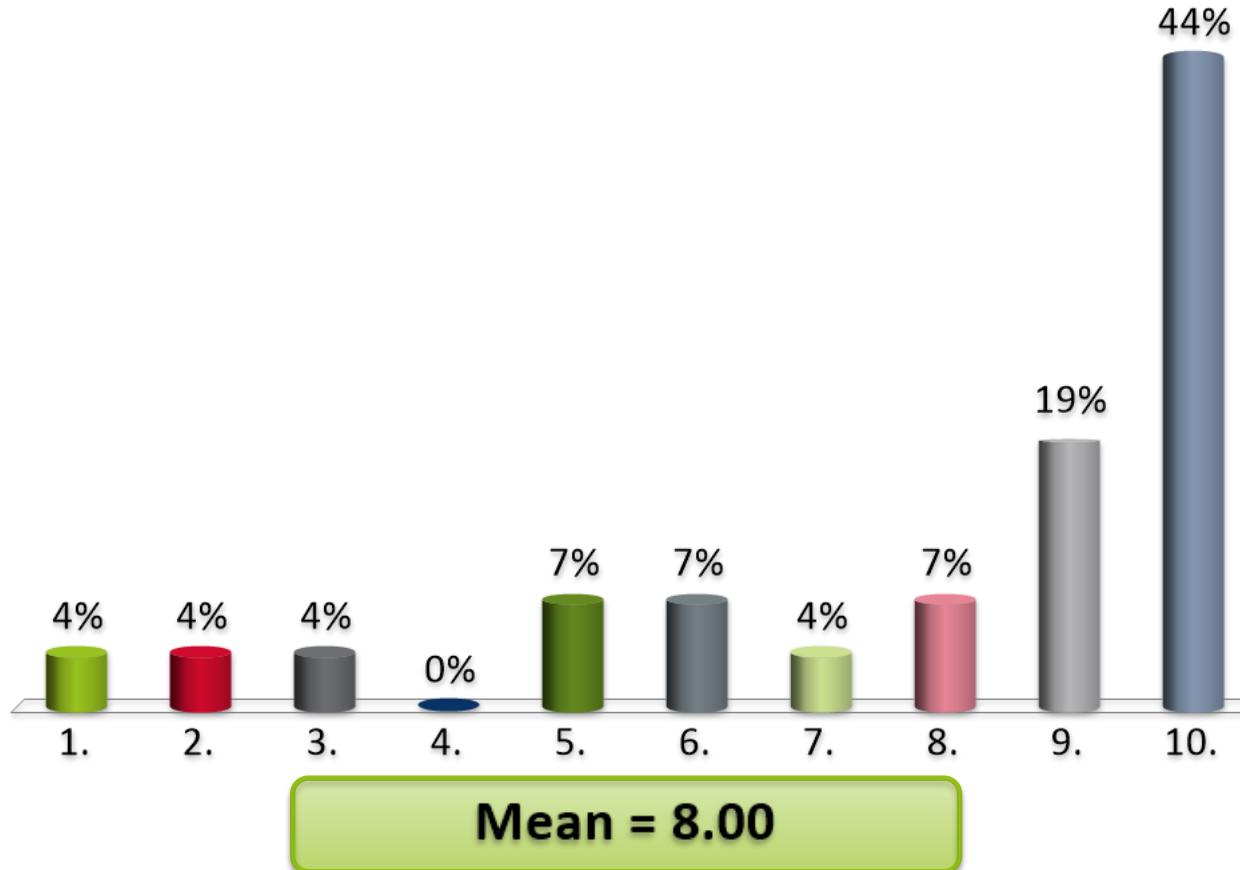
2% total emissions
reduction by 2050

1

10

Match Best in Class

5% total emissions
reduction by 2050



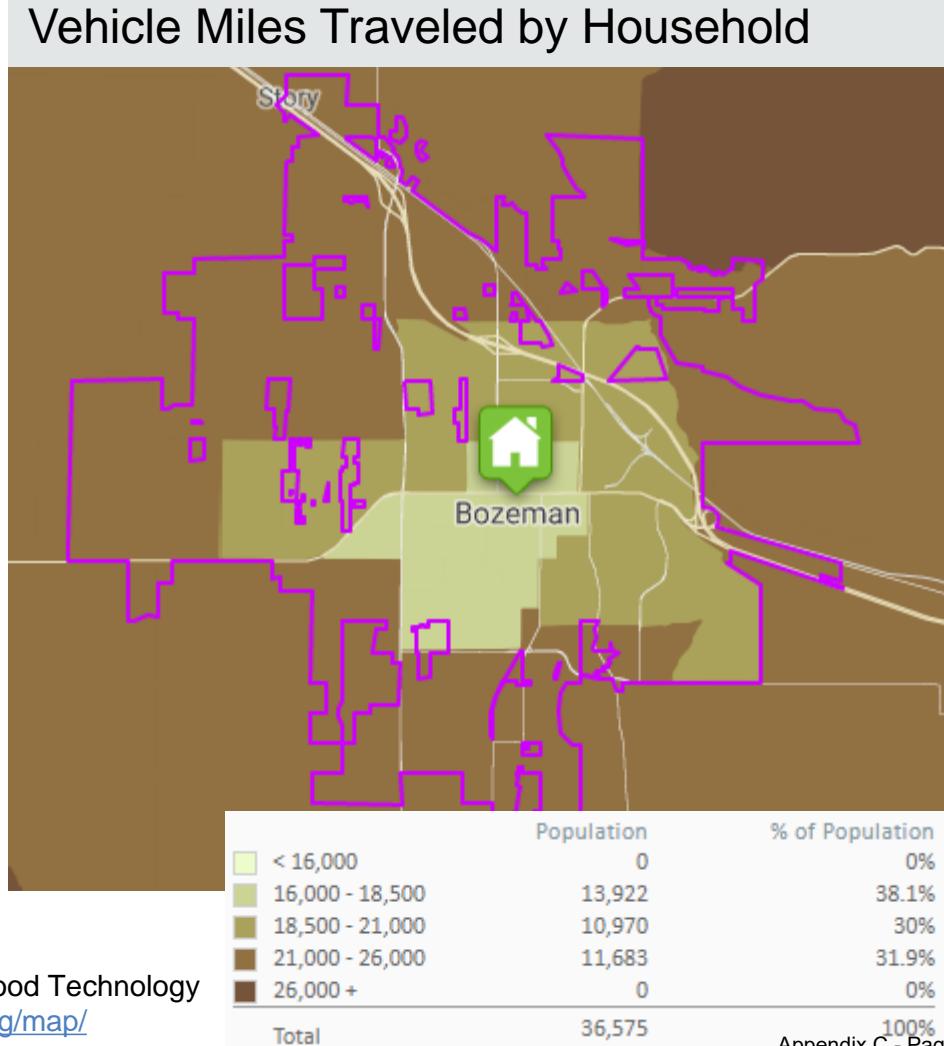
Solution 8. Facilitate Compact Development Patterns



Bozeman
Climate
Plan

By reducing the distance residents have to travel to work and basic amenities, transportation based emissions can be reduced.

- The most influential factor for the amount people drive is distance to downtown.
- Mixed-use neighborhoods have additional community building benefits.



Solution 8. Facilitate Compact Development Patterns



Bozeman
Climate
Plan

Current Efforts

- Negligible impact to on-road emissions
 - Unified Development Code (4/2018) includes changes to standards such as allowing higher density requirements and smaller lot sizes.
 - Community Plan establishing future land use patterns

Best in Class

- 31% on road vehicle emissions reduction (12% of projected 2050 emissions)
 - Based on the average increase in population density of the top performing cities.
 - Then the typical influence of distance to downtown and population density were then applied to this increase

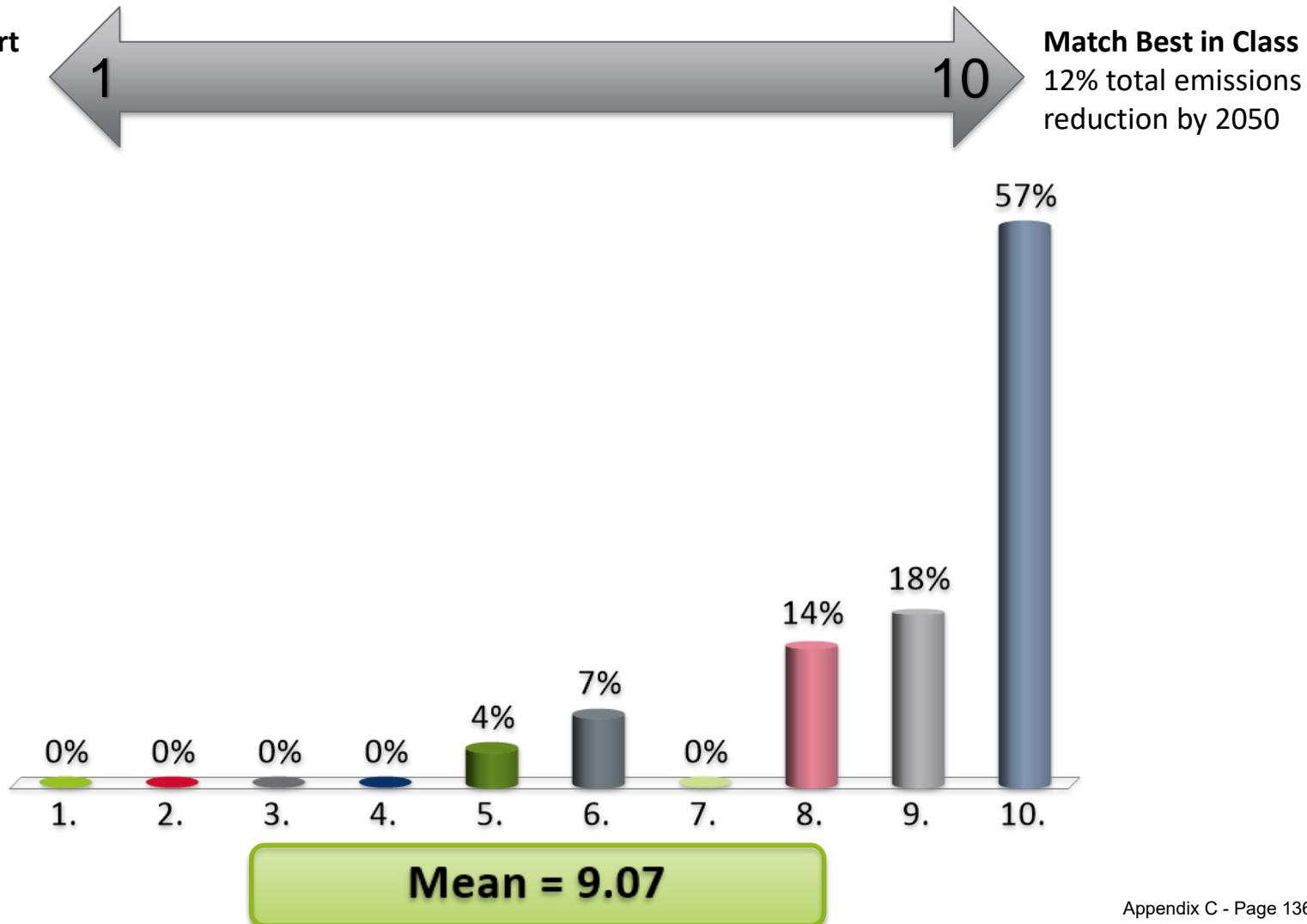
On scale of 1-10 what level of emissions reduction do you think Bozeman should target through this strategy?



Bozeman
Climate
Plan

Current Level of Effort
0% total emissions reduction by 2050

Match Best in Class
12% total emissions reduction by 2050



Solution 9. Increase Use of Alternative Transportation

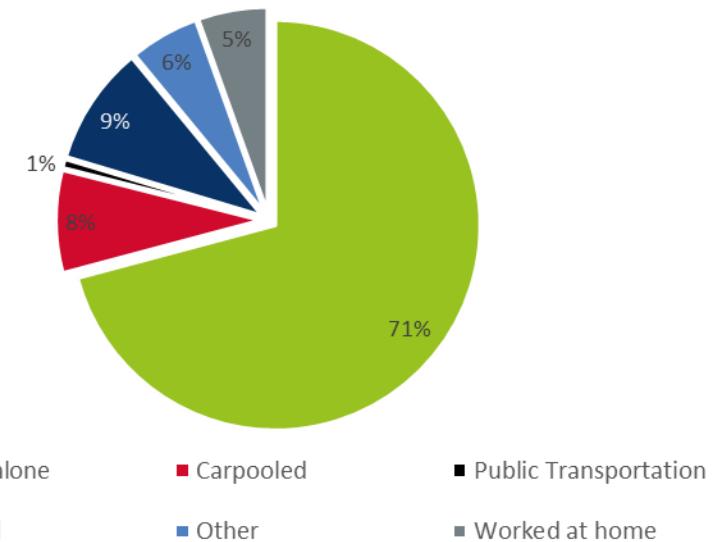


Bozeman
Climate
Plan

Increase the percentage of residents using alternative transportation to commute.

- Most residents drive alone to work
- Transit use is more feasible in denser development, so this solution is tied to Solution 8

Commuter Mode Breakout
Bozeman 2016



Solution 9. Increase Use of Alternative Transportation



Bozeman
Climate
Plan

Current Efforts

- Negligible impact to on-road emissions
 - The portion of Bozeman residents using alternative transportation decreased from 2012 to 2016

Best in Class

- 28% on road vehicle emissions reduction (11% of projected 2050 emissions)
 - Ithaca, NY has the highest alternative transportation rate of cities under 50,000 people

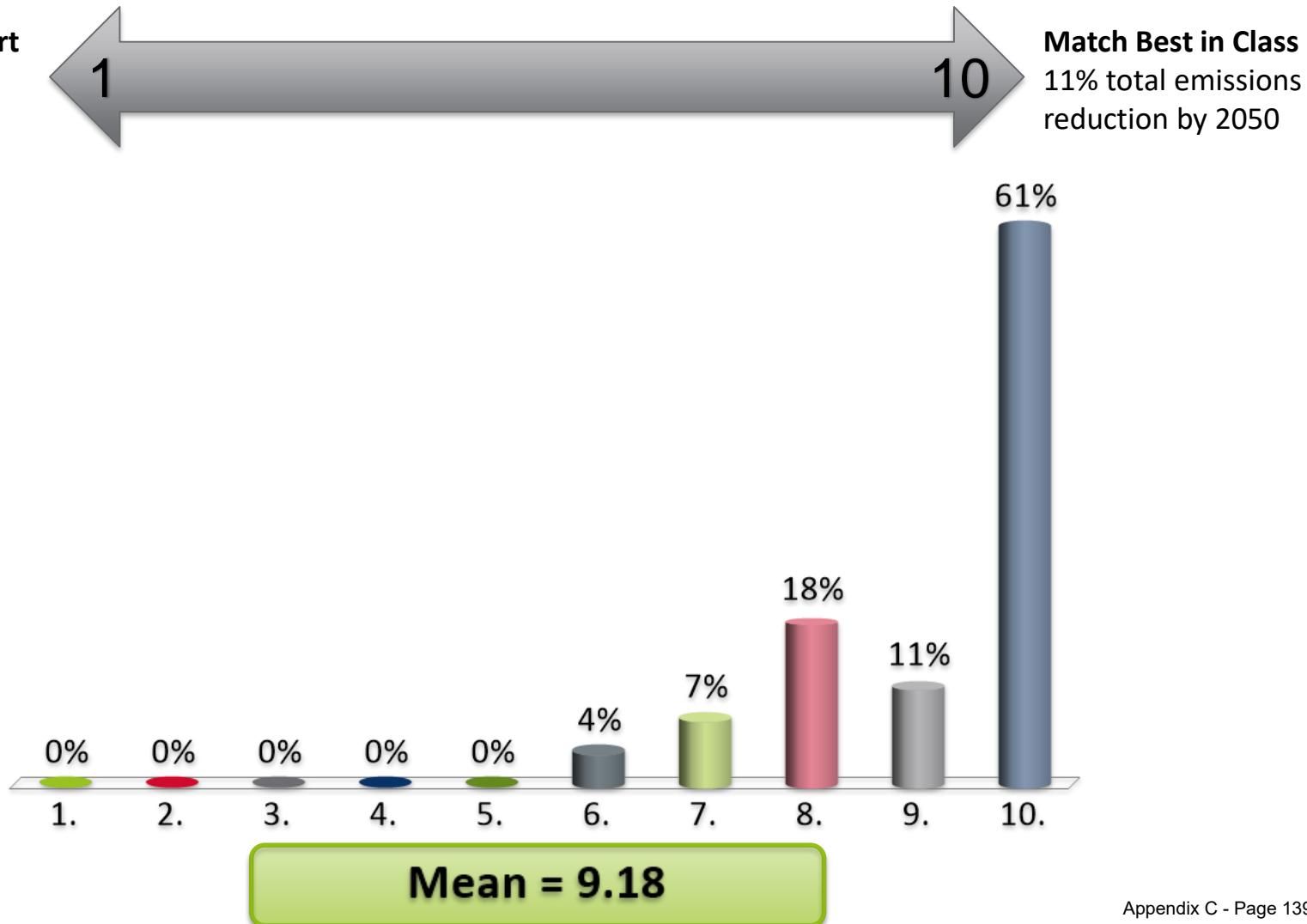


On scale of 1-10 what level of emissions reduction do you think Bozeman should target through this strategy?



Bozeman
Climate
Plan

Current Level of Effort
0% total emissions reduction by 2050



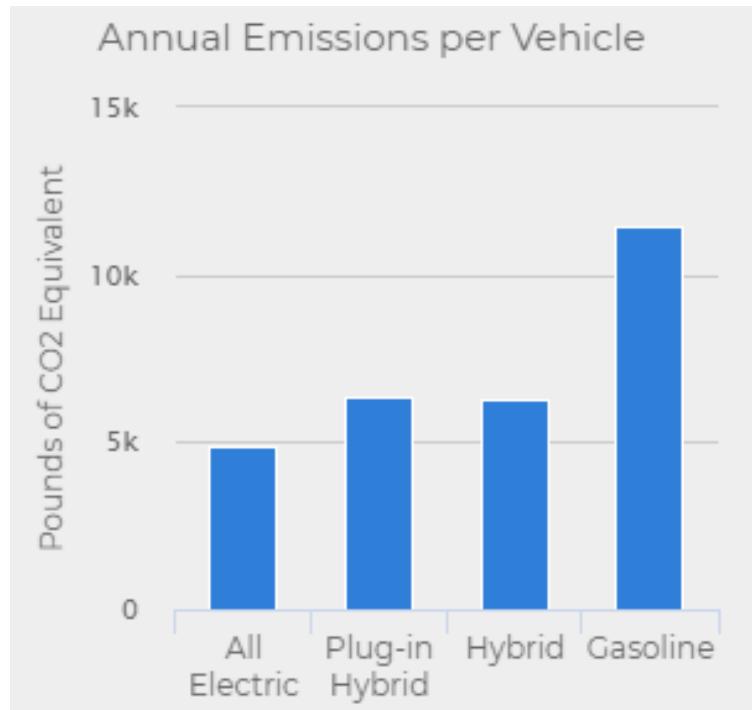
Solution 10. Decrease Direct Vehicle Emissions



Bozeman
Climate
Plan

Work to improve the efficiency of vehicles in Bozeman through high efficiency cars and transition to electric vehicles.

- Near term most Bozeman residents will use a personal vehicle for transportation.
- Vehicle fuel efficiency is often the easiest way to influence on road emissions.
- Does not address other transportation issues like traffic congestion.



Emissions by fuel type: Montana State average
US DOE Alternative Fuels Data Center
https://afdc.energy.gov/vehicles/electric_emissions.html

Solution 10. Decrease Vehicle Emissions



Bozeman
Climate
Plan

Current Efforts

- 9% on road vehicle emissions reduction (4% of projected 2050 emissions)
 - Bozeman saw a 3% improvement in emission per mile traveled between 2012 and 2016
 - This is similar to rates seen nationally
 - Expect these gains to start to plateau.
 - Projected half this annual rate of savings out to 2050
 - Percentage of EVs in Bozeman is negligible

Best in Class

- 69% on road vehicle emissions reduction (27% of projected 2050 emissions)
 - Efficiency gains likely from EVs by 2050
 - Examined projected trends of EV sales light duty vehicles and typical vehicle turnover rate.
 - Anticipate nation-wide light duty rate is about 70% by 2050
 - Best in class communities will likely be about 95% light-duty EVs
 - Does not assume significant EV adoption for heavy-duty vehicles since commercially viable technology doesn't exist currently.

On scale of 1-10 what level of emissions reduction do you think Bozeman should target through this strategy?



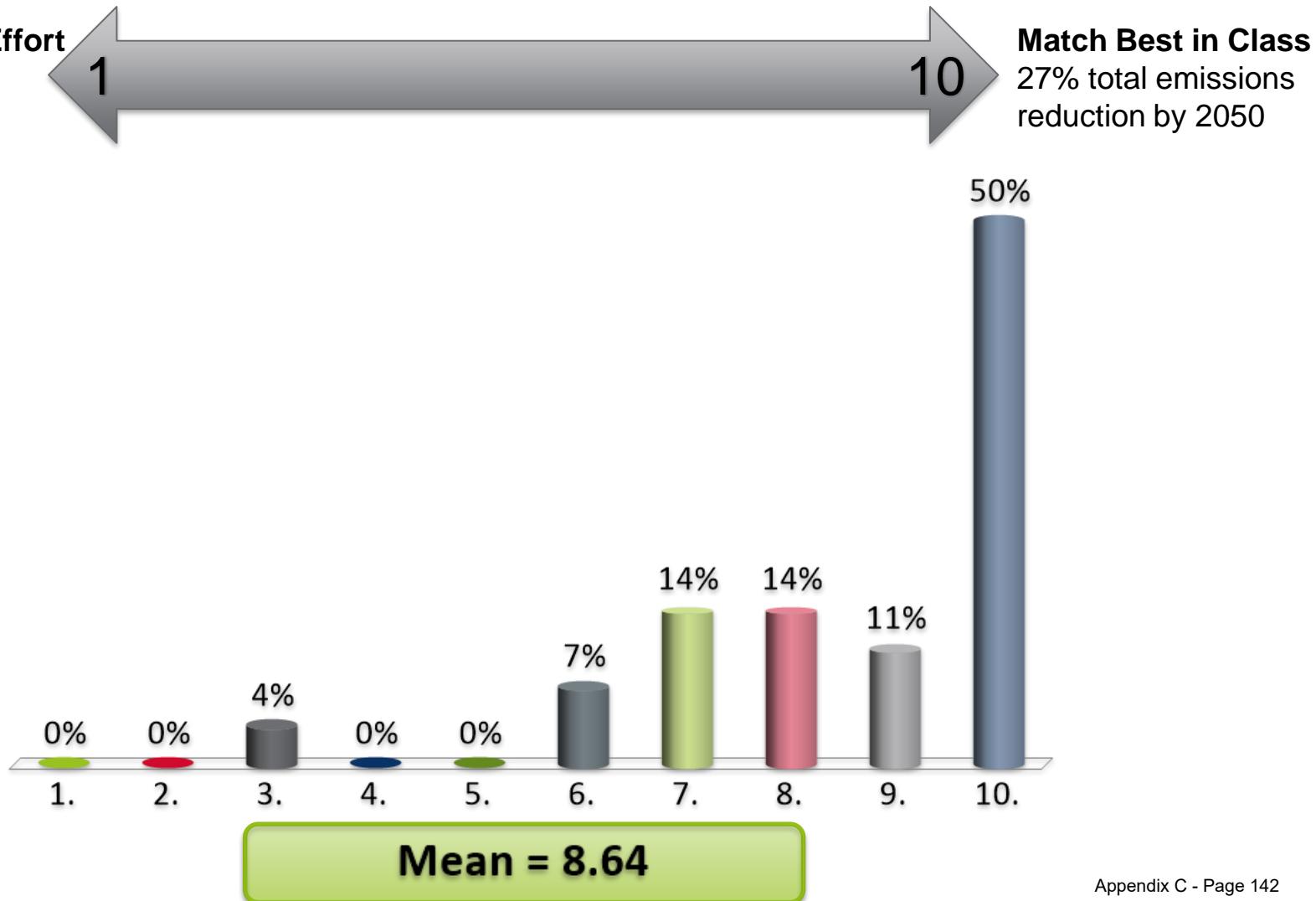
Bozeman
Climate
Plan

Current Level of Effort

4% total emissions
reduction by 2050

Match Best in Class

27% total emissions
reduction by 2050



Solution 11. Advocate for Increased Airline Fuel Efficiency



Bozeman
Climate
Plan

Advocate for airline fuel efficiencies.

- Airlines have developed technology to improve fuel efficiency.
- Retrofits of existing airplanes is possible.



By redlegsfan21 - Flickr, CC BY-SA 2.0,
<https://commons.wikimedia.org/w/index.php?curid=38043012>

Solution 11. Advocate for Increased Airline Fuel Efficiency



Bozeman
Climate
Plan

Current Efforts

- Negligible impact on airline fuel efficiency
 - Bozeman saw a significant increase in airline emissions between 2012 and 2015

Best in Class

- 12% in airline emissions (1% of projected 2050 emissions)
 - Based on anticipated fuel efficiency gains and market penetration possible from Project Drawdown.

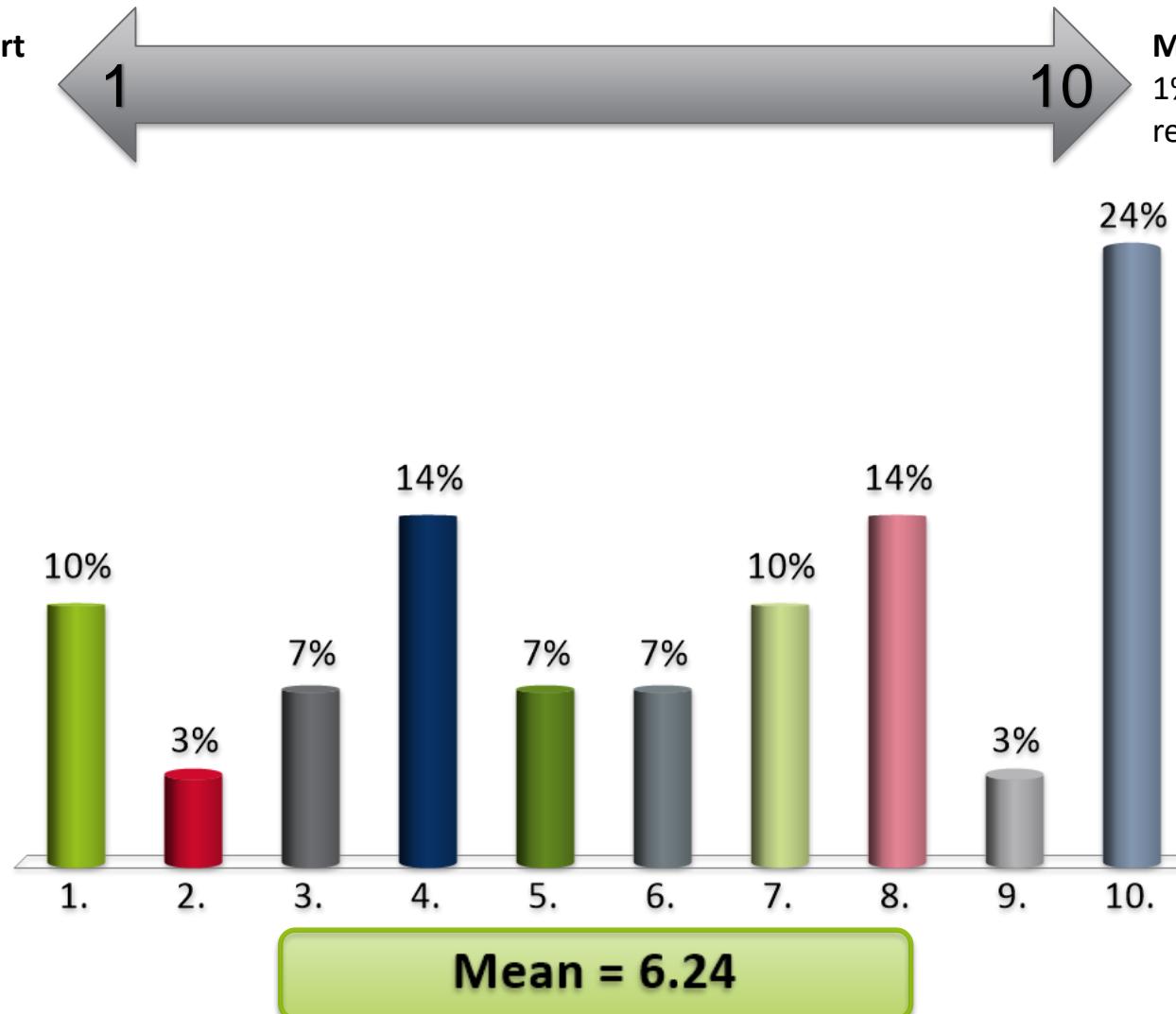
On scale of 1-10 what level of emissions reduction do you think Bozeman should target through this strategy?



Bozeman
Climate
Plan

Current Level of Effort
0% total emissions reduction by 2050

Match Best in Class
1% total emissions reduction by 2050



Land Use Carbon Sequestration Opportunities



Bozeman
Climate
Plan



Regenerative Agriculture Practices*
(0.4 MT CO₂e per hectare)



Managed Grazing*
(0.63 MT CO₂e per hectare)



Afforestation*
(4.7 MT CO₂e per hectare)



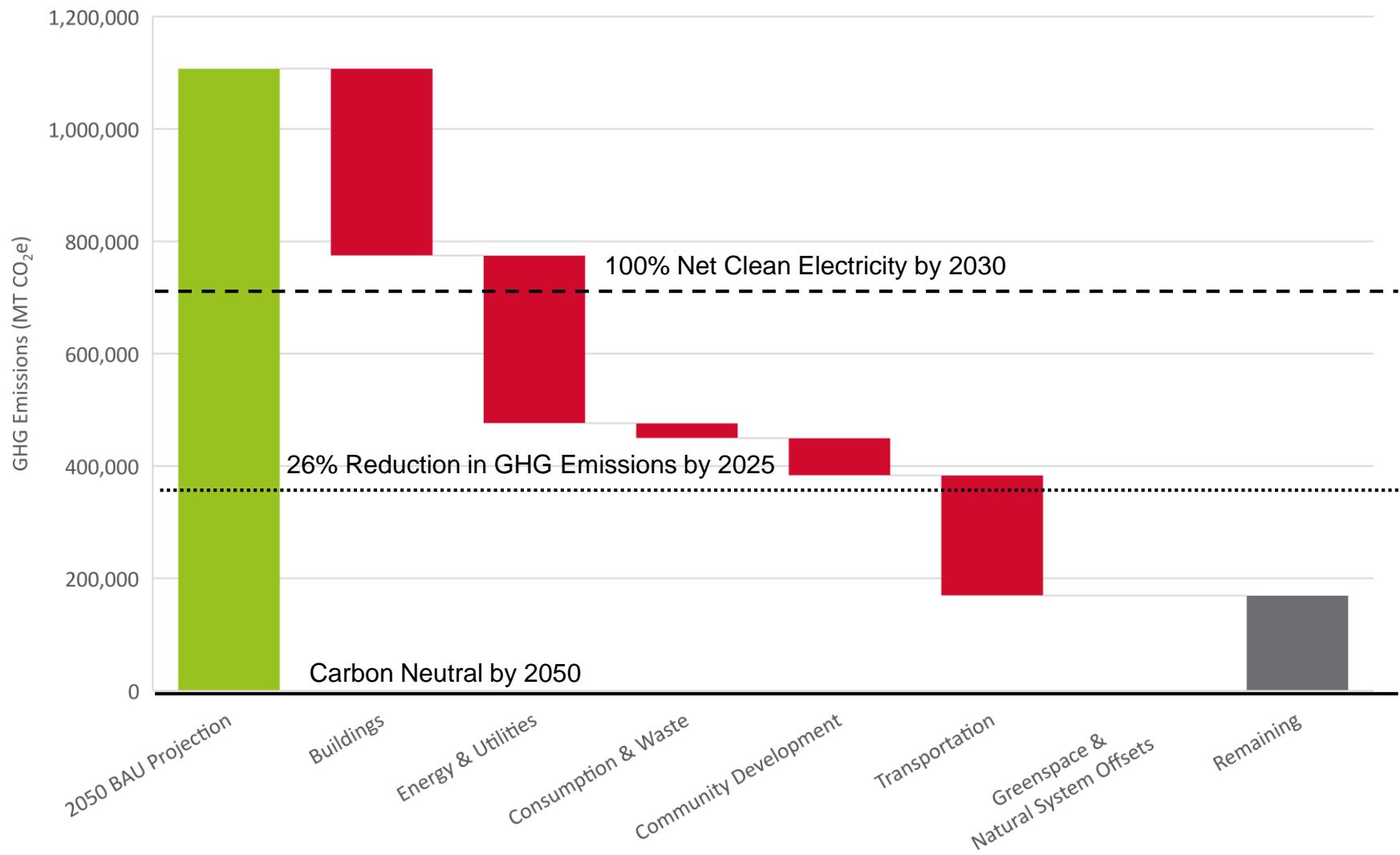
Urban Forest
(145 lbs. per tree)

*Photos and sequestration estimates from Project Drawdown: <https://www.drawdown.org/>

Drawdown Scenario to be Developed



Bozeman
Climate
Plan





Bozeman
Climate
Plan

Defining and prioritizing susceptible systems

VULNERABILITY AND RESILIENCY

Climate Resiliency



Bozeman
Climate
Plan

The ability and extent to which systems can prepare and plan for, absorb, respond to, recover from, and adapt to the effects of climate-related shocks and chronic stressors.



Resiliency Goal

Survey Feedback

60%	Create a community that can respond quickly to and recover from climate related events and stressors through well planned infrastructure, supportive social networks, and balanced economic prosperity.
0%	Understand and prepare for expected climate and weather changes due to climate change.
30%	Incorporate climate change resiliency considerations into City decision making at all levels.
10%	Other: <ul style="list-style-type: none">• A mix of all 3 would be best• At minimum: "Incorporate climate change resiliency considerations into City decision making at all levels."



Bozeman
Climate
Plan

Proposed Revised Goal

Incorporate climate change resiliency considerations into all City decision making and be a community that prepares for, responds quickly to, and recovers from climate-related events and stressors through well-planned infrastructure, supportive social networks, and balanced economic prosperity.

Vulnerability Key Terms



Bozeman
Climate
Plan

Key Term	Definition
Vulnerability	Vulnerability is the degree to which an asset is susceptible or unable to cope with a climate hazard
Risk	The estimated impact that a hazard would have on people, services, facilities, and structures in a community
Sensitivity	The degree to which an asset is affected by exposure to a climate hazard.
Adaptive Capacity	The degree to which a system can currently cope and accommodate change caused by exposure to a climate hazard within existing resources and constraints.
Shock	A sudden acute event that refers to a high-impact, short-term event that may significantly affect basic services, public safety, or the environment
Stressor	A chronic stress that refers to an ongoing environmental, social, and/or economic issue that weakens a system

Climate Plan Focus Areas: What assets could be considered?



Bozeman
Climate
Plan

Assets are the physical elements of a city that act as key resources for maintaining quality of life.

Buildings

- Homes
- Businesses
- Schools
- Community Buildings

Neighborhoods

- Historic Preservation
- Affordable Housing
- New Development
- Redevelopment

Consumption & Waste

- Landfills
- Recycling Facilities
- Disposal Infrastructure

Energy & Utilities

- Electricity
- Natural Gas
- Propane
- Renewable Energy

Greenspace, Food Systems & Natural Environment

- | | |
|--------------|---------------|
| •Parks | •Urban Forest |
| •Open Space | •Gardens |
| •Agriculture | |

Transportation

- | | |
|-----------------|-----------------|
| •Road | •Paths & Trails |
| •Sidewalks | •Vehicles |
| •Transit System | •Airlines |

Climate
Equity

Human
Health &
Well-Being

City Assets

Major Climate Hazards



Bozeman
Climate
Plan



Extreme Heat – More severe and intense



Flooding – More severe



Drought – More frequent and intense



Mountain Snowpack – Decline in volume



Wildfire – More extensive, frequent, and intense



Winter Storms – More severe





Extreme Heat (Stressor)



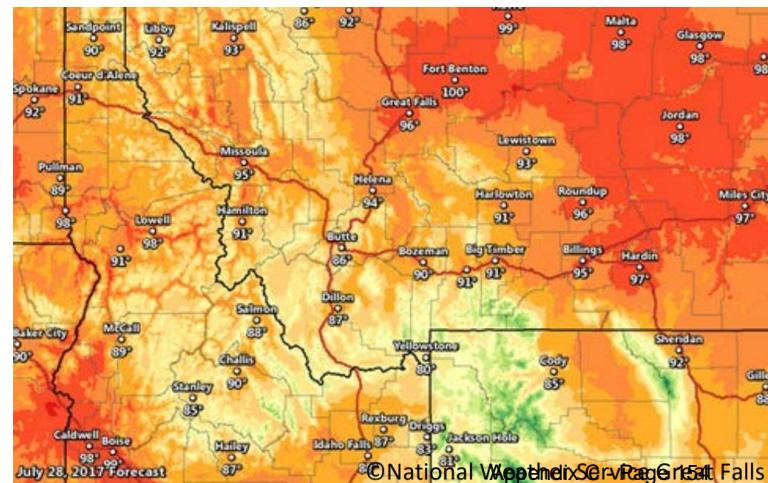
Bozeman
Climate
Plan

Future Conditions

- Increased annual and seasonal temperature averages
- Increased number of days with extreme heat
- Impacts on health, comfort, and well-being
- Increased energy use (air conditioning)
- Impacts on air quality and urban heat island

Highly Vulnerable City Assets

- Law & Justice Center (old)
- Shops Complex
- Bozeman Senior Center
- Lindley Center
- Story Mill Community Center



Flooding (Shock)



Bozeman
Climate
Plan

Future Conditions

- ➥ More frequent precipitation
- ➥ Potential inability to store increased volumes of water
- ➥ Increase risk to human health and safety
- ➥ Increase in extent and damage to City and private property

Highly Vulnerable City Assets

- ➥ Bozeman City Hall
- ➥ Bozeman Fire Department Station #1
- ➥ Story Mill Community Center





Drought + Mountain Snowpack (Stressors)



Bozeman
Climate
Plan

Future Conditions

- ➥ Warmer average temperatures
- ➥ Decline in snowpack volume and earlier snowmelt
- ➥ More intense, longer, and more frequent droughts
- ➥ Challenges meeting needs of all water users
- ➥ Municipal operations and services at risk
- ➥ Potential tourism industry impacts

Highly Vulnerable City Assets

- ➥ Water Treatment Plant operations
- ➥ Swim Center





Wildfire (Shock)



Bozeman
Climate
Plan

Future Conditions

- Negative impacts on water quality (sediment, and heavy metals)
- Increase risk of damage to Hyalite Reservoir
- Increase risk of flash floods and landslides
- Unhealthy air conditions





Highly Vulnerable City Assets

Wildfire

- Water Treatment Plant operations
- Story Mill Landfill/Convenience Site/HHW
- Lindley Center

Smoke

- Shops Complex
- Alfred Stiff Professional Building
- Bozeman City Hall
- Law & Justice Center
- Story Mill Community Center
- Senior Center
- Bozeman Public Library



Winter Storms (Shock)



Bozeman
Climate
Plan

Future Conditions

- More frequent and severe winter storms
- High snow loading compromising building integrity
- Impacts to building equipment and functions

Highly Vulnerable City Assets

- Parking Garage
- Beall Rec Center
- Swim Center
- Bozeman Senior Center
- Bozeman Fire Department Station #1



Resiliency Discussion

- Which of our focus areas and assets (e.g., people, services, facilities, structures) are most vulnerable to these risks? Why?
- Which of our focus areas and assets (e.g., people, services, facilities, structures) have the most adaptive capacity? Why?



Bozeman
Climate
Plan

Climate Plan Focus Areas



Cross-Cutting Topics





Bozeman
Climate
Plan

What's next?

WRAP UP & NEXT STEPS

Next Steps



Bozeman
Climate
Plan

Climate Team

- Post-workshop assignment (early 2020)
- Workshop 3 – March 24

Community Engagement

- Topical Focus Groups – January and February
- Save the Date: Community Event – February 18, 2020 evening
- Community Survey - February
- Community Forum - May



BOZEMAN CLIMATE PLAN Buildings Focus Group

Thursday, February 6, 2020, 2:30-4:30
Bozeman City Hall (121 N Rouse Ave) - Commission Room

Focus Group Objectives

- Explore some of the preliminary climate solutions in more detail
- Confirm what solutions are already happening and working well
- Discuss opportunities for new or improved solutions
- Examine the co-benefits and challenges of the solutions

Agenda

Time	Agenda Item
2:30 – 2:50pm	Welcome, Objectives & Introduction Presentations
2:50 – 3:20pm	Climate Strategy #1: Energy Efficiency in Existing Buildings
3:20 – 3:50pm	Climate Strategy #2: Net-Zero Energy New Construction
3:50 – 4:20pm	Climate Strategy #3: Electrify Buildings
4:20 – 4:30pm	Open Discussion & Next Steps

Attendees

Name	Organization
Natalie Meyer	CoB Sustainability
Anders Lewental	Southwest Montana Building Industry Association
Chris Dorsi	MT Weatherization Training Center
Chris Saunders	CoB Community Development
Douglas Fischer	BSD7 Board of Trustees
Jay Sinnott	Bozeman Climate Partners
Heather Higinbotham Davies	CoB Sustainability
Addie Melvin	JM Engineering
Jon Henderson	CoB Strategic Services
Lindsay Schack	Love Schack Architecture
Sarah Rosenberg	CoB Community Development
Tanya Andreasen	CoB Community Development
Wyatt Catron	MT Weatherization Training Center
Kristin Blackler	Montana State University
Jeff Fox	Renewable Northwest

Presentations

Chris Dorsi, Montana Weatherization Training Center:

1. In the building and sustainability field for 40 years
2. Consistently high performance housing has been a tough sell
3. Responsibility to make sure this work doesn't become window dressing
4. If we can't do this here in Gallatin Valley, who possibly can? Should be one of the greenest cities on the planet
5. Important to split out new and existing buildings: almost unrelated to one another
 - o Different methods, materials, approaches, funding streams, incentives
6. Full electrification implies decarbonized grid, which we don't yet have
7. Education is the disconnect
8. Builders associations will deliver what the home buyers and developers need and want. We need to drive the demand

Natalie Meyer/Heather Higinbotham, City of Bozeman Sustainability (see attached presentation)

Discussion Questions

City of Bozeman

- What is the City's role in implementing this strategy?
- Are there new programs, policies, or assets that need to be considered?

Community Partnerships

- What community organizations and partnerships can support implementation of this strategy?
- How should they be engaged and what are their roles?

Community Members

- What is the role of neighborhoods in implementing this strategy?
- What can individuals do to support this strategy?

Market Considerations

- What market transformations are needed for implementation to be effective?
- What incentives should be explored or considered?
- What is the role of business community in implementation?

Challenges and Benefits

- Who might be left out or impacted negatively by implementation of this strategy? How?
- Who stands to benefit from implementation? How?
- Are there resiliency co-benefits? Are there human health co-benefits?

Preliminary Solution Ideas

These preliminary ideas are pulled from the Climate Plan community engagement activities and are provided to help inform the discussion.

Discussion Notes:

Energy Efficiency in Existing Buildings

- City Policy/Program/Codes/Engineering Standards
 - o Limit use of outdoor gas/electric heaters
 - o Benchmarking program
 - Building energy use disclosure for large commercial

- Efficiency programs to target low income populations, renters, mobile homes, and/or owners of older homes
 - Messaging: it is easier to sell comfort, safety, durability, children's health than efficiency/kWh. EE= "happier, healthier, wealthier"
 - *Community Partnerships:*
 - MSU students with infrared cameras
 - HRDC & section 8 applicants: home buyer education on utility bills and opportunities for improvement
- Buildings recommissioning programs
 - Need to identify incentives
- Energy Use disclosure at point of listing (MLS)
 - Home Energy labeling, Energy Star, Pearl
 - Require efficiency upgrades before selling
 - Tie to home loans?
 - *Challenges and benefits:*
 - Motivations are challenging—people want granite counter tops and don't care about efficiency
 - Tabs on MLS for Energy Star, LEED, ACH, etc. have been there for years; nobody asks about them or uses them
 - Most loans are sold to Fannie and Freddie. If they don't require it, industry is less likely to do it
 - There is a lot of opportunity in homes 10-40 years old with air sealing, HVAC upgrades, furnace exchanges
 - Education for general public—they in general have no idea that their homes are leaking air or furnaces could be more efficient
 - *Market considerations:*
 - Must have tangible value to Realtors and banks
 - Could incentivize banks to offer lower interest loans because of better health and durability and lower default risk, loans could be more secure
 - When capital is available for home purchase, tie into mortgage
 - Banks sometimes offer lower down payments if a home can demonstrate lower utility bills
 - Educate banks to talk to borrowers about benefits of energy efficiency
- Residential rental licensing program with safety and energy efficiency provisions
 - Help address split incentive for landlords/tenants
 - *Market considerations:*
 - Can landlord charge more for energy efficient rentals to recoup costs? Generate \$ for EE and affordable housing
 - ~50% of housing in Bozeman is rentals
 - If market is slow, rating system and reviews might be beneficial. Slow market may not/probably won't last. Also rentals change quickly from year to year
 - If more rentals become energy efficient, will pressure less efficient properties to upgrade
 - *Community Partnerships:*
 - MSU education: rate property manager/rental
 - NWE on-bill financing, Universal System Benefits (USB) funds?
 - *Challenges:*
 - Large shares of the city have no records
 - Can City charge higher licensing fees for less efficient buildings? More stick than carrot
- Use thermal imaging/drone technology to identify least efficient buildings

- *Community Partnerships:*
 - MSU students with infrared cameras to target older homes
 - FLIR
 - Potential for private company entrepreneurship
 - SWMBIA
- Education
 - Promote energy efficient lighting
 - 10% energy reduction challenge
 - Yard sign recognition
 - Certified contractors network
 - Builders as educators: this is the entry point
 - Direct training
 - Improve conversion rates after energy audit
 - *Community partnerships:*
 - Couple service providers
 - On-bill financing through NWE
 - Green home tours and energy efficiency retrofit tours
 - Who are the captive audiences in town? First time home buyer classes (four hundred in past few years), folks applying for section 8 rental housing vouchers (approximately 700 people in community)
 - Divide efficiency programs into incentives, materials/product exchanges (similar to toilet exchange), and straight up funding. We need to pay people who can't pay to make their home more efficient. Incentives make sense for building community, and perhaps less sense for individual with less cash (referring to those who are receiving housing assistance)
 - MSU/City partnership to educate students as they are moving off campus. Can/should include info on energy efficiency.
 - Program will include online platform to search for roommate, room to rent, rental house, and opportunities to rate that property or property manager. Could include energy efficiency or other components as items to rate
 - Challenge: some students just aren't heating their houses in winter
- State Law or State Energy Code
 - Property Assessed Clean Energy (PACE) financing
 - Identify heat leaks and offer support loans to address
 - Air sealing renovation is key
 - Air sealing is the most cost effective energy efficiency measure in older homes
 - *Community Partnerships:*
 - On-bill financing through NWE
 - Incorporate incentives?
 - Should be revenue generating for NWE
- Utility/Regulatory
 - Tiered utility rate structure that penalizes high energy demand
 - Support real time electrical usage to impact behavior change
 - City petition PSC to open investigation into what NWE is using the USB funds for, and whether there are other/better uses for those funds their customers are paying to NWE each month. Work with NWE to develop program to incentivize. NWE residential incentives have gradually disappeared.
 - NWE audit program is underutilized. Audit-lite. Conversion rate is 1-2%. A lot of consumers may believe having the audit done is actually doing the work. How can we leverage, couple service providers with auditors to increase conversion rate? Could partner with MSU students to drive around with infrared cameras and identify biggest needs.
 - Ask NWE to send audits to energy efficiency contractors, if homeowner agrees. Opt in or opt out?

Net-Zero Energy New Construction

- City Policy/Program/Codes/Engineering Standards
 - Prohibit or restrict installation of outdoor gas/electric heaters
 - Stretch Code
 - Incentivize efficient building envelopes
 - South-facing, solar, EV, 50-amp outlet, passive heating, natural lighting
 - Incentivize solar PV for commercial buildings
 - Encourage LEED, Passive House, and 3rd party certifications
 - Encourage passive heating and cooling
 - Building orientation: it doesn't cost any more
 - Disclose carbon intensity of materials
 - Use carbon negative materials such as hempcrete
 - Incentivize
 - Require life cycle analysis
 - Provide a list of various building materials that show carbon intensity for builders to be able to compare/decide
 - Partnerships:
 - All manufacturers have that information. LCA: how do we help people quantify?
 - Incentivize smaller homes
 - Identify unintended consequences of home limitations. Measure to inside walls instead of exterior, that won't inadvertently require more building materials because of not being able to use standard sizes
 - City require 3rd party verification of ACH
 - Community Partnerships:
 - Pearl home certification for residential. Private for profit targeting real estate community more than buyers or sellers
 - Potential for statewide stretch code
 - Challenges and Benefits:
 - Code does not require proper ventilation
 - Must include health and safety in conversation about efficiency
 - Struggle to find true incentive could offer at city level that would be of value to builders
 - 2018 IECC includes performance path for rating system; could be simple tool to use
 - Introduces builders to performance testing for the first time
 - Stretch Code Incentives
 - Market differentiation/recognition
 - City seal, certification
 - Motivates home buyer, builder
 - Reduced fees
 - Expedited review
 - Benchmarking
 - Building energy use disclosure for large commercial
 - Design EV service equipment-ready for large commercial and multi-family
 - Charge (even) higher fees for larger homes and/or further from city center
 - Impact fees are difficult to prove life cycle savings, especially when considering occupant behavior
 - At some point, get to the plateau of addressing discretionary consumption. We've come a long ways in terms of reduction
 - Require net zero energy for all buildings receiving public funding

- CoB incentivize or require energy modeling
 - 3D heat mapping of buildings (specifically commercial but can work in residential): can change windows, shading, orientation, etc. prior to building the building
 - Require builder/contractor training
- Education
 - Promote energy efficient lighting
 - Promote pilot projects
 - Certified contractors network
 - Builder training
 - Promote above code construction
 - Green home tours
 - Low energy cooling systems
 - Explore green or cool roofs
 - Bird-friendly glass
 - *Community Partnerships:*
 - HOA model best practices, including how to revoke solar PV prohibitions
 - How to work with existing HOAs to make changes?
 - Model covenants would save developers legal fees to draft covenants
 - Banks: Could incentivize banks with lower interest loans because of better health and durability and lower default risk
 - Any potential with insurance companies?
 - *Challenges and Benefits:*
 - Private capital, education, banks, Realtors
 - Resiliency component
 - School district: uphill battle to convince board to prioritize efficiency, because tradeoffs for teacher salary, whiteboards, etc. District not considering LEED or Living Building Challenge
 - MSU backstop: State High Performance Building Standard
 - Always discussion with financial decisions, pay now or pay later
 - All schools built through bonds; operating costs paid from general fund
- State Law or State Energy Code
 - Property Assessed Clean Energy (PACE) financing
 - C-PACE
 - *Community Partnerships:*
 - Banks
 - Require solar PV or PV-ready on all new construction
 - Require 3rd party testing of building envelopes (blower door/duct testing)

Electrify Buildings

- City Engineering Standards, State Energy Code, and Utility Incentives
 - Encourage conversion of natural gas appliances to electric
 - Require all electric in new construction
 - Do not allow new gas lines
 - Don't build for obsolescence
 - Multi-family attrition of gas lines: pure physics. Cheaper to build all electric because of cost of installing vent lines in each residence and multiple sets of utilities and infrastructure
 - If NWE is installing gas lines for free and people aren't using them, cost to utility
 - Convert propane and heating oil systems to electric
- *Community Partnerships*
 - HOAs
- *Challenges and Benefits*
 - Is it legal to ban natural gas? Must provide utility easement—phone, power, cable, fiber, etc.

- Unknown if HOA could prohibit gas. Could put in covenants but utility has right to do whatever they want in that easement; it is their easement. They could still install gas lines, but developer doesn't have to allow homes to hook up
 - Private HOA covenants are powerful in MT.
- NWE concern about being able to meet peak capacity with existing natural gas; having to use diesel
 - Restrictions on utility to provide services
 - NWE may not be properly planning for electrification loads and putting in proper rights of way
 - Technology limitations for heat pumps in extreme cold

Suggested Reading & Resources

City of Bozeman Sustainability

- Commercial Efficiency: <https://www.bozeman.net/government/sustainability/bozeman-energy-project>
- Residential Efficiency: <https://www.bozeman.net/government/sustainability/residential-energy-efficiency>

Municipal Natural Gas Bans, Climate Law Blog:

http://blogs.law.columbia.edu/climatechange/2020/01/09/municipal-natural-gas-bans-round-1/?utm_source=FINAL+Jan+30+2020+USDN+Weekly+Update&utm_campaign=Jan+30+2020+Weekly+Update&utm_medium=email

PACE Nation, What is PACE Financing? <https://pacenation.org/what-is-pace/>



BOZEMAN CLIMATE PLAN Energy & Utilities Focus Group

Bozeman Fire Station #3 (1705 Vaquero Pkwy) – Community Room
Monday, February 10, 2020, 2:30pm-4:30pm

Focus Group Objectives

- Explore some of the preliminary climate solutions in more detail
- Confirm what solutions are already happening and working well
- Discuss opportunities for new or improved solutions
- Examine the co-benefits and challenges of the solutions

Agenda Template

Time	Agenda Item
2:30 – 2:50pm	Welcome, Objectives & Introduction Presentations
2:50 – 3:20pm	Climate Strategy#1: Utility Renewable Energy Mix
3:20 – 3:40pm	Climate Strategy#2: Green Power Programs
3:40 – 4:20pm	Climate Strategy#3: Distributed Solar Generation
4:20 – 4:30pm	Open Discussion & Next Steps

Attendees

Name	Organization
Natalie Meyer	City of Bozeman Sustainability
Danica Jamison	Greater Gallatin United Way
Chris Pope	HD65 MT Legislature
Britt Ide	Ide Energy
Karen Kirk	Science writer
John Bushnell	NorthWestern Energy
Terry Cunningham	City of Bozeman Commissioner
Jay Sinnott	Bozeman Climate Partners
Jeff Fox	Renewable Northwest
Jon Henderson	City of Bozeman Strategic Services
Emma Bode	Forward Montana Foundation
Kristin Blackler	MSU Office of Sustainability
Heather Higinbotham Davies	City of Bozeman Sustainability
Claire Vlases	Bozeman High School

Presentations

Natalie Meyer, City of Bozeman Sustainability

(Acknowledgment of World Resources Institute and Rocky Mountain Institute for use of some graphics)

- City commission signed 100% net clean energy provisional resolution
 - 140 cities across 30 states (not including Bozeman or Helena)
- Cities are increasingly collaborating with utilities to identify solutions to reach those 100% renewable energy goals
 - Formal and informal partnerships: six across six states
 - Case study through Duke Energy, six communities working together
 - Collaborations focus on integrated resource planning, distribution grid planning, smart cities strategies, EV infrastructure, data transparency
- NWE grid portfolio: 61% carbon free energy
 - Three cities with 100% renewable energy goals: Missoula, Helena, Bozeman
 - Proposed Colstrip purchase: 56% carbon free energy
 - 2019 Resource Procurement Plan details carbon intensity
 - Two major decreases relate to qualifying facilities KELP and YELP
- City targets are based on sense of responsibility to constituents and guiding principles around equity and climate action and resiliency
- NWE responsibilities are to investors; NWE is a business
- Opportunities around energy efficiency, renewable energy, distributed resources, electrification of buildings and transportation, demand response, energy storage
- Grid transformation: increasing clean energy percentage base grid mix
 - Resource planning, accelerating coal and natural gas plant retirements, clean energy portfolios as alternative to new gas and coal
- Important to recognize that utility planning is on a long-term scale
 - Immediate opportunities: energy efficiency and local renewable energy
 - Emerging opportunities: smart metering, demand response, pricing to incentivize time of use, distributed resources, electrification, storage
 - Long-term: grid mix
- Challenges: cold snaps and variable weather with climate change
- Unique regulatory environment in Montana
- We know generation assets do not meet capacity needs
- Legal limitations: MT code requires “adequate, reliable electricity supply service at the lowest long-term cost”
- Renewable Energy Certificates (RECs): have always been available to City of Bozeman to purchase to offset, but the City has never purchased RECs and doesn’t see that as best tool to make a difference
- Onsite solar: limitations with 50kW net metering limit
 - Economies of scale more difficult to reach within constraints of 50kW
- Community solar: in MT, it would have to be utility-led
 - Can pair with local assets to bring down price
 - Successful examples across the country
 - No enabling legislation in MT: three projects in state are led by co-ops
 - Colorado Excel Energy program is very successful
 - Third party can help with admin burden
- Sleeved Power Purchase Agreement (PPA): work with utility to identify/develop a project, come to contract agreement on price, bundled RECs (energy + REC) are sold to utility and passed through to end customer
 - Has been done at the city level; originated at corporate level with companies like Walmart
 - Would require a large customer as the anchor or flexible off-taker to lead project with utility

- Green tariffs: similar to PPAs but open to an entire customer class (commercial, residential). Developer works with utility, sells bundled RECs to utility, customers can participate
 - Can be larger scale so possibly more cost effective
 - Additional renewables on grid
 - Fixed predictable long-term price for energy
- NWE has offered E+Green program, which is unbundled RECs (different from a green tariff)
- Rocky Mountain Power and SLC area partnership to develop legislation that allows communities that opt-in to work with utility to achieve 100% net renewable energy by 2030
 - Key parts of legislation: collaboration with cities and utility; agreement to guiding principles around cost shifting; no REC shifting; no impact to low-income customers;
 - Distinction between legislation and green tariff or sleeved PPA: with green tariff, everyone has to opt in. With RMP/SLC example, whole community opts in, and individuals can choose to opt out
 - This would require enabling legislation in Montana
 - Montana constitution guarantees the right to a clean and healthy environment

Discussion Questions

City of Bozeman

- What is the City's role in implementing this strategy?
- Are there new programs, policies, or assets that need to be considered?

Community Partnerships

- What community organizations and partnerships can support implementation of this strategy?
- How should they be engaged and what are their roles?

Community Members

- What is the role of neighborhoods in implementing this strategy?
- What can individuals do to support this strategy?

Market Considerations

- What market transformations are needed for implementation to be effective?
- What incentives should be explored or considered?
- What is the role of business community in implementation?

Challenges and Benefits

- Who might be left out or impacted negatively by implementation of this strategy? How?
- Who stands to benefit from implementation? How?
- Are there resiliency co-benefits? Are there human health co-benefits?

Preliminary Solution Ideas

These preliminary ideas are pulled from the Climate Plan community engagement activities and are provided to help inform the discussion.

Utility Renewable Energy Mix

- Wind development
- Biothermal energy from composting facility
- Utility scale renewable energy projects

- Utility scale solar is more cost effective than rooftop solar
- Geothermal electricity
- Municipal utilities or co-op utilities
 - Don't forget possibility of public utilities
- Decouple utility revenue from electricity sales
- Support the development of Green Banks in Montana
 - Sometimes banks are the ones holding up green options because they are worried the building might not be sellable
 - Rooftop and community solar
 - Funding specifically with goals to invest in climate action planning
 - Green banking
 - Public banking: need around investment
 - Crosses multiple focus groups
 - Impact investing, Blackrock announcement
 - Companies wanting to invest in smart climate solutions
 - Predicted that banks would identify the risks of climate change and modify portfolios accordingly
 - Need an economic model: identify the things that will actually pencil and have ROI
 - Educate the community
 - How to include non-economic? I.e. electric school buses and children's health
 - *Partnerships:*
 - North Fork Financial
 - Community Renewables Steering Committee
- Demand response strategies
 - Smart metering (Advanced Metering Infrastructure)
 - Coordinate with utility on rebate/incentive programs to increase energy audit conversation rate
 - Time of use rates plus education for time-of-use impacts, peak loads, shifting behaviors to off-peak hours. How do consumers get that info? Currently not available from NWE
 - NWE in process of deploying AMI technology for gas and electricity; will come into Montana with years of experience deploying in SD. NWE pilot for AMI in Bozeman encouraged
 - Currently working on widget on NWE home page to share resource mix in real time for consumers to make informed decisions
 - Nothing exists today for consumers to get this information. How does utility get info out, but also how does this group/coalition get the info out? What are best practices of when to avoid utilities' peak demand periods?
 - We know when the grid is peaking in summer and winter; that is in resource procurement plan
 - Bozeman has AMI for water; nobody has resisted. Not entire city has upgraded, but probably 60% of customers
 - Emphasize customer choice
 - *Challenges:*
 - Some people will not agree due to privacy concerns. Turn conversation into incentive based rather than punitive: you can save \$20/month on utility bills if you participate
 - How do we advocate for the group of folks that can't afford the higher utility costs with time of use pricing?
 - *Partnerships:*
 - NWE: app for utility grid mix
 - Could NWE take the ~\$20M planned to upgrade/repair Colstrip into other renewables instead?
 - *Challenges:*

- Capacity issue: wind and solar aren't always there when needed. Must incorporate storage
- How do we minimize capacity peak so we can use wind/solar/storage?
- Constraints around what NWE can do with procurement in legal framework in which they operate

Green Power Programs

- Green tariff program
 - Potential to structure program to allow federal/state agencies, universities, municipalities, other large users to participate and drive demand
 - Statewide partnership to electrify bus fleet and pair with green tariff program
 - Improve air quality, reduce air pollution:
 - NWE can give time of use rate for bus charging
- Increase participation in green power purchase program

Distributed Solar Generation

- Community solar gardens
 - Low-income household carve out
 - Gives people opportunity to invest who can't afford or whose roofs aren't feasible for rooftop PV
 - NWE could potentially still lead a community solar program. NorthWestern Energy would not likely support community solar virtual net-metering as this would result in a cost shift.
 - A separate community solar could be proposed to the PSC that does not result in a cost shift
 - Bulk bidding: 50% of project cost is customer acquisition
 - Challenges:
 - If the community solar project has to be in City limits, it will be more expensive due to property value
- Smart grid requirements for new neighborhoods
- Rooftop solar installations
 - Low hanging fruit, near term wins: onsite generation
 - Rooftop solar is economical with a 7-10 year ROI (with Investment Tax Credit)
 - Challenges:
 - Acknowledge net metering may have some components of cost shifting, but it is the law of the land today and a solid investment: additional benefits to community including supporting jobs in town, monetary benefits to taxpayers if installed on public buildings
 - Upfront capital costs
 - Not supported by utility
 - More expensive to install than large scale
 - Economic/cost analysis of rooftop solar residential vs. rooftop solar commercial vs. purchasing land for large scale: valuable exercise to come up with economic models and assessment of solar resources and location availability
 - Land, sidewalk, covered parking
 - How to increase efficiency of solar based on where it's sited
 - How to ensure something being built as "solar ready" is truly solar ready: Jabs Hall example at MSU
 - Partnerships:
 - How to collaborate with utility to make it less threatening?
 - Solarize campaigns: education, bulk pricing, community adoption, increased scale
 - MSU: feasibility research, campus solar assessment, revolving loan fund example
- PACE financing for renewables
- Solar or wind development on closed landfill

- Can we work with NWE to determine site constraints at landfill? Are there technological ways of getting around them? Can we develop community solar in partnership with NWE?
 - Landfill site is not near substation, initial assessment with Bozeman Solar Project revealed Water Reclamation Facility (WRF) to be a better location. Still a lot of space available at WRF; anticipated space is for expansion of WRF and redundancy to land-apply waste
- Landfill gas to energy
- Solar farm at Idaho Pole site
 - City doesn't own it
- Build on success of Bozeman Solar Project
 - How do we work with NWE to ensure that Bozeman gets picked for NWE projects? Partnership. Put Bozeman taxpayer \$ down to fund upfront cost and benefit from return
- Financial incentives for solar installations
- Advocate for utility policies that support distributed generation installations
- Renewables on City/public buildings, schools
 - Assess all public buildings
 - Procure in bulk
 - Benefits come back to tax payers: can say exactly when taxpayer will start saving money
 - Takes commitment, financial dexterity, upfront capital
 - Solar bonding program?
- Challenges:
 - We don't have time to exclude the externalities and just focus on low hanging fruit
 - How to monetize the benefits of immediate returns of cleaner air, healthier kids
- Partnerships:
 - Given the net metering limitations, entities like MSU can generate substantial amounts of solar and use it all (non-export system) without being impacted by net metering limitations. Can City cooperate with entity like MSU to develop a solar farm? The energy that MSU could generate and use would reduce GHG emissions.
 - NWE: developing MOU with Missoula and laying out work plan for collaboration with utilities; will be in place by the end of March

Other

- Citizens Climate Lobby: lobbying for carbon fee and dividend on a national level through bipartisan bill
 - Letter from Kristen Walser talked about what a carbon tax could do for the City of Bozeman
 - Economic incentives to reduce carbon with dividend back to citizens
 - City could include specific clause in Bozeman Climate Plan:
 - "The City of Bozeman recognizes the effectiveness of a federal carbon fee and dividend policy to lower greenhouse gas emissions county-wide, while supporting households during the transition, creating jobs, and community health. We encourage our federal delegation to work in a bipartisan way to pass and implement a robust and fair federal carbon fee and dividend policy like HR 763."
 - Show support as a City for legislation at the national level
 - Would the City become an advocate of helpful legislation on any other level, whether it be international, federal, state, or even county? Include support for advocacy in the Climate Plan including support for carbon fee and dividend and any other legislation that will help the City meet goals
 - Support elimination of all fossil fuel subsidies
 - "Request that all departments of the City use a carbon price in their planning to assess ways to transition off fossil fuels; for example, prices for (fill in from Kristen's letter)"

- Assessing city services at a greater amount than the cost to deliver
 - Pricing would figure into decision making as to how green facilities should be, and drive departments to push for more efficient vehicles or energy efficiency in buildings so it wasn't a perpetual premium on city services
- “Use the revenue to pay for energy efficiency measures until a federal law is enacted”
- *Challenges:*
 - Carbon tax might not be high enough to motivate change
 - Doesn't provide any money for just transition or low-income community members to make changes. Sierra Club had concerns about federal bill
 - If tax is not effective in reducing carbon pollution, no recourse
 - Elimination of fossil fuel subsidies might be more clear way to not perpetuate GHG emissions
 - City does not have the ability to tell all gas stations to increase gas prices by \$0.16/gallon; could only apply carbon price to direct/internal City costs and operations
 - Advocating for Carbon Fee & Dividend is a “Letter to Santa Claus”
 - Idea: Colstrip could be ideal test case to demonstrate how to help a community with a just transition from fossil fuels to convert to green energy/climate solutions. Could be a pilot bill the legislature could work together on: labor component, energy, environment
 - Community partners:
 - Group that met in Big Sky (Missoula, Helena, Bozeman, NWE, etc.): community renewables steering committee
 - MACO, MT Association of Cities, labor groups, chambers of commerce
- Determine best “bang for the buck” in the money we do have to spend to offset carbon
 - Economic accountability, responsibility—example 5%, need to show return/cost, climate efficiency
 - *Partnerships:*
 - Epic-N (City-MSU classroom partnership)
- School buses good potential for added storage to the grid in off-use hours. Large pollution source in terms of resident health
 - Unknown how much storage they would provide
- Sleeved PPA with other large customers
 - Best bang for buck: pool with other large entities like Missoula, Helena, Walmart, etc. and determine best place to site it
- Natural gas as transition fuel: rapidly dropping cost of the next electron
 - In next 10 years, prospect for our access to renewables to grow tremendously
 - What position should the City of Bozeman take (smart, scientific, data driven)? Get ahead of the conversation with residential construction to build EV ready, make stronger recommendations that homes are heated by heat pumps before natural gas
 - This applies at the building level but also at the utility level
 - Data driven planning, right-of-way planning for EVs, building electrification
 - *Challenges:*
 - If you build new facilities (plants, pipelines), out 40 years to recoup infrastructure costs
 - Heating in Montana
 - Utility planning for adequate supply
- Support legislation to ease permitting for brownfield sites for renewable energy (i.e. solar at Colstrip)
- Leadership role that Bozeman and Missoula are playing is really important: provide benefits not only to our municipalities but to other communities in the future
- Is there a capacity project the City could support for NWE?
 - RFP, partner with bidders
- Worth mentioning: not that much low hanging fruit left

- City make a commitment that this won't be easy or most fiscally affordable, accept that it is going to take money and will be hard because we've waited so long to act
 - Acknowledge the cost of inaction
- Market consideration: environmental economics of maintaining a healthier environment. Economic value in preserving our resources now.
- Consider potential to be carbon negative, not just carbon neutral: reverse the amount of carbon we've put out, ex: look into what Microsoft is doing
- Acknowledging feelings of helplessness: things we can't do now, but reaching toward those targets and having them on the books
- Health component and data on air pollution:
 - The phase outs of coal over the past 10 years have saved 26,000 American lives
 - Air pollution kills ~100,000 Americans annually
 - Cost implications: \$1 trillion/year in associated health care costs
 - Payback period is essentially instant: when shut off sources of air pollution, health improvements are evident within weeks
 - Actionable, quantifiable, locally relevant
 - City of Bozeman to report on air quality?
- Local renewable portfolio standard for the City for energy: community and City timeline. 100% renewable energy target for City

Suggested Reading & Resources

NorthWestern Energy Carbon Statement, December 2019:

http://www.northwesternenergy.com/docs/default-source/documents/colstrip/carbon_statement_2019-12-10.pdf

NorthWestern Energy 2019 Environmental Stewardship Report (pages 1-11):

http://www.northwesternenergy.com/docs/default-source/documents/environment/environmental_report_2019_v2_5-25x8_web.pdf

Pathways to 100: An Energy Supply Transformation Primer for U.S. Cities

Find "Pathways to 100" at: bit.ly/PathwaysTo100

Greenspace, Food Systems & Natural Environment Focus Group

Tuesday, February 4, 2020, 1:00-3:00pm

Bozeman City Hall (121 N Rouse Ave.) – Madison Conference Room



Bozeman
Climate
Plan

Focus Group Objectives

- Explore some of the preliminary climate solutions in more detail
- Confirm what solutions are already happening and working well
- Discuss opportunities for new or improved solutions
- Examine the co-benefits and challenges of the solutions

Agenda Template

Time	Agenda Item
1:00 – 1:30pm	Welcome, Objectives & Introduction Presentations
1:30 – 1:55pm	Climate Strategy #1: Urban Farms & Gardens
1:55 – 2:20pm	Climate Strategy #2: Water Supply & Conservation
2:20 – 2:50pm	Climate Strategy #3: Carbon Sequestration & Land Management
2:50 – 3:00pm	Open Discussion & Next Steps

Attendees

Name	Organization
Natalie Meyer	City of Bozeman Sustainability
Danica Jamison	Greater Gallatin United Way
Alex Nordquest	City of Bozeman Forestry Division
Jessica Ahlstrom	City of Bozeman Water Conservation Division
Frank Greenhill	City of Bozeman Stormwater Division
Addi Jadin	City of Bozeman Parks Division
Kate Wright	Open and Local
Erin Jackson	Gallatin Valley Farm to School
Selena Ahmed	MSU Sustainable Food Systems
Jay Sinnott	Bozeman Climate Partners
Jennifer Boyer	Farm 51
Libby Khumalo	Citizen-at-large
Eli Frandsen	MSU Geography (recent graduate)
Emma Bode	Forward Montana Foundation

Presentations

Addi Jadin, City of Bozeman Parks Division

- Related to urban farms and gardens, the Park Plan doesn't reference these topics, but developing partnerships would be the best in-road to develop urban agriculture programming in City Parks
 - There are examples of growing partnerships underway: Gallatin Valley Farm to School will be hosting camps at Story Mill Community Park, MSU Extension is interested in becoming the organizing body for our community gardens, the Food Bank has entered into collaboration to manage garden plots at Story Mill Community Park (which is a park that will continue to have a strong partnership with the Trust for Public Lands for ongoing stewardship programs)
- Related to water supply & conservation, the current code says new developments are required to provide parkland based on a ratio to the number of housing units
 - In Bozeman, you can't include natural open space and wetlands in this, only active parks
 - Developers can ask for a waiver of parkland dedication, including protection of critical habitat
 - Waivers can be presented by the developer, but there is no structure or definition for critical habitat, which The Parks Division hopes to address this in the new park plan
- Related to carbon sequestration and land management, Parks works with Water Conservation on natural landscape design
 - Currently the standards for parks only requires sidewalks and irrigation for turf
- Ideas included in the Climate Plan can be built upon in the Parks Plan
- The Parks Division staffing plan calls for a second planner, which they would like to be a landscape architect, who could help shape park landscaping policy

Alex Nordquest, Forestry Division

- The Forestry Division maintain City-owned trees, including boulevards and parks
 - They do not maintain private trees
 - Trees are a unit of city infrastructure that intersect with sustainability, water conservation, and stormwater
- In reference to urban farms and gardens, use caution when considering orchard-style fruit trees that require a high level of maintenance
- Pollinator friendly tree species are encouraged in the street tree guide
- In reference to water conservation, trees may require more water up front, but over time the trees replace turf and create shade that reduces irrigation requirements
- Drought-tolerant species are encouraged, not necessarily all native, encourage a diverse palette to resist insects & diseases
- In reference to carbon sequestration, trees contribute and they encourage climate friendly species and drought tolerant species
- Trees are part of green infrastructure
 - They have pilots that include permeable surfaces, overflow for stormwater runoff, and are buffered by trees
- Have 25,000 trees currently
 - Goals of planting new trees tend to overshadow the maintenance requirements
 - When considering expanding the urban forest, maintenance is the most challenging
 - Boulevard trees are city-owned, but depend upon residents to water, mulch, and call city for pruning/replacement options

- Water bags sold with boulevard trees to simplify watering requirements along with plastic shields to protect trees from rodents and mowing damage
- Current Forest Resource Plan includes species diversity to build in climate resilience

Frank Greenhill, City of Bozeman Stormwater Division

- Stormwater is a regulated utility operating under an MS4 permit
- They manage infrastructure, including cleaning pipes/inlets
- Provide flood protection by upsizing pipes to mitigate flooding/improve public safety
- Develop water quality projects with mechanical separation that remove pollutants, sediment, and debris
 - A total of 53 tons of debris were removed from Bozeman and Mandeville Creek in 2019
- Street sweeping contributes to water quality improvements
- They encourage rain barrels to help capture water and reuse, as well as rain gardens, and trees
- New developments are required to implement control measures that provide for capture or reuse for the first 0.5 inch of a 24-hr storm event
- Related to carbon sequestration, maintaining wetlands (natural or constructed) serve to sequester carbon
 - They facilitate sedimentation and eventually run out of capacity—dredging of wetlands is expensive and permitting is difficult
- Permeable paver patio in front of City Hall is a great example of green infrastructure in which the snowmelt/rainwater does not run-off, mimics natural filtration process
- Proper management of herbicides/pesticides encouraged
- RFP out to update City engineering standards to reflect changes in runoff patterns, including intense storms and rapid spring runoff
 - Updating the Intensity Duration Frequency (IDF) curve they expect to see that a 50 year event is now a 10 year event
 - Result will likely lead to more Low Impact Development from development community
- Good example of a municipal wetland in Billings, Shiloh Conservation Area
- Sanding material Streets Division uses includes magnesium chloride, the amount variable based on temperature
 - The percentage is lower than most communities, but necessary
 - Water runoff from streets can still be used to irrigate street trees
- Street sweeping debris T-clip analysis (general toxicity test) has never had a “hot hit” (exceeding max allowable threshold)
 - Material can be used for building trails, parks, etc.
- Ordinance protecting net loss of wetlands?
 - Wetlands can be lost within city with new development and most of west side of town includes wetlands
 - The wetland mitigation bank in Three Forks allows developers to offset locally lost wetlands.
 - Wetlands must be maintained within the Upper Missouri river.
 - Code indicates we should encourage/enforce developers to prioritize keeping wetlands on site.
 - Developers easily describe jobs/housing as community benefit to justify use of wetland mitigation bank
 - The code could be less subjective and say that it must be a one to one replacement within valley or set distance from the project
 - The Commission has asked staff to create a white paper on the cost of maintenance and describe the difficulty of the issue to help determine whether it should remain a priority.

Jessica Ahlstrom, Water Conservation Division

- City Water Conservation Program started five years ago and has included all voluntary measures
- The 2013 Integrated Water Resources Plan looks at water supply and growth
- New water rights are not readily available and growth in demand is exceeding what the plan projected
- The Plan calls for 18,000 additional acre-feet and half of that should come from water conservation
- Transitioning the program from all voluntary and education-based to having some teeth in code, especially for new development
 - Looking at revising landscaping code, including putting sidebars on how much water a landscape can require
 - The City requires that parkland is irrigated, looking at specifying efficiency irrigation standards
 - HOA's often require green turf, looking at opportunities to address this in code
 - Natural landscapes in city property, lots of opportunity in code to look at native grasses with lower maintenance and water requirements
- The Drought Management Plan identifies 4 stages of drought
 - If in stage 3 or 4 drought, the city could ask residents to stop watering lawns, but not trees
 - This is something to consider when discussing urban farms and gardens
 - Could restrict times that residents water or completely restrict irrigation
 - Permanent time of day irrigation restrictions are possible, but may be countered by HOA penalties for not maintaining green lawns
 - Watering restrictions would apply to exempt wells, but difficult to enforce
 - DNRC issues permits for wells (exempt wells) as a permit, but not a water right
- Goal in October to review landscaping requirements for commercial, residential, and parks
 - Generally assume that most food production would not exceed the water demands of turf grass, but this should be quantified

Danica Jamison, Greater Gallatin United Way and Erin Jackson, Gallatin Valley Farm to School

- Natural systems conversation not complete without considering humans and our need to eat
- Food systems critical to everyone
 - Consider times that you have been “hangry” and what that experience would be if you were food insecure
 - The middle to upper economic class in Bozeman is accustomed to being able to go to grocery store at any point to get what they want
- See Bozeman Food Plan
- Food system includes complex web of food processes required to get food from farm to table
 - All components of the Climate Plan tie into the food system
- Discussion of the focus areas brings to light the ability of city to impact the food system in a more holistic framework
- Food for human consumption can be the lens from which to address all the other topics we have discussed in the Climate Plan

Dr. Selena Ahmed, MSU Sustainable Food Systems (see presentation)

- Climate change and food systems, critical to have a role for food system as the largest contributor to global climate change and it is impacted by climate change
- 20-30% of human caused greenhouse gas emissions from food systems
- Already seeing impacts of climate change on reduced food security
- Farmer's in MT are perceiving that climate change is impacting productivity and nutritional quality
- Anxiety among farmers increasing due to uncertainty presented by climate change
- Food systems have the ability to help mitigate climate change
- This translates so local level policy recommendations related to greenspace and irrigation

- MSU integrating pollinator gardens that include diverse, native plants, and edible landscapes
- The illustration of carbon footprint of various food sources is locally nuanced. Ex: role of hunted wildlife and bison; local versus imported
 - Another nuance is that keeping cattle producers on land prevents prairie from being plowed up, which releases a lot of carbon
- Kelly Wiseman from Bozeman Food Co-op emphasizes how food insecure we may be
 - One major snow storm can prevent food truck deliveries
 - We currently have an on-demand food system
 - Has city considered emergency food supply? Have we assessed our food security to determine how resilient our food system might be?
 - 90% of food produced out-of-state
- See components of Bozeman Food Vision Plan and Building a Climate Resilient City

Discussion Questions

City of Bozeman

- What is the City's role in implementing this strategy?
- Are there new programs, policies, or assets that need to be considered?

Community Partnerships

- What community organizations and partnerships can support implementation of this strategy?
- How should they be engaged and what are their roles?

Community Members

- What is the role of neighborhoods in implementing this strategy?
- What can individuals do to support this strategy?

Market Considerations

- What market transformations are needed for implementation to be effective?
- What incentives should be explored or considered?
- What is the role of business community in implementation?

Challenges and Benefits

- Who might be left out or impacted negatively by implementation of this strategy? How?
- Who stands to benefit from implementation? How?
- Are there resiliency co-benefits? Are there human health co-benefits?

Preliminary Solution Ideas

These preliminary ideas are pulled from the Climate Plan community engagement activities and are provided to help inform the discussion.

Urban Farms & Gardens

- Work with partners to create a Bozeman/Gallatin Food Council
 - Analyze food system for vulnerabilities
 - Food security: HRDC is also concerned about food reserves in Bozeman during emergency

Partnerships:

- MSU Sustainable Food Systems, MSU Office of Sustainability, Food Producers, Open & Local, Gallatin Valley Farm to School, Gallatin County Emergency Management, Members of the Triangle Plan Coordinating Committee
 - Triangle Plan Section on Agriculture, 1) Encourage development designs that integrate significant agricultural opportunities such as cluster development, community gardens, and agrihoods 2) support & encourage farm to table opportunities in triangle area 3) protect conservation easements 4) protect existing agricultural activity 5) encourage new appropriate and compatible agricultural opportunities within the triangle area
 - Planning Coordination Committee is recommending adoption in Bozeman, Belgrade, and Gallatin County. Now going to planning boards for review and adoption in early March
- Support food producers through City Economic Development
 - There is a need to develop the food sector, not just high-wage industries--Food producers all operate on tight margins
 - Support a Bozeman food hub
 - Open & Local examining
 - Can create another income stream for farmers and ranchers
 - Work with County to encourage cottage food businesses
- Allow public farms in green spaces
- Consider how to support agrihoods within the planning framework
 - Definition is a housing development centered around community agriculture
 - Over 200 models exist, should work with partners to bring speakers to Bozeman to learn about opportunities
 - Nutrition and Physical Activity Committee led by Bozeman Health, part of Community Health Improvement Plan is interested in bringing speakers to Bozeman
- Review city codes for barriers to food production
 - Policies around yards and gardens
 - Obstacles to light industrial agriculture

Challenges & Benefits

- Food System bigger than “urban farms and gardens” referenced in Climate Plan. Food systems are the nexus of food insecurity, food waste, physical activity, and social cohesion
- Need plan to ensure that planted food is managed and harvested, not just a bear and wildlife attractant
- Convert lawns to garden space
- Encourage developments to have gardens and fruit trees

Market Considerations

- Gardens require a person or group interested in maintaining
- Gardens part of every park
- Community gardens

City of Bozeman

- Improve management and model for community gardens in Bozeman
- Pockets of community gardens not organized in a way that can pool resources to re-invest in garden infrastructure
 - Examine Helena and Missoula

Community Partnerships

- Potential among Master Gardeners to assist with management and other groups using gardens for therapy

Challenges & Benefits

- Community gardens can provide tons of food to food bank
- Support farmers markets
- Set goals for food security

Water Supply & Conservation

- Replace lawns with drought-tolerant, native plants (climate/pollinator friendly lawns)
- Encourage rainwater capture and use
- Provide education and limit any HOA landscaping requirements

City of Bozeman:

- Water Conservation is evaluating options
 - City cannot limit HOAs, but whichever code is most restrictive is the code that applies, so landscaping and irrigation code must be carefully written if we wanted the city code to apply
- City promoted HOA language as an educational tool
 - Include food vision ideas, allowing gardens on all sides of home, etc.
 - Include expiring language in HOA covenants

Partnerships:

- Could we find one HOA to change and lead by example? Volunteer led Food System Council could lead the effort
 - Record of HOAs filed at Courthouse and most HOAs managed by property management companies

Market Considerations:

- Changing HOA covenants difficult because they typically require 80% vote to overturn, but cannot rarely get a quorum
- New development should pay their way and offset their demand in community or within the development
- Make water more expensive
- Don't wait for drought before implementing water use restrictions
 - Consider seasonal time of use irrigations restrictions
- Review all codes pertaining to landscaping
 - Avoid contradictions between water conservation and vegetation requirements, including 75% live vegetation requirement
 - Incorporate limits on irrigation for new developments
- View parking code in relation to water conservation
 - What is the impact of a the parking lot on the surrounding vegetation that requires irrigation
 - Climate Plan should recommend eliminating parking minimums for a variety of reasons
 - Parking islands, however, needed for stormwater management where there is parking

Carbon Sequestration & Land Management

- Quantify carbon sequestration potential and irrigation requirements of different types of vegetation
 - Need performance measure to indicate the goal and verify performance
 - Example: Denver has goal of 99.2 acres in active agriculture. If set the goal, have multiple ways to get to it.
 - Carbon sequestration potential could fit within a stretch code
- Maintain and expand functional wetlands
 - Ordinance to ensure wetland mitigation stays within watershed
 - Need to prioritize wetlands for the many benefits of habitat, water infiltration, water retention, and native species
- Low Impact Development standards
- Climate friendly landscaping on every parking bulb and median

- Encourage permeable surfaces (and green infrastructure) (ground water recharge/mitigate urban flooding)

City of Bozeman:

- Incentivize

Partnerships:

- Montana State University Facilities

Market Considerations:

- Challenge because it is expensive to install and maintain

Challenges & Benefits:

- Quantify externalities and benefits related to flood mitigation, etc. Cost of not doing it?

- Connect habitat corridors
- Limit pesticides and herbicides in city parks
- Promote Phosphorous-free city
 - Look for natural ways to fertilize instead of chemical inputs
- Implement a Biochar program
 - Biochar is made through the pyrolysis process, along with biogas or oil that can be used for heavy-duty diesel
 - Wood from urban forest may be the best application
 - Biochar creates longest carbon sequestration potential from wood (1,000 yrs)
 - MSU researchers studying, potential for a mobile biochar truck

Market Considerations:

- Phosphorous found in detergents, some cities have banned
- Maintain and expand urban forest
 - App to monitor tree health and carbon sequestration
 - Work with schools on tree planting programs
 - Afforest cemetery and other public space for carbon sink and cooling
 - Grow a more natural forest to build carbon sequestration, such as at the Water Reclamation Facility or Water Treatment Plant
 - Require developers to replant trees they cut down
- Greenways along all bike/walking paths
- Proportionally expand greenspace with new developments

Challenges & Benefits:

- Anything with plants, need to consider and document water demand
- Would it result in lower water use? What is impact on affordable housing?
 - Climate justice major value of Climate Team. How to manage greenspace in affordable housing?
 - In affordable housing developments, stormwater control measures allowed for in open space, but not parkland
- Improve access to greenspace and open space to all residents
 - Trust for Public Lands mappings shows that only 80% of community members live within a 10-minute walk of a park (4-5k without easy access)

Partnerships:

- Need to use existing infrastructure to create more parks and gardens within city
- Can we formalize agreement with MSU that articulates how the general public can use certain green spaces?

Challenges & Opportunities:

- Much easier to keep on board with other climate programs if people have access and appreciate the outdoors
- Support/incentivize regenerative agriculture
- Support managed grazing practices through partnerships, including purchase of carbon offsets

Education

- Develop a strategy and action tools for individuals to make personal improvements related to food, water conservation, stormwater, carbon sequestration, and land management

Suggested Reading and Resources

Denver FoodVision 2017:

https://www.denvergov.org/content/dam/denvergov/Portals/771/documents/CH/Final_FoodVision_120717.pdf

Forestry Division Website: <https://www.bozeman.net/government/forestry>

Parks Division Website: <https://www.bozeman.net/government/parks>

Prairie Climate Center Climate Resilient City Agriculture: <http://prairieclimatecentre.ca/wp-content/uploads/2017/04/pcc-brief-climate-resilient-city-agriculture-food.pdf>

Stormwater Division Website: <https://www.bozeman.net/government/stormwater>

Water Conservation Division Website: <https://www.bozeman.net/government/water-conservation>

Attachments: Trees and Climate Change comment submitted by Aida Murga, Bozeman FoodVision, submitted by Climate Team members Danica Jamison and Erin Jackson



BOZEMAN CLIMATE PLAN Neighborhoods Focus Group

Thursday, January 30, 2020, 12:00-2:00pm

Bozeman City Hall (121 N Rouse Ave.) – Madison Conference Room

Focus Group Objectives

- Explore some of the preliminary climate solutions in more detail
- Confirm what solutions are already happening and working well
- Discuss opportunities for new or improved solutions
- Examine the co-benefits and challenges of the solutions

Agenda Template

Time	Agenda Item
12:00 – 12:15pm	Welcome & Objectives
12:15 – 1:45pm	Climate Strategy: Compact Development Patterns
1:45 – 2:00pm	Open Discussion & Next Steps

Attendees

Name	Organization
Addi Jadin	City of Bozeman Parks
Chris Naumann	Downtown Bozeman Partnership
Danica Jamison	Greater Gallatin United Way
Jennifer Boyer	Farm 51
Libby Khumalo	Citizen-at-large
Sarah Rosenberg	City of Bozeman Community Development
Jay Sinnott	Bozeman Climate Partners
Chris Saunders	City of Bozeman Community Development
Randy Carpenter	Future West
Candace Mastel	MSU and Bozeman Area Bicycle Advisory Board
Eli Frandsen	MSU Student Body, recent Architecture graduate
Natalie Meyer	City of Bozeman Sustainability

Presentations

Chris Saunders, City of Bozeman Community Development

- 2009 Community Plan is 6th edition, currently working on 7th version
 - Consistent priorities over the years: affordable housing appeared in 1972, compact development appeared in 1982, and preservation of environment is always a theme
- Community Plan cross references multiple plans, city has 26 diverse plans across the organization

- Western boundary of city has not moved for over 20 years, while population has gone up 72%, land area up 58%
- 2010 census 33% of all homes in Bozeman had one person living in it, major implications for affordable housing and density
- Compact development driven by demand for services, parks, demographics, and social trends
- Everything checked on the list in the agenda (see presentation) has been in place for 10 years or more
- Community Plan update will go out for public comment mid-March; elements tied to climate action, affordable housing, etc.

"The literature suggests that doubling residential density across a metropolitan area might lower VMT by about 5-12%, and perhaps by as much as 25%, if coupled with higher employment concentrations, significant public transit improvements, mixed uses, and other supportive demand management measures." –Driving the Built Environment: The Effects of Compact Development on Motorized Travel, Energy Use, and CO₂ Emissions (2009).

Discussion Questions

City of Bozeman

- What is the City's role in implementing this strategy?
- Are there new programs, policies, or assets that need to be considered?

Community Partnerships

- What community organizations and partnerships can support implementation of this strategy?
- How should they be engaged and what are their roles?

Community Members

- What is the role of neighborhoods in implementing this strategy?
- What can individuals do to support this strategy?

Market Considerations

- What market transformations are needed for implementation to be effective?
- What incentives should be explored or considered?
- What is the role of business community in implementation?
-

Challenges and Benefits

- Who might be left out or impacted negatively by implementation of this strategy? How?
- Who stands to benefit from implementation? How?
- Are there resiliency co-benefits? Are there human health co-benefits?

Preliminary Solution Ideas

These preliminary ideas are pulled from the Climate Plan community engagement activities and are provided to help inform the discussion.

Compact Development Patterns:

- Mixed use developments
 - Increase access to grocery stores and restaurants in residential areas
 - Encourage home daycares/eldercare in residential areas

City of Bozeman

- Most city falls within mixed use zoning, no zones for single family homes only, city has been working at this for a long time
- City needs to be able to articulate expectations and sustainability goals to developer and Commissioners
 - Identify leverage points for shifting expectations: engineers, consultants, lenders, realtors, appraisers
- Use a recognition program to raise profile of excellent developments (put all city awards under one heading to raise the profile of the event). Encourage market advantage of being “green”

Community Partnerships

- Consultants could have a role in the education/influence with lenders/developers and can push better design philosophy
 - Could highlight successfully sold non-conventional developments (education)
 - Need thought-leaders from private sector to educate and build partnerships
 - Need a lot of entities to build educational/conversational discussion
 - Use Envision Tomorrow software tool to demonstrate impacts of new development on traffic, emissions, maintenance, etc.
 - Message based on convenience, safe, fun, efficient (not climate change/sustainability)
 - Majority of Americans are concerned about climate change and more want to see sustainability, so who are we trying to convince
- Southwest Montana Building Industry Association to assist with movement away from spec homes
- Seat at the Table

Community Members

- Difference between moving from knowledge to being willing to change
- Help educate neighbors around connection between density, reduced Vehicle Miles Traveled, improved air quality, and reduced emissions

Market Considerations

- City enters the conversation relatively late in the process. The realtor sets the sale price and lenders buy off on initial land purchase. There is a high degree of frustration among city staff that they can't spend enough time on education, but also recognize critical decisions already made by the time they see the project
- There are numerous provisions authorized in code, but these may not be used for a variety of factors, such as awareness, property configuration, private covenants, etc.
- People funding the projects really have the power, they just want to know if they can sell the development
- Lenders (ex: Blackrock) signaling shift, need to think ahead to take advantage of these shifts

Challenges & Benefits

- Developers hugely powerful in separating people by economic class
- Recognize the need for a cultural shift to overcome NIMBYism;
 - Acknowledge climate change as part of the difficult discussion around parking and downtown density
- Use growth policy to encourage more compact city

City of Bozeman

- If developer can still build single family homes in highest density zones, is the lot size too big?
- Site constraints related to utility provisions in compact development

- Compact Development Standards are being developed to review the city's requirement for physical separation from water/sewer utilities
 - Review new compact development standards to account for building electrification/EV Service Equipment
- Planned Unit Developments
 - City can prioritize affordable housing and sustainable design
 - Points for LEED Platinum, gardening, etc.
 - Get rid of open space performance points, it provides an out to density requirement (unless it is wetlands)
 - Ex: Billings Clinic needs to be annexed, requires performance points
 - What do we need to require? Solar, sustainable materials, superior quality of materials, local gardening on campus, LEED Platinum building design, EV charging on-site,
 - Nothing is codified as to what they must do and what the relaxations will be
 - Development will grow around this facility
 - Zoning around should accommodate a variety of housing types
 - Need opportunity to bike less than 2 miles for amenities
 - Could the city require use of a recognition system, like LEED or State of MT High Performance Building Standard?
 - City cannot offload regulatory responsibility or delegate approval authority by mandating LEED certification, but can recognize that a certification is valuable to the city.
 - Could create a zoning standard that duplicates LEED, but would need a staff person to administer

Market Considerations

- In assessing the best opportunities for sustainability in a project, the consultant has the best opportunity and sees project much earlier than city
- Zoning code allows for a lot, but rate of change very slow
- Potential allowed, but real world circumstances are obstacles
 - Ex: carsharing allowed in code for 10 years, political process recently resulted in only 1 of 4 proposed space for a carshare, which is impractical. Need to educate leaders on purpose of progressive code provisions
 - Lenders may dictate the amount of parking required
 - Ex: Previously city had to force parkland requirement, now there is market understanding that it is a very valuable asset
 - Developer can meet all the standards on paper, then hold a lot intended for density. City can't compel them to sell the lot adjacent to multi-million dollar single family

Challenges & Benefits

- Must plan for climate migrants, even greater population growth
- Account for human health and mental health to build community resilience and adaptation to climate change. Relationships are critical in response situations. Where do people go for grieving?
 - Salt Lake City actively promotes the Good Grief Network
 - City Strategic Plan describes a Safe, Welcoming, Community with neighborhood centers
 - Mental health should be addressed on a neighborhood scale
 - Radical changes can happen after individuals go through process of grieving around climate change
 - The city can offer facility spaces (for free) for people to support one another

- Components of physical design standards influence where people gather, relate to each other (parks, urban forest)
- Accessory dwelling units

City of Bozeman

 - R-1 zoning closest thing to single-family zoning, but this zoning still allows for Accessory Dwelling Units (ADU) and 4,000SF lots
 - Allow/encourage conversion of homes to duplexes
 - ADUs allowed since 1998 as interior or exterior, less than 1% have been interior conversions despite the lower cost and ease of permitting
- Encourage smaller homes

City of Bozeman

 - Minimum house size is the minimum allowed within the building code. Community Development has issued permits for sub-300SF homes
- Neighborhood orientation to encourage passive solar design
- Walkable neighborhoods
 - Complete streets
 - Trail connectivity, paved bike paths, bike lanes
- *Market Considerations*
 - The community was designed around Single Occupancy Vehicles
 - Perpetuating Single Occupancy Vehicles paradigm in development will not result in a reduction in Vehicle Miles Traveled
 - Need 15-22 homes per acre to support a neighborhood business without access (parking) for SOVs
- Regional coordination to encourage urban growth

City of Bozeman/Community Partnerships

 - Coordination with adjacent government bodies is a long-standing theme. Belgrade, Gallatin County, City of Bozeman developed the Triangle Plan for cross-jurisdictional planning on streets, utilities, etc.
- Encourage preservation of natural wetland infrastructure

City of Bozeman

 - Educate residents on functional role of wetlands in flood mitigation
 - Incorporating natural systems with subdivision meandering drives was good, but it also perpetuates expansive suburbs; these natural system features should be designated, mapped features
 - Community Plan lightly discusses keeping wetlands local. Planning with the natural environment is a section of the Community Plan; the new park plan update will include a broader discussion of the definitions of critical wetlands/habitat in order to promote/incentivize opportunities to maintain these systems
- Provide development bonuses for higher density developments

City of Bozeman

 - Does the city offer development bonuses?
 - Depends on how you think of what constitutes a bonus; ex: the City only requires additional parkland up to a certain level depending on zone, then it is free and additional density does not require more parkland.
 - Other examples related to parking reductions
- Master plan for EV infrastructure in new developments to help avoid conflict with compact development

City of Bozeman

 - Review new compact development standards to account for building electrification/EV Service Equipment
- Support HOAs with city-approved climate resilience language for covenants

City of Bozeman

- Provide legally reviewed standard language for sustainable HOA best practices
 - It can be very difficult to find the representatives of a HOA, but the city is always accessible. State law prevents city from restricting HOAs.
 - Ensure sun-setting or re-affirmation of covenants provision; eliminate HOA covenants with annexation; or after full build-out of subdivision
 - No turf requirements (city requires 75% live vegetation, but HOA can require turf)
 - Allow clotheslines, climate friendly yards, food gardens on all sides, and solar on any surface
 - Encourage smart irrigation of turf in parks, need to maintain meeting space/sports spaces in parks
- Encourage co-housing, cottage development, and sharing economy

City of Bozeman

- Cookie-cutter housing only practical to a subset of residents
 - Need shared storage/lockers and reduced residential square footage
 - Unified Development Code Article 5 emphasizes shared storage and can be used towards open space requirement
 - "Thingery Sheds" to promote sharing of household and yard equipment
 - City is in process of annexing a co-housing development; applicant will only need to submit site plan (no PUD, no variances);
 - If city identifies affordable housing as priority and the development provides this, it is easier for parks to consider habitat restoration in lieu of parkland

Community Partnerships

- Shared storage could be promoted through HOA
- MSU partnership, using ag-land, promote for their staff

Market Consideration

- The edge of town is sometimes the only place with a piece of land available that would support a larger co-housing/cottage housing development
- Cottage Development is in code and allows for small homes with shared services. Obstacle has been that developers usually try to do this on left-over piece of land that has major obstacles, such as wetlands

Suggested Reading and Resources

2019 Community Plan: <http://weblink.bozeman.net/WebLink8/0/doc/201141/Electronic.aspx>

2019 Downtown Bozeman Improvement Plan:

https://downtownbozeman.org/uploads/2019_DBIP_Final_Draft_low-res.pdf

BOZEMAN CLIMATE PLAN

Transportation Focus Group



Bozeman
Climate
Plan

Focus Group Objectives

- Explore some of the preliminary climate solutions in more detail
- Confirm what solutions are already happening and working well
- Discuss opportunities for new or improved solutions
- Examine the co-benefits and challenges of the solutions

Agenda Template

Time	Agenda Item
2:30 – 2:45pm	Welcome & Objectives
2:45 – 3:15pm	Climate Strategy #1: Transit & Active Transportation
3:15 – 3:45pm	Climate Strategy #2: Direct Vehicle Emissions
3:45 – 4:15pm	Climate Strategy #3: Airline Fuel Efficiency
4:15 – 4:30pm	Open Discussion & Next Steps

Attendees

Name	Organization
Maia Madrid	Energy Corps Service Member, MT DEQ Energy Office
Kyla Maki	MT DEQ Energy Office
Danae Giannetti	Western Transportation Institute
Owen Mitchell	Bozeman High School
Emma Bode	Forward Montana Foundation
Terry Cunningham	City of Bozeman
Jay Sinnott	Bozeman Climate Partners
Heather Higinbotham Davies	City of Bozeman
Lori Christenson	Gallatin County Health Department
Danica Jamison	Greater Gallatin United Way
Taylor Lonsdale	City of Bozeman
Karin Kirk	Freelance Journalist, Bridger Bowl
Bonnie Hickey	Bridger Bowl
Jeff Fox	Renewable Northwest
Candace Mastel	MSU and Bozeman Area Bicycle Advisory Board
Chris Saunders	City of Bozeman
Natalie Meyer	City of Bozeman

Presentations

Danae Gianetti, P.E., Research Engineer, Western Transportation Engineer

- Streets as places from the lenses of equity, community, economic vitality, environmental sustainability, health. Equity was a focus of our Climate Plan word cloud
- Ithaca, NY referenced as best in class community during Climate Team meeting #2, thus will look to their strategies for best practices
- Reviewed Bozeman plans, including Strategic Plan, Triangle Plan, Community Plan, and Transportation Master Plan (TMP)
- Mode share map shows higher rate of biking, walking, transit near university, and less in the northwest where there is less infrastructure
- City responsible for 215 miles of maintenance
 - \$18.5M planned for transportation expenditures with \$9.9M in capacity expanding projects, \$100K for annual pedestrian ramp repair, \$150K HRDC Streamline and \$2 mil per year needed for Streamline and Galavan combined
- Provided highlights of TMP recommended capacity expanding projects for 5-lane arterials
- Wide roads can be stressful to non-motorized commuters
- Bozeman still very dependent upon single passenger vehicles (71%)
- Ithaca, NY in contrast 46% commute by vehicle
- Many similarities in Ithaca, but provides for green hierarchy of transportation that prioritizes pedestrians, cyclists, public transport, freight, and private vehicles. They also have a strong Transportation Demand Management program (TDM)
- Cannot build our way out of congestion
 - Instead of building capacity to move more cars, should plan to move people more efficiently
- TDM program has included ridesharing app (Bozemansubway.org), traffic calming pop-up projects, and recent efforts with Bridger Bowl
- How can we support Transportation Demand Management? How will widening roads support multimodal transportation and our GHG emissions reduction goals?

Kyla Maki, Montana DEQ Energy Office, Montana Electric Vehicle Activities & Barriers

- Transportation Demand Management critical before or in conjunction with vehicle electrification
- Offers an opportunity for smart mobility, but reducing Vehicle Miles Travelled is critical backbone--efficiency first!
- Bad news in 2016 transportation overtook the electricity sector for emissions. Good news is that electricity emissions are coming down and there is an opportunity to electrify transportation
- Every state has a different emissions profile, but 90% of the country will reduce emissions by transitioning to electric vehicle, including MT
- Adoption in MT is relatively low, Plug-in Electric Vehicle registrations are low relative to WA, OR, CA where they have state tax credits
- Range anxiety is a major obstacle in MT where we are large geographically with low population density, little fast charging available over long distances, and the infrastructure challenge is substantial
- Demand charges from utility are an obstacle
- Need to build infrastructure for people to feel comfortable purchasing an EV
- Level II and fast charging (Level III) increases adoption rates. MT only has 3 Level III publicly available stations
- State has signed the Regional Electric Vehicle Plan for the West with 7 other states (CO, UT, NV, WY, AZ, ID, NM). Focuses on I-15, I-90, and I-94 as interstate corridors in MT. All states have put 15% of VW funding towards EV charging infrastructure

- MT \$12.6M from VW emissions scandal for EV infrastructure, Electric Transit, diesel reduction, \$1.89 mill for Level II stations, will fund up to 10 DC fast charging stations
 - Considering Interstates and Yellowstone Glacier corridors
 - Locations will be more defined for fast charging, likely up to \$25k for each station
- No major policies from the state to drive adoption, local jurisdictions play an important role
- Policy direction primarily coming from Governor Bullock's Climate Solutions Council Executive Order to promote alternative modes of transportation and electrification of the transportation sector
- Fast charging station locations should be spaced 65-80 miles apart, according to NREL
 - Fast charging costs range dramatically with soft costs making up 90%, Level III stations average around \$80k
- Mountain Line in Missoula now has 8 EV transit buses
 - They are charging overnight, which is best for the grid and they are exploring EV transit rate design with NorthWestern Energy
- Do not need extensive fast charging infrastructure in town, primarily need Level II, NREL has EV-Pro model indicates the entire state would only need 30 fast charging stations
- 80% of time charging occurs at home
 - Level II infrastructure in town is more affordable and equitable

Discussion Questions

City of Bozeman

- What is the City's role in implementing this strategy?
- Are there new programs, policies, or assets that need to be considered?

Community Partnerships

- What community organizations and partnerships can support implementation of this strategy?
- How should they be engaged and what are their roles?

Community Members

- What is the role of neighborhoods in implementing this strategy?
- What can individuals do to support this strategy?

Market Considerations

- What market transformations are needed for implementation to be effective?
- What incentives should be explored or considered?
- What is the role of business community in implementation?

Challenges and Benefits

- Who might be left out or impacted negatively by implementation of this strategy? How?
- Who stands to benefit from implementation? How?
- Resiliency co-benefits?

Preliminary Solution Ideas

These preliminary ideas are pulled from the Climate Plan community engagement activities and are provided to help inform the discussion.

Discussion Notes:

Transit & Active Transportation

- Prioritize walking and non-motorized transportation in the transportation planning hierarchy
 - *CoB*
 - Transportation Plan includes some conflicting priorities, city should commit to non-motorized hierarchy
 - Dense development supports transit and active/non-motorized transportation
 - Add teeth to vision/goals in planning documents
 - Amplify the message of saving lives and making transportation safer
 - Bike network expansion
 - More separated path infrastructure is needed to convert drivers to bikers
 - Provide for major N-S and E-W separated path corridor
 - Prioritize maintenance of separated paths
 - Ex: of Pinellas Trail in Fl with over-passes, tunnels for bike/ped
 - Don't assume it is more expensive if all infrastructure within the acquired right-of-way
 - Ensure bike paths/sidewalks are safe and well lit
 - Maintain bike paths, clear of snow and sweep
 - Need enforcement around sidewalk shoveling
 - Allow adults to ride bikes on sidewalks where there is capacity/low congestion
 - Rules about adults vs. children on sidewalks should be evaluating
 - When streets become constricted due to snow storage, remove on-street parking on a long- and/or short-term basis
 - Winter maintenance a challenge because shoveling would fall to adjacent property owners, likely to see less access
 - Safe pedestrian crossings
 - For safety, all potential crossing lanes should be stopped when pedestrian crossing signal is active
 - Ensure islands are included in design for 5-7 lane roadways (including existing)
 - *Community Partnerships*
 - Inclusive planning in development of Metropolitan Planning Organization
 - *Challenges & Benefits*
 - Consider aging population design within multi-modal infrastructure and transit
 - Plan for all, particularly those with limited mobility
 - Engage in design thinking based on empathy for all users, be aware of elite projection (privilege based on physical and financial status)
 - Use walking audits to help inform design
- Predictable, convenient, and reliable transit system
 - *CoB*
 - Signal priority for transit during development review process
 - *Community Partnerships*
 - MSU, HRDC, Gallatin County, City of Belgrade
 - Explore on-demand transit services for first/last mile, such as *Via (Mobility as a Service)*
 - Expanded Belgrade Park and Ride needed
 - Map goal of a convenient/reliable system, identify distance to key destinations from stops and time on bus between major hubs
 - Set goal of 75% of city is within $\frac{1}{4}$ mile of bus stop (see TMP goals)
 - Install sensors on buses that activate green traffic signal

- Bike share programs
 - Consider in conjunction with e-bikes/electric scooters for first/last mile transit
- *Market Considerations*
 - Requires sustainable transit funding, such as support from large employers or creation of an urban Transportation District once Bozeman forms a Metropolitan Planning Organization upon reaching the 50,000 population threshold
 - There is a bus driver shortage and the Motor Vehicle Division is under-funded, can't get drivers licensed in a timely manner
 - Some large employers should fund dependable circulator routes
 - We don't know exactly what the outcomes will be for disruptive technologies, including Mobility as a Service (MOS)
 - There are battery leasing models to help fund EV transit
- *Challenges & Benefits*
 - Support a just transition from taxi drivers to bus drivers
 - Need creative solutions, such as affordable housing for drivers
 - E-scooters as transit or tourist novelty that induces trips?
- Carpooling programs
 - *Community Partnerships (WTI, HRDC, Gallatin County)*
 - Support carpool services to major recreation areas, such as Hyalite
 - Support carpool to airport
 - Use existing Riding Amigos rideshare app
 - Mobility as a Service with curated trip planning
 - Promote carshare to support residents who do not want to own a car, but may need one periodically
 - *Market Considerations*
 - High participation rate needed for rideshare apps to be efficient/useful
 - Uber/Lyft can increase emissions due to idling/circulating
- Train system to connect regional destinations
 - *Market Considerations*
 - State-level support required
- Incentives for choosing non-motorized transportation and transit
 - CoB
 - Charge for parking to equitably distribute the city's cost of supporting the convenience of Single Occupancy Vehicles
 - Make parking easier for compact vehicles
 - Reduce the amount of parking
 - Market Considerations
 - Parking requirements/standards in development should be developed in consideration of the current social reality (ex: carshare parking reduction allowance in development code does not reflect reality that most MT households have more than one car parked at home)
 - Communications should reflect options and choices and steer away from guilt while also noting the urgency of our situation because we are past the point of education-only approaches
 - Streamline traditionally funded as a need-based system and transitioning to convenience-based system, need holistic community conversation about transit, how we invest/plan/support it
 - Climate Plan discussion can spark that planning

- A large portion of Streamline funding comes from MSU student fees, thus charging a fee may not be cost-effective since 60% of riders should not have to pay twice; national trend moving towards fare free system that is funded by Urban Transportation Districts
 - This is how Missoula, Great Falls, and Billings fund their systems. Can raise funds to increase service based on voter approval
- Challenges & Benefits
 - The level of planning precision to achieve all of these goals is extremely high
 - These decisions may change the character of the community and may outpace the rate of social change
 - City code does not require parking to be free, some charge/close private parking
 - It's private business that chooses not to charge
 - A social change is required, which is harder than a code change

Direct Vehicle Emissions

- Vehicle Electrification
 - *CoB and Community Partnerships*
 - Convert city and state fleet light duty fleet to EVs
 - Electric vehicle (EV) group buy
 - Offer tax incentive
 - Encourage residents to convert to EVs
 - Public access to EV charging infrastructure
 - Offer Level III charging on I-90 corridor, Level II around town
 - Convert to electric buses
 - Use dedicated street impact fees for a scheduled road improvement & expansion to instead fund EV transit and EV infrastructure that will serve the area of the foregone street expansion
 - Justify with reduced congestion on roadway
 - Need creative funding solutions, including state DEQ VW settlement funds
 - Coordinate with utility to plan for EV infrastructure
 - *Challenges & Benefits*
 - State DEQ EV transit funding requires retirement of diesel buses, which are needed in our growing system
 - However, some buses are or will likely be due for retirement
 - Focusing on transit electrification more equitable than SOV electrification
 - Dealerships are not interested/able to sell EVs locally, they don't make as much off maintenance
 - Utility connections, placement of conduit, transformers is a major challenge
 - If need significant on-the-ground resources, this translates to affordable housing issues
- Trip Reduction
 - *CoB and Community Partnerships*
 - City ordinance to ban vehicles from driving exclusively for advertising (ex: driving downtown during crowded events with banner advertisement)
 - Encourage efficient meeting/video conferencing
 - Charge for doing the most polluting things, such as driving downtown/tolls
 - State authorized a 2 cent gas tax during last legislative session, need County to authorize on ballot
 - Community Members

- Make the case to community members not to drive as much, support with education
- Partner to develop messaging for individuals about how small things add up (ex: cost of owning a vehicle and cost of commuting from out of town)
- Anti-idling policy
- Transition to alternative fuel vehicles for heavy duty fleets (hydrogen, propane, natural gas)
- Infrastructure improvements to improve traffic flow (roundabouts?)

Airline Fuel Efficiency

- Encourage alternative transportation modes for short airline trips
 - Revive southern passenger rail (coordinate with other cities, like Missoula)
 - Support bus line to neighboring cities, cost is too high for current routes
- Purchase carbon offsets
- Promote less flying, most important
 - *CoB*
 - CoB should not help fund airport expansions, it makes no sense to plan for expanded air travel in a post-carbon world
 - Airport cannot be used in 25 years



BOZEMAN CLIMATE PLAN

Consumption & Waste Focus Group

Wednesday, February 5, 2020, 1:30-3:30
Bozeman City Hall (121 N Rouse Ave) - Commission Room

Bozeman
Climate
Plan

Focus Group Objectives

- Explore some of the preliminary climate solutions in more detail
- Confirm what solutions are already happening and working well
- Discuss opportunities for new or improved solutions
- Examine the co-benefits and challenges of the solutions

Agenda

Time	Agenda Item
1:30 – 1:50pm	Welcome, Objectives & Introduction Presentations
1:50 – 2:20pm	Climate Strategy #1: Waste Diversion
2:20 – 2:50pm	Climate Strategy #2: Recycling
2:50 – 3:20pm	Climate Strategy #3: Construction Waste Management
3:20 – 3:30pm	Open Discussion & Next Steps

Attendees

Name	Organization
Anders Lewental	Southwest Montana Building Industry Association
Ray Harrison	Gallatin County Solid Waste
Patty Howard	Gallatin County Solid Waste
Emma Bode	Forward Montana
Heather Higinbotham Davies	CoB Sustainability
Kristin Blackler	MSU Sustainability
Russ Ward	CoB Solid Waste
Terrence Gotz	Republic Services of Montana
Erin Jackson	Gallatin Valley Farm to School
Danica Jamison	Greater Gallatin United Way
Natalie Meyer	CoB Sustainability

Presentations

Russ Ward, City of Bozeman Solid Waste

- City, Republic Services, L&L Site Services service area for trash, recycling, compost
- CoB offers commercial, residential, construction waste, cardboard recycling, curbside recycling and yard waste composting in summer months

- Recycling: curbside is single stream for regular residential and commercial accounts
 - Cardboard only recycling available for commercial accounts
- CoB is in early stages of working with a company called ReCollect, an online tool with information on what can be recycled where in the community, and what is not recyclable
 - Glass: no local market, no place to ship it
- Specialty programs:
 - Partnering with MSU for students moving off campus and picking up bulk items around town. Program was larger than anticipated: in one month period, picked up over 170 couches
 - If there isn't an outlet for those types of items, ends up being abandoned on curbs or streets -great partnership with MSU
 - Large item pickup for a fee also offered to regular customers
 - CoB will pick up hazardous materials, with charge for removal of Freon, etc. at the Logan Landfill.
 - Christmas tree and pallet pickup included in composting
 - CoB collects used motor oil at the vehicle maintenance shop
 - Composting partnership with MSU: new program in its second year
 - CoB is composting food scraps from MSU dining halls
 - Ag-bag system at the landfill to mix food scraps with wood chips with 90-day turnaround (it would take 2 years in a traditional compost pile)
 - Pre- and post-consumer waste
 - MSU weighs compost as it goes out; last year they diverted 350,000 pounds of food waste, which is good but shocking
 - MSU focusing efforts on front-end reduction: They went tray less and instituted smaller plates/serving utensils and education to reduce food waste from consumption; those efforts reduced food waste by half
 - CoB wants to offer curbside food waste compost pickup to general public; waiting for policy direction from City Commission.
 - Used compostable plates and cups for City picnic as a pilot to make sure items are actually being composted
 - This system would be able to include food-soiled items like pizza boxes
 - Finished product is used for city parks, reduced need for fertilizer, improves soil water holding capacity, etc.
 - Concern: grass clippings are large part of compost pickup, and residents/businesses use a lot of chemical weed killers.
 - The curing pile is one of the only ways to get rid of the residue
 - CoB is communicating with Happy Trash Can and Yes Compost
 - Obvious concern is for the City to not take away business from those companies, possible opportunities for partnership

Patty Howard, Gallatin Solid Waste Management District

- Gallatin Solid Waste Management District website has information on what the Logan Landfill accepts for recycling
- Gallatin County offers Household Hazardous Waste days at the convenience site at the Story Mill Landfill
 - They sort it onsite, then a contractor hauls it out of state to a facility where it can safely be disposed of.
 - They are at capacity currently with HHW collection once a month
 - HHW program is being subsidized by the Logan Landfill to be able to offer it for free to the community

- Over 5,200 items dropped off last year (not including oil, gasoline, light bulbs, batteries, mercury thermometers).
 - Storage capacity also limits ability to collect more
 - Ideally, they don't want to grow that collection and encourage people to use more HHW; the goal is to reduce the quantities of HHW being used
- In 2019, over 156,000 tons of material were brought to Landfill: 30% is construction; 61% is household waste; 4% is special waste
 - A lot of household waste can be reduced
 - Recycling is great but we don't want to encourage people to consume more
 - Plastic is only recyclable up to 9 times; paper is only recyclable up to 7 times
 - Reduction and reuse should be priority over recycling
 - More efficient shipping (i.e. via rail) would help reduce emissions from recycling transport

Natalie Meyer, City of Bozeman Sustainability

- Half of City waste emissions are estimated to be from organic material in the closed Story Landfill
- There is a methane extraction system that converts methane to CO₂ but not enough volume or quality to do co-generation
- Once organics are in the landfill, it's a long term problem and little we can do beyond flaring

Kristin Blackler, MSU Sustainability

- Last year had a pilot for move-out day where MSU collected items from the dorms and sold items at a garage sale in the police parking lot during move-in day (i.e. microwaves, mini fridges, futons, fans)
 - Goal wasn't to make a profit but to divert from landfill
 - Sold out by 1:00 p.m.
 - Main challenge is storage space
 - Exploring partnering with Goodwill who is developing a model for Universities
 - Goal is to help students who need it most
 - Shifting timing this year because of international students that move in early and family/grad apartments
 - Group also mentioned partnering with HRDC
- MSU was able to host two zero-waste events last year
 - When the conversation first came up, everyone said it wasn't possible
 - Two largest events on campus (first dinner for new students and families, and welcome back event for staff and faculty) were successful zero-waste events
 - Looking at how to implement at basketball games, football games
 - Once infrastructure is in place, these events grow

Discussion Questions

City of Bozeman

- What is the City's role in implementing this strategy?
- Are there new programs, policies, or assets that need to be considered?

Community Partnerships

- What community organizations and partnerships can support implementation of this strategy?
- How should they be engaged and what are their roles?

Community Members

- What is the role of neighborhoods in implementing this strategy?
- What can individuals do to support this strategy?

Market Considerations

- What market transformations are needed for implementation to be effective?
- What incentives should be explored or considered?
- What is the role of business community in implementation?

Challenges and Benefits

- Who might be left out or impacted negatively by implementation of this strategy? How?
- Who stands to benefit from implementation? How?
- Are there resiliency co-benefits? Are there human health co-benefits?

Preliminary Solution Ideas

These preliminary ideas are pulled from the Climate Plan community engagement activities and are provided to help inform the discussion.

Waste diversion

- Limit junk mail
- More frequent opportunities for hazardous waste disposal
 - *Challenges:*
 - Limitations in space and staff capacity
- Food recovery program
- City-wide compost drop off
- Yard waste and kitchen waste curbside compost
 - *Vermont, other communities have fines for not composting organic waste*
 - *Create best management practices to educate and encourage people to use less harmful products and encourage them to use alternatives*
 - City has best management practice for City property to use “least aggressive solution possible” but not a ban on Round Up: certain weeds they have no alternatives
 - *Challenges:*
 - Weed killers/pesticides on grass clippings. Could part of the solution include ban or educational campaign on Round Up, neonicotinoids, and other harmful products in the compost? That would be a policy change through the City commission
 - Difficult to enforce a ban
 - *Partnerships:*
 - Company that does biological fertilization
 - YES Compost, Happy Trash Can
 - Lawn care companies
- Composting for restaurants, large buildings and multi-tenant properties
- Encourage utilization of waste from food processors (Ex: livestock, game, Amsterdam Meats)
- Ban single use plastics (e.g., water bottles, straws, bags, etc.)
 - There is a group locally working on a single use plastic ban in the community. Currently doing education and they hope City Commission will take up the issue.
 - *Partnerships:*
 - Roxy's in Big Sky is sourcing all aluminum for water bottles, to get rid of plastic water bottles.

- *Challenges:*
 - Ban on campus difficult: contracts get negotiated every seven years, and only had one bidder so not much leverage.
- Explore regulating Styrofoam ban
- Compostable poo bags for pets
- Buy Nothing Day
- Community swaps
- **Sharing sheds, The Thingery**
 - Registry/library of things to use
 - Could be physical space or registry of who has what and how to contact them to borrow it
 - Shed or mobile unit or building with tools, equipment, etc. that people may only need to use once or a handful of times
 - Resiliency co-benefit
 - Also builds relationships with neighbors—those connections are important in times of emergency
 - Fix-it Clinic, maker space: they have a shop with memberships to use their tools
- Bulk buying in grocery stores
- Working with businesses on supply chain and packaging
- Improve metrics: weigh recycling and waste at truck
- Fiscal reason for having less “stuff”: happier, healthier, wealthier
- Safety and emissions consideration: having a truck only go through a neighborhood once a week to pick up everything vs. three times/week or every day to pick up different items
- *Partnerships:*
 - Developers—they are often the ones that create the HOAs. HOA rules are enforceable
 - Logjam: zero waste facility because their musicians demand it. How can we capitalize on that and apply it to DBA and Music on Main, Art Walks, etc.?
 - Put it in the public sphere where people are participating anyway and this becomes the norm and doesn't feel like a compromise
 - Tie in to Leave No Trace ethic: what you do on weekends shouldn't be different than what you do in day-to-day life
 - Do good to feel good!
 - Sunrise Movement to help with education campaign
 - Neighborhood associations
 - Junior achievement community service work to partner with businesses

Recycling

- Better access to free recycling services
 - Incentivize recycling, increase cost to landfill (recycling bin free)
 - New rates for trash.
 - Bozeman is unique—we compete with Republic Services and L&L, which factors into all decisions around pricing for services.
 - *Challenges:*
 - Educate on cost savings
 - People need incentives: not everyone is in the mindset of doing good for the sake of doing good
 - Commission is sensitive to anything that implies punishing middle class. Socioeconomic challenges
 - Consider equity piece

- Recycling currently is lower cost than trash, but current pricing is barely sustaining the program. If costs are lowered for customers, City would have to subsidize that difference—it's not "free"
 - Penalize for not recycling
 - Opt-out instead of opt-in for recycling service
 - Pay-as-you-throw pricing structures: research communities where this has been implemented
 - How can we incentivize and still incorporate equity considerations?
 - *Challenges:*
 - Scales fail often
- Education on recycling
 - Reducing waste leads to behavior change
 - *Challenges:*
 - So much of recycling is feel good right now, wishful recycling that ends up in landfill somewhere else
 - Plastics 3-7 are not being recycled right now
 - People need to change their behaviors, but also need to demand that manufacturers change the way they design and package things
 - How do we change this feel good to something that actually changes behavior?
 - Targeted campaigns such as Story of Stuff
 - Education on reduction component
 - *Partnerships:*
 - MSU
 - Transient population, especially with international students that need everything when they arrive
- More plastic recycling options
 - *Partnerships:*
 - Group at MSU with a grant to study how plastics 3-7 can be used in road construction. Tie R&D in with local businesses, university research
- Glass recycling expansion
 - *Partnerships:*
 - Big Sky is bringing in a glass crusher. Is there a way to partner with them?
 - MSU engineering: feasibility study for glass in foundations or other construction applications
 - *Challenges:*
 - Glass can be used in paving, but it's basically sand, and it's cheaper to just buy sand
 - Only up to 10% can be used in roads
- Improve curbside recycling
 - *Challenges:*
 - Make sure we don't generate more emissions than we're saving (i.e. with glass)
 - Costs to separate materials
 - Is it the City's responsibility to create these markets?
 - We are charged with the responsibility to lead, not wait for others
 - Bigger, systemic problem: we don't have a circular economy. Look at this as a system and figure out how we can change the system. Extended producer responsibility laws
 - As our system exists, it doesn't matter how well we design the recycling system—our consumption system is designed to keep us consuming
 - Can't have this conversation in isolation, and can't place responsibility only on City or citizens
 - Look at packaging

- Reduce and Reuse are much more important than recycling
- Unintended consequences of increasing demand by increasing recycling options
- Include some carrot and some stick: how can we incentivize private industry?
- *Partnerships:*
 - Non profits
 - Manufacturers
 - School district education
 - Reduce waste, food education
 - Developers creating HOAs
 - Bozeman High School
 - Downtown Bozeman Partnership
 - Music on Main zero waste
 - Seven-point strategy to reduce waste
- Sunrise Movement: education and outreach

Construction and demolition materials management

- Complete a waste audit
- Construction waste ban or limits
 - Roll off bins are expensive/cost prohibitive. Opportunities to reduce that cost should be good incentive.
 - The City does offer wood-only bins for half the cost, but not all contractors use them. Also space constraints to have multiple containers in urban environment
 - A need for more education
 - Opportunity to use glass in aggregate fill for garages (not structural)
 - Opportunity to use sheet rock scraps in landscaping to improve pH in soil
 - Tie into stretch code incentive/recognition
 - Streamlined permitting
 - Equity piece is easier to incorporate with construction waste
 - Contractors do pay for what they throw away. Some use smaller bins by choice, but not many
 - Increase education about availability of options and cost savings of smaller bins
- *Partnerships:*
 - SWMBIA: education, best practices
 - Bozeman version of stamps/recognition for projects that are building more efficiently, wasting less
- *Challenges:*
 - Competition limitations in terms of changing pricing structures

Other

- Methane capture and Landfill Gas to Energy at both landfills
- Waste truck alternative fuels
 - No sources of certified biodiesel
 - Using biodiesel in some trucks, but ran into quality issues with others and fuel impacting vehicles/reducing vehicle life span
- Transfer station
 - Study and proposal to manager of landfill for new transfer station, centrally located, relatively close to rail spur. Current site is not sustainable with the amount of current volume.
 - Not at Mandeville site; that site has been sold
 - Transfer station can sort everything and only send landfill materials to Logan

- Promising solution that this group has identified in the past
 - Tried two years ago, proposed a consolidation station, but it was not funded
 - Idaho Pole site?
- Biochar: produced by burning compostable, organic waste anaerobically instead of composting
 - It produces biochar (charcoal) and bio oil/biogas
 - Bio oil/gas can be used in heavy duty vehicles in place of diesel
 - Biochar can be land applied, used in ag. applications, Stormwater treatment (great purifier), into plastics as conductor for biodegradable plastic products
 - Carbon sequestration is much longer term than composting
 - Two options for conversion plant
 - Put facility in same area as composting facility
 - Agriculture: instead of slash and burn or composting, convert organic wastes to biochar. Offer a mobile truck to use at area farms
 - Cardboard: unreliable market, low demand. Turn cardboard into biochar and return to ground.
 - Could also convert paper and food waste, but weigh pros/cons of food waste in compost vs. biochar, nitrogen retention, benefits to the soil
 - Compost nitrogen rich materials and biochar for more carbon heavy materials
 - Biochar is biomimicry, emulating the natural role of fire in the ecosystem
 - Scalable systems that can be used for different applications
 - UM has a mobile biochar system for logging operations
 - Construction waste good opportunity for biochar
 - Treated wood is not allowed in scrap and emissions profile is unknown for treated wood
 - Urban forest good opportunity for City with regard to biochar
 - *Challenges*
 - Staff and space, pre-sorting
 - *Partnerships:*
 - University of Montana
 - MSU
 - Logan Landfill
- Incorporate local food system in conversation about waste reduction
- At end of this process, final products are the City's Climate Plan and a Citizen Climate Plan
 - Easily readable action booklet showing City actions, and separate section or toolkit of all the individual actions community members, neighborhoods, and businesses can take to reduce their impacts and help the City meet Climate Plan goals
 - Colorful pictures, engaging
 - Incorporate a competition, block by block campaign or program like the water counter
 - Best practices
 - Non-profit support if neighborhoods applied for support or funding
 - *Challenges/partnerships:*
 - Need energetic partners to be successful with effort like this
 - Republic Services—national network, ability to assess new technologies (i.e. CNG for trucks)

Suggested Reading & Resources

City of Bozeman Curbside Recycling Program: <https://www.bozeman.net/government/garbage-recycling/recycling/acceptable-materials>

Gallatin Solid Waste Management District: <https://gallatinsolidwaste.org/recycling/>

We Recycle MT: <http://www.werecyclemt.com/ask-us/>

Zero by Fifty, Missoula's Pathway to Zero Waste: <https://www.zeroifyiftymissoula.com/>



Bozeman Climate Plan

BOZEMAN CLIMATE PLAN – Climate Team Workshop Series #3

Climate Team Work Sessions

Topic	Energy Efficiency & Renewable Energy	Waste & Natural Environment	Neighborhoods & Transportation
Date	Tuesday, 6/23	Wednesday, 6/24	Thursday, 6/25
Focus Areas Covered	<ul style="list-style-type: none">• Healthy, adaptive, and efficient buildings• Responsible and reliable renewable energy supply	<ul style="list-style-type: none">• Comprehensive and sustainable waste reduction• Regenerative greenspace, food systems, and natural environment	<ul style="list-style-type: none">• Vibrant and resilient neighborhoods• Diverse and accessible transportation options

Participants

Name (last, first)	Affiliation	Work Session Participation		
		Energy Efficiency & Renewable Energy	Waste & Natural Environment	Neighborhoods & Transportation
Climate Team Members				
Bellamy, Heather	NorthWestern Energy			
Blackler, Kristin	Montana State University	x	x	x
Blessing, Sara	Bozeman Sunrise Movement			
Bode, Emma	Forward Montana		x	x
Boyer, Jennifer	Farm 51		x	x
Bushnell, John	NorthWestern Energy	x	x	x
Carpenter, Randy	Future West			
Catron, Wyatt	Montana Weatherization Center	x		
Christenson, Lori	Gallatin County Health Department			
Cunningham, Terry	Bozeman City Commission	x		
Dorsi, Chris	Montana Weatherization Center-MSU Extension			
Fischer, Douglas	Bozeman School District	x		
Fox, Jeff	Renewable Northwest	x		
Frandsen, Eli	Montana State University-Student Body			
Giannetti, Danae	Western Transportation Institute			x
Hickey, Bonnie	Bridger Bowl			x
Holm, Ryan	Mystery Ranch			x
Jackson, Erin	Gallatin Valley Farm to School	x	x	x
Jamison, Danica	United Way			
Khumalo, Libby	World Wildlife Fund		x	
Kirk, Karin	Freelance Writing, Science Education	x		x

Name (last, first)	Affiliation	Work Session Participation		
Lewental, Anders	Southwest Montana Building Industry Association			
Mastel, Candace	Bozeman Area Bicycle Board, MSU Planning			x
Melvin, Addie	JM Engineering			
Mitchell, Owen	Bozeman High School-Student Body			
Nash Wanzek, Riley	Montana State University-Student Body			
Naumann, Chris	Downtown Bozeman Partnership			x
Pope, Chris	Montana Legislature – HD65		x	
Ross, Sunshine	Human Resources Development Council-Streamline/Galavan			x
Rowley, Nicole	Gallatin County			x
Schack, Lindsey	Love Schack Architects	x		
Sinnott, Jay	Bozeman Climate Partners	x	x	x
Stoddart, Bill	NorthFork Financial			
Vlases, Claire	Bozeman High School-Student Body			
Willey, Edie	Bozeman Health			
City of Bozeman Staff				
Kevin Handelin	City of Bozeman Solid Waste		x	
Henderson, Jon	City of Bozeman Strategic Services	x	x	
Dani Hess	City of Bozeman Neighborhoods			x
Higinbotham, Heather	City of Bozeman Sustainability	x	x	x
Jadin, Addi	City of Bozeman Parks	x	x	
Lonsdale, Taylor	City of Bozeman Transportation			x
Kohtz, Shawn	City of Bozeman Engineering			x
Kyle Mehren	City of Bozeman Stormwater		x	x
Meyer, Natalie	City of Bozeman Sustainability	x	x	x
Nordquest, Alex	City of Bozeman Forestry		x	
Rosenberg, Sarah	City of Bozeman Community Development	x	x	x
Saunders, Chris	City of Bozeman Community Development	x	x	x
Consulting Team				
Dorsey, Judy	Executive Project Manager, Brendle Group	x		
Ide, Britt	Ide Energy	x		
Sommer, Shelby	Project Manager, Brendle Group	x	x	x
Stock, Becca	Project Analyst, Brendle Group		x	x
Observers				
Kack, David	Western Transportation Institute			x
Kurnick, Rebecca	Montana Ale Works		x	
Johnson, Karl	YES Compost		x	
Wright, Kate	Open and Local		x	

Approach

Objectives

- Orient the group to the draft Climate Plan
- Discuss draft actions and preliminary priorities
- Clarify next steps for providing feedback and community engagement

Agenda

11:50 a.m.	Join the meeting early for an optional technology check
12:00 p.m.	Welcome & Project Updates <ul style="list-style-type: none">• Web meeting logistics and participation ground rules• Project status and process updates
12:05 p.m.	Draft Plan Orientation <ul style="list-style-type: none">• Overview of all focus areas & solutions• Emissions reduction analysis & key takeaways
12:20 p.m.	Focus Area Review – Part A <ul style="list-style-type: none">• Orientation to each solution and supporting actions• Discussion (for each solution)<ul style="list-style-type: none">○ Are the proposed actions clear?○ Do you have any first reactions to the preliminary priorities?○ Do you see a role for you or your organization in implementation?
12:55 p.m.	Focus Area Review – Part B <ul style="list-style-type: none">• Orientation to each solution and supporting actions• Discussion (for each solution)<ul style="list-style-type: none">○ Are the proposed actions clear?○ Do you have any first reactions to the preliminary priorities?○ Do you see a role for you or your organization in implementation?
1:20 p.m.	Wrap up and Next Steps

Discussion Outcomes

Climate Team members shared their feedback on the proposed actions, prioritization, and implementation roles. A summary of the major discussion themes and subsequent plan revisions is provided in the Summary of Preliminary Draft Plan Revisions section below.

Climate Team Survey

In addition to soliciting feedback on the preliminary draft plan through a series of three topic-specific work sessions, all Climate Team members were encouraged to review the preliminary draft plan and provide feedback via a survey. A total of 14 Climate Team members provided suggestions on action refinement and prioritization. Their comments are reflected in revisions to the draft plan, and summarized in the following section by focus area.

Summary of Preliminary Draft Plan Revisions

Energy Efficiency & Renewable Energy

Focus Area 1. Healthy, Adaptive & Efficient Buildings

- General Revisions
 - Added various new implementation partners and text revisions
 - Reinforced that the City cannot adopt more aggressive code requirements than State, so need to influence State code/policy
- Reprioritization & Refinements
 - Action 1.B.5. Offer a Voluntary Pathway & Incentives for Above-Code construction - reworked to de-emphasize third party rating systems due to legal concerns and implementation/timing challenges. Shifted to Level 3 and revise to emphasize adoption of new above-code options & incentives in code (rather than third party)
 - Action 1.B.2. Advocate for Adoption of State-Wide Net Zero Energy Code – shifted from Level 2 to 1.
 - Expanded Action 1.B.3. Encourage High Performance Construction for All Publicly Funded Buildings to include other community institutions (note that City cannot mandate this for other entities but can look into policy options for City-funded projects)
 - Action 1.B.4. Analyze and Support Opportunities for District Energy - kept as Level 2 due to need to collaborate on an approach and find resources for studies.

Focus Area 2. Responsible & Reliable Renewable Energy Supply

- General Revisions
 - Added more discussion of public/private partnerships.
 - Reinforced that a MOU is in development with NorthWestern Energy (related to comments about getting a more formal commitment).
- Reprioritization & Refinements
 - Action 2.E.1. Support Green Tariff Program Development & Participation - revised to "Advance" to elevate the role of City of Bozeman in helping shape this.
 - Action 2.F.2. Streamline Solar Permitting and Adopt Solar-Ready Code Provisions - shifted from Level 2 to 1.
 - Action 2.F.3. Advance Distributed Solar Policies with NW Energy – shifted from Level 3 to 2 to coordinate with solar permitting and code revisions.
 - Action 2.F.4 . Promote Education & Incentives for Distributed Renewable Energy and Storage - kept as Level 3 so that earlier actions addressing solar permitting and solar policies can be addressed and included in this action.

Waste & Natural Environment

Focus Area 5. Comprehensive & Sustainable Waste Reduction

- Reprioritization & Refinements
 - Action 5.M.1 Actively Promote Source Reduction, Recycling & Repair - shifted from Level 2 to 1.
 - Action 5.M.3. Improve Waste Policies, Services & Operations – addressed the need to consider more efficient options for transport to Logan Landfill (i.e., transfer/sorting station) as part of improved operations.

Focus Area 6. Regenerative Greenspace, Food Systems & Natural Environment

- General
 - Emphasized ongoing climate-water research and forecasting with local partners in focus area narrative, so did not add as a separate action.
 - Did not include suggestion to study legal issues related to construction outside of planning areas since that is better addressed in Growth Policy efforts.

- Mentioned water catchment and greywater systems as potential long-term opportunities but current regulatory structure is prohibitive, so did not add as an action.
- Noted that the City already has tiered water rates and is making some landscape code changes that will address submetering for large water users, so did not add as new actions.
- Reprioritization & Refinements
 - Action 6.N.3 Encourage Local Agriculture and Food Production, Processing & Distribution – separated into 2 actions.
 - 6.N.3. Encourage Local Agriculture and Preservation of Working Lands (Level 2)
 - 6.N.4. Support Local Food Production, Processing, and Distribution (Level 3)
 - Action 6.P.2 Expand & Maintain Urban Forest - keep at Level 1 and revised title to Maintain & Expand.
 - Action 6.P.4 Provide Outreach on Water Pollution Prevention & Carbon Sequestration Strategies
 - Shifted from Level 3 to 2.
 - Included discussion of pest management practices and limiting neonicotinoid use in city limits, especially in public parks and shared spaces.
 - Action 6.P.3 Promote Greenspace and Carbon Sequestration for New Development
 - Shifted from Level 2 to 1
 - Added extra emphasis on native landscapes and greenspace preservation within the suburban development occurring.
 - Emphasized enhancing or replacing wetlands and expanding green infrastructure.

Neighborhoods & Transportation

Focus Area 3. Vibrant & Resilient Neighborhoods

- General Revisions
 - Incorporated emphasis on green infrastructure throughout section and especially into Action 3.G.2. Revise Development Code to Enhance Compact and Sustainable Development.
 - Will pull out all actions that link to Development Code updates into a summary section in the Implementation Chapter of the plan.
- Reprioritization & Refinements
 - Action 3.H.3 Support Residential and Business Preparedness Outreach - shifted from Level 3 to 2.
 - Added new action 3.H.4 Incorporate Resiliency into Infrastructure Plans.
 - Action 3.I.1. Support Community and Neighborhood Resilience Programming - addressed institutionalization of mutual aid programs such as the one that organically formed from the COVID-19 pandemic.
 - Action 3.I.1. Support Community and Neighborhood Resilience Programming -addressed social cohesion, mental health, and personal resilience as critical components.

Focus Area 4: Diverse & Accessible Transportation Options

- General Revisions
 - Revised language around a new MPO being established in 2021 and reframed actions around prioritizing multi-modal planning within City and region.
 - Suggestion to remove Electrifying VMT - did not remove but are stressing/emphasizing multi-modal over this action.
 - Expanded introduction to discuss alternative technologies and fuels and the benefits/impacts of telecommuting.
- Reprioritization & Refinements
 - Action 4.J.2. Expand Pedestrian and Bicycle Connections Network
 - Referenced City Transportation Plan that identifies improvements for network connectivity.
 - Linked to new Transportation Demand Management Position and linked to integration of Safe Routes to School as part of a TDM program.
 - Action 4.J.4. Pursue Sustainable Transit Funding and Expansion - shifted to Priority 1 from 2.
 - Action 4.J.8. Develop Bike and Car Share Programs - shifted from Priority 2 to 3.
 - Action 4.K.3. City Fleet & Transit EV Investment –
 - Kept at Priority 2 (need sustainable transit funding first).
 - Expanded to include alternative fuels and new technologies for heavy duty vehicles.

- Action 4.K.4. Advocate for EV Utility Rates, Incentives, Infrastructure, and Efficiency Standards – refined to address emissions standards for State of MT.
- Action 4.K.5. Limit Wasteful Vehicle Emissions - shift up from Priority 3 to 2
- Action 4.J.6. Regional Transit Service Coordination & Outreach
 - Moved under Solution J. Increase Walking, Bicycling, Carpooling & Use of Transit
 - Shifted from Priority 2 to 1.
 - Included advocacy for restoration of southern public rail line (Hiawatha Route).
- Action 4.L.1. Build Awareness through Employee Air Travel Policies –
 - Shifted from Priority 3 to 2.
 - Shift to leveraging City's influence with other community orgs and members
 - Increased awareness of carbon impacts of "binge flying"
- Action 4.J.7. Leverage Parking Policies to Encourage Other Modes of Transportation - new action added to address comments about parking management and infrastructure.

APPENDIX D: COMMUNITY FORUM SUMMARIES



BOZEMAN CLIMATE PLAN – Community Forum 1 Summary

October 23, 2019
4:30 – 6:30 p.m.
Story Mill Community Center

Forum Objectives

- Build an understanding of the Climate Plan purpose and process
- Help shape the plan vision
- Explore potential climate solutions

Agenda

4:30 p.m.	Open House
5:15 pm	Welcome and Project Overview: Natalie Meyer, City of Bozeman Sustainability Program Manager
5:20pm	Our Climate Plan Perspectives: Bruce Maxwell, Montana Climate Assessment
5:25 pm	Our Climate Plan Perspectives: Claire Vlases, Bozeman High School
5:30 pm	Our Climate Plan Perspectives: Terry Cunningham, City Commissioner
5:35 pm	Open House

Project Overview

Natalie, Sustainability Program Manager and Bozeman Climate Team Project Manager for the City of Bozeman, welcomed everyone, provided an overview of the agenda and forum objectives. Highlights of her presentation include the following:

- The City has already agreed to upholding Paris Climate Agreement, this process will explore more specifically what this means for Bozeman.
- 7 focus areas and two cross-cutting themes will be addressed.
- This effort builds on various related efforts:
 - 2008 Municipal Climate Action Plan
 - 2011 Community Climate Action Plan
 - 2019 Climate Vulnerability & Resiliency Assessment
- NOAA indicated that 2017 was the costliest on record for natural disasters.
- There are already many local climate action success stories to report - see the display boards for a few examples.



Our Climate Plan Perspectives

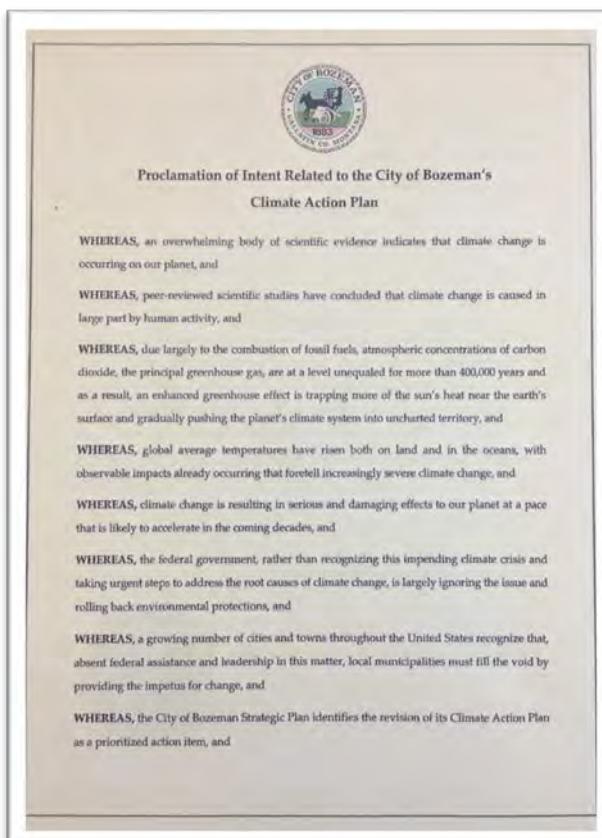
Three members of the Bozeman community provided brief presentations that shared their hopes and perspectives for the Bozeman Climate Plan:

- **Bruce Maxwell** with the Montana Climate Assessment provided an overview of the State of Montana climate goals. He stressed the importance of local action in light of the United States' exit from the Paris Climate Agreement. The climate planning efforts at the state and local level can build on the work of the Montana Climate Assessment. The state plan will identify the role of state agencies and how they interact with local government on climate. They need communities like Bozeman to share information and ideas, such as major impediments to climate action, information gaps, and help identifying where to spend and focus state resources.
- **Claire Vlases**, solar club president from Bozeman High School, shared her story about learning about the concept of a carbon footprint and how we leave footprints everywhere we go. She challenges us to all focus on how we can all clean up our footprints for future generations, as well as from previous generations. She shared that when she had the idea to install solar at her middle school. At first, she encountered a lot of skepticism and "no" responses. She persevered and noted the need to be resilient and persistent – climate justice cannot wait. The overwhelming success of the school solar project has created momentum for state legislation that will support solar installations at all Montana schools.
- **Terry Cunningham**, Bozeman City Commissioner, read a poem by Warsan Sire (see attached slides for full presentation):

*"Later that night
I held an atlas in my lap
ran my fingers across the whole world
and whispered
where does it hurt?

it answered
everywhere
everywhere
everywhere."*

He noted that if an asteroid was heading towards earth, the global response would be massive and resolute – we would put aside our differences and cooperate to save the planet. He shared that Bozeman chooses to engage in finding climate solutions, and then read the proclamation issued by Mayor Cyndy Andrus on October 22, 2019 (see images below).

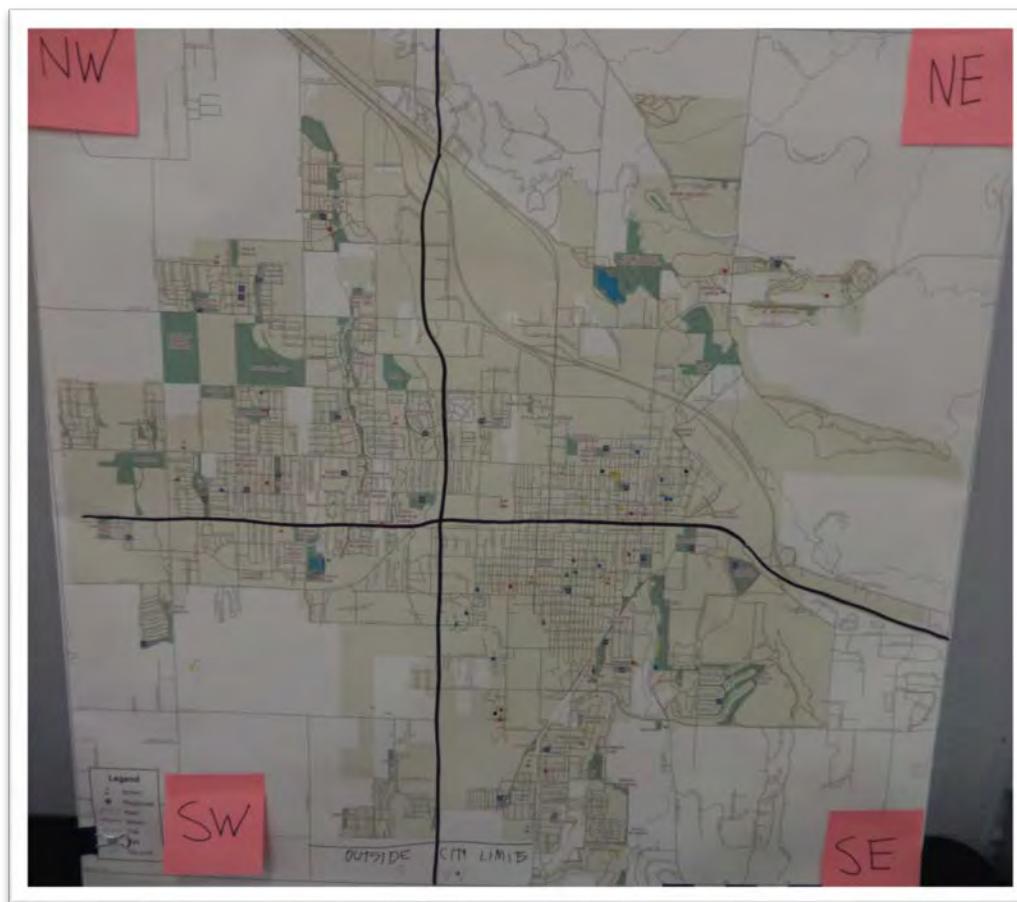


Open House Activities & Stations

Welcome & Sign-in

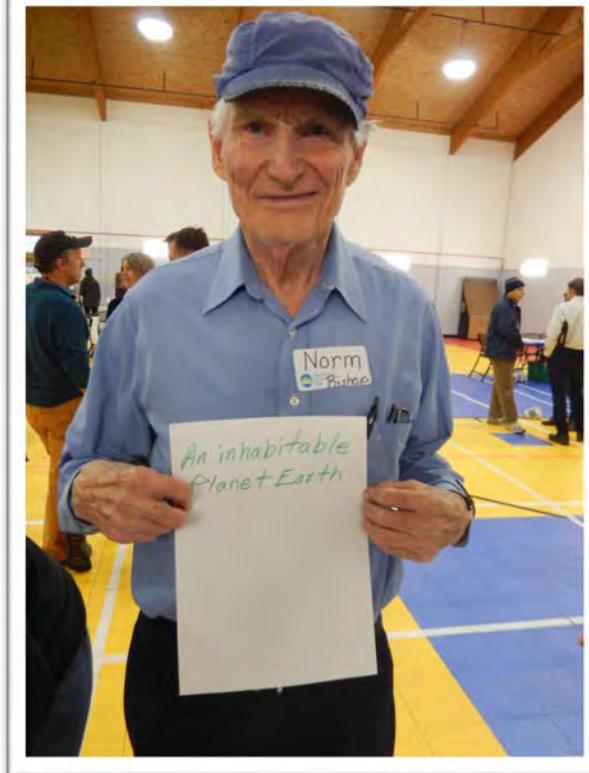
As participants entered the open house, they signed-in, provided email addresses for project-related updates, and indicated which portion of the community they live in by putting a pin on a map and noting the quadrant on the sign-in sheets. The following information was collected on the sign-in sheets:

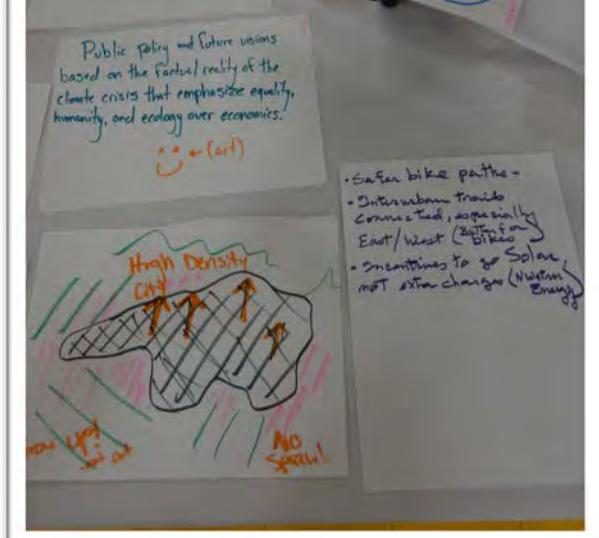
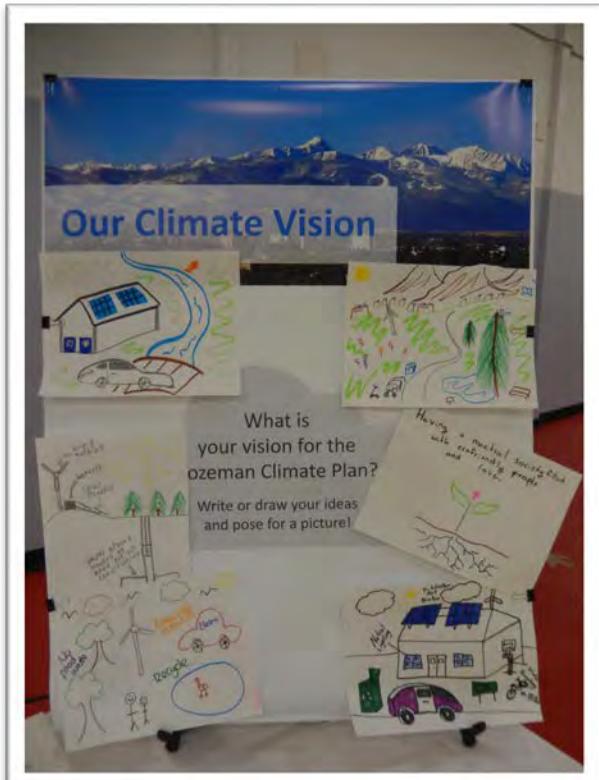
- 79 contacts (over 100 people were present during the presentations)
- 11% from Northwest Bozeman
- 30% from Northeast Bozeman
- 4% from Southwest Bozeman
- 41% from Southeast Bozeman
- 6% from outside City limits
- 8% did not provide a location



Our Climate Vision

Participants at this station wrote or drew their “vision” for the Bozeman Climate Plan and many posed for a picture with their vision. These photos and vision ideas will be used in the Climate Plan document and will inform the vision statement development.

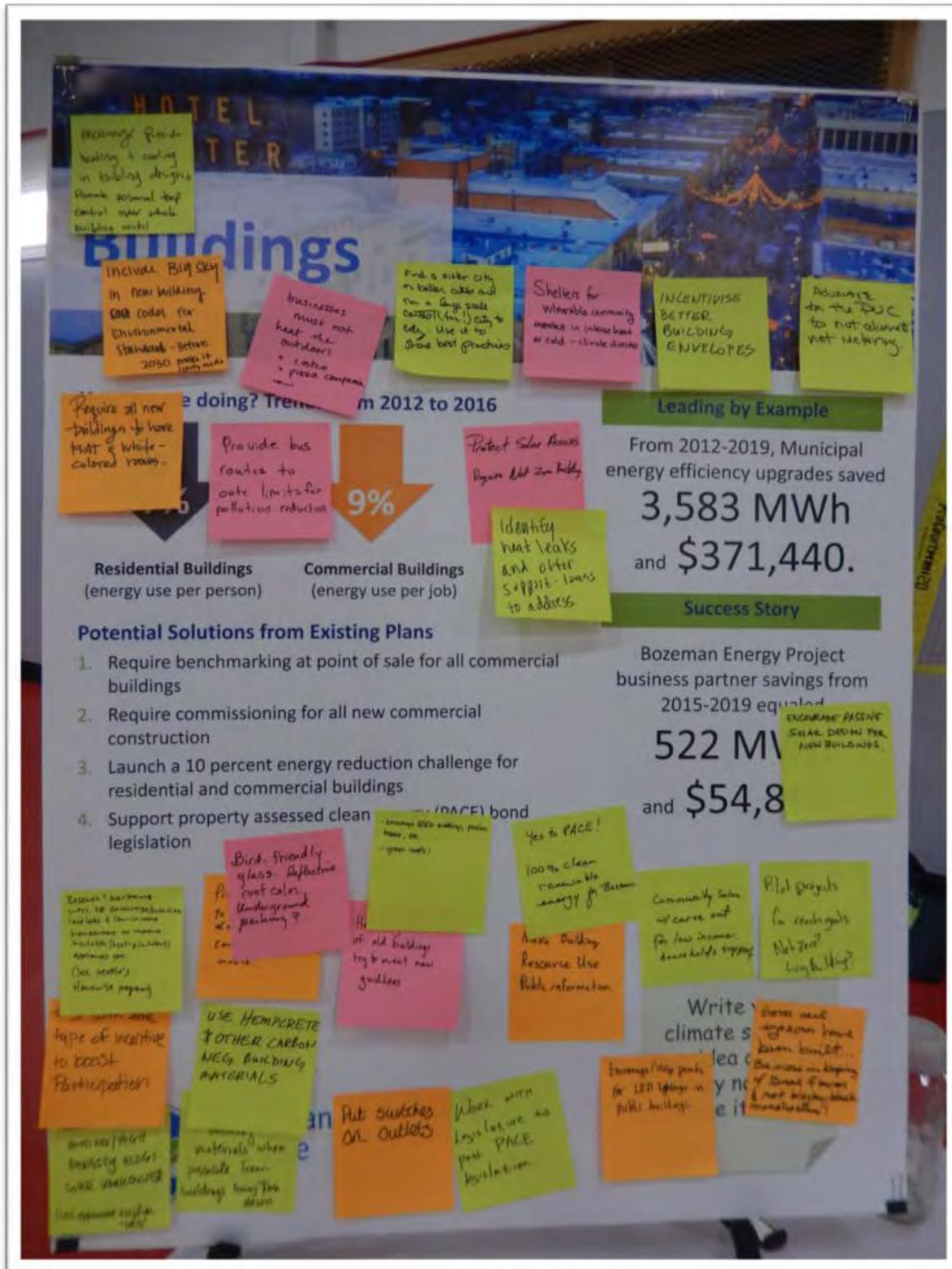




Focus Area Stations

The following pages show the ideas for the climate solutions generated by participants for each focus area. These ideas will be added to the “solution inventory” for exploration and consideration during the planning process. Refer to the display boards PDF file to see the full display board content since some of the information is covered by community ideas.

Buildings



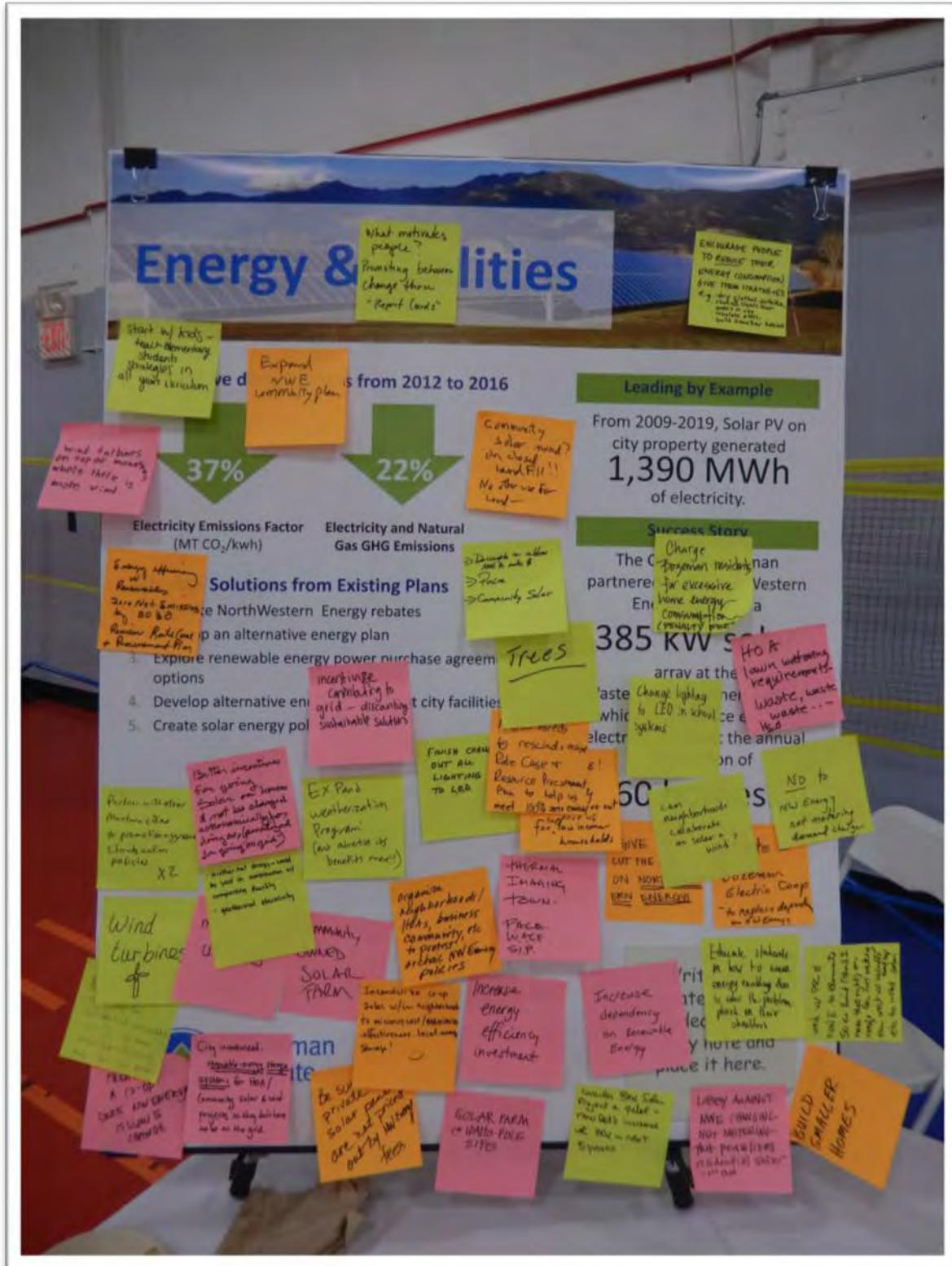
Community Development



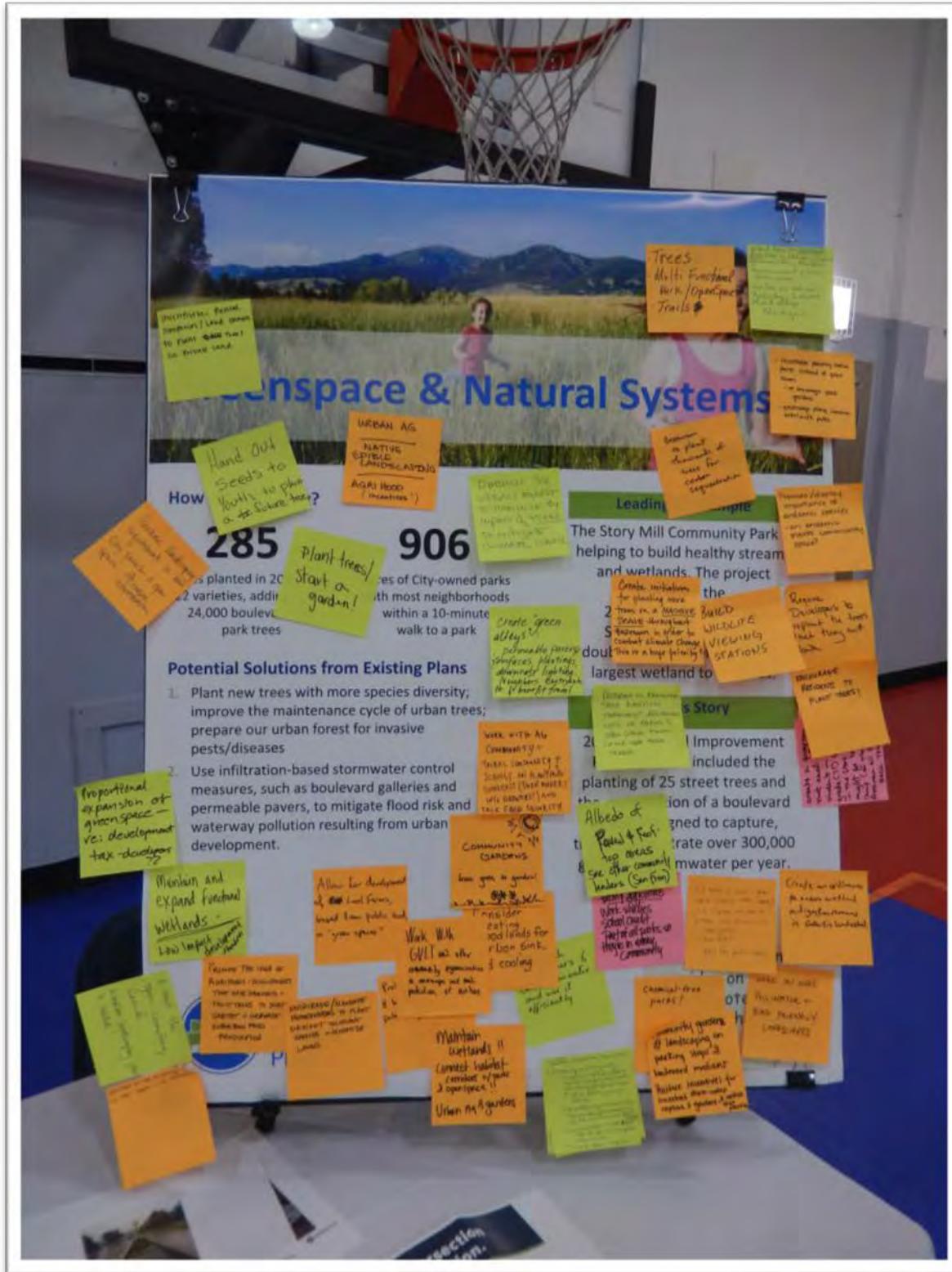
Consumption & Waste



Energy & Utilities



Greenspace & Natural Systems



Transportation



Kids Activities

City of Bozeman Parks & Recreation Staff led children in a coloring activity to help them understand their ecological footprint.





Bozeman
Climate
Plan

Bozeman Climate Plan

Community Forum - October 23, 2019

Story Mill Community Center



WELCOME

Orientation



Bozeman
Climate
Plan

Objectives

- Build an understanding of the Climate Plan purpose and process
- Help shape the plan vision
- Explore potential climate solutions

Activities

- Guest Speakers
- Vision Photo Booth
- Solution Brainstorming

Climate Plan: Project Overview



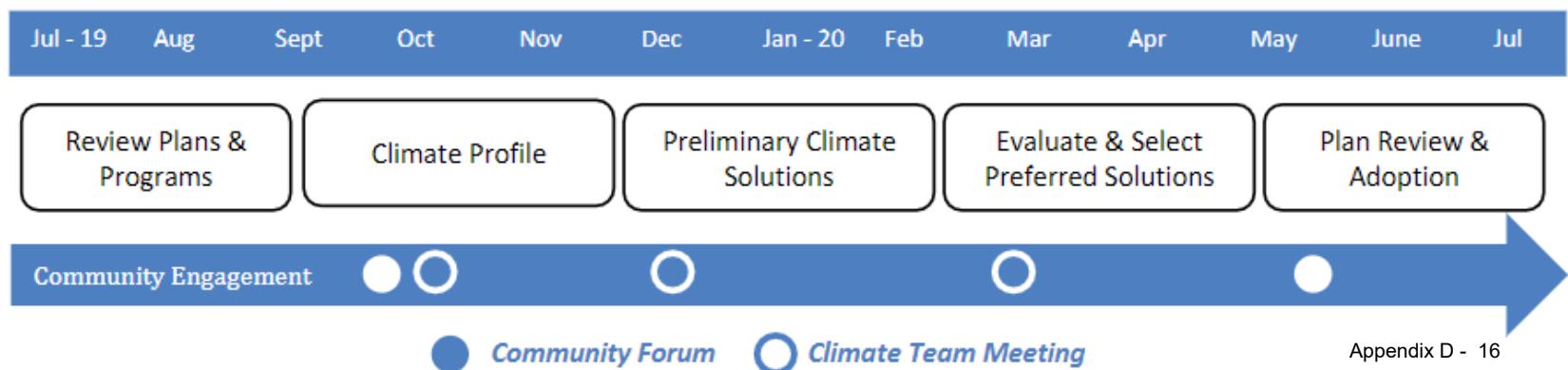
Bozeman
Climate
Plan

Goals

1. Align the City's emissions reduction goals in accordance with the Paris Climate Agreement.
2. Create an actionable project implementation and policy-making guide.
3. Include a diverse group of stakeholders in shaping Bozeman's response to climate change



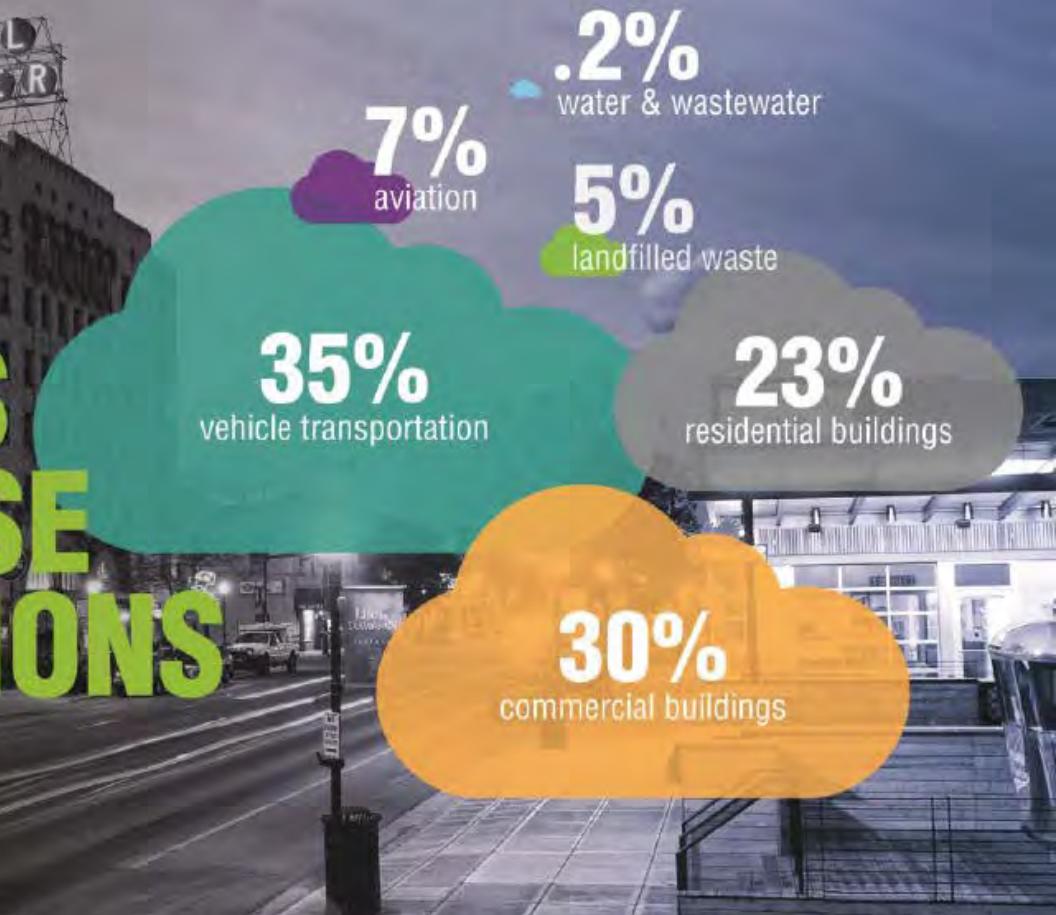
Timeline





Bozeman
Climate
Plan

WHERE DO BOZEMAN'S GREENHOUSE GAS EMISSIONS COME FROM?

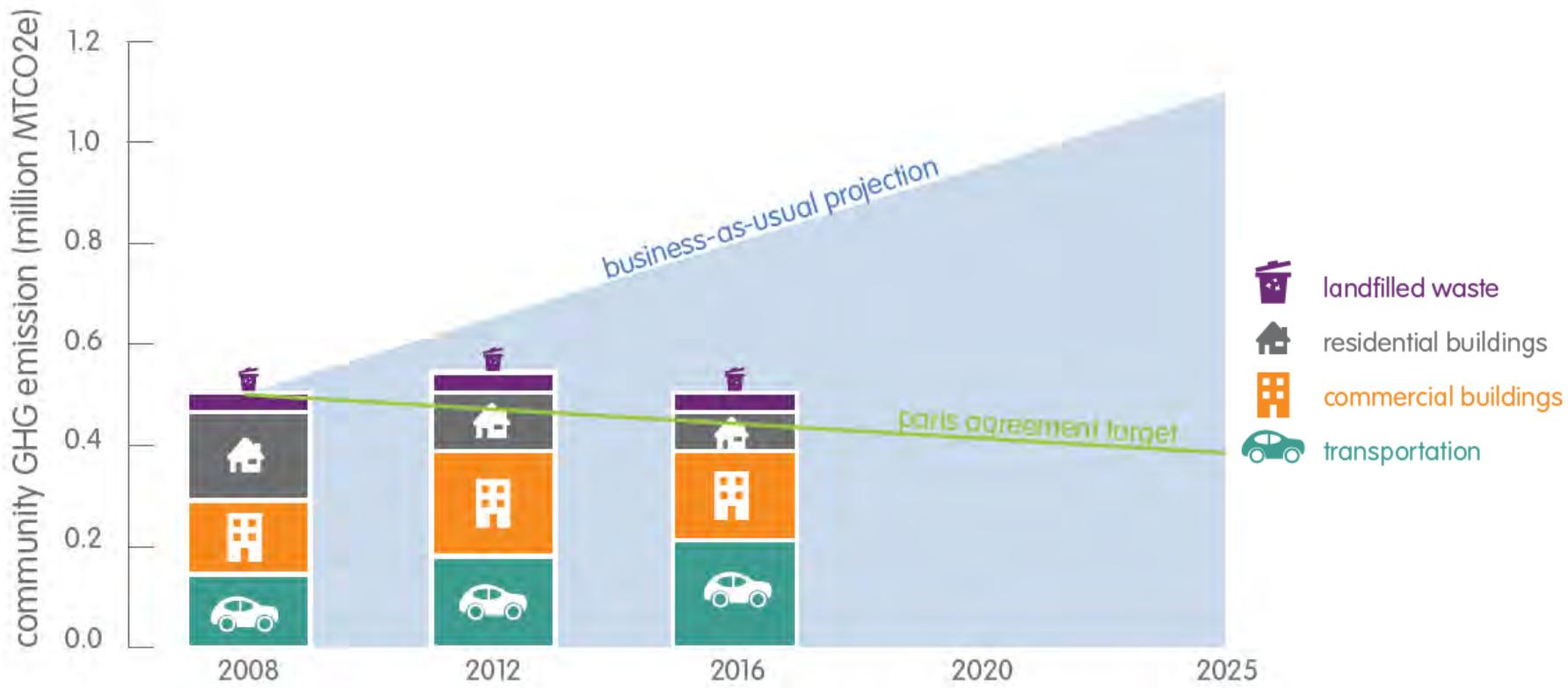


What is our Goal?

In 2017, Bozeman passed a resolution to join the Climate Mayors, a partnership of over **400 United States mayors** committing to uphold the goals of the **Paris Climate Agreement** through local action.



Bozeman
Climate
Plan



Paris Climate Agreement



Bozeman
Climate
Plan

2015 International Agreement

- Aims to limit the global temperature increase to 1.5 degrees Celsius
- Requires all Parties to put forward their best efforts through nationally determined contributions (NDCs) and to strengthen these efforts in the years ahead.
- This includes requirements that all Parties report regularly on their emissions and on their implementation efforts

US Targets & Status

- March 2016: First NDC submission from US
 - Committed to 26% GHG emissions reduction below 2005 levels by 2025
 - Intention to make best efforts to reduce emissions by 28%
- June 2017: US to cease all participation on climate change mitigation
 - Agreement specifies a 4-year exit process
 - Exit will be complete on November 4, 2020

Mayor's Climate Protection Agreement



Bozeman
Climate
Plan

- Bozeman joined the Climate Mayor’s Agreement in 2017
- Commits Bozeman to adopt, honor, and uphold commitments to the Paris Agreement goals

As 407 US Mayors representing 70 million Americans, we will adopt, honor, and uphold the commitments to the goals enshrined in the Paris Agreement. We will intensify efforts to meet each of our cities' current climate goals, push for new action to meet the 1.5 degrees Celsius target, and work together to create a 21st century clean energy economy.

We will continue to lead. We are increasing investments in renewable energy and energy efficiency. We will buy and create more demand for electric cars and trucks. We will increase our efforts to cut greenhouse gas emissions, create a clean energy economy, and stand for environmental justice. And if the President wants to break the promises made to our allies enshrined in the historic Paris Agreement, we'll build and strengthen relationships around the world to protect the planet from devastating climate risks.



State of Montana Context



Bozeman
Climate
Plan

Executive Order

- Joins US Climate Alliance
- Establishes Climate Solutions Council
- Commits to issuing a Montana Climate Solutions Plan by June 1, 2020

Interim Goals

- Net greenhouse gas neutrality for average annual electric loads in the state by no later than 2035
- Net-zero greenhouse gas emissions economy-wide at a date to be determined by the Council

Impacts of Climate Change in Bozeman



Bozeman
Climate
Plan



More Extreme Heat



More Flood Events



Longer & More Intense Drought



Reduced Mountain Snowpack



More Severe Wildfire



More Severe Winter Storms

Bozeman Community Climate Action Plan 2011



Photo Source MSU: Hyalite Reservoir

BOZEMAN CLIMATE PROTECTION TASK FORCE

Bozeman Climate Action Plan

Municipal CAP



Scott Bistline, Co-Chair
Otto Pohl, Co-Chair
Peter Brischwender
David Boggeman
Steve Bruner
Molly Cross
Mark Johnson
Martin Knight
Mel Kotur
Matthew Madden
Pat McCown
Colin Moore
Greg Pederson

Bozeman Sustainability Coordinator Hattie Baker

June 2008

Printed on recycled paper



Craig Herget

Climate Vulnerability Assessment & Resiliency Strategy

APRIL 2019

Previous Efforts



WHAT OUR CLIMATE PLAN MEANS TO ME

Local Perspectives & Inspiration



Bozeman
Climate
Plan

Montana Climate Assessment

BRUCE MAXWELL



Bozeman
Climate
Plan

Bozeman High School

CLAIRE VLASES



Bozeman
Climate
Plan

City of Bozeman

COMMISSIONER TERRY CUNNINGHAM



Bozeman Climate Plan



*"later that night
i held an atlas in my lap
ran my fingers across the whole world
and whispered
where does it hurt?*

*it answered
everywhere
everywhere
everywhere."*

— Warsan Shire



Everywhere



Everywhere



Everywhere





The Response....



- Immediate. Urgent. Top Priority.
- Massive. Unprecedented. No Holes Barred.
- International. Cooperative. Collaborative.
- Technology. Innovation. Creativity. Can-do Spirit.
- Leadership. Accountability.

The Response?



- Deny the Science.
- Declare It's Just a Cyclical Global Event.
- Deal With it Later.
- Point Finger of Blame at Others.
- Politicize The Issue.

City of Bozeman Strategic Plan

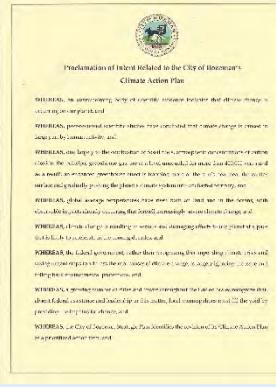
- **6.3 Climate Action** - Reduce community and municipal Greenhouse Gas (GHG) emissions, increase the supply of clean and renewable energy; foster related businesses.
- a) **Update the Climate Action Plan.** Update the Climate Action Plan and revisit greenhouse gas emissions inventories, review reduction targets, and explore a voluntary energy efficiency incentive program or stretch code to encourage new residential and commercial construction to exceed the performance standards of the currently adopted building energy code.
- b) **Increase Solid Waste Recycling Services.** Adopt incentive programs to increase the public's utilization of city recycling and solid waste services.
- c) **Create Solar Energy Policies.** Review three-year data from NorthWestern Energy's Community Solar Installation to inform planning and policies.
- d) **Climate Change Adaptation and Mitigation.** Increase the community's resiliency and preparedness in response to climate change.

We Hold These Scientific Truths To Be Self Evident:

- Global warming & climate change is occurring.
- Climate change is caused in large part by human activity.
- Climate change is resulting in serious and damaging effects, and this pace is likely to accelerate in the coming decades. It is an **emergency**.
- The federal government is largely ignoring the issue, even rolling back environmental protections.
- Absent federal leadership, local municipalities must fill the void by providing the impetus for change.

Mayoral Proclamation of Intent:

- Bozeman shall be a leader in addressing climate change by developing a climate action plan that identifies bold targets for carbon reduction and climate change mitigation, and
- We will create a policy document that will weave sustainability and climate change resilience into the City of Bozeman's decision-making processes, capital planning and city budgets, and
- Bozeman will pursue partnerships with other municipalities and our utility provider to reach a goal of 100% net renewable energy for the City of Bozeman by 2030, and
- We call upon the Montana governor's office, state agencies, the state legislature, the Public Service Commission, Gallatin County, Northwestern Energy and all Bozeman residents to join us as we seek aggressive, actionable solutions to address one of the most critical issues that mankind has ever faced.



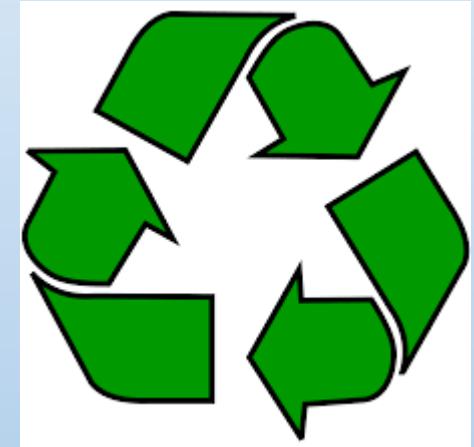
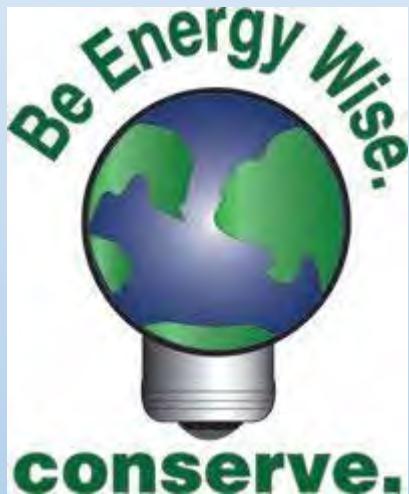


The Response...

- A community-wide effort.
- Diverse group of stakeholders.
- Create an actionable project implementation and policy-making guide.
- Align the City's emissions reduction goals in accordance with the Paris Climate Agreement & other identified goals.
- Do what is necessary, not just what is viable.

Where Will We Need Your Help?

Everywhere



Everywhere



Everywhere



Open House Instructions



Bozeman
Climate
Plan

1. Sign-in and make a name tag
2. Visit the photo booth and share your vision
3. Review the 6 focus areas and help brainstorm potential climate solutions
4. Listen to the project overview (5:15 pm)
5. Get inspired by our guest speakers (5:20 pm)





Bozeman Climate Plan

DRAFT BOZEMAN CLIMATE PLAN – Community Workshop

October 01, 2020

6:30 – 8:00 p.m.

Webex Virtual Workshop

Forum Objectives

- Orient the community to the draft Climate Plan
- Answer community questions about the draft plan
- Clarify next steps for plan refinement and adoption

Agenda

6:30 p.m.	Welcome & Draft Climate Plan Introduction
6:50 p.m.	Part 1. Buildings & Energy
7:10 p.m.	Part 2. Neighborhoods & Transportation
7:30 p.m.	Park 3. Waste, Food & Natural Environment
7:50 p.m.	Wrap-Up & Next Steps

Participants

Alex Weber, Bruce Maxwell, Duncan Small, Eva Molina, Janelle Sanchez, Jennifer Boyer, Julia Ryder, Kate Burnaby Wright, Kristen Walser, Kyrie Dawson, Mark Chavez, Matt Thompson, Peter Aengst, Rachel just, Seth Kane, Ted Weaver, Will Swearingen

Presentation Summary Slides (see attached)

Part 1. Buildings & Energy Q&A

1. How are you going to increase rooftop solar in Bozeman, especially when the utility is continuously trying to kill net metering?
 - a. Looking for legislative opportunity to increase the cap for net metering.
 - b. Increased opportunities for non-export systems especially for large commercial.
 - c. Follow-up: Some businesses are interested in solar if the cap can be adjusted.
 - d. See action 2F3.
2. Are there any initiatives to push building code beyond the current green building standards?
 - a. Locally not allowed to adopt a code that is more stringent than the state-wide code.
 - b. 1B2: Advance at the state-wide standard though advocacy.
 - c. Can incentivize above code construction locally as well.
3. What kind of input did NorthWestern Energy give to the plan process?

- a. Have been working with NorthWestern energy for many years.
 - b. Most promising opportunity is a green tariff in collaboration with other MT communities.
 - c. Also work on DSM, efficiency, and smart metering.
 - d. Follow-up: Green tariffs allow Bozeman to be a leader in the state.
4. How do you recommend advocating for more stringent energy and water regulations?
- a. State code council makes a recommendation every couple years.
 - b. Need to watch the schedule - a hearing coming up soon.
 - i. Can follow-up with information with how to engage.
 - ii. Ted and Alex are interested in this information.
5. Will transportation emissions overcome stationary energy emissions?
- a. This is starting to happen in some communities and will come soon to Bozeman.
6. Are you coordinating or referencing how these recommendations are supported or support the Governor's Climate Solutions Council recommendations?
- a. Did reference the draft climate solution recommendations, there are a variety of parallels.
 - b. Report seems to be generally in line.
 - c. Both documents can benefit from identifying where there is consistency with the Governor's recommendations.
 - d. Were very closely coordinated during the drafting process, but implementation needs to be coordinated as well.

Part 2. Neighborhoods & Transportation Q&A

1. What are "resiliency hubs within cities"?
 - a. A neighborhood stronghold, likely a city facility, that is designed to withstand shocks and stressors providing a safe place for community members to go during a disaster.
 - b. Looking to public safety center to serve in this capacity.
2. Has there been any thought or conceptual planning measures to use an urban growth boundary similar to Portland that would encourage infill development and discourage extensive land use for expanding land development?
 - a. Very fortunate to have good relationships among departments allowing strong collaboration. Working to coordinate with future community plan that is happening now. In alignment in presenting a plan that provides higher density development that is amenable to transit and alternative transportation.
 - b. Incentives and policies will be in place to help encourage this type of development.
 - c. Parking policy is also involved in management of sprawl.
 - d. Sphere of influence limited to City limits, so limited ability to establish this type of boundary.
 - e. Focus on incentivizing this type of development.
3. Recommendation: Pressure MSU to change their policy to be consistent with most other universities and not allow freshman to have personal vehicles. Would get students in the habit of taking alternative transportation in their first year.
 - a. There is a good opportunity to work with MSU on coordinated parking policies.
 - b. Goes hand in hand with transit access.
4. There is not a bus out to the airport. Maybe at the peak student times (thanksgiving/end of the school year)
 - a. Funding issues right now.
 - b. There has been a bus during peak times in the past.
5. Perhaps incentives for freshman without vehicles.

Part 3. Waste, Food, and Natural Environment Q&A

1. Have there been any conversations on creating a community wide composting system?
 - a. Yes - City of Bozeman has been working on scaling up household compost service for a couple years as well as working with MSU's cafeteria

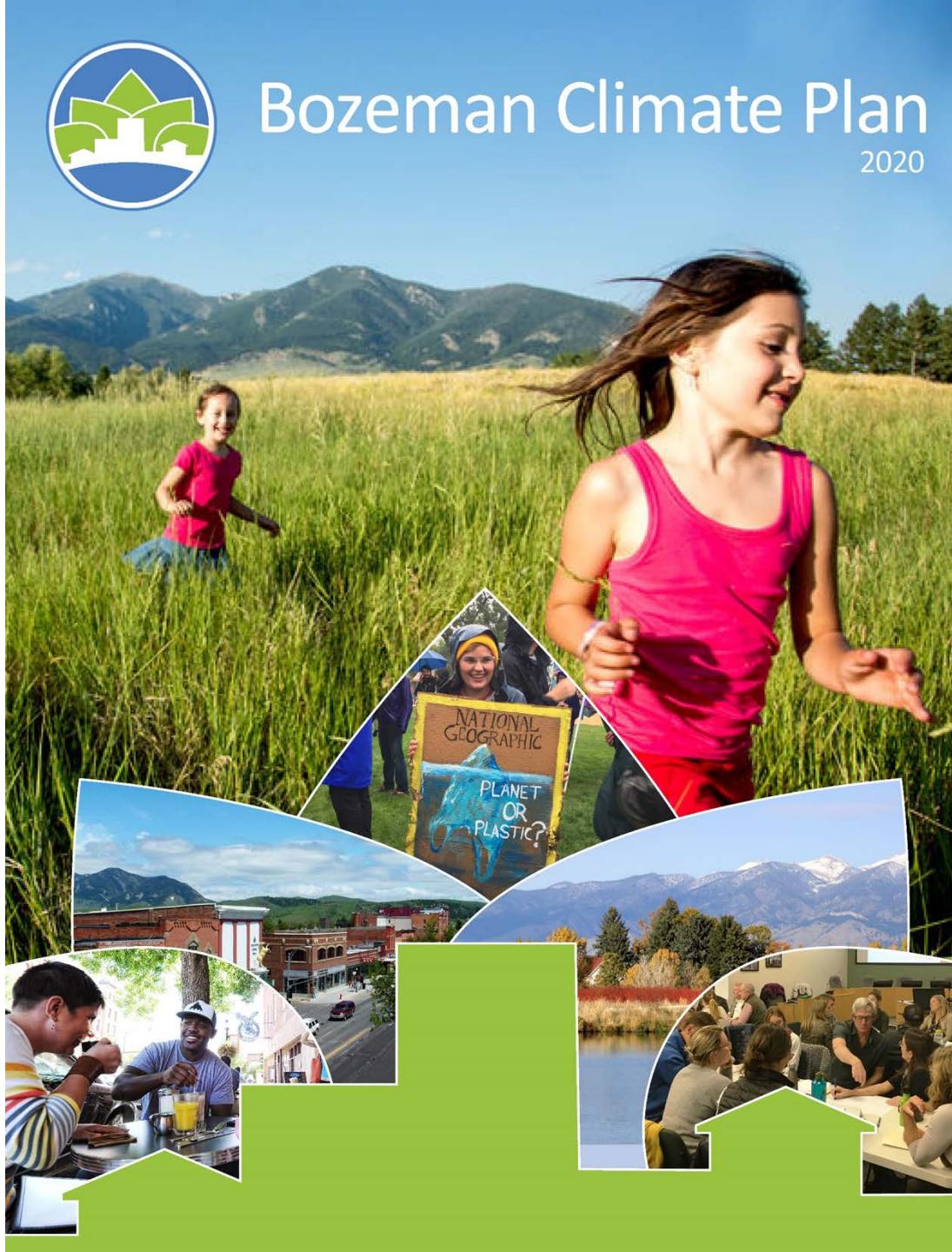
- b. Have talked to local composting businesses to increase capacity through these private businesses.
 - c. Working on modeling costs and acquiring the necessary equipment.
- 2. I think we should keep yard waste separate from food waste to create two streams of end-products. One that can be used as reclamation material and mulch (yard waste) and one that can be used as high-quality fertilizer/compost for use on organic farms.
 - a. Thank you for your suggestion.
- 3. Also, I think we should have a "re-use" zone at the landfill where usable items can be stored and then taken for free by other patrons. Lots of good stuff ends up just getting tossed. This exists in a lot of other locations
- 4. Thinking about green spaces, food systems, and the natural environment. Have the surrounding tribal communities been involved in this planning process?
 - a. One Climate Team member identified as a Native American, but outreach and participation could be more robust.
 - b. Follow-up: Will be able to help make connection.
- 5. Are there alternatives to composting that may have been explored such as biofuels.
 - a. There was discussion about biochar as a possibility.
 - b. Composting is a good opportunity for returning nutrients to the earth.
- 6. Encouraged to work with MSU. Community-wide composting increases participation considerably. How does the city's operations work with the small producers right now? Can we help promote these producers in the meantime?
 - a. City has been mindful of the existing local composters and looking for ways to partner and collaborate. It seems to be feasible and mutually beneficial.
- 7. Owner of Yes Compost - it has been good working with the City to figure out how to make composting more accessible. A lot of that may be able to be done through educational events to improve awareness. Most people just don't know the programs exist and are happy to participate when they learn. Biofuel works well with high carbon materials. Composting returns the compost back in the ground - circular cycle rather than a downgrade.
- 8. Clearly constrained by what can be influenced where it is harder to go fast. Funding is important to get things done to meet the commitments. Across the board, if people don't know about it, they can't do anything. Share the strategies and build a base of supporters. Build a culture of sustainability - relatively low cost and high payback.
 - a. Good point. Education and outreach that is included in this plan will be exciting and important.

Part 4. Wrap-up & Next Steps Q&A

1. Note - this is a remarkable plan that will be a great model for other communities. Being contacted by other communities to help build their own plans and it is nice to be able to show this plan. Address how you stand as an island in the county and the state. How can this be scaled to higher levels?
 - a. Always looking to build coalitions and collaboration with other communities. Seeing more interest across the state.
2. Is there somewhere in the report that talks about the cost associated with each of the solutions?
 - a. This can be found in Chapter 4 implementation guide

Virtual Community Workshop

October 1, 2020



Logistics and Ground Rules



- This meeting is being recorded.
- Use of video is optional.
- Please keep yourself muted unless prompted to speak.
- Use the “raise hand” feature if you wish to speak.
- Use the chat feature to provide feedback, ask questions, or raise any technical issues.
- If you are on the phone only, please announce who you are when speaking.

Workshop Overview



Agenda

Time	Agenda Item
6:30 p.m.	Welcome & Draft Climate Plan Introduction
6:50 p.m.	Part 1: Buildings & Energy
7:10 p.m.	Part 2: Neighborhoods & Transportation
7:30 p.m.	Part 3: Waste, Food & Natural Environment
7:50 p.m.	Wrap-Up & Next Steps

Objectives

- Orient the community to the draft Climate Plan
- Answer community questions about the draft plan
- Clarify next steps for plan refinement and adoption

Meet the Project Team!



Natalie Meyer
Sustainability
Program Manager
City of Bozeman



Jon Henderson
Strategic Services
Director
City of Bozeman



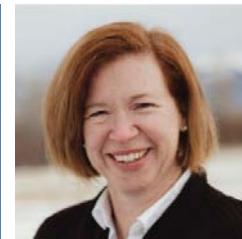
**Heather
Higinbotham**
Energy Conservation
Technician
City of Bozeman



Shelby Sommer
Project Manager
Brendle Group



Judy Dorsey
Executive Project
Manager
Brendle Group



Britt Ide
Energy Expert
Ide Energy



Sarah Martin
Resiliency Planner
Brendle Group



Becca Stock
Lead Engineer
Brendle Group



Katie Kershman
Document
Dev. & Design
Brendle Group



Megan Moore
Engagement
Coordinator
Logan Simpson



Bruce Meighen
Plan Integrator
Logan Simpson

Draft Climate Plan

Available at:

www.bozeman.net/climateplan

Community Survey at:

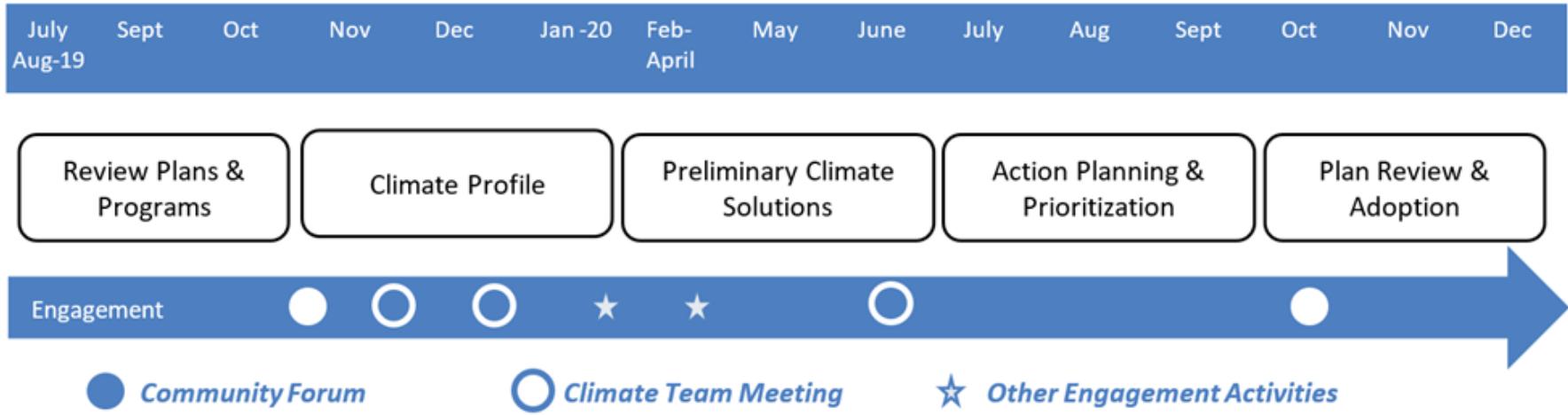
<https://www.surveymonkey.com/r/cobclimatesurvey>

Share survey comments by
October 25

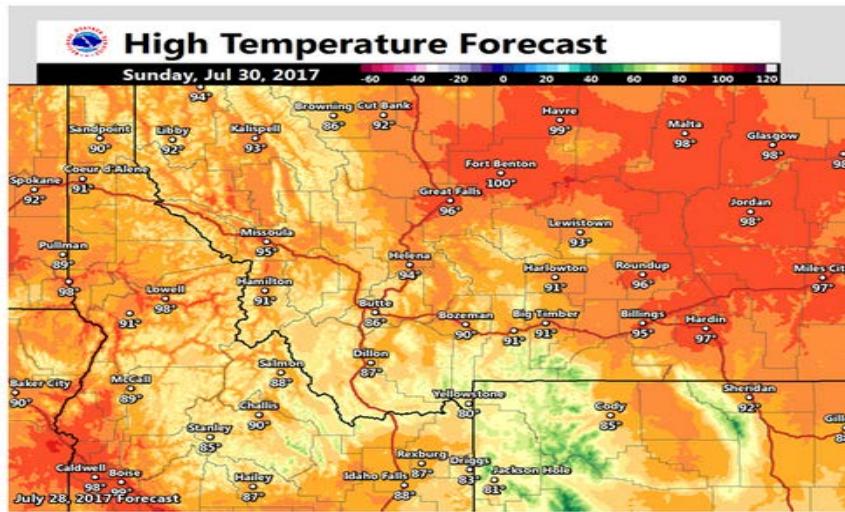
Submit general comments to:
agenda@bozeman.net



Process & Timeline



Local Climate Change Impacts



High Temperature Forecast in Montana (Jul 2017)



Beall Park, -39°F Record Low (Mar 2019)

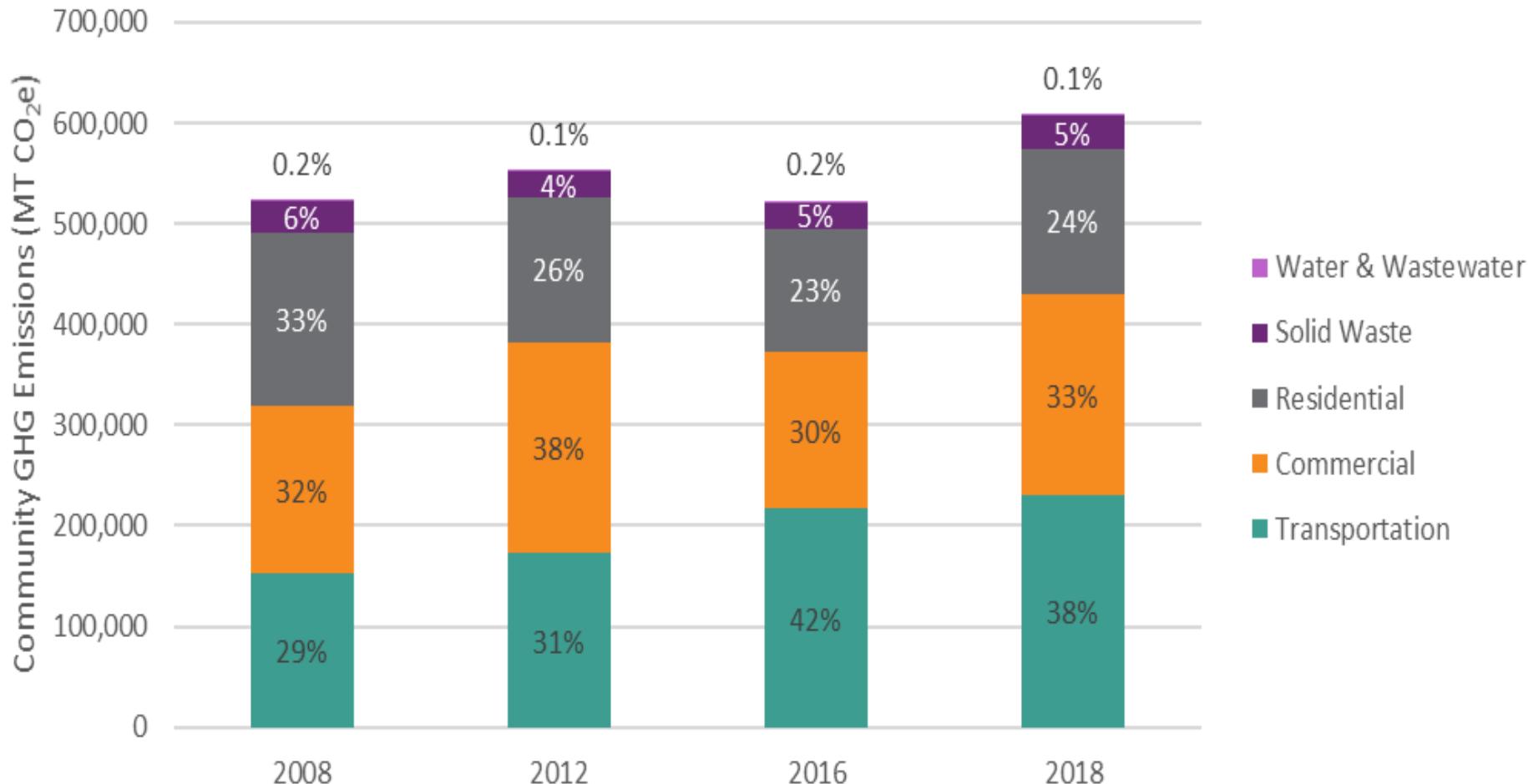


Ditch Flooding on College St.



Bridger Foothills Fire (Sep 2020)

Draft Climate Plan Orientation: Climate Trends and Goal Contributions



Total 2018 Emissions: 607,139 MT CO₂e

Since 2008: Emissions ↑ 16%, Population ↑ 37%

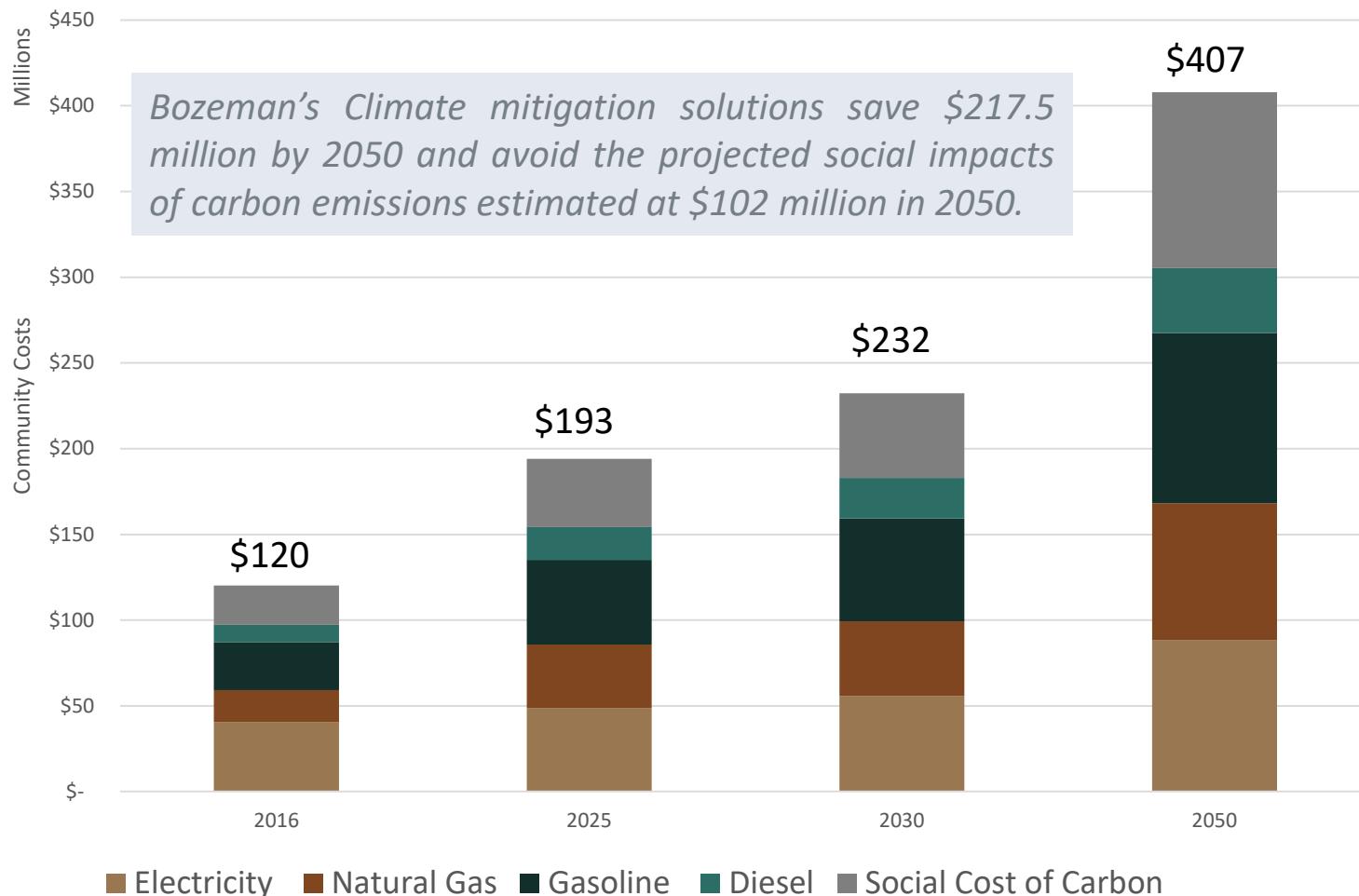
Draft Climate Plan Orientation



Draft Climate Plan Orientation: The Cost of Inaction



Bozeman
Climate
Plan

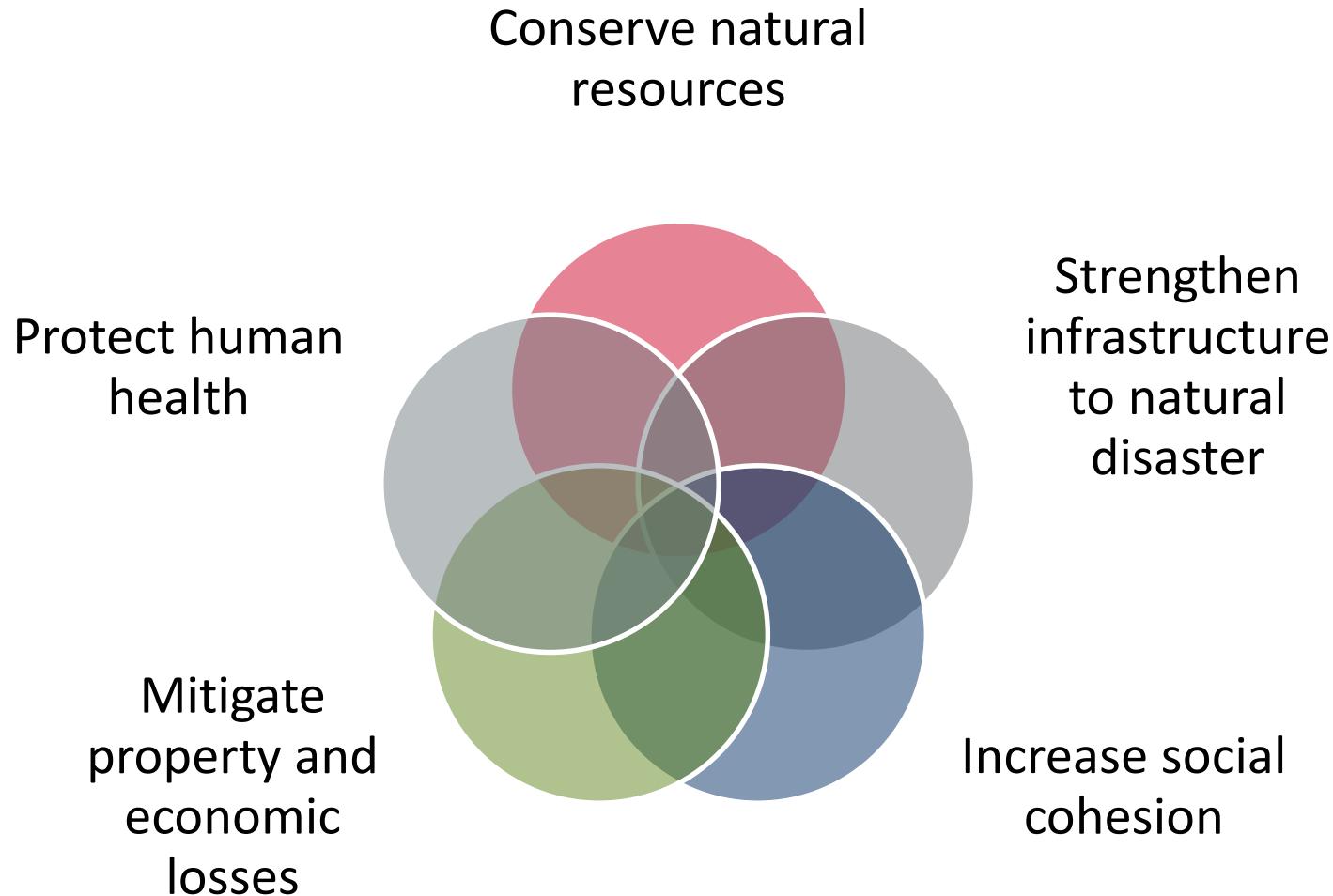


*Projected Cost of Energy Use and Social Impacts of Carbon Emissions
Under Business as Usual in the High-Growth Scenario*

Draft Climate Plan Orientation: Climate Resiliency



Bozeman
Climate
Plan



Draft Climate Plan Orientation: Vision – Position Statement



Through leadership and collaboration, the City of Bozeman will advance innovative solutions to cultivate a more equitable and resilient, low-carbon community for current and future generations.



Draft Climate Plan Orientation: Vision - Guiding Principles



Bozeman will be a leader in addressing climate change by:

- Adopting **bold targets** for emissions reduction and renewable energy.
- Weaving sustainability and resilience into **decision-making** processes.
- Pursuing **partnerships** with other municipalities and our utility provider.
- Seeking innovative, **actionable** solutions to mitigate climate change.
- Inviting all Bozeman **residents** to join us, including current and future leaders.

Draft Climate Plan Orientation: Climate Mitigation Goals

26% reduction in GHG
emissions by 2025

(from 2008)

Carbon neutral
by 2050

100% net clean
electricity by
2030

Focus Areas & Cross-Cutting Themes



Bozeman
Climate
Plan



Equity



Human Health
& Well-Being



City Assets



Focus Area 1:
**Healthy, Adaptive &
EFFICIENT BUILDINGS**



Focus Area 2:
**Responsible & Reliable
RENEWABLE ENERGY SUPPLY**



Focus Area 3:
**Vibrant & Resilient
NEIGHBORHOODS**



Focus Area 4:
**Diverse & Accessible
TRANSPORTATION OPTIONS**



Focus Area 5:
**Comprehensive
& Sustainable
WASTE REDUCTION**



Focus Area 6:
**Regenerative Greenspace,
Food Systems &
NATURAL ENVIRONMENT**



PART 1: OVERVIEW



Focus Area 1:

**Healthy, Adaptive &
EFFICIENT BUILDINGS**



Focus Area 2:

**Responsible & Reliable
RENEWABLE ENERGY SUPPLY**



Focus Area 1:

Healthy, Adaptive & EFFICIENT BUILDINGS

Solution A. Improve Efficiency of Existing Buildings

Solution B. Achieve Net Zero Energy New Construction

Solution C. Electrify Buildings



Focus Area 2:

Responsible & Reliable RENEWABLE ENERGY SUPPLY

Solution D. Increase Utility Renewable Energy Mix

**Solution E. Increase Community Participation in
Utility Green Power Programs**

**Solution F. Increase Community-Based Distributed
Renewable Energy Generation**

Part 1: Discussion



Bozeman
Climate
Plan



Focus Area 1:
**Healthy, Adaptive &
EFFICIENT BUILDINGS**



Focus Area 2:
**Responsible & Reliable
RENEWABLE ENERGY SUPPLY**

WE WANT TO HEAR FROM YOU!

(raise hand or chat feature)

- *What questions do you have about these topics?*
- *Is anything missing?*
- *How do you plan to advance the solutions identified?*

POTENTIAL WAYS TO ENGAGE:

Reduce energy use
during peak energy
demand (4pm to 8
pm)

Learn about and
begin to make
changes to your
energy behaviors

Contact NorthWestern
Energy, or other qualified
auditor, to schedule a home
energy audit and make
efficiency improvements to
your home

Advocate for more
stringent state-wide
energy and water
efficiency
regulations

Explore opportunities
to install on-site
renewable energy and
storage on your
property



PART 2: OVERVIEW



Focus Area 3:
**Vibrant & Resilient
NEIGHBORHOODS**



Focus Area 4:
**Diverse & Accessible
TRANSPORTATION OPTIONS**



Focus Area 3:

Vibrant & Resilient NEIGHBORHOODS



Solution G. Facilitate Compact Development Patterns

**Solution H. Reduce Vulnerability of Neighborhoods
and Infrastructure to Natural Hazards**

**Solution I. Enhance Social Infrastructure and
Community Preparedness**



Focus Area 4:

Diverse & Accessible TRANSPORTATION OPTIONS

Solution J. Increase Walking, Bicycling, Carpooling, and Use of Transit

Solution K. Decrease Direct Vehicle Emissions

Solution L. Limit Emissions from Air Travel

Part 2: Discussion



Bozeman
Climate
Plan



Focus Area 3:
**Vibrant & Resilient
NEIGHBORHOODS**



Focus Area 4:
**Diverse & Accessible
TRANSPORTATION OPTIONS**

WE WANT TO HEAR FROM YOU!

(raise hand or chat feature)

- *What questions do you have about these topics?*
- *Is anything missing?*
- *How do you plan to advance the solutions identified?*

POTENTIAL WAYS TO ENGAGE:

Plan a neighborhood activity to help build social connections	Get to know your neighbors and swap contact information for times of need or emergency	Review City maps to understand if you are in a location that is vulnerable to flooding, fires, or other hazards and develop an emergency plan	Walk, bike, carpool, or take transit to destinations instead of driving alone	Limit idling and combine trips when using a vehicle for transportation	Consider investing in an electric vehicle for your next vehicle purchase	Find alternatives to air travel, avoid binge flying, and/or purchase offsets for your next airline trip
---------------------------------------------------------------	----------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------	------------------------------------------------------------------------	--------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------



PART 3: OVERVIEW



Focus Area 5:
**Comprehensive
& Sustainable
WASTE REDUCTION**



Focus Area 6:
**Regenerative Greenspace,
Food Systems &
NATURAL ENVIRONMENT**



Focus Area 5:

Comprehensive & Sustainable WASTE REDUCTION



Bozeman
Climate
Plan

Solution M. Move Toward a Circular Economy and Zero Waste Community



Focus Area 6:

Regenerative Greenspace, Food Systems & NATURAL ENVIRONMENT



Solution N. Cultivate a Robust Local Food System

Solution O. Manage and Conserve Water Resources

Solution P. Manage Land and Resources to Sequester Carbon

Part 2: Discussion



Bozeman
Climate
Plan



Focus Area 5:
Comprehensive & Sustainable WASTE REDUCTION



Focus Area 6:
Regenerative Greenspace, Food Systems & NATURAL ENVIRONMENT

WE WANT TO HEAR FROM YOU!

(raise hand or chat feature)

- *What questions do you have about these topics?*
- *Is anything missing?*
- *How do you plan to advance the solutions identified?*

POTENTIAL WAYS TO ENGAGE:

Review your waste and consumption practices and look for opportunities to reduce, reuse, or share products

Volunteer at or donate to a local food bank

Learn to garden and grow your own food

Plant and maintain a tree

Update irrigation equipment and landscaping to use less water

Reduce pesticide and herbicide use

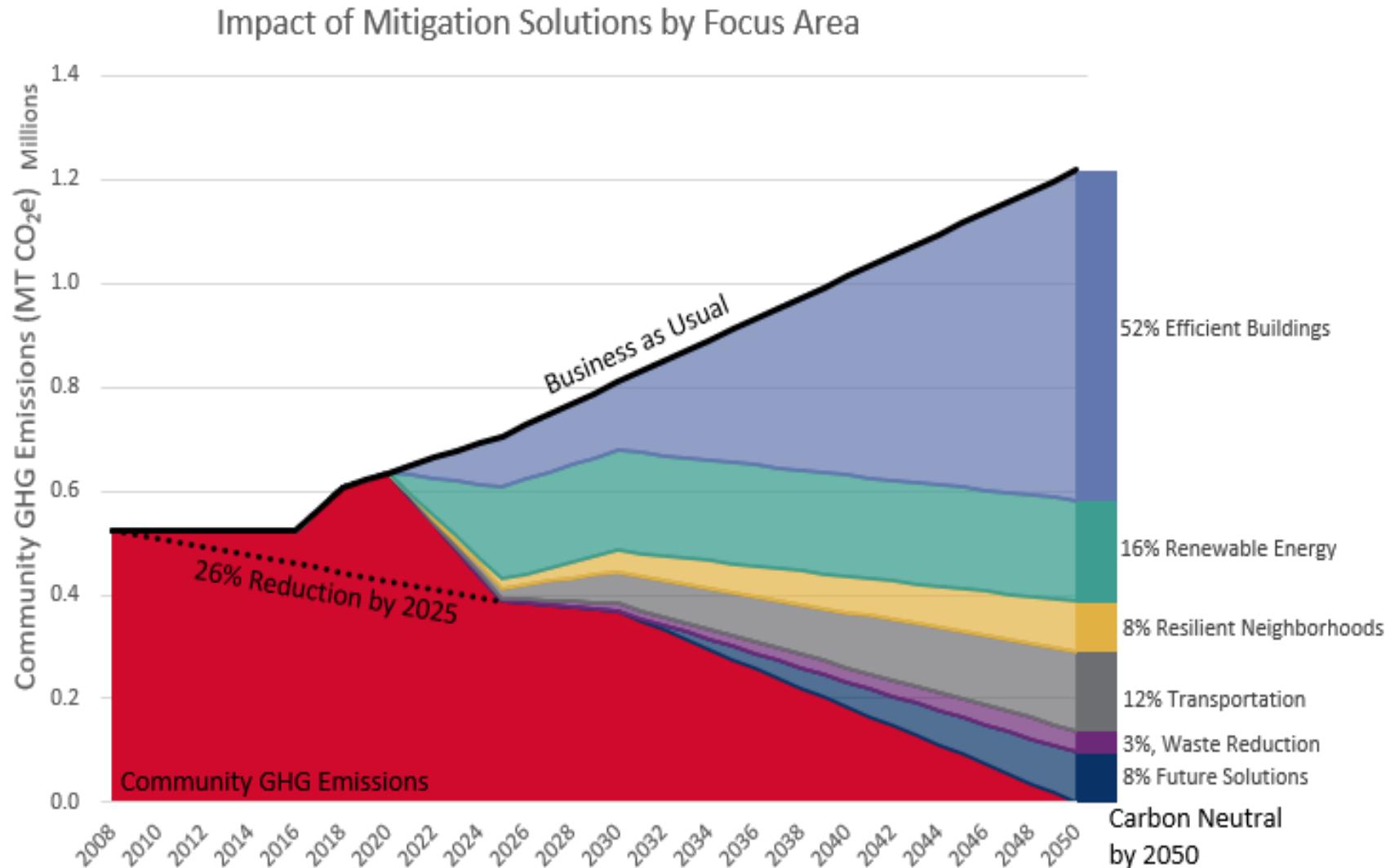


Bozeman
Climate
Plan

What's next?

WRAP UP & NEXT STEPS

Draft Climate Plan Orientation: Climate Trends and Goal Contributions



Upcoming Community Events & Activities



- 2040 Virtual Screening and Presentation, October 5, 2020, 7:00 p.m.
Register at GallatinValleyEarthDay.org.
- Draft Climate Plan Virtual Community Workshops by Focus Area
 - Energy Efficiency & Renewable Energy, October 8, 2020, 12:00-1:30 p.m.
 - Transportation & Neighborhoods, October 15, 2020, 12:00-1:30 p.m.
 - Waste, Food Systems, Greenspace, & Natural Systems, October 20, 2020, 12:00-1:30 p.m.
- Community Survey (Oct. 1 to Oct. 25)

Visit the project website for all documents, survey, and registration details!

www.bozeman.net/climateplan

Plan Review Process Next Steps



- City Commission Work Session 2, Draft Bozeman Climate Plan Community Feedback Summary, November 17, 2020, 6:00-11:00 p.m.
- Bozeman Climate Plan Commission Hearing and Resolution for Adoption, December 8, 2020, 6:00-11:00 p.m.

Visit the project website for all documents and meeting details!

www.bozeman.net/city-projects/bzn-climate-plan