



CEAP Colorado's Energy
Economy Strong



CEAP Colorado Resilient
to Climate Change



LA PLATA CLIMATE & ENERGY ACTION PLAN

CEAP Colorado's Energy Economy Strong

CEAP Colorado Resilient to Climate Change

Prepared by the CEAP Steering Committee and Work Groups

June 9th, 2011

Executive Summary

The development and implementation of a local Climate and Energy Action Plan (CEAP, pronounced “keep”) is an opportunity for improving the economic, environmental and social sustainability of our community.

La Plata County, the City of Durango and the Town of Ignacio resolved to develop a climate and energy action plan with specific policies and programs to reduce greenhouse gas (GHG) emissions after they all signed the U.S. Mayors Climate Protection Agreement. Under the Agreement, participating cities must strive to meet or beat the Kyoto Protocol targets in their own communities.¹ La Plata County and the City of Durango are also members of ICLEI-Local Governments for Sustainability (formerly referred to as the International Council for Local Environmental Initiatives (ICLEI)).² In order to join, they each passed a resolution pledging to reduce GHG emissions from their local government operations and throughout their communities. La Plata County took the additional step of commissioning a baseline emissions inventory and the governments commissioned the Four Corners Office for Resource Efficiency (4CORE) to facilitate development of the CEAP.

Following a kick-off meeting in November, 2008, nine work groups formed to develop the CEAP. Consisting of community volunteers, the various work groups amended the baseline inventory, established recommended targets, reviewed scientific evidence on regional climate change and its projected impacts, and used their local knowledge, experience, research, and brainstorming sessions to generate and quantify 42 proposed actions to help reduce local GHG emissions. Based on this evaluation, certain actions were identified as having the greatest GHG reduction potential and collateral benefits for the local residents and the economy.

GHG emissions from La Plata County are estimated to total 6.9 million metric tons per year. The oil and gas industry, the county’s largest industry, account for 66% of the emissions. Another 15% are derived from surface emissions originating from the geological outcrop formation in which the coal bed methane is produced. Community emissions from other sources total 1.3 million metric tons per year, contributing 19% of the emissions inventory.

The recommended GHG emission reduction target is to reduce emissions 80% below 2005 levels by 2050, with incremental reduction targets in the interim (Table 1). Proposed actions to reduce emissions associated with the production of oil and gas within La Plata County are: Green Well Completions, Low Bleed Controllers, (Solar) Electric Wellheads, and Emissions Leak Detection. The top five proposed community actions (non-oil and gas) are: Vehicle Emission Testing, Transit Oriented Development, Carbon Sequestration through Rangeland Management (Soil Sequestration Rangeland), Solar Photovoltaic (PV) Energy, and Renewable Energy Credits. Unfortunately, at the level of implementation evaluated for the CEAP, the proposed actions will suffice only to keep emissions from growing significantly, not generate the reductions embodied in the emissions targets.

According to initial analysis, about half of the suggested actions will pay for themselves within ten years. Actions with payback times of five years or less can achieve about 78% of the GHG emissions mitigated by all the actions evaluated for the CEAP. Augmenting these with additional actions that yield the greatest collateral benefits

¹ <http://www.usmayors.org/climateprotection/agreement.htm>

² <http://www.icleiusa.org/about-iclei/history>

would improve the reductions to 99% of the total estimated mitigation potential of all the recommended actions.

Implementation of the proposed actions would engage a wide range of stakeholders, from local governments, to businesses and non-profits, to individuals, as identified in Section 7.2. Because many of the actions are cost-effective independent of any link with climate change, stakeholders may consider each of these actions on their own merit.

Reaching the long-term emission reduction goals articulated in the Mayors Climate Protection Agreement will require coordination of the implementation process over many years, along with periodic review of the emissions inventory, evaluation of the effectiveness of various actions, and updating of the CEAP. Accordingly, the CEAP is a dynamic process that will continue to adapt and change based on community values and needs, as well as new technologies and policy developments. Ongoing facilitation of this process should be delegated to a single agency, as outlined in Section 7.

Finally, continuation of recent climate trends will require adaptation of the community to warmer temperatures and generally drier conditions. Consequently, the CEAP recommends development of an adaptation plan to enhance community resilience in parallel with CEAP implementation.

Acknowledgements

The La Plata County Commissioners, the City of Durango Councilors, and the Town of Ignacio Board Members would like to thank the following individuals for their input and guidance on the Plan:

CEAP Steering Committee:

Josh Joswick-Chair, Heather Erb-Vice Chair, Nancy Andrews, Peter Diethrich, Kim Herb, Ryan Huggins, Walt Serfoss, Mark Schwantes, Ophelia Wilkins, Mark Williams, Dick White

*Former Steering Committee Members: Greg Caton, Jenny Craig, Shawn Nau, Scott Shadid, Peter Tregillus, Sarah Wakefield, Christi Zeller

Work Group Contributors:

Emissions Inventory: Josh Joswick-Chair, Andy Hawk-Vice Chair, Patrick Cummins, Steve Folk, Ethan Hinkley, Walt Serfoss

Reduction Targets: Nancy Andrews-Chair, Erick Aune -Vice Chair, Mike Meschke, Mark Schwantes, Mark Williams

Scientific, Technical, and Analysis Advisory (STA): Dick White-Chair, Kim Herb-Vice-Chair, Chris Butcher, Root Routledge, Ilana Stern

Residential, Commercial, and Industrial (RCI): Heather Erb-Co-Chair, Ophelia Wilkins-Co-Chair, Bill Bader, David Dillon, Gregg Dubit, Steve Kawell, James Ketter, Butch Knowlton, Ron LeBlanc, Greg Mantell-Hecathorn, Mike Olson, Michelle Reott, Michael Thunder

Forestry, Agriculture, and Waste Management (FAWM): Scott Shadid-Co-Chair, Jenny Craig Co-Chair, Peter Diethrich-Vice Chair, Nancy Andrews, Dave Cantrell, Jim Dyer, Terry Fitzgerald, Wayne Hilgedick, Craig Leggett, Mark Williams, Walt Serfoss, Jenny Wrenn, Terry Woodward

Energy Supply and Distribution (ESD): Josh Joswick (Co-Chair), Ryan Huggins (Co-Chair), Joanne Spina, Tim Wheeler, Kent Ford, Mark Schwantes. ESD Oil and Gas focus group: Josh Joswick, Andy Hawk, Ethan Hinkley.

Transportation and Land Use (TLU): Sara Wakefield-Chair, Peter Tregillus-Vice Chair, Laurie Blanz, Greg Caton, Spencer Compton, Jim Davis, Ron Dent, Thomas Humphrey, Jeanine Justice, Brian Kimmel, Jason Meininger, Jason Ragsdell, Vicki Vandegrift, Keith Walzak, Jenny Wrenn

Climate Change Preparation (CCPrep): Kim Herb-Chair, Craig Goodell-Vice Chair, Sally Bellerue, Marcie Bidwell, Deanna Collins, Kevin Hall, Werner Heiber, Ryan Huggins, Carolyn Livensperger, Koren Nydick, Wally White, Thurman Wilson, Bruce Whitehead

Communications: Amanda Saunders-Chair, Peter Diethrich, Kim Herb, Elsa Jagniecki, Josh Joswick, Root Routledge

4CORE: The CEAP process was facilitated by 4CORE through the efforts of Aileen Tracy, Executive Director, Amanda Saunders, Program Coordinator and Elsa Jagniecki, Intern

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1. Overview

CEAP Vision

A Climate and Energy Action Plan that impacts personal, organizational, and governmental policies, practices, and behaviors in a meaningful, measurable, and cost-effective* way to minimize or neutralize local greenhouse gas emissions and to adapt successfully to climate change.

*Note: “Cost-effectiveness” takes external costs—such as, but not limited to, staffing changes and future impacts—into account

1.1 Purpose of the CEAP

The development and implementation of the CEAP is an opportunity for improving the economic, environmental and social sustainability of our community by reducing greenhouse gas (GHG) emissions in La Plata County. Implementation of the CEAP will augment similar efforts of communities across the U.S. Currently, seventy-eight percent of the U.S. population lives in the 1,051 communities that have endorsed the U.S. Mayor’s Climate Protection Agreement, the 563 jurisdictions that are members of ICLEI, and/or are in one of the 38 states with Climate Action Plans.³ Through these combined efforts it is possible to realize a significant reduction in GHGs in our nation.

1.2 Background

La Plata County, the City of Durango and the Town of Ignacio all signed the U.S. Mayors Climate Protection Agreement. Under the agreement, participating cities must strive to meet or beat the Kyoto Protocol targets in their own respective communities.

By entering into this agreement, these municipal entities acknowledged that current activities within their jurisdictions impact atmospheric levels of GHGs and that inaction could be costly in the future. The Intergovernmental Panel on Climate Change (IPCC) concluded that “...anthropogenic GHG concentrations are very likely [at least 90% probability] to have caused most of the increases in global average temperatures (which causes climate changes) since the mid-20th century” (IPCC, 2007b). In 2010, the U.S. National Academy of Sciences reviewed and confirmed the IPCC conclusions.⁴ Additionally, 2009 EPA findings indicated that GHG emissions “threatened the public health and welfare of the American people.”⁵ Rises in average temperatures are already affecting our local environment and adding stressors to our local economy, as described in Appendix A (Ray, et al., 2008). The extent of climate change effects, and whether these effects harm or benefit society, will vary by region, over time, and with the ability of different societal and environmental systems to adapt to or cope with the change. The IPCC stated that “... it is very likely that all regions will experience either declines in net benefits or increases in net costs... Taken as a whole, the range of published evidence indicates that the net damage costs of climate change are likely to be significant and to increase over time” (IPCC, 2007a).

³ <http://www.icleiusa.org/about-iclei/members/member-list>, <http://www.usmayors.org/climateprotection/list.asp>, <http://www.epa.gov/statelocalclimate/state/state-examples/action-plans.html>

⁴ <http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=05192010>

⁵ <http://www.epa.gov/climatechange/endangerment/downloads/FinalFindings.pdf>

Climate-related impacts are anticipated to negatively impact Colorado's economy (Williamson, Ruth, Ross, & Irani, 2008; National Conference of State Legislatures; University of Maryland's Center for Integrative Environmental Research, 2008; RESI, 2008). Regional Economic Studies Institute (RESI) analysis suggests that Colorado can expect a total economic loss associated with the ski industry of over \$375 million by 2017 and over 4,500 jobs lost (RESI, 2008). This does not include losses in associated industries such as real estate, leasing, and insurance sectors. While many areas of the U.S. anticipate potential agricultural benefits associated with climate change, Colorado does not. Arid temperatures and regional stressors on water supply could reduce the value of farmland by an average of 36% (RESI, 2008; Williamson, Ruth, Ross, & Irani, 2008).

Climate trends indicate that this region is already experiencing tangible changes (Ray, et al., 2008). Existing climate observations show that southwestern Colorado has warmed about 2° F in the last three decades (i.e., 1977 to 2006) (Ray, et al., 2008). This rate of warming is the same as for western Colorado, but greater than the western U.S., or any other region of the U.S. except Alaska (Redmond, 2007; Diaz, 2007; Saunders, 2008; Rangwala & Miller, 2010). From 1978 to 2004, snowmelt has already shifted about two weeks earlier in western Colorado (Clow, 2010). Even if a prompt global response to curb emissions were to occur, our community can anticipate changes associated with GHGs currently in the atmosphere (some of which will remain in the atmosphere from hundreds to thousands of years⁶).

The box below summarizes many of the anticipated changes; Appendix A of this document provides further detail. The information presented is from a 2008 report entitled Climate Change in Colorado: A Synthesis to Support Water Resources Management and Adaptation for the Colorado Water Conservation Board by researchers at: National Oceanic and Atmospheric Association (NOAA), Western Water Assessment, and the University of Colorado at Boulder. Other information comes from peer-reviewed literature, and a detailed synthesis of the literature has been published by the Mountain Studies Institute (MSI). This literature review, available on the MSI website (www.mountainstudies.org), includes more information on temperature and precipitation trends at the global, regional, and local levels. Downscaled model projections for the San Juan Mountains and Southwest Colorado are also available. It also discusses the many potential effects that climate change may have on ecosystems, wildfire, carbon storage, and wildlife. Because these changes are already in motion despite our mitigation efforts, it is critically important to address how our community can adapt so that we remain strong, healthy, and vibrant in the face of change and uncertainty. Section 6 addresses this issue.

⁶ <http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter2.pdf>

Figure 2: Summary of Projected Climate Change in Southwest Colorado

Temperature

- Temperatures are likely to increase by an additional 1.5 to 3.5 °F by 2025 and 2.5 to 5.5 °F by 2050 (IPCC, 2007a; Ray, et al., 2008).
- Summers are projected to warm more than winters. By 2050, typical average monthly temperatures in the summer are projected to be as warm as or warmer than the hottest 10% of summers from 1950 to 1999 (Ray, et al., 2008).
- The current climate of lower elevations is projected to migrate upward to higher elevations and the climate of the desert southwest to progress up into the valleys (Ray, et al., 2008).

Evaporation and Evapotranspiration

- Due to increased temperatures, the rate at which water is evaporated from water bodies, soil, and vegetation is likely to increase (Christensen & Lettenmaier, 2006).
- This will make the environment drier even if precipitation stays the same.

Precipitation

- Projections of change in amounts of precipitation for Colorado are not in consensus. Some studies indicate that annual precipitation will decrease slightly while others project an increase in the winter (Ray, et al., 2008).
- Some models project more variable precipitation patterns with more frequent extreme events (Ray, et al., 2008).

Snowpack and Stream Flow

- Warming temperatures are projected to have significant effects on snowpack, timing of snowmelt, and stream flow even without a decrease in precipitation (Clow D. , 2008; Stewart, Cayan, & Dettinger, 2004; Ray, et al., 2008; Milly, Dunne, & Vecchia, 2005).
- It is likely that in the future more rain will fall as snow, snow packs will decrease and melt earlier, and peak stream flow will occur earlier in the spring (Christensen & Lettenmaier, 2006).
- A decrease in the amount of water contained in snowpack is projected for elevations below 8,200 feet (i.e., a 20 to 60% reduction of snowpack by the period 2040 to 2069). Above 8,200 feet, the snowpack is anticipated to decrease by 10 to 20% (Christensen & Lettenmaier, 2006).

Compiled by Mountain Studies Institute, www.mountainstudies.org with review by the Climate Change Preparation Group, Four Corners Office for Resource Efficiency (Nydick & CCPrep, 2009)

1.3 Process

La Plata County government and the City of Durango joined with over 1,000 international cities, including over 500 U.S. cities, to participate in the Cities for Climate Protection program managed by ICLEI. In order to join, they each passed a resolution pledging to reduce GHG emissions from their local government operations and throughout their communities. The ICLEI process identifies five milestones.

ICLEI-Cities for Climate Protection Milestones

- **Milestone 1.** Conduct a baseline emissions inventory and forecast.
- **Milestone 2.** Adopt an emissions reduction target for the forecast year.
- **Milestone 3.** Develop a Local Action Plan.
- **Milestone 4.** Implement policies and measures.
- **Milestone 5.** Monitor and verify results.

The following timeline summarizes the key events in the development of the CEAP:

- Fall 2006: The City of Durango and La Plata County endorse the Mayors Climate Protection Agreement. The Town of Ignacio joined this endorsement in February 2009.
- Fall 2007: La Plata County commissions the emissions inventory (ICLEI Milestone 1).
- April 2008: Emission inventory (Brendle Report) completed.
- Fall 2008: Four Corners Office for Resource Efficiency (4CORE) engaged to facilitate the development of the CEAP.
- November 2008: CEAP kick-off meeting occurs, work groups form.
- January 2009: CEAP Steering Committee convenes.
- July 2009: Phase I document with 350 suggested actions put out for public input.
- August 2009 – November 2010: Work groups narrow action list and evaluate top actions.
- November 2010: Draft CEAP issued for public comment.
- March 2011: Public input closed.
- June 2011: CEAP completed.

The City of Durango and La Plata County tasked the Four Corners Office for Resource Efficiency (4CORE) with completion of Milestones 2 and 3, as well as a revised baseline emissions inventory (Milestone 1). 4CORE sought to engage representatives of local constituencies – environmental organizations, the oil and gas industry, county and city governments, agriculture, local utilities, businesses, to the community-at-large – to collaborate on establishing GHG reduction targets and recommended actions specific to this community. The effort was organized under the nine working groups listed in the Acknowledgements and guided by a Steering Committee, which articulated the following mission.

Mission of the CEAP Steering Committee

Develop and implement a community/public-driven process to:

1. Review, clarify, and where needed, complete the inventory of GHG emissions in La Plata County
2. Set percentage-based and time-specific targets for the reduction of human caused GHG emissions from La Plata County
3. Provide implementable recommendations to local governments, industry, businesses, and other organizations that will result in reduced GHG emissions, improved health, environmental preservation, and economic revitalization
4. To begin the process required to provide similar recommendations for climate change adaptation

The entire CEAP process represents more than 10,000 hours of community volunteer time.

1.4 Scope of the CEAP

The CEAP proposes actions to reduce GHG emissions and estimates their impacts, costs, and savings. Through the analysis of these actions, the CEAP suggests a long-term plan to reduce GHG emissions and conserve our resources while ensuring that these actions provide economic and societal benefits.

The CEAP is NOT a regulatory document. It proposes a set of actions based on two years of work. However, whether or not these actions will be implemented depends on decisions made by local government, businesses, and the community-at-large. Actions chosen for implementation will then require a more detailed, program-specific cost-benefit analysis, which is not included in this document.

1.5 Results and Key Findings

This action plan recommends that La Plata County reduce its GHG emissions by 80% below 2005 levels by 2050, and proposes forty-two actions that will help achieve the recommended targets. This target has been determined by climate scientists to be the reduction needed to stabilize GHGs in the atmosphere in order to avoid the most extreme effects of climate change.⁷ A phasing plan is shown below:

Greenhouse Gas Emission Reduction Targets

- 5% below 2005 levels by 2015; 3% per year for the next 5 years
- 20% reduction by 2020; then 2% per year
- 40% reduction by 2030
- 80% below 2005 levels by 2050

1.5.1 Accomplishments To-Date

From grassroots initiatives to local government operations, our community has already begun achieving many of the CEAP's goals. This support speaks to the ingenuity and forward-thinking mindset of our community, which will be integral to the success of implementing the CEAP. Appendix C lists existing efforts.

1.5.2 Proposed Types of Actions: Strategies

Our community can continue working towards the GHG reduction targets by implementing the 42 action items detailed in this plan. These proposed actions are grouped into six strategic emission reduction categories, ranked below from highest to lowest based on their GHG reduction potential.

⁷ (IPCC (2007)). Summary for Policymakers. In: Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Pachauri, R.K and Reisinger, A. (eds.)] IPCC, Geneva, Switzerland, 1-22. http://www.ipcc.ch/pdf/assessmentreport/ar4/syr/ar4_syr_spm.pdf.

Emission Reduction Strategies

1. Reduce emissions from local oil and gas production
2. Develop renewable sources of energy
3. Develop a multi-modal transportation system
4. Increase the energy efficiency of buildings and infrastructure
5. Enhance the local agricultural system
6. Reduce waste

The top five proposed community actions, based on GHG reduction potential, are:

1. **Vehicle Emission Testing:** Improve air quality and reduce emissions of CO₂ and other pollutants through regular vehicle emissions testing.
2. **Transit Oriented Development:** Create higher-density mixed-use development within walking distance or a half-mile of transit.
3. **Carbon Sequestration through Rangeland Management:** Increase biological CO₂ capture and storage through land-management techniques.
4. **Solar PV Energy:** Increase the installation and interconnection of Solar PV on buildings/residences and develop large scale Solar PV farms/gardens.
5. **Renewable Energy Credits:** can be purchased to offset conventional electricity generation

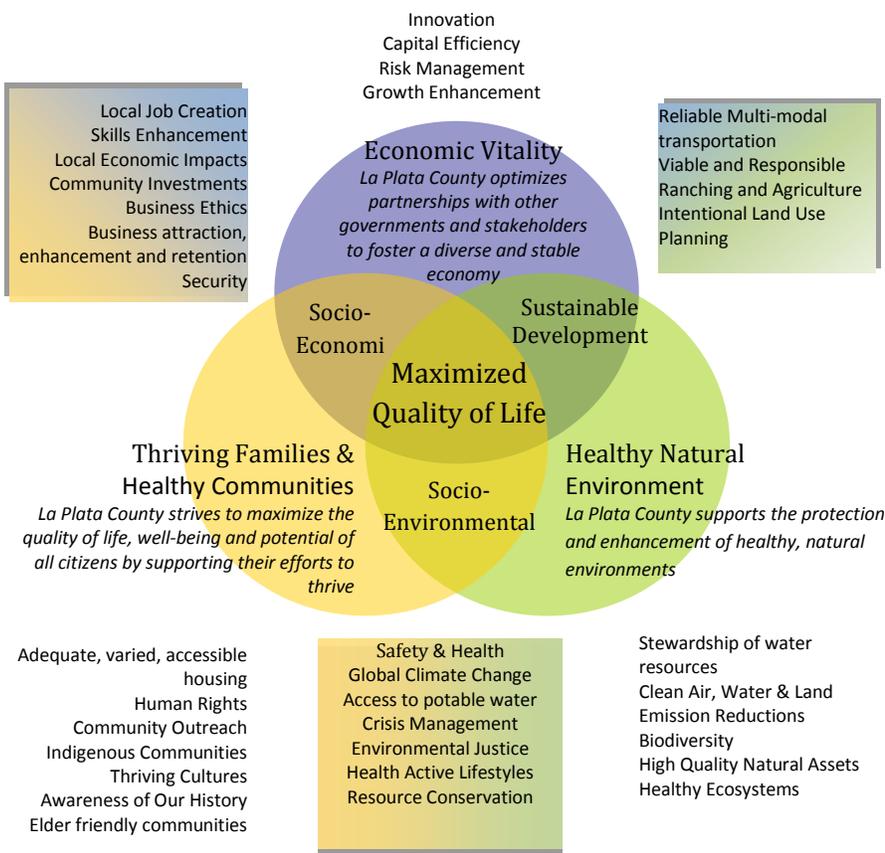
The following are the four highest priority actions proposed by the industry analysts of the Oil and Gas work group of the CEAP that the local oil and gas industry can take to reduce emissions during production:

1. **Green Well Completions:** Recover methane from well completions instead of venting or flaring methane.
2. **Low Bleed Controllers:** Reduce fugitive emissions of methane through replacement or retrofit of high-bleed natural gas pneumatic controllers with low- or no-bleed pneumatic controllers.
3. **Electric Wellhead:** Convert reboilers and heaters to electric power. (Note that this is only a recommended action if the electricity source is renewable energy.)
4. **Emissions Leak Detection:** Use optical imaging to detect methane and other gaseous leaks from equipment, processing plants, and pipelines and mitigate those leaks once identified.

1.6 Resiliency and Strategic Planning

The way we use energy, the design of our buildings, our transportation choices, our waste generation, and our food consumption all contribute to the emission of GHGs. All of these actions have financial and societal costs and benefits associated with them, while potentially compromising our local air and water quality. La Plata County, the City of Durango and the Town of Ignacio have guiding documents in place that illustrate community preferences to help us assess the impact of our decisions on our economy, our society, and our environment. The La Plata County Compass calls out our community’s priority to balance economic vitality, sustainable development, transportation, a healthy natural environment, organizational excellence, and thriving families and healthy communities. The City of Durango Comprehensive Plan, adopted in 2007, promotes sustainability as one of its key principles. The plan’s goals include energy conservation, protecting the Animas River,

Figure 3: Economic, Environmental, and Societal Benefits Inter-related



maintaining high air quality, and the preservation of wildlife habitat and corridors. The Town of Ignacio adopted an update to its Comprehensive Plan in 2010, which states in the Land Use Chapter that conservation practices should be encouraged by all citizens receiving utility services. It supports maintaining clean air, solar gain options, preserving our water quality, and using raw water for irrigation. Figure 2 suggests how these elements can come together to create and maintain a high quality of life for La Plata County residents.

As shown in this figure, there are many links connecting our economic, social and environmental actions and choices. For example, our ability to

buffer our economy from climate-related impacts is associated with our energy use, which accounts for a large proportion of our GHG emissions. Volatile and generally increasing energy costs make our residents, businesses, and industry economically vulnerable. Capitalizing on opportunities for energy efficiency will strengthen our economy by reducing operating costs for businesses and keeping more dollars in the pockets of the people who live here. Furthermore, diversifying our energy sources to include more renewable energy will reduce emissions, increase the security of our energy future, and allow our community to be more economically resilient if national climate policies were to put a price on carbon emissions. Reducing energy consumption and

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GHG emissions can come packaged in actions that align with our economic, social development, and environmental stewardship vision.

2. ICLEI Milestone 1: Baseline GHG Analysis

A prerequisite for effective emissions reductions is to establish a baseline emission inventory. For this reason, La Plata County commissioned the initial emissions inventory.

2.1 Initial Emissions Inventory

The initial emissions inventory was conducted by the Brendle Group, Inc. based on county data from the baseline year of 2005. The *Baseline GHG Emission Profile and Forecast*, also referred to as “The Brendle Report,” dated April 3, 2008 is provided in a separate document and is available online.⁸

2.2 Revised Emissions Inventory

Following review of this study, the La Plata Energy Council voiced concerns regarding the relevance of the data sources used to establish the emissions baseline for oil and gas operations in La Plata County. As a result, the County’s Planning Department recommended that Brendle Report Appendix B data not be used. Accordingly, the CEAP Emissions Inventory Work Group researched and prepared a revised emissions inventory to replace Appendix B of the April 3, 2008 *Baseline GHG Emission Profile and Forecast*. The *Revised Emissions Inventory Report* is available online.⁹ Figure 3 provides a graphical representation of the changes between the two reports.

Here and throughout this document, GHG emissions are described in terms of metric tons of carbon dioxide equivalent (tCO_{2e})¹⁰ or in millions of metric tons of carbon dioxide equivalent (MtCO_{2e}). The Brendle Report inventoried emissions in short tons, rather than metric tons. One short ton is the equivalent of 0.9072 metric tons. The Scientific and Technical Analysis and Advisory (STA) work group decided to convert all short tons to metric tons to be consistent with the units that were used in the analysis software, “Climate and Air Pollution Planning Assistant” (CAPPA), and those used by the broader scientific community.

The Brendle report projected decreases in oil and gas emissions owing to decreasing production. The Revised Emissions Inventory questioned some of the underlying assumptions and suggested that the Brendle projections might be underestimated, but did not offer revised projections. Neither study included the impact of wellhead electrification that is being implemented in La Plata County in the interest of noise mitigation and improvement in local air quality. Displacing power from on-site combustion of natural gas to remotely generated electricity, primarily generated from coal-burning, will result in a large increase in inventoried emissions. This is discussed in the Action Plan Detail Sheet for Oil and Gas actions¹¹, along with potential emissions reduction from the industry. The estimated emissions increase by about 0.9 MtCO_{2e} in 2015 and 1.8 MtCO_{2e} in 2020. These values depend directly on the assumed rate of new drilling, which is uncertain by 50%.

⁸ <http://www.fourcore.org/CEAP/docs/061208BaselineGreenhouseGasEmissionProfileandForecast.pdf>

⁹ http://www.fourcore.org/CEAP/docs/PDF_Draft_Emissions_Inventory_Revisions_Report.pdf.

¹⁰ CO₂-equivalent emission is the amount of CO₂ emission that would cause the same time-integrated radiative forcing, over a given time horizon, as an emitted amount of a long-lived GHG or a mixture of GHGs. The equivalent CO₂ emission is obtained by multiplying the emission of a GHG by its Global Warming Potential (GWP) for the given time horizon (100 years in this case). For a mix of GHGs it is obtained by summing the equivalent CO₂ emissions of each gas. Equivalent CO₂ emission is a standard and useful metric for comparing emissions of different GHGs but does not imply the same climate change responses -- http://www.ipcc.ch/publications_and_data/ar4/syr/en/mains2-1.html

¹¹ http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/O&G_GrnWells.pdf

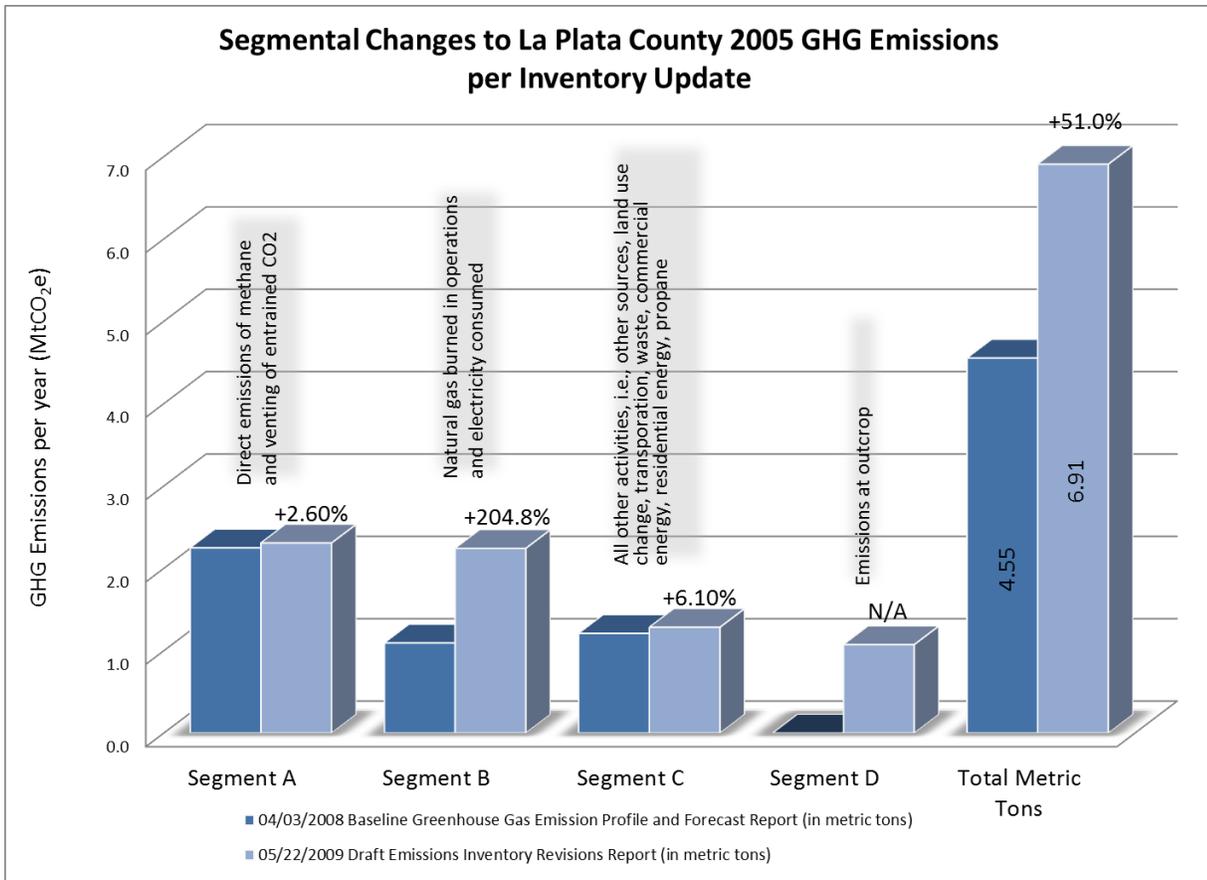


Figure 4: Changes in La Plata County GHG emissions inventory

A summary comparison between the *Baseline GHG Emission Profile and Forecast* and the *Revised Emissions Inventory Report* is provided in Table 19 of Appendix B in this document. The combined work of these two inventories based on the data at hand reveals that the majority of emissions in the county are attributable to the natural gas industry, with direct emissions and energy use of the industry resulting in approximately 66% of La Plata County’s overall emissions. Emissions from methane seeps at the Fruitland Outcrop contributed another 16%. These emissions are also associated with the natural gas industry, which brings the total emissions contribution for this industry to 81%. All other activities in the community contribute 19% of the inventory. Within the other activities, transportation was the largest contributor, with 29% of community emissions, closely followed by residential and commercial energy use, respectively 23% and 22% of community emissions. These relationships are shown in the following figures.

Figure 5: Distribution of 2005 GHG emissions in La Plata County (MtCO₂e/year)

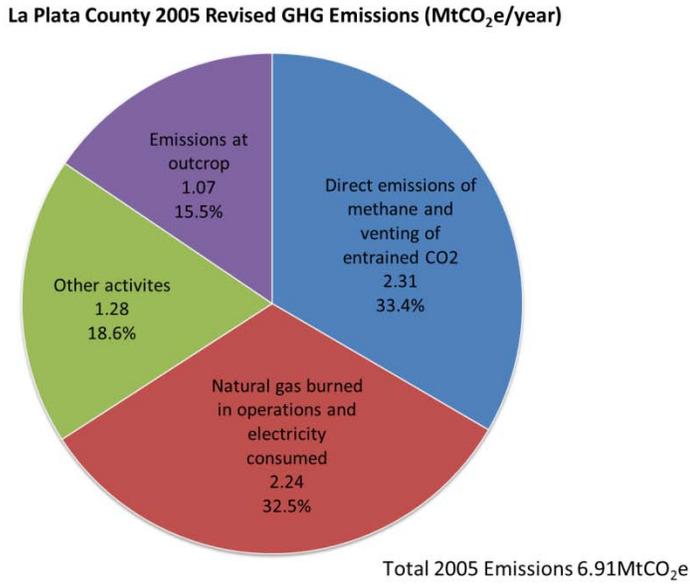
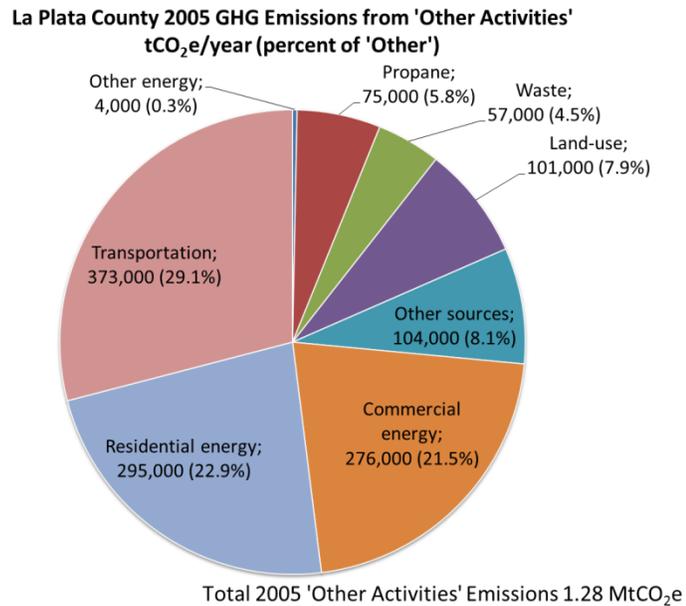


Figure 6: Distribution of 2005 GHG emissions from other county activities (tCO₂e/year)



3. ICLEI Milestone 2: Emissions Reduction Targets

The completion of these emissions inventories has enabled the CEAP work groups to understand La Plata County's current emissions profile, and therefore determine what emission reduction targets are most suited to our community's particular needs. The Reductions Targets group of the CEAP researched the goals of Climate Action Plans from 18 US cities¹², along with targets of the Western Climate Initiative, the 2030 Challenge, the EPA, and several international communities. Using that information, recommendations from the *Baseline GHG Emission Profile and Forecast* and committee members' knowledge, the work group developed the emission reduction targets outlined in the table below. Note that Energy Supply and Distribution targets are limited to electricity. Interim oil and gas industry targets will be based on comprehensive input from the Environmental Protection Agency and Western Climate Initiative.

Understanding the trends in La Plata County's energy use and identifying the most effective distribution of reduction targets enabled the CEAP work groups to explore emission reduction actions that would yield the greatest benefits to the community at the least cost. The work groups generated proposed actions that would help reduce GHG emissions using local knowledge, experience, research, and brainstorming sessions. These proposed GHG reduction actions are similar to measures successfully adopted in other communities. All but a few measures were quantitatively evaluated using the CAPP software tool developed by ICLEI.¹³ This tool provides a standardized method for evaluating the benefits, impacts, and costs of proposed climate protection measures and for prioritizing them in a climate action plan, subject to locally specified evaluation criteria. For the remaining actions (oil and gas industry actions, soil sequestration rangeland, and vehicle emission testing) that could not be evaluated using the CAPP software, GHG emission reductions were calculated by the STA work group in consultation with industry experts.

¹² Aspen, CO; Boulder, CO; Denver, CO; Fort Collins, CO; Austin, TX; Salt Lake City, UT; Miami, FL; Burlington, VT; Philadelphia, PA; Keene, NH; Falmouth, MA; Portland, ME; Chicago, IL; Los Angeles, CA; Portland, OR; San Francisco, CA; Seattle, WA; Berkeley, CA

¹³ Oil and gas industry actions, Soil Sequestration Rangelands, and Vehicle Emissions Testing

Climate and Energy Action Plan

Table 1: La Plata County GHG Emission Reduction Targets

Long-term GHG reduction target	Interim goal	Agriculture Forestry Waste Mgmt	Energy Supply & Distribution (does not include O&G)	Residential Commercial Industrial	Transportation & Land Use
80% below 2005 levels by 2050	5% below 2005 levels by 2015; 3%/yr for the next 5 years = 20% reduction by 2020; then 2%/yr = 40% reduction by 2030	Divert 25% of waste from landfills by 2015; 50% by 2020 70% by 2030 90% by 2050 Agriculture and Forestry included in Land Use target	Generate and/or purchase double the state’s mandate for coops for electricity from renewable resources as required by the Renewable Energy Portfolio Standard 2% through 2010 12% by 2015 20% by 2020 40% by 2030 80% by 2050	All new buildings, developments and major renovations shall be designed to reduce GHG emissions below 2005 levels by: 10% by 2015 25% by 2020 50% by 2030 100% by 2050 All existing buildings shall reduce GHG emissions below 2005 levels by: 10% by 2015 20% by 2020 40% by 2030 70% by 2050	Transportation: Reduce emissions by 80%, thus achieving 57% below 2005 by 2050 Land Use: Reduce emissions by 2% annually thus targeting a 90% decrease below 2005 by 2050

4. ICLEI Milestone 3: Proposed Actions

This section describes ways that La Plata County can work toward a GHG emission reduction target of 80% below 2005 levels by 2050 through mitigation efforts. It also frames how La Plata County can build resiliency through climate adaptation.

Mitigation can be described as actions taken to reduce the concentration of greenhouse gases, either by reducing their sources or by increasing their sinks.¹⁴ Reducing the intensity of climate change is a global effort. Adaptation, alternatively, includes actions that enable a local community to be more resilient to changing climate conditions. These actions are efforts to reduce the local negative impacts associated with climate change and climate variability.

4.1 Evaluation

Proposed actions were evaluated in terms of the benefits to the environmental, economic, and social systems of our community. This approach aligns with the County Compass, the City of Durango Comprehensive Plan and the Town of Ignacio Land Use Goals, respectively. For the purposes of the CEAP, these criteria are defined as follows:

- *Environmental Stewardship* rankings are based solely on estimated annual emission reductions in terms of tCO₂e mitigated per action by the year 2015 (as calculated using CAPP software), given a variety of action details. Action details can be found in Appendix H.
- *Economic Development* in this context is expressed in terms of simple payback time (shorthand: return on investment, or ROI), i.e., the estimated capital cost divided by the annual savings. In many cases, the cost and benefit estimates are rough, so the Economic Development potential is expressed on a five-point scale, as tabulated in Table 21 in Appendix F. If the payback time is less than two years, the score is five; if greater than 15 years, the score is one. Scores of three or more correspond to payback times of 10 years or less.

The CAPP software provides a more complex evaluation of possible economic development impacts using six characteristics: capital cost, operation and maintenance costs, payback time, implementation timeframe, government staff time required, and level of government control. Each proposed action receives a Benefit Ranking on a five-point scale, as detailed in Table 21 in Appendix F. To emphasize local priorities, the rankings are combined in a weighted average according to Criteria Values assigned in accordance with surveys of the CEAP Steering Committee and government and community leaders. The resulting Priority Score provides a more comprehensive, but less intuitive measure of economic development potential than payback time. Figure in Appendix F shows that the survey generated very similar priorities for actions for the community and for government operations.

¹⁴ An environmental reservoir that absorbs and stores more carbon than it releases, thereby offsetting greenhouse gas emissions. Forests and oceans are examples of carbon sinks.

- *Societal Development* refers to thriving families and healthy communities assessed in terms of the extent to which a variety of societal benefits could be felt in our community. Actions that were expected to benefit greater than 10% of both rural and urban La Plata County ranked high, greater than 10% of either rural *or* urban La Plata County ranked medium, and less than 10% ranked low. Societal benefits considered included the following:

Table 2: Societal Development Criteria

• Diversity	• Skills Enhancement	• Environmental Justice
• Human Rights	• Local Economic Impacts	• Healthy Active Lifestyles
• Community Outreach	• Security	• Awareness of Our History
• Indigenous Communities	• Safety & Health	• Job Creation
• Labor Relations	• Access to potable water	
• Thriving Cultures	• Crisis Management	

- *Adaptation* to climate change includes benefits that cross environmental, economic and societal benefits, but are developed specifically in light of climate projections for our area. Actions were evaluated in terms of their potential for building community climate resiliency and are indicated as such in the tables in Section 4.2 Six Strategies. To supplement these tables, Appendix H includes action plan detail sheets that give in-depth descriptions of each action, including strategies for implementation.

4.2 Six Strategies

The CEAP Actions were categorized into six strategies targeting different sectors of our community based on the following process:

- The various GHG mitigation work groups researched and considered over three hundred potential actions
- By assessing details such as feasibility, applicability to our region and likelihood of success, the work groups narrowed that down to forty-two actions that could reduce GHG emissions in La Plata County, while also spurring economic development and improving overall quality of life.
- Within each strategy, actions were broken into those implemented by various government entities, businesses, individuals, and/or non-profits
- These actions were analyzed using CAPP to project GHG emission reductions, and for actions with enough cost detail provided by work groups, simple payback and cost savings were also calculated. The actions were also qualitatively analyzed by the CEAP work groups to determine the broader impacts and benefits of each action and to develop strategies for implementation.
- After analysis was complete, each action was then reviewed and approved by the CEAP Steering Committee.
- Potential actions that were not given a CAPP analysis by the GHG mitigation work groups have been retained (Appendix E):

- for their potential to provide complementary components to selected actions,
- to be considered as future opportunities, and
- to expose potential market gaps that present potential business opportunities

Following each strategy description is a table that lists each proposed action, the associated economic, environmental and societal benefit rankings used to help prioritize actions, and an indication of their potential to improve our ability to withstand potential climate impacts.

Strategy 1. Reduce emissions of the oil and gas industry

The vast majority of emissions in La Plata County (66%) are attributable to the direct emissions and energy use of the natural gas industry. Also associated with the natural gas industry are emissions from methane seeps at the Fruitland Outcrop, the surface trace of the coalbed methane-producing greater Upper Cretaceous Fruitland Formation of the San Juan Basin, which contribute another 16%.

Recently announced Environmental Protection Agency (EPA) regulations are slated to require the industry to report GHG emissions for calendar year 2011 in 2012. This will ensure more accuracy and consistency in reporting GHG emissions from larger emissions sources and will likely inspire more efficiency in industry practices and procedures. The potential for further EPA regulation may encourage additional innovation.

Apart from seepage at the Fruitland Outcrop, emissions from the natural gas industry result from direct emissions of methane (CH₄) and venting of CO₂ entrained with coalbed methane, as well as energy consumed in natural gas production. Action proposals from the industry analysts on the Oil and Gas subgroup of the Energy Supply and Distribution work group address fugitive CH₄ and energy consumption (Table 3).

Much of the energy used to produce natural gas is consumed to power equipment at wellheads using on-site natural gas. Electrification of these facilities reduces local noise, air pollution, and local GHG emissions. However, if the electricity comes from the grid, and hence primarily from coal-fired power plants, electrification of wellheads drastically increases total GHG emissions, because coal-fired grid-delivered electricity is roughly six times more carbon-intensive than burning natural gas on site. As indicated in Section 2.2 Revised Emissions Inventory, estimates of the resulting emissions are included in the projected emissions in 2015 and 2020.

A possible way to reduce these emissions is investment in solar energy on a scale large enough to power the local natural gas industry. Space on well-pads alone could provide roughly enough power to run auxiliary equipment (Electric Wellhead in Table 3), but running pumps and compressors would require off-site energy generation (Electric Lift in Table 3). By siting the large solar farms needed to provide this energy in La Plata County, economic benefits would continue to accrue as natural gas production declines, and sustain these benefits indefinitely into the future. However, this would entail large capital costs and significant land-use changes. These farms could also be employed for electricity export transmission lines now being discussed to import electricity for natural gas production. Assessing the

technical and economic feasibility of such large scale (gigawatt) deployment of solar energy would require detailed analysis that extends beyond the scope of this report.

Table 3: Proposed Actions to Reduce Emissions of the Oil & Gas Industry

Action Full Name	Environmental Stewardship (tCO ₂ e Mitigated)	Economic Development (ROI rating)	Social Development	Adaptation	Suggested Entity Involved with Implementation
Green Well Completions ¹⁵	248,000	5	Med	Yes	Oil and Gas Industry
Low Bleed Controllers	224,700	5	Med	Yes	Oil and Gas Industry
Electric Wellhead ¹⁶	72,605	1	Med		Oil and Gas Industry
Leak Detection	1,838	5	Med	Yes	Oil and Gas Industry
Electric Lift ¹⁷	-700,000	0	UK		Oil and Gas Industry

Economic Development: If the payback time is less than 2 years, the score is 5; if greater than 15 years, the score is 1. Scores of 3 or more correspond to payback times of 10 years or less.

Environmental Stewardship: tCO₂e Mitigated by 2015 (approximate)

Social Development: SD Ranking High: benefits to >10% of both rural and urban populations, Med: benefits to >10% of urban or rural population, Low: benefits to < 10% of rural and urban population

Adaptation: Action would add to community resiliency

¹⁵ GHG emission reduction for this action are dependent on future drilling rates

¹⁶ Ibid. Further, these reductions depend on the assumption that the electricity comes from renewable sources.

¹⁷ The CO₂e mitigated for this action are negative, which means that this action would actually result in an increase in emissions.

Strategy 2. Develop renewable sources of energy

Looking toward a future with increased regulations on, increased cost of, and reduced availability of fossil fuel energy, communities across the nation have begun to develop and implement sustainable energy plans that aim to provide a variety of benefits. These benefits include many economic enhancement opportunities, such as cost savings through energy efficiency and resource conservation, stimulated job market within the new energy economy, community-wide general economic development, attraction of tourism, new business partnerships within the community and investment and reinvestment into community projects. Examples of potential job creation areas for renewable energy include: installers, electricians, engineers, investors and maintenance personnel, among others. Other benefits include: increased environmental stewardship, improved image and community branding (regionally, nationally, and even internationally), increased retention of residents and increased pride and self-reliance in the community.

Incorporating more locally generated sources of renewable energy into our county's energy portfolio will reduce our emissions and the detrimental environmental impacts associated with a fossil fuel-based energy supply. It will also increase the security of our energy future, lessen dependence on foreign oil, and provide the previously mentioned economic and societal benefits. The use of cost-saving energy efficiencies, effective technologies, and creative investment strategies will assist in further advancing renewable energy technologies in La Plata County.

Locally distributed renewable energy is important as it offers higher energy efficiencies due to shorter distribution lines and thus less energy is lost in the transmission of electricity to consumers. Moreover, locally generated renewable energy increases consumers connection to their energy generation, thus increasing the consumer's consciousness of their energy consumption.

It is noted that the environmental impacts of energy sources (fossil fuels and renewable) should be evaluated on a life-cycle assessment basis. Impacts include environmental, economic, and social consequences. This approach takes into account the impacts associated with procuring the materials to build the power generation facility (such as a solar panel or a coal power generation station), the lifetime impacts of those materials, how the materials can be recycled to new products, or the permanent impacts due to disposal of the materials. As feasible, the impacts of using status quo energy sources vs. the proposed renewable energy sources should be considered in the detailed evaluation process that will be used when implementing the proposed strategies for renewable energy sources.

The actions in the table below are designed to encourage and increase renewable energy development and to transition toward a more sustainable energy economy. The last two actions recommend additional studies that could lead to further renewable energy supplies.

Hydropower, wind power, biofuel, and other methods of renewable energy were not sufficiently developed locally to evaluate as a measure for the CEAP, but should be considered for our county in the future.

Table 4: Proposed Actions to Develop Renewable Sources of Energy

Action Full Name	Environmental Stewardship (tCO ₂ e Mitigated)	Economic Development (ROI Rating)	Social Development	Adaptation	Suggested Entity Involved with Implementation
Use Solar Photovoltaic (PV) Energy	9,623	2	Med	Yes	Residential/commercial/industrial/government buildings, government entities, LPEA, private investors, others
Renewable Energy Certificates	9,436	1	Low		Energy users
Purchase Non-Local Renewable Electricity	7,593	1	Low		Energy users through LPEA program
Solar Hot Water	1,867	1	Med	Yes	Residential and commercial/industrial/government building owners
Geoexchange Heat Pump & Cooling	772	3	Med	Yes	Residential and commercial/industrial/government building owners
Renewable Energy Site Feasibility Study	--	--	--		LPEA, Government, other entities
Low-temp Geothermal Study	--	--	--		Renewable Energy Entrepreneurs, LPEA, O&G Industry, Colorado Geological Survey, and Community-based groups.

Economic Development: *If the payback time is less than 2 years, the score is 5; if greater than 15 years, the score is 1. Scores of 3 or more correspond to payback times of 10 years or less.*

Environmental Stewardship: *tCO₂e Mitigated by 2015 (approximate)*

Social Development: *SD Ranking High: benefits to >10% of both rural and urban populations, Med: benefits to >10% of urban or rural population, Low: benefits to < 10% of rural and urban population*

Adaptation: *Action would add to community resiliency*

Strategy 3. Develop a multi-modal transportation system

La Plata County is currently faced with the challenge of addressing both urban and rural population growth and the associated growing demand for transportation. These challenges are coupled with concerns for reducing GHG emissions and pollution, while supporting a healthy environment and the needs of a thriving and growing community.

Motor vehicles greatly contribute to the release of GHG emissions, pollutants and toxins that are hazardous to human and environmental health. GHG emissions from on-road vehicle travel are direct, occurring at the tailpipe as the result of fossil fuel combustion in the vehicle's engine.¹⁸

As of the 2005 inventory, GHG emissions from on-road vehicle travel in La Plata County account for 411,000 tCO₂e,¹⁹ making transportation the second largest contributor of emissions, outside of the oil and gas industry. Estimated vehicle miles traveled in the county each day were 2.2 million in 2010. Vehicle miles are projected to increase relative to population projections to 3.6 million miles per day in 2030.²⁰ The CEAP aims to reduce the release of the harmful emissions associated with on-road vehicle travel by increasing the efficiency of vehicles in our community and by developing a multi-modal transportation system to decrease vehicle miles traveled.

The CEAP drafts a multi-modal transportation strategy for the county that utilizes advantageous design mechanisms, such as Complete Streets²¹ and Smart Growth²² urban and rural development. These mechanisms are designed with the community in mind to reduce dependency on private vehicle use, promote economic development and job growth, support and promote mixed-use development, encourage more localization of community infrastructure, support active living and increase community health.

¹⁸ (Colorado CAP Final Report) <http://www.cdphe.state.co.us/ic/coloradoclimateactionplan.pdf>

¹⁹ (Brendle Group Report) <http://www.fourcore.org/docs/CEAP/061208BaselineGreenhouseGasEmissionProfileandForecast.pdf>

²⁰ 2030 Trip Study for La Plata County

²¹ Complete Streets is a policy for planning roadways designed and operated to enable safe, attractive, and comfortable access and travel for all users (www.completestreets.org).

²² Smart Growth is an urban planning and transportation methodology that concentrates growth in the center of a city to avoid urban sprawl; and advocates compact, transit-oriented, walkable, bicycle-friendly land use (www.smartgrowth.org).

Table 5: Proposed Actions to Develop a Multi-Modal Transportation System

Action Full Name	Environmental Stewardship (tCO ₂ e Mitigated)	Economic Development (ROI Rating)	Social Development	Adaptation	Suggested Entity Involved with Implementation
Emission Testing	18,976	5	Med		Government
Transit Oriented Development	13,638	3	High	Yes	Community and government
Education on Low-Carbon Transportation Options	4,510	5	Low	Yes	Various Organizations
Initiate Car Share	2,902	3	High	Yes	Business opportunity
Bicycling Paths & Facilities	501	3	High	Yes	Community and government
Compressed Natural Gas Buses	113	5	Low		Government and other fleet operators
Safe School Routes	85	4	High		School Districts and Government
Promote Carpooling & Vanpooling	59	4	Med		Government and Various Organizations
Increase Bus Ridership & Service	47	4	High	Yes	Community and government
Walking Friendly Environments	3	0	High	Yes	Community and government

Economic Development: *If the payback time is less than 2 years, the score is 5; if greater than 15 years, the score is 1. Scores of 3 or more correspond to payback times of 10 years or less.*

Environmental Stewardship: *tCO₂e Mitigated by 2015 (approximate)*

Social Development: *SD Ranking High: benefits to >10% of both rural and urban populations, Med: benefits to >10% of urban or rural population, Low: benefits to < 10% of rural and urban population*

Adaptation: *Action would add to community resiliency*

Strategy 4. Increase the energy efficiency of buildings and infrastructure

Reducing energy consumption through increasing infrastructure efficiencies and smarter building design and development is one of the most cost effective and proactive means of reducing direct and indirect GHG emissions. Making efficiency improvements on existing developments and incorporating energy efficient design into new developments has a number of benefits. These benefits include job creation, a solid return on investment, improvement of the quality and marketability of building stock, cost savings on energy, a reduction in overall emissions, and improvements in overall energy consumption and conservation in the community.

In the United States, energy inefficiencies from infrastructure account for 39% of carbon dioxide (CO₂) emissions and 48% of all GHG emissions.²³

La Plata County residential and commercial energy uses together are the largest non-oil and gas contributors, with a total of 44% of GHG emissions in La Plata County. Emissions from these two sectors resulted in 571,000 tCO₂e in 2005.

Table 6: Proposed Actions to Increase the Energy Efficiency of Buildings and Infrastructure

Action Full Name	Environmental Stewardship (tCO ₂ e Mitigated)	Economic Development (ROI Ranking)	Social Development	Adaptation	Suggested Entity Involved with Implementation
Lights Out at Night Policy	8,091	5	Low		Business and Government
Residential Energy Code	5,619	3	Med		Government
Efficient Lighting Retrofits	3,686	5	Med	Yes	Business and Government
Residential Square-Footage Offset	3,594	4	Low		Community and Government
Encourage Retrofits of Existing Homes	3,030	4	Low		Homeowners, 4CORE, LPEA
Lighting Occupancy Sensors	2,427	5	Low		Business and Government
Low-Income Home Weatherization	1,069	3	High	Yes	4CORE

²³ <http://www.documents.dgs.ca.gov/dgs/pio/facts/LA%20workshop/climate.pdf>

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Action Full Name	Environmental Stewardship (tCO ₂ e Mitigated)	Economic Development (ROI Ranking)	Social Development	Adaptation	Suggested Entity Involved with Implementation
Green Building Contractor Education	917	3	Med		4CORE
Water Conservation Ordinance	499	5	Med	Yes	Community, Business and Government
Energy Efficiency Improvements Loans	288	2	High	Yes	Local banks and/or Government
Energy Efficiency Education Target Businesses	346	3	Med	Yes	Various organizations
Require Energy Audit at Sale	101	4	High	Yes	Government , Association of Realtors

Economic Development: If the payback time is less than 2 years, the score is 5; if greater than 15 years, the score is 1. Scores of 3 or more correspond to payback times of 10 years or less.

Environmental Stewardship: tCO₂e Mitigated by 2015 (approximate)

Social Development: SD Ranking High: benefits to >10% of both rural and urban populations, Med: benefits to >10% of urban or rural population, Low: benefits to < 10% of rural and urban population

Adaptation: Action would add to community resiliency

Strategy 5. Enhance the local agricultural system

La Plata County can work toward localizing food systems and supporting sustainable agriculture as another way to reduce GHG emissions. Sustainable approaches are those that are the least toxic and least energy intensive, yet maintain productivity and profitability (CalCAN, 2011). Supporting sustainable agricultural practice and products could reduce the associated GHG emissions associated with producing, processing, and transporting food into La Plata County from outside. This will also help shift economic support to local farmers and ranchers to keep more money within our community.

Agriculture and land-use practices in La Plata County in 2005 resulted in about 111,000 tons of GHG emissions, which is 1.5% of the total emissions inventory or 7.9% when oil and gas emissions are removed. These, and the other environmental impacts described below, result from the following agricultural practices:

- GHG emissions from livestock, use of nitrogen fertilizers/soil amendments, and manure management;
- Air quality impacts from agricultural burning, dust from tillage, traffic and harvest, pesticide drift from spraying, and nitrous oxide emissions from the use of nitrogen fertilizer;
- Water quality impacts from salinization and contamination of ground and surface waters by pesticides and fertilizers;
- Water supply impacts from overdraft of groundwater, furrow irrigation, and inefficient water management (Feenstra, Ingels, & Campbell, 2011)

Agriculturalists, ranchers, and landowners can work toward incorporating cultivation techniques and land management practices that emit less GHG emissions. Examples of these techniques include:

- Reducing tillage, the use of synthesized nitrogenous fertilizers, and pesticides/fungicides;
- Using cover crops (such as nitrogen-fixing legumes), compost, animal manure for fertilizer, organic practices in animal diet, riparian buffers, drought-tolerant crops, and subsurface irrigation;
- Practicing manure management, soil management, multicropping/crop rotation, permaculture design, efficient fertilizer use/management, and rotational grazing (Feenstra, Ingels, & Campbell, 2011; CalCAN, 2011; Pew Center on Global Climate Change, 2011).

By implementing measures to enhance agricultural and land-use practices, landowners and the greater community would experience many collateral benefits, such as increased primary production (agricultural products), increased soil water retention, improved soil condition and fertility, reduced crop water use, reduced fuel consumption, increased habitat for beneficial insects (reducing the need for pesticides), increased access to fresher foods, better producer-consumer communication, and natural resource conservation (CalCAN, 2011).

The following table lists actions that aim to improve the local environmental, economic and community health, and help our community work toward more self-reliance and sustainability. Though the table is brief, the action plan detail sheets for these actions contain more extensive detail.

Table 7: Proposed Actions to Enhance the Local Agricultural System

Action Full Name	Environmental Stewardship (tCO ₂ e Mitigated)	Economic Development (ROI Ranking)	Social Development	Adaptation	Suggested Entity Involved with Implementation
Soil Sequestration Rangeland	12,607	1	High	Yes	Agriculturalists
Local Healthy Sustainable Food ²⁴	Unknown	Unknown	High	Yes	Food producers and consumers

Economic Development: *If the payback time is less than 2 years, the score is 5; if greater than 15 years, the score is 1. Scores of 3 or more correspond to payback times of 10 years or less.*

Environmental Stewardship: *tCO₂e Mitigated by 2015 (approximate)*

Social Development: *SD Ranking High: benefits to >10% of both rural and urban populations, Med: benefits to >10% of urban or rural population, Low: benefits to < 10% of rural and urban population*

Adaptation: *Action would add to community resiliency*

²⁴ As this report was being completed, the STA work group provided a very rough estimate that the emissions reduction from the Local Food action would be about 1000 tCO₂e/yr by 2015, perhaps twice that by 2020. This action deserves more detailed evaluation in the future.

Strategy 6. Reduce Waste

Waste disposal activities (solid waste land filling, wastewater treatment, and medical waste incineration) in La Plata County accounted for about 57,000 tCO₂e in 2005, which is 4.5% of the county's emissions profile.²⁵

Solid waste disposal in landfills accounts for 98% of waste emissions in the county (nearly 62,000 tCO₂e), with organic waste as one of the largest solid waste materials. When biodegradable waste decomposes in landfills it emits methane (CH₄), which is twenty-one times more effective at trapping heat than carbon dioxide.

Landfills are one of the largest sources for GHG emissions, in particular accounting for 25% of human-related methane emissions in the U.S, where 37% of those total emissions are from products and packaging.²⁶ Landfills also accumulate waste from man-made substances, chemicals, and compounds, which can be persistent because they are difficult to break down in nature and contribute to environmental pollution and negative health impacts (USEPA, 2006).²⁷

La Plata County generated a total of 55.4 million tons of solid waste in 2009 (USEPA, 2006).²⁸ Also in 2009, La Plata County recycled approximately 6.4 million tons of material from City of Durango residents and 1.2 million tons from residents who live outside of the City limits. For 2009, the overall recycling rate was approximately 13.7% for the county, which is slightly lower than the 15.3% rate of 2008.²⁹

Reducing waste presents an opportunity to save money in waste removal services, spur the local job market, and support local entrepreneurs. At the same time, it will reduce the generation of GHG emissions, support the protection of our natural resources by utilizing existing materials instead of extracting and processing new ones, and improve the quality of our air and water. Waste reduction will also contribute to a more resilient, self-reliant, and sustainable society.

25 (Brendle Group Report) <http://www.fourcore.org/docs/CEAP/061208BaselineGreenhouseGasEmissionProfileandForecast.pdf>

26 U.S. Greenhouse Gas Emissions: Systems-based view. Source: U.S. EPA, 2009.

27 US Inventory of Greenhouse Gas Emissions and Sinks: 1990–2004 (and earlier editions), US Environmental Protection Agency, Report # 430-R-06-002, April 2006. Available at: <http://www.epa.gov/climatechange/emissions/usinventoryreport.html>

28 *ibid.*

29 Walt Serfoss, La Plata County Sustainability Coordinator. July 29, 2010

Table 8: Proposed Actions to Reduce Waste

Action Full Name	Environmental Stewardship (tCO ₂ e Mitigated)	Economic Development (ROI Ranking)	Social Development	Adaptation	Suggested Entity Involved with Implementation
Waste Water Treatment Methane Capture	6,384	1	Low		Private and government operators
Zero Waste (Pay as You Throw Program)	378	3	Low		Government
Expand Business Recycling	89	5	Med		Local Business, Government and other operators
Expand Materials Recycled	75	4	Med		Private and government operators
County Wide Composting (Yard)	40	1	Med	Yes	Private and government operators
County Wide Composting (Kitchen)	36	2	Med	Yes	Private and government operators
Zero Waste (Reuse)	8	3	Med	Yes	Entrepreneurs and government

Economic Development: If the payback time is less than 2 years, the score is 5; if greater than 15 years, the score is 1. Scores of 3 or more correspond to payback times of 10 years or less.

Environmental Stewardship: tCO₂e Mitigated by 2015 (approximate)

Social Development: SD Ranking High: benefits to >10% of both rural and urban populations, Med: benefits to >10% of urban or rural population, Low: benefits to < 10% of rural and urban population

Adaptation: Action would add to community resiliency

4.3 Unanalyzed actions with business potential

As mentioned in Section 4.2 Six Strategies, the CEAP work groups initially considered over 300 potential actions. Of these, 42 were selected for more detailed analysis. However, many of the actions initially considered expose market gaps and present potential business opportunities in our community. Additional opportunities were also suggested by La Plata County residents during the public input period. These opportunities are highlighted below:

Table 9: Unanalyzed Actions with Business Potential

Strategy	Business Opportunity
Develop Renewable Sources of Energy	<ul style="list-style-type: none"> • Develop means for energy generation from anaerobic digestion of animal wastes, food waste, and biosolids • Develop biomass energy (woodstoves, pellets, and source materials)
Develop a Multi-modal Transportation System	<ul style="list-style-type: none"> • License additional shuttles: DMR, Casino, Airport • Provide B20 (fuel with 20% biodiesel content) at area gas stations • Take advantage of local liquefied natural gas (LNG) resources to fuel buses • Establish solar charging facilities for plug-in hybrids
Increase the Energy Efficiency of Buildings and Infrastructure	<ul style="list-style-type: none"> • Create a production facility for pre-fabricated housing in La Plata County that uses either high performance or local, naturally sourced building materials.
Enhance the Local Agricultural System	<ul style="list-style-type: none"> • Develop use for biogases from manure lagoons • Develop use for forestry and agricultural by-product biomass production • Dedicate a percentage of acreage of on-farm land to grow biofuel crops for fueling agricultural equipment • Develop and incentivize a system for local businesses (including food market places) to buy local food and fiber products • Develop a municipal procurement plan that incorporates a set standard for local product acquisition and support • Develop a local food map showing where community members can access a variety of local food products • Develop a Street Tree program with recommended species • Develop business ventures that deliver services for installing or designing edible landscapes • Increase public access to commercial kitchens for canning purposes • Develop more locations and times for seasonal markets in the County
Reduce Waste	<ul style="list-style-type: none"> • Produce biodegradable packaging material • Develop a resource recovery park and related business ventures • Develop forest product discards to replace fossil fuel intensive steel, concrete, brick, and aluminum building components • Develop local industries to reprocess/reuse materials • Expand composting infrastructure beyond yard and kitchen waste

5. Action Analysis

Comparisons of the proposed actions for each GHG emission reduction strategy are outlined in the figures below. These figures enable us to quickly identify those actions with both a high GHG reduction potential, as well as a high ROI. Furthermore, actions with a high community benefit are indicated with a plus (+) sign and actions that improve our community’s ability to adapt to climate change are indicated with an asterisk (*).

5.1 Oil and Gas Industry Actions

Figure 6 illustrates potential GHG mitigation impact of technology changes in the oil and gas industry, including Low Bleed Controllers, Green Completions, and Electric Wellheads in the oil and gas industry. Such actions could result in upwards of 0.55 MtCO₂e mitigated per year by 2015 and 0.92 MtCO₂e by 2020.

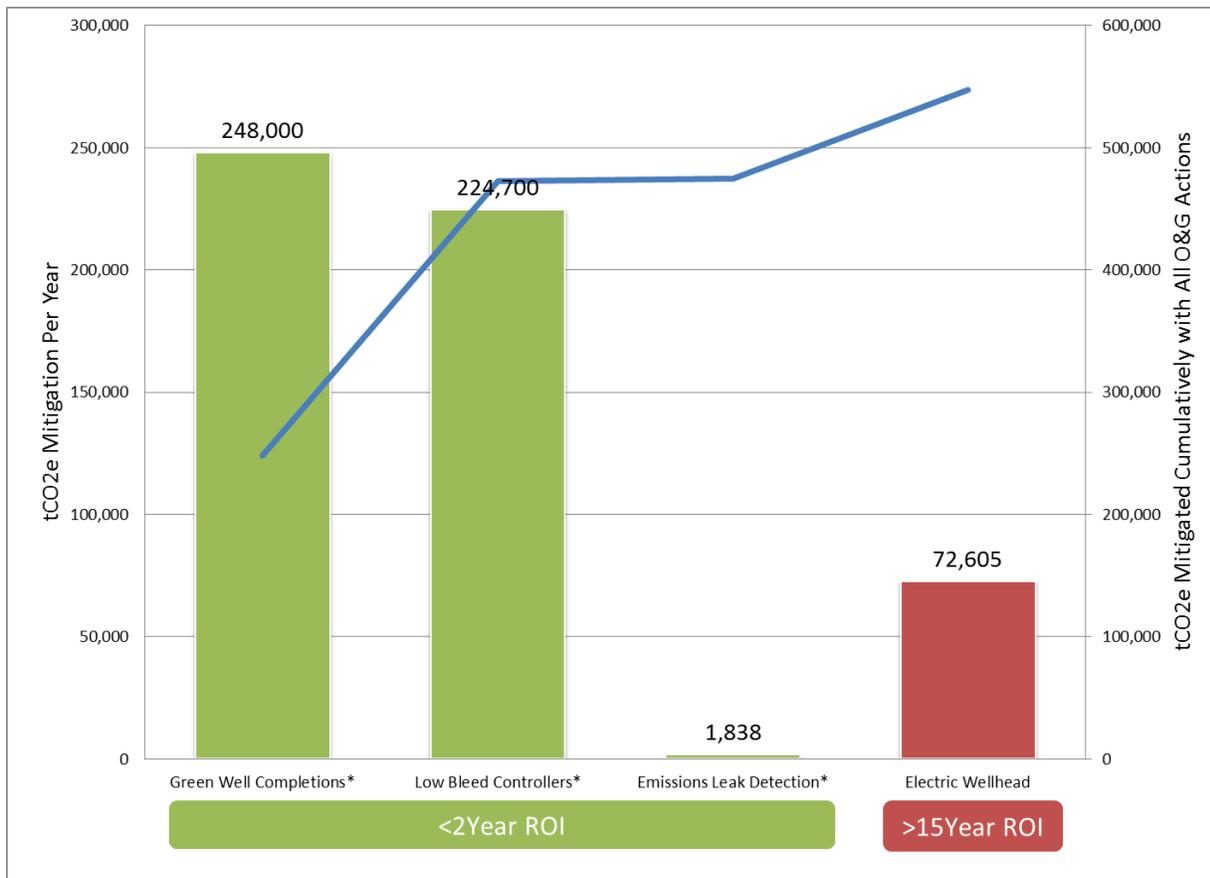


Figure 7: Mitigated tCO₂e per year by 2015 for Oil and Gas Industry Actions

5.2 Community Actions

Looking beyond the oil and gas industry, our community has the potential to reduce GHG emissions by 127,000 tCO_{2e} by 2015, and by 253,000 tCO_{2e} by 2020 if all recommended actions are implemented.

5.2.1 ROI of less than two-years

Figure 8 shows those actions with a ROI of less than two-years ranked by their GHG reduction potential. The top three actions in this figure are Emissions Testing, Lights out at Night Policy, and Efficient Lighting Retrofits. These actions should be given the highest priority for conducting a detailed program and implementation analysis due to their high GHG reduction potential and their quick ROI. The other actions shown in this figure also warrant consideration as sound financial investments.

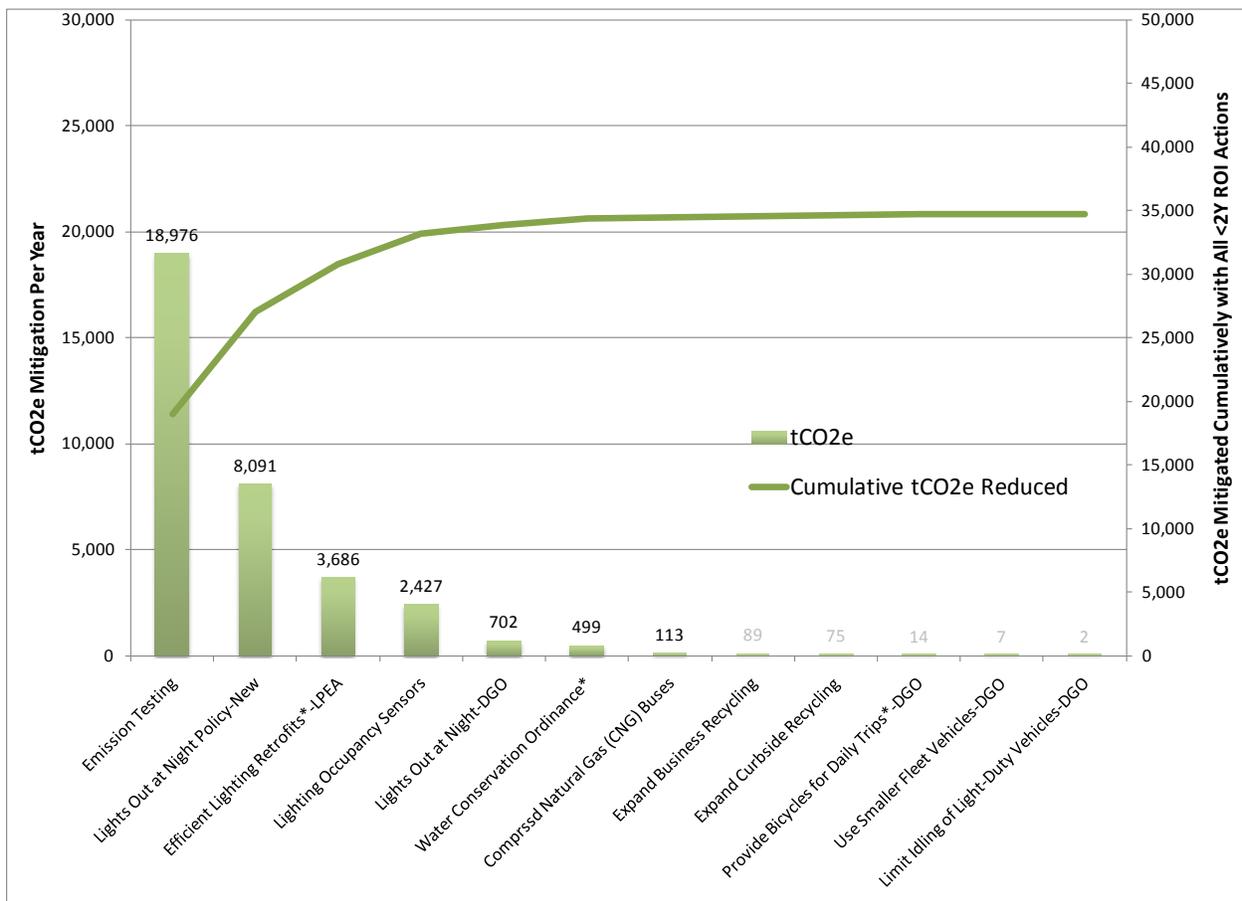


Figure 8: Mitigated tCO_{2e} per year by 2015 for Actions with <2 year ROI

5.2.2 ROI of less than 10 years

Figure 8 and Figure 9 detail additional actions with a ROI of less than 10 years. Encourage Retrofits of Existing Residences and Residential Square-Footage Offset have the highest GHG reduction potential of those actions with a 2-5 year ROI, and Transit-Oriented Development, Residential Energy Code, and Education on Low-Carbon Transportation Options have the highest GHG reduction potential for those actions with an ROI of 5-10 years. Independent of GHGs reduced, implementation of these actions would be a solid investment due to their fairly high ROI.

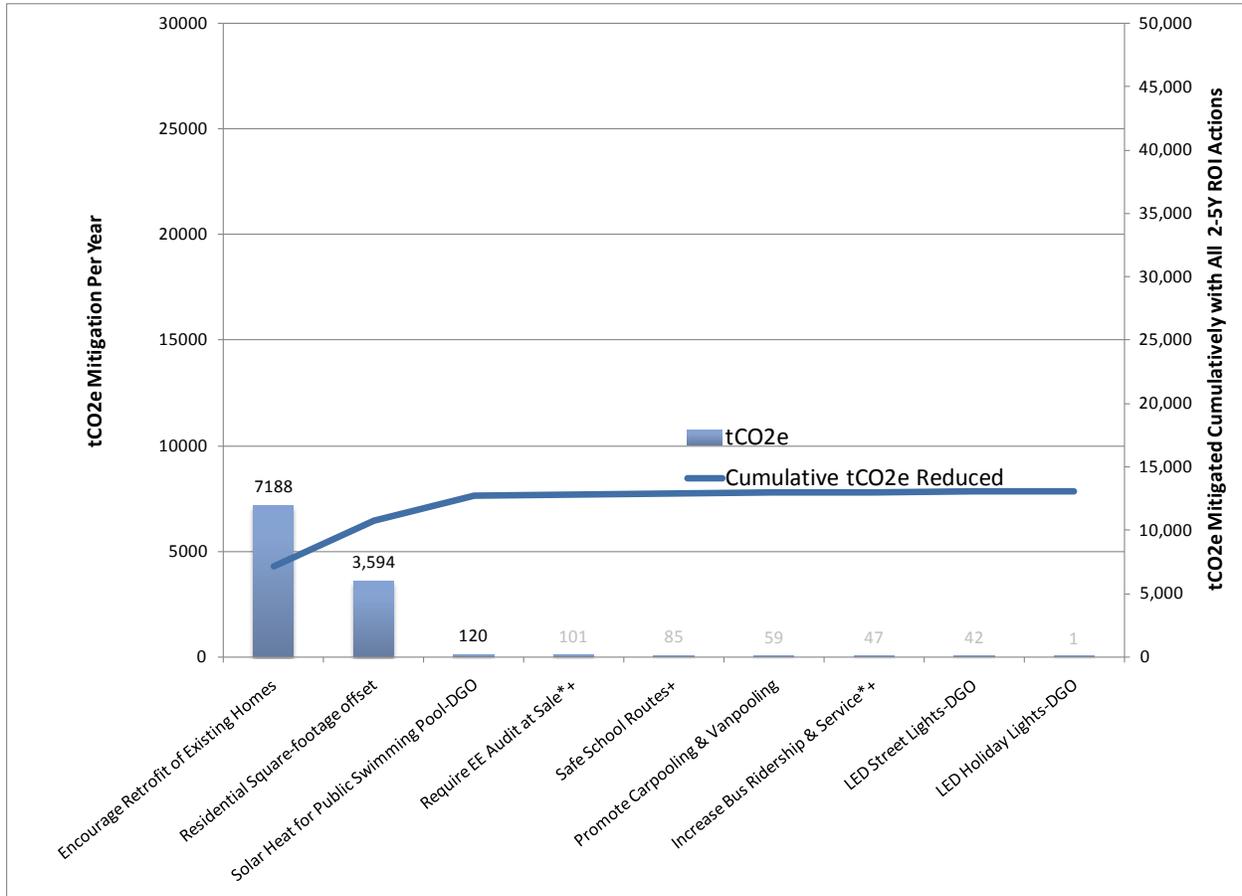


Figure 9: Mitigated tCO2e per year by 2015 for Actions with 2-5 year ROI

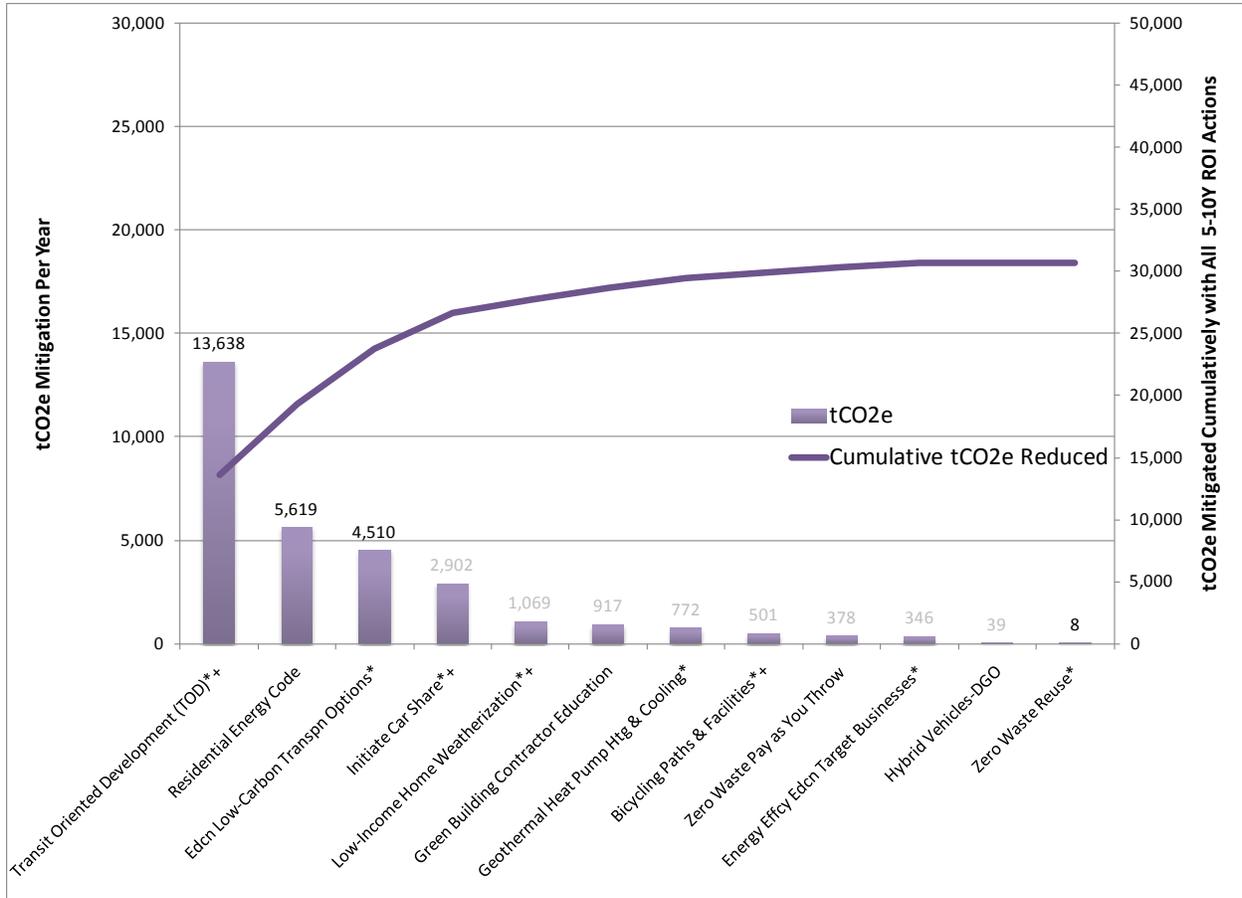


Figure 10: Mitigated tCO2e per year by 2015 for Actions with 5-10 year ROI

5.2.3 ROI of greater than 10 years

The actions represented in Figure and Figure 11 would require more detailed analysis for cost-effectiveness due to an ROI of greater than 10 years. These actions may not be the most cost-effective at this time, but they would still yield long-term GHG reductions. Also, these measures may warrant implementation consideration because of collateral benefits, such as their ability to help our community become more resilient to change (again, those marked with an asterisk are indicated as such). Also, some of these actions may fit into a long-term strategy for energy independence and economic development and, as such, the County may want to consider implementing them. Some of these actions may become more appropriate as financial conditions change and new technologies become available.

Climate and Energy Action Plan

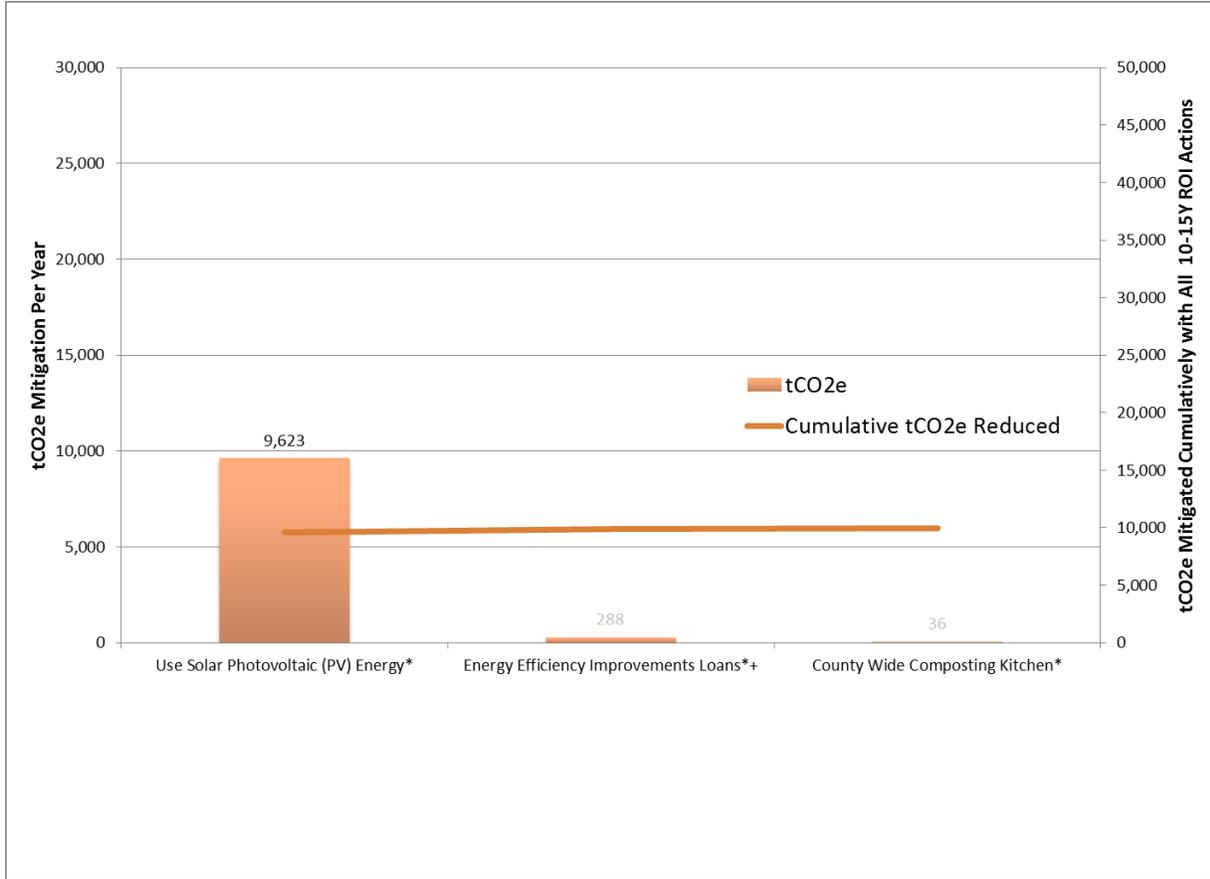


Figure 10: Mitigated tCO2e per year by 2015 for Actions with 10-15 year ROI

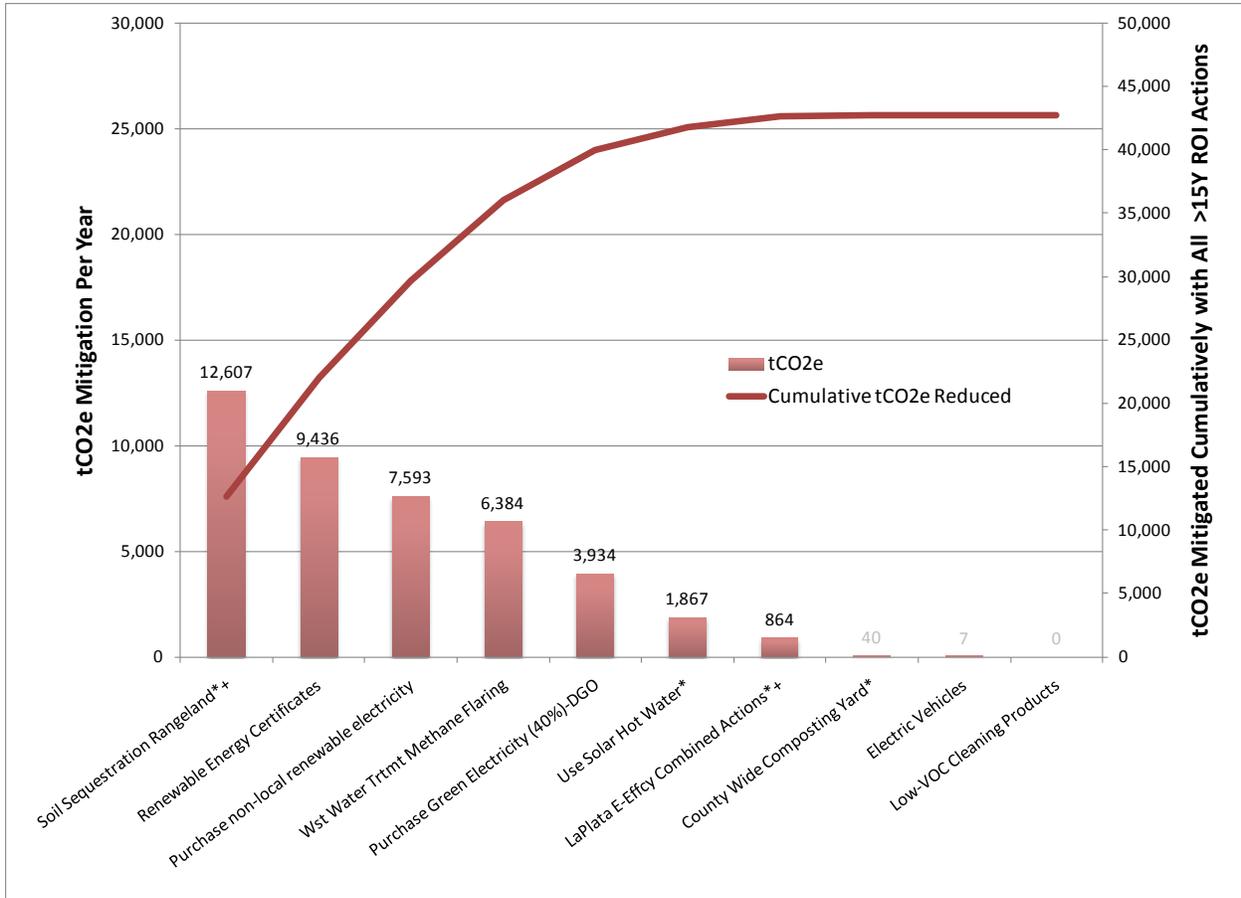


Figure 11: Mitigated tCO2e per year by 2015 for Actions with >15 year ROI

5.3 Comparison with Projected Emissions

Figure 12 displays the Brendle Report projected “business as usual” emissions (grey) and revised projections adding in emissions from the electrification of oil and gas well components (orange), along with the proposed target reductions (green) and the reduction potential of the evaluated CEAP actions (purple). It shows that if our community implemented all of the proposed actions, rather than having emissions 5% below 2005 levels, which is the target, by 2015 our emissions will be 5% **higher** than 2005 levels as a result of electrification. Neither would we meet the 2020 target of being 20% below 2005 levels, but rather our GHG emissions will be 19% higher than 2005 levels. Even to achieve the projected GHG mitigation from these actions, our community will need to rely heavily on the voluntary mitigation efforts of the oil and gas industry, and implement nearly ALL of the actions proposed.

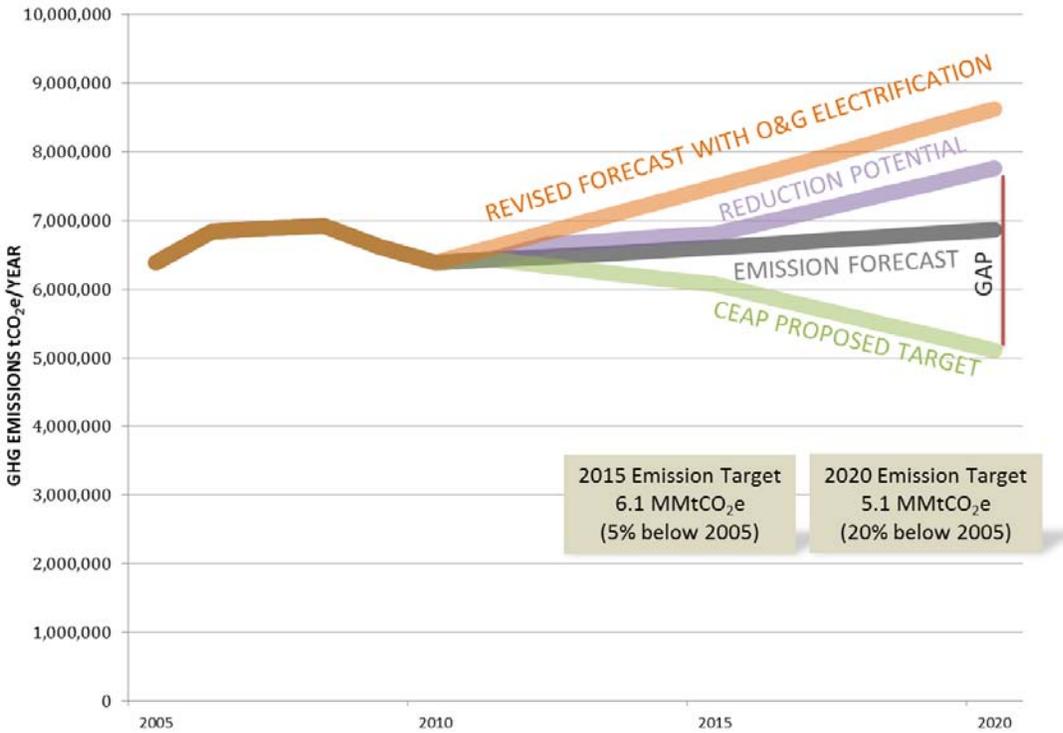


Figure 12: Projected 2020 Emissions with Action Implementation

Figure 13 shows the projections, targets and reduction potential for the community emissions outside the oil and gas sector. Community emissions include those from the following areas:

Electricity – residential	Biomass Carbon Removal
Electricity – commercial	Soil Carbon Losses
Electricity – other	Soil N ₂ O Emissions
Natural gas – residential	Manure Methane Emissions
Natural gas – commercial	Manure N ₂ O Emissions
Natural gas – industrial	Non-CO ₂ Biomass Burning Emissions
Other stationary fuel combustion	Enteric Methane Emissions
Bondad Landfill	Refrigerant loss
Waste Management transfer station	Non-road vehicles and equipment
Wastewater treatment	Coal mining methane emissions
Medical waste incineration	Propane
On-road vehicle transportation	Aviation fuels
Trains	

Given growth projections in the Brendle Report, community emissions are anticipated to be 25% above 2005 levels by 2020, instead of 20% below as our targets recommend. The figure makes clear that at the evaluated level of implementation the proposed CEAP actions fall far short of the adopted targets.

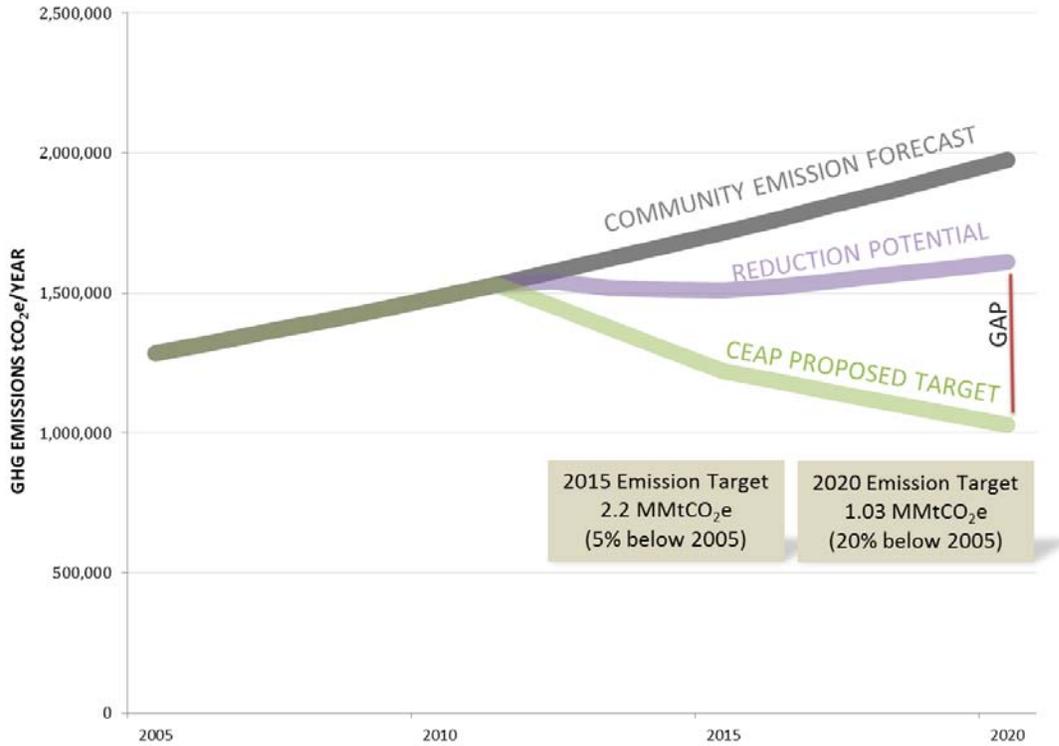


Figure 13: Community Emissions by 2020 Implementing all Proposed Community Actions

These data make clear that reducing community emissions to meet the adopted target is a daunting challenge. Meeting the target will require implementation of the proposed actions and consideration of even more aggressive action. As documented in Appendix C, we have already taken many steps towards self-reliance. The actions proposed to reduce GHG emissions offer additional benefits for the economic and social health of the community. Meeting the long-term challenge of reducing GHG emissions promises to enhance these benefits, but will require resolute action on many fronts.

6. Adaptation

As impacts of climate change become more recognizable, adaptation planning offers a way to build a community that is resilient to change. Adaptation planning examines key vulnerabilities so that we can prepare for negative impacts of climate change, and identifies key opportunities so that we can take advantage of positive impacts.

6.1 Overview

Like the Milestone process used for GHG mitigation, ICLEI has a five milestone process for climate change preparation.

The Climate Change Preparation work group of the CEAP (CCPrep) used this process, as well as work from the MSI and their partners, Model Forest Policy Program's Climate Solutions University, as a mechanism to assess how our community may be vulnerable to climate change and to develop adaptation strategies.

6.1.1 Principles

To guide our progress, the CCPrep team adopted the following simple goal:

To facilitate our community's ability to become Climate Resilient.

A Climate Resilient Community is one that takes proactive steps to prepare for (i.e., reduce the vulnerabilities and risks associated with) climate impacts.³⁰

6.1.2 Methodology and Process

To achieve this goal CCPrep began an adaptation planning process guided by the ICLEI model and the Climate Solutions Framework. Our adaptation planning process includes:

1. Compiling climate change projections for our region;
2. Defining sectors that may be impacted;
3. Scoping the climate change impacts to each sector;
4. Identifying planning areas relevant to each sector;
5. Identifying key vulnerabilities and opportunities in planning areas;
6. Developing goals to build a climate resilient community,
7. Breaking down the goals into specific measurable actions that can be implemented, and
8. Crafting a Community Adaptation Plan for the San Juan Mountain region.

Page 4 of this document includes a summary of projected regional climate changes while Appendix A provides a link to a "Summary of Projected Climate Changes for Southwest Colorado, USA" by Dr. Koren Nydick of MSI prepared for the CEAP and CCPrep, from which this summary was crafted. It is a synopsis of projected impacts of climate change for this region (i.e. the San Juan Mountains) and includes information on the source of projections and level of certainty. This table is taken from a larger

³⁰ From ICLEI *Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments*.

document entitled Climate Change Assessment for the San Juan Mountain Regions, Southwestern Colorado, USA: A Review of Scientific Research by Nydick, K., et al., which was, at the time of the printing of this document, in press. This data compilation enabled the CCPrep workgroup to summarize regional sectors that could be vulnerable to the effects of climate change.

The CCPrep Group used this information to survey a focus group of government staff and local experts regarding the impact of these changes on our community. Participants were selected due to their association with one of twelve sectors: hydrology, agriculture, biodiversity, forests, recreation, energy, transportation, infrastructure, ecosystem services, business, and emergency services. The purpose of this narrative survey was to develop an initial assessment of the context and a list of priorities for the creation of a Community Adaptation Plan, and to identify planning areas around which we could build resiliency. Additionally, the narrative survey results laid the foundation for a framework to incorporate important potential impacts, necessary resources, system drivers, regulating agencies, and governing policies into the adaptation planning process.

6.1.3 Survey Results: Major Themes and Key Findings

The dominant theme of the survey was water, and the impact climate change will have on water resources. The increase or decrease in water availability, timing, flow, and storage capacity will greatly affect the Southwest’s ecological and economical systems. Another dominant theme was the need for plans, policies, and regulations to prepare individuals for climate adaptation actions. Survey respondents recognized the need for local businesses, government, and communities to examine their current policies in light of projected climate changes. The third theme of the survey was increasing and utilizing knowledge. Continuing scientific research is needed about climate change, its impacts, and how Colorado and La Plata County citizens should adapt. More importantly, respondents felt strongly that knowledge needs to be translated and communicated to the public through outreach and education.

6.2. Climate Change Impacts

Table 10 lists the themes and sub-themes that emerged from the survey, broadly categorized in terms of natural systems and human systems.

Table 10: Sectors Likely to be affected by a Changing Climate

	Broad Themes	Sub-themes
Natural Systems	Water	Timing Availability/Storage Flow Snowpack Evaporation
	Ecosystem Health	Vegetation Forests Watersheds Insects Dust

	Temperature
	Fire
Human Systems	Economy Tourism Agriculture Economic Development Other
	Society Human Health Population Adaptation Knowledge
	Policy Energy Engineering Greenhouse Gases Government

6.2.1 Natural Systems

The greatest concerns expressed by survey respondents pertained to water resources and wildfires. The majority expressed alarm for ecosystem health.

6.2.2 Human Systems

The community’s economic drivers, such as tourism and agriculture, dominate human-system concerns related to climate change. Participants were concerned for each of these human activities, and all responses were related to the decline in water

resources. Participants also indicated concern for society, mentioning adaptation, clean energy, and concerns about changes in our base economy directly related to climate changes

Rising costs and impacts on tourism were the leading economic effects anticipated from climate change by participants. Cost concerns included construction flux, rising living expenses, water, infrastructure, wildfire prevention, and more. Some participants believed shorter winter and/or summer seasons in addition to declines in water availability will be the changes that alter the tourist industry.

6.2.3 Additional Analysis

Guided by the narrative survey, MSI, through the Climate Solutions University of the Model Forestry Policy Program (www.mfpp.org), assisted the CCPrep work group by identifying planning areas and, using a compendium of existing data and research, generating the following list of potential climate change impacts to the natural systems of La Plata County. The Climate Solutions University program afforded an opportunity to begin examining human system impacts, such as the economy, but a detailed study of planning areas and associated climate impacts has yet to be done. Table 11 breaks down Natural System impacts by suggested planning areas.

Table 11: Regional Projected Natural System Climate Impacts and Planning Areas

Planning Area	Current and Expected Impacts of Climate Change
Water Supply	<ul style="list-style-type: none"> • With a drier climate, early snowmelt, increased evaporation from soils and reservoirs, and populations growth, water management will be a challenge in our area (Ray, et al., 2008; Clow D. , 2010; Williamson, Ruth, Ross, & Irani, 2008; IPCC, 2008). • The potential for a shorter ski season could have negative economic impacts and increase demand and need for snowmaking to support the industry (Williamson, Ruth, Ross, & Irani, 2008). • Increased evaporation of the snowpack due to more frequent wind and sedimentation events is expected (Painter, et al., 2007), which could impact

Planning Area	Current and Expected Impacts of Climate Change
	<p>tourism, agriculture and other water-based businesses.</p> <ul style="list-style-type: none"> • Dust storms will exacerbate the problem of early snowmelt, leading to increased flooding in the spring (Clow D. , 2010; Mote, Hamlet, Clark, & Lettenmaier, 2005).
Agriculture	<ul style="list-style-type: none"> • The biggest use of water in the county is agriculture. There will be less water available for irrigation, which will further stress farmers (Williamson, Ruth, Ross, & Irani, 2008; IPCC, 2008). • There will be higher demand for irrigation due to lower soil moisture (Ray, et al., 2008). • On the positive side, longer summers may mean a longer growing season for species that we are currently unable to cultivate well.
Water Quality	<ul style="list-style-type: none"> • A shift to earlier snowmelt raises flooding potential in the spring (IPCC, 2008). Increased erosion may occur following severe fires. • In some cases, warmer climate also means warmer water temperatures (Ray, et al., 2008; Cooney, Covich, Lukacs, Harig, & Fausch, 2005).
Vegetation	<ul style="list-style-type: none"> • There will be elevation shifts upward in forest and vegetation communities. This could result in some species declining (high-elevation Engelmann spruce) and some species spreading (Gambel oak) (Rehfeldt, Crookston, Warwell, & Jeffrey, 2006; Worrall, Marchetti, Egeland, Mask, Eager, & Howell, 2010a). • Sudden Aspen decline, which has been associated with drought, may worsen (Worrall, Marchetti, Egeland, Mask, Eager, & Howell, 2010a). • Invasive species that are able to tolerate a range of climatic condition are likely to spread (Janetos, et al., 2008); while others may simply change distribution with changing climatic conditions (Bradley, Oppenheimer, & Wilcove, 2009) . In our area, invasive species of concern include musk thistle, spotted knapweed, yellow toadflax, and tamarisk. • Warmer and drier conditions may result in plants becoming more vulnerable to biological pests and diseases (Janetos, et al., 2008; Worrall, Adams, & Tharp, 2010b). • Negative economic impacts can result from invasive weeds that decrease the value and productivity of rangelands.
Wildfire	<ul style="list-style-type: none"> • A drier, warmer climate puts our community at risk of more frequent and higher intensity wildfires (Westerling, Hidalgo, Cavan, & Swetnam, 2006; Liu, Stanturf, & Goodrick, 2010). • Increased carbon emissions may occur during forest wildfires (Dore, et al., 2008; Huang, Asner, Barger, Neff, & Floyd, 2010). • Colorado Department of Health allowable standards of air pollution may be exceeded an increased number of times during severe fires.
Wildlife	<ul style="list-style-type: none"> • Ecological changes in phenology (periodic biology phenomenon, such as when migration or breeding occurs) and distribution of wildlife species are occurring, and these changes are linked to local and regional climate change (Parmesan & Yohe, 2003; Inouye, Saavedra, & Lee-Yang, 2003; Miller-Rushing & Inouye, 2009;

Planning Area	Current and Expected Impacts of Climate Change
	<p>Blumstein D. , 2009; Bruzgul, Long, & Hadley, 2005; Cayan, Kammerdiener, Dettinger, Caprio, & Peterson, 2001; Corn & Muths, 2002; Ditto & Frey, 20074; Forrest, Inouye, & Thomson, 2010).</p> <ul style="list-style-type: none"> • Range restricted species, such as the American Pika, are at risk of being extirpated from their habitat (Parmesan & Yohe, 2003; Beever & Berger, 2003). • Warmer waters, as well as increased flooding and wildfire, may negatively affect fisheries, including native trout species that are already endangered (Rahel & Olden, 2008; Cooney, Covich, Lukacs, Harig, & Fausch, 2005; Harper & Peckarsky, 2006; Keleher & Rahel, 1996; Williams, Haak, Neville, & Colyer, Consequences of climate change to persistence of cutthroat trout populations., 2009).

From this list of potential natural system impacts, MSI conducted a preliminary vulnerability assessment and risk analysis to determine the key vulnerabilities and potential planning areas. Tables 12 and 13 show suggested key vulnerabilities and opportunities; however, these need further review by the community before going forward.

Table 12: Water and Watersheds Key Vulnerabilities and Opportunities

Water and Watersheds	
Key Vulnerabilities	<ul style="list-style-type: none"> • Water shortages for municipal supply and agriculture • Increased risk of flooding • Decreased water quality
Key Opportunities	<ul style="list-style-type: none"> • Business opportunities related to water conservation • Potential new markets for selling, trading or sharing water rights

Table 13: Forest and Ecosystem Key Vulnerabilities and Opportunities

Forests and Ecosystems	
Key Vulnerabilities	<ul style="list-style-type: none"> • Increased risk of wildfires, specifically in the wildland-urban interface (WUI) • Invasion of exotic species • Air pollution from forest fires
Key Opportunities	<ul style="list-style-type: none"> • Increase in forest products related to thinning • Development of biofuels industry

6.3 Next Steps for Adaptation

The responses to the initial narrative survey has since informed a broader online survey of stakeholders and a larger public audience, which is currently being used to further refine and articulate climate

change adaptation priorities and opportunities for adaptation planning. The survey is still open (as of July 2011) and can be taken at <http://www.surveymonkey.com/s/YQMY7LP>. MSI and the CCPrep group will compile results and anticipate making them available by late summer 2011.

Our community is poised to begin implementing the CEAP and the above mentioned adaptation work lays the groundwork for a La Plata County climate adaptation plan. For some planning areas we have enough vulnerability information to inform GHG mitigation efforts with regard to adaptation planning. Actions included in the CEAP were evaluated in terms of their ability to provide community resiliency in the face of projected and uncertain changes. Prioritizing actions that provide community resiliency will build adaptive capacity and ensure lasting change, while minimizing the impacts of future climate change on our environment, our society, and our economy.

Using the ICLEI model our community can evaluate resiliency by looking at our human, built, and natural systems. Future projects can complement and work collaboratively with those efforts by initiating similar resiliency efforts for our 'built' and 'human' systems, such as transportation and land use, local food production and distribution, sustainable business, and public health and well-being.



The next steps for the La Plata County community will be to use the information gathered from the CEAP process to prepare for future climate change. Tasks include:

- Setting climate change preparedness goals for the county
- Working to adopt a Forest and Water Resource Adaptation Plan (currently in draft form)
- Conducting Agriculture/Food System and Economic Disruption Adaptation Plans
- Using these plans to inform forest, water, food system and sustainable business GHG mitigation efforts
- Developing guidance documents to analyze community projects through the lens of adaptation

Adaptation efforts should include conducting and collaborating on regional asset mapping and risk assessments, working with stakeholders to prioritize projects, providing recommendations on funding and allocation of both financial and human resources, developing resiliency solutions, and implementation measures, as well as providing recommendations on the development of rapid deployment of information sharing and decision support tools on a regional level.

7. Implementation and Evaluation

Milestones 4 and 5 in the ICLEI process are implementation and evaluation. Effective implementation relies on having a strategy for action timing that considers stated goals, knowing which entity or entities are best poised to take actions to the next step and knowing what the next steps entail. Evaluation is necessary to determine whether implementation steps achieve the intended goals and to ensure that they continue to be appropriate as the external environment changes. *Responsibility for facilitating implementation and evaluating its effectiveness should be delegated to a single agency, along with adequate resources to meet the assigned responsibility.*

7.1 Implementation Strategy Recommendation

This section articulates three alternatives for implementation:

- All Actions: every action proposed in the CEAP;
- Rapid Payback or Collateral Benefit: all actions with a simple payback of five years or less, in addition to other actions that yield a GHG mitigation potential greater than 1,000 tCO₂e per year by 2015, provide high societal benefits (benefits to >10% of both rural and urban populations) or add to the resiliency of our community in the face of climate change;
- Rapid Payback Only: all actions with a simple payback of five years or less.

Table 14 is a matrix comparing the alternatives based on the CEAP stated goals. Environmental goals are represented by GHG mitigation potential (tCO₂e mitigated by 2015 and 2020), societal goals by societal benefits (high-5, medium-3, or low-1) averaged for the selected actions, economic goals by average simple payback time, and adaptation goals by the percentage of the total number of implemented actions that help prepare the community for climate change.

Table 14: Implementation Alternatives Matrix

Goals	Criteria	Alternatives		
		All Actions	Rapid Payback or Collateral Benefit	Rapid Payback Only
Environmental	<i>2015 GHG mitigation potential (tCO₂e)</i>	684,000	675,000	534,000
	<i>2020 GHG mitigation potential (tCO₂e)</i>	866,000	862,000	595,000
Societal	<i>Benefits to rural and urban populations</i> <ul style="list-style-type: none"> • <i>High/5: >10% benefits to both</i> • <i>Med/3: >10% benefits to one</i> • <i>Low/1: <10% benefits to either</i> 	Medium (2.7)	Medium (2.9)	Medium Low (2.4)
Economic	<i>Average Simple Payback of actions included</i>	5-10 Year	2-5 Year	<2 Year
Adaptation	<i>Percent of actions in alternative that add to resiliency to change</i>	43%	49%	29%

Based on this comparison, the CEAP Steering Committee recommends that the implementing entities (to be specified below) endeavor to implement the Rapid Payback or Collateral Benefit alternative, which would mitigate 99% of the GHG emissions mitigated by all the actions evaluated for the CEAP. This would result in 267,000 more tCO₂e mitigated by 2020 than just the Rapid Payback Only alternative. Additionally, it yields a slightly higher average of societal benefits (to >10% of rural or urban populations) than the other alternatives, an attractive average two to five year simple payback, and the highest percentage (nearly half) of actions that contribute added resiliency for our community.

It is noteworthy that just actions in the Rapid Payback Only alternative, with payback times of less than five years, would mitigate 78% of the GHG emissions (about 535,000 tCO₂e) mitigated by all the actions evaluated for the CEAP. As noted in Section 5, however, even implementation of the All Actions alternative would fall short of the adopted CEAP reduction targets.

7.2 Implementing Entities

Implementing entities for the actions identified in this plan include various government entities (La Plata County, City of Durango, and Town of Ignacio), businesses, the oil and gas industry, school districts, LPEA, 4CORE, local banks, other non-profits, and residents. Based on the information provided by work groups, the Steering Committee suggests which entities ought to assume responsibility for initiating next steps. Overwhelmingly, the next steps fall to government entities, 4CORE, and LPEA. The details regarding next steps suggested by the various working groups appear in the action plan detail sheets for each action. The work groups that proposed the various actions will not continue into the implementation phase.

7.2.1 Government

Table , Table 16, and Table 17 list actions that require a response on the part of La Plata County, the City of Durango, and the Town of Ignacio, respectively. Where an action can be implemented at different levels of government, there is overlap of responsibility, e.g., the City of Durango may choose to implement an action that La Plata County could also have implemented. In the event that an action appears under more than one entity, the Steering Committee urges the entities to collaborate in implementation.

7.2.1.1 La Plata County

Table lists the actions to be initiated by La Plata County government in the Rapid Payback or Collateral Benefit alternative, organized by strategy. Partners in implementation are at least some of the entities who could provide assistance and added value to program creation.

Table 15: La Plata County Government Recommended Actions

Strategy	Action Full Name	Partners in Implementation
Energy Efficiency	Residential Energy Code	
	Lighting Occupancy Sensors	Businesses, Industry
	Water Conservation Ordinance	
	Residential Square-footage offset	
	Require Energy Efficiency Audit at Sale	LPEA, 4CORE
Transportation	Emission Testing	
	Compressed Natural Gas (CNG) Buses	4CORE
	Transit Oriented Development (TOD)	
	Safe School Routes	School Districts
	Promote Carpooling & Vanpooling	Businesses, School Districts
	Walking Friendly Environments	4CORE, Non-Profits
	Bicycling Paths & Facilities	Non-Profits
Waste Reduction	Expand Business Recycling	Businesses
	Expand Materials Recycling	
	Zero Waste (Reuse)	
	County Wide Composting (Kitchen)	Businesses
	County Wide Composting (Yard)	Businesses
	Waste Water Treatment Methane Capture	

7.2.1.2 City of Durango

Table 16 lists analogous information for the City of Durango.

Table 16: City of Durango Government Recommended Actions for Consideration

Strategy	Action Full Name	Partners in Implementation
Energy Efficiency	Lights Out at Night Policy-New	
	Residential Energy Code	
	Lighting Occupancy Sensors	4CORE
	Residential Square-footage offset	
	Water Conservation Ordinance	
Transportation	Transit Oriented Development (TOD)	
	Safe School Routes	School Districts
	Promote Carpooling & Vanpooling	Businesses, School Districts
	Increase Bus Ridership & Service	
	Bicycling Paths & Facilities	Non-Profits
	Walking Friendly Environments	4CORE, Non-Profits
Waste Reduction	Zero Waste (Reuse)	
	County Wide Composting (Kitchen)	Businesses

County Wide Composting (Yard)	Businesses
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7.2.1.3 Town of Ignacio

Table 17 lists analogous information for the Town of Ignacio.

Table 17: Town of Ignacio Government Recommended Actions for Consideration

Strategy	Action Full Name	Partners in Implementation
Energy Efficiency	Residential Energy Code	
	Lighting Occupancy Sensors	4CORE
	Residential Square-footage offset	
	Water Conservation Ordinance	
	Lights Out at Night Policy-New	
Transportation	Compressed Natural Gas (CNG) Buses	4CORE
	Transit Oriented Development (TOD)	
	Safe School Routes	School Districts
	Promote Carpooling & Vanpooling	Businesses, School Districts
	Walking Friendly Environments	4CORE, Non-Profits
	Bicycling Paths & Facilities	Non-Profits
	Increase Bus Ridership & Service	Businesses
Waste Reduction	Expand Business Recycling	Businesses
	Expand Materials Recycling	
	Zero Waste (Reuse)	
	Composting (Yard)	Businesses
	Composting (Kitchen)	Businesses

7.2.2 Other Entities

Other public, private, and non-profit entities, as well as residents also have important roles to play in implementing CEAP actions. Appendix G includes suggested actions to be addressed by LPEA, 4CORE, local businesses, the oil and gas industry, school districts, and non-profits.

7.3 Implementation Steps

The action plan detail sheets provide strategies for implementation, as well as approximate costs and potential sources of funding. Possible financing sources include:

- Bonds and grants
- Federal, state, utility and local rebates
- Tax credits
- Loans/Revolving loan funds
- Agreement with an Energy Services Company (ESCO)

- Alternative financing options, see example in Solar PV action plan detail sheet

Specific plans will be the responsibility of the entities involved with implementation. These entities will need to run project-specific cost-benefit analyses, based on available resources and priority goals, before implementing actions. Potential implementation entities include:

- In-house energy manager/sustainability coordinators within local government
- Contracts with an ESCO
- Individual contractors selected on a project-by-project basis
- Independent action by individual community members
- Local non-profits

Implementing the CEAP will require an ongoing commitment from and partnership with a multitude of stakeholders from across the county, including local governments, the energy industry, local utilities, individuals, businesses, non-profit organizations, and trade associations, among others. Coordination, accountability and communication across all sectors of society are critical to the implementation of this plan. The implementation phase also should involve ongoing public participation and buy-in to ensure that the CEAP continues to meet the needs of the entire community.

7.4 Monitoring and Evaluation

To ensure our community's success in achieving its intended goals, this section includes a recommended guide to evaluate and monitor the implemented action items. The monitoring of actions will accurately document efforts to reduce GHG emissions, efficiently evaluate the economic, environmental and community effectiveness of the actions, and modify approaches when necessary. Over time, technology, policy, and community opinion are likely to evolve. Effective implementation will require adaptation to these changes.

Evaluating and monitoring the implementation process is necessary to verify the effects of each action as it is implemented and to ensure consistency between an action's objective and its outcome. Actions that fail to meet intended emission reduction targets and to provide collateral benefits may be revamped or replaced by other options. As the community strives to meet the GHG emission reduction targets, the 300+ actions that were initially considered by the CEAP mitigation work groups (Appendix E) should be reassessed periodically. Incorporating new technologies and developments as appropriate will ensure that the most effective options are chosen at every step. Preliminary resources for implementing and evaluating actions appear in 0.

Updating the baseline emissions inventory is essential for tracking GHG emission reductions. The recommended timeframe for conducting GHG emissions inventory updates is every five years, subject to budgetary constraints. Tracking other community indicators is also critical to understanding and linking the relationships between the economy, energy use, and various other environmental and social aspects of our community. Examples of such indicators relevant to the CEAP appear in Table 18.³¹

³¹ http://www.climatemanual.org/Cities/downloads/CPM_Chapter6_Performance.pdf

Table 18: Potential Indicators for Monitoring CEAP Emission Reduction Strategies

Strategy	Indicator	
Develop Renewable Sources of Energy	<ul style="list-style-type: none"> • Installed kW of Renewable Energy • Percentage of Renewable Energy 	<ul style="list-style-type: none"> • Green Power Purchased
Develop a Multi-modal Transportation System	<ul style="list-style-type: none"> • Decreased Vehicle Miles Traveled • Increased Bus Ridership • Development of Car/Van Pool Programs • Percent of residential, mixed-use projects that are within ½ mile of transit nodes 	<ul style="list-style-type: none"> • Increased Use of Alternative Fueled Vehicles • Alternative Transportation Options Available • Less Traffic Congestion • More Bicycle Lanes
Increase the Energy Efficiency of Buildings and Infrastructure	<ul style="list-style-type: none"> • Decreased Energy Use • Decreased Water Use • Decreased Carbon/GHG footprint 	<ul style="list-style-type: none"> • Green Building/Construction Practices Implemented • Buildings Retrofitted
Enhance the Local Agricultural System	<ul style="list-style-type: none"> • Percent of produce purchased by restaurants, groceries, schools, governments that is local and/or sustainably grown • Local Purchasing Policies in Place 	<ul style="list-style-type: none"> • Increase in Sustainable Agricultural Practices • Increase in Produce Sales at Farmers' Markets
Reduce Waste	<ul style="list-style-type: none"> • Decrease in Wastewater Generation • Decrease in Solid Waste Generation • Decrease in Waste Landfilled 	<ul style="list-style-type: none"> • Decrease in Water Use • Increase in Waste Diverted (recycled, composted)

A Report Card³² is one potential mechanism for measuring and reporting progress on the most important indicators. This sort of system would ensure accurate documentation of progress in a format easily accessible to the entire community. The Region 9 Economic Development District maintains an Index of Community Health, which might be adapted for this purpose.

An evaluation and monitoring process will also enable our community to demonstrate positive performance results. This is necessary to ensure continued support of and to garner additional support for this process, retain or increase funding, recruit and retain talented staff, and engage stakeholders and collaborators.³³ In addition to demonstrating successful results, it is also important to celebrate successes in order to maintain momentum and encourage further action. This can be achieved through newspaper stories, recognition events, award ceremonies, and other mechanisms.

For efficiency, monitoring and evaluation of CEAP implementation should be the responsibility of the agency selected to facilitate CEAP implementation.

³² An example from Santa Monica, CA can be found at:
http://www.natcapsolutions.org/ClimateManual/Cities/Chapter7/SantaMonica_ReportCard.pdf

³³ http://www.climatemanual.org/Cities/downloads/CPM_Chapter6_Performance.pdf

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Appendix A Summary of Projected Climate Changes for Southwest Colorado

Projected Climate Changes for our region are available in a report developed by MSI online at:

http://www.mountainstudies.org/sites/default/files/pdf/research/Climate/Climate_Summary.pdf

Appendix B Baseline and Revised Emissions Inventory Report Comparison

Table 19. Initial and Revised Emissions Inventory Comparison

Item Description	04/03/2008 Baseline Greenhouse Gas Emission Profile and Forecast Report in short tons (metric tons)	05/22/2009 Draft Emissions Inventory Revisions Report in short tons (metric tons)	Approximate % Change
<u>Segment A</u> : Direct emissions of methane and venting of entrained CO ₂	2,479,051 (2,248,957)	2,544,361 (2,380,205)	2.6%
<u>Segment B</u> : Natural gas burned in operations and electricity consumed	1,206,777 (1,094,770)	2,472,033 (2,242,591)	204.8%
<u>Segment C</u> : All other activities, that is, other sources, land use change, transportation, waste, commercial energy, residential energy, propane	1,333,645 (1,209,862)	1,415,995 (1,284,569)	6.1%
<i>Subtotal Short Tons</i>	<i>5,019,473</i> <i>(4,553,589)</i>	<i>6,432,389</i> <i>(5,835,365)</i>	<i>28%</i>
<u>Segment D</u> : Emissions at outcrop	This segment was not included	1,183,000 (1,073,200)	N/A
Total Short Tons	5,019,473 (4,553,589)	7,615,389 (6,908,565)	51%

**Note: One short ton = 0.907 metric tons. Metric ton = 2,204 lbs. A short ton is a unit of weight equal to 2,000 lbs.*

***Note: references to Segments A, B, and C below refer to the category labels given to each Segment in the Baseline GHG Emission Profile and Forecast. The Emissions Inventory work group kept this nomenclature to provide continuity between these revisions and the original report.*

Appendix C Summary of Current Sustainability Initiatives in La Plata County

Community

Below is a list of some of the environmental related activities the community is currently involved in. This is an evolving list that will continue to grow over time:

Economic Organizations

- Fort Lewis College Development Center
- Ignacio Chamber of Commerce
- Durango Chamber of Commerce
- Durango Tourism Office
- Bayfield Chamber of Commerce
- Region 9 Economic Development
- Durango Business Improvement District
- Durango Industrial Development Foundation
- Colorado Workforce
- 4CORE (brings grant funding and new jobs to La Plata County)
- Local First (exists to create a centralized voice and resource for independent, locally owned businesses in La Plata County)
- Green Business Roundtable (hosted by the San Juan Citizen's Alliance)

Energy Efficiency and Renewable Energy

- Several businesses have already installed solar thermal systems to heat water. Many of these received rebates from 4CORE, LPEA and the GEO.
- The Durango Community Recreation Center re-commissioned 64 solar hot water panels that were installed to heat the center's half million gallons of pool water.
- Carver's Brewing heats all of their water using solar thermal panels
- The Durango Discovery Museum has insulated and sealed the museum building and installed solar PV, solar thermal, and geothermal. They also participated in regional energy efficiency and renewable energy assessments and planning for sustainable community and building design. This will be integrated into the museum building/exhibits.
- The Smiley Building, a retrofitted historic junior high school installed the following renewable (more information can be found at <http://smileybuilding.com/solar/conservation.html>):
 - Recently installed a horizontal geothermal system-Water sent down 400-foot-deep shafts will be boosted from ground temperature (50 degrees) to a level appropriate for in-floor heating.

- Solar Electric (Photovoltaic): 44.6 kilowatt (or 44,600 watts) photovoltaic system consisting of 279 individual modules. This system provides more than 100% of the building's electricity needs year around.
- Solar Thermal: 1000 sq ft solar thermal system. Provides 30% of the building's heat in winter and most of the hot water year around. Hot water from the solar is circulated in tubing within the floors.
- Over 100 homes and businesses now have solar photovoltaic electrical generation, including the following.
 - Mercury Payment Systems in Durango installed a 32 kW Roof Mount Grid Tied Photovoltaic System.
 - Tile Art & Light Art of Durango have a 6.84 kW photovoltaic system
 - The Payroll Dept have a 7.6 kW photovoltaic system
 - Open Shutter Gallery installed a 12 kW photovoltaic system
 - Bland Solar donated a 1.5 kW PV system to the La Plata County Humane Society
 - For The Birds in Durango added a 6 kW PV system during a building remodel
 - The Commons Building installed a 10.5 kW PV system
 - Tarpley RV installed a 4.2 kW PV system
 - Dalton Ranch Golf Course installed an (8) 4x10 solar hot water system
- A few dozen homes use geothermal systems for space heating.
- Over a dozen new homes have been constructed to Energy Star standards.
- La Plata County Energy Tour held to showcase homes utilizing renewable energy technologies
- 39 home owners used 4CORE rebates to insulate and seal for better efficiencies.
- 62 home owners used 4CORE rebates to install solar thermal systems to heat water.
- Two business owners, Zia Taqueria and Dalton Ranch, used 4CORE rebates to install solar thermal systems to heat water.
- 4CORE implements the GEO weatherization program to provide weatherization services to low-income homes
- 4CORE provides seminars and technical trainings for energy efficient construction
- 4CORE Administers Sustainable Building Education Program
- 4CORE disseminates information about:
 - Statewide Recharge Colorado Program rebates
 - LPEA rebates for solar photovoltaic and efficient appliances
 - Atmos Energy and Source Gas rebates for insulation and appliances
 - Federal tax rebates
- 4CORE is collaborating with many organizations to develop and implement a Resource-Smart Business Program
- 4CORE matches projects and programs with grants and funding opportunities for businesses and non-profits through the Project and Funding Matrix
- SASCO – SEC is working on policy options

Waste Reduction

- Phoenix Recycling: first co-mingled construction waste recycling facility in Colorado

Food Production

- The Organic Lands Stewardship of La Plata County (OLS) is a local group of individuals and businesses collectively visualizing and implementing an "Organic Zone" in La Plata County
- Beginning Farmer Program conducted by the extension office of the Sustainability Alliance of SW Colorado
- Farm to School Program by Sustainability Alliance of SW Colorado
- La Plata County Community Food Assessment conducted in 2005 by the Growing Partners of Southwest Colorado with funding from the U.S. Department of Agriculture to assess food security in the county
- Shared Harvest community garden in Durango on Florida River (CR 234)
- Mesa Verde Country Guide to Local Sustainable Food and Fiber created to connect consumers to local, sustainably produced food and to support farmers who employ sustainable production methods
- Farmer's Markets held weekly
- The Garden Project of SW Colorado – education, horticultural therapy and food security
- The Twin Buttes development will include a community garden, at least part of which is already under cultivation

La Plata County Operations

La Plata County is involved in the following environmental activities:

Waste Management

- Adopted a County Facilities Recycling Policy requiring county employees to recycle at all county owned buildings
- In 2010, installed three recycling drop-off stations at La Plata County Fairgrounds to encourage Special Events participants to recycle their cans, plastic bottles and glass
- Launched a Pilot Rural Recycling Program to serve the communities in the western area of the county
- In 2008, La Plata County, the City of Durango, 4CORE and LPEA partnered to hold the first ever Scrap Metal Recycling Event
- La Plata County offers residents a yard waste collection site located at the Bayfield Convenience Center that provides local residents a free option for the disposal of their dry, brown yard waste – yard waste is then mulched and provided to residents free of charge
- La Plata County and City of Durango battery recycling program, with battery collection tubes in 25 locations county-wide

Transportation

- County adopted an Engine Idling Policy for county employees
- Vehicle fleet of county averages 16 mpg, and hybrid vehicles bought when feasible

Energy Efficiency and Renewable Energy

- In early 2008, The Brendle Group, Inc. submitted the *Baseline Greenhouse Gas Emission Profile and Forecast Report* to La Plata County – was then revised in 2009 by the CEAP Emission Inventory Work Group
- In 2008 a technical energy audit was completed on county buildings
- La Plata County uses 5% local and environmentally friendly products up to 5% over cost of other bids through the Environmentally Preferable Purchasing (EEP) policy
- The La Plata County Courthouse installed a 3 kW roof top PV system
- The La Plata County Airport added solar PV panels to their rooftop
- \$186,125 budgeted to be used for HVAC replacement at the Senior center, lighting upgrades, window replacements/filming and, if funds are available, additional PV
- La Plata County facilities have reduced their carbon footprint by 17.8%, a reduction of 710 tons of CO₂. The facility energy efficiency (EE) and renewable energy (RE) projects are provided in the following table

Table 20: Summary of Renewable Energy and Energy Efficiency Improvements made to La Plata County Facilities

PHASE I Work Items	Cost	Annual Energy Savings	Payback in Years
1. * OMPO Boiler Replacement	\$ 212,806	\$ 2,952	72.1
2. Lighting Retrofit	\$ 177,329	\$ 23,030	7.7
3. Jail Solar Thermal Heating Unit	\$ 73,294	\$ 3,106	23.6
4. Vending Mizers	\$ 3,003	\$ 639	4.7
5. Renegotiate Natural Gas Rates	\$ 4,621	\$ 1,711	2.7
6. * Pump Replacements	\$ 11,354	\$ 353	32.2
7. Jail Gas Fired Booster Heater	\$ 39,213	\$ 5,523	7.1
8. Audit	\$ 20,655	NA	NA
TOTAL PHASE I	\$ 542,275	\$ 37,314	-
PHASE II Work Items	Cost	Annual Energy Savings	Payback in Years
1. * Courthouse DDC Controls	\$ 291,776	\$ 12,007	24.3
2. * Jail Boiler Replacement	\$ 196,694	\$ 7,963	24.7
3. Demand Based Ventilation	\$ 17,368	\$ 3,405	5.1
4. Courthouse 3 kW Solar Photovoltaic System	\$ 39,998	\$ 624	64.1
5. * Courthouse Pump Replacements	\$ 173,225	\$ 6,254	27.7
6. * Jail Roof Top Units Replacements	\$ 189,609	\$ 1,650	114.9
7. Courthouse Energy Information Network (EIN)	\$ 5,833	NA	NA
8. *Chilled and Hot Water Valve Replacements	\$ 221,671	NA	NA
9. * OMPO Chilled Water Pump	\$ 19,391	NA	NA
10. Courthouse Free-Cooling Tower	\$ 10,000	\$ 2,000	5.0
11. Audit	\$ 20,970	NA	NA
TOTAL PHASE II	\$ 1,186,535	\$ 33,903	-
Total PHASE I & PHASE II COSTS	\$ 1,728,810	\$ 71,217	
* Denotes equipment due to be replaced because of age or wear factor.			

Southern Ute Indian Tribe

The Southern Ute Indian Tribe is involved in the following environmental activities:

Air Quality

- Completed their “Air Emissions Inventory of Criteria and Hazardous Air Pollutants on the Southern Ute Indian Reservation, Colorado Base Year 2002”
- New codes that are more stringent than the states
- Monitoring that exceeds national averages
- Maintain 2 air quality monitoring sites plus a temporary school monitoring site.

Water Quality

- Monitor any activities that may affect Tribal water which lead to U.S. waterways.
- Over 40 wells and groundwater
- 24 sites on 7 rivers and 14 wetland monitoring sites
- Restored 4.5 miles of stream banks since 1999
- 319 cost share program increases irrigation efficiency and riparian fencing for 450 acres in the priority watershed
- Biannual sampling of Tribal waters with lab results sent to Regional EPA
- Biannual sampling of water chemistry, periphyton, macroinvertebrates, and bacteria.

Recycling

- All Tribal offices, Tribal Elders, and local schools and post office. Paper, cardboard, cans, plastic bottles
- Hazardous material collection and disposal
- Electronics collection and disposal
- Radon and lead testing for Tribal membership

Other

- New museum construction includes a partial green roof, passive solar and photovoltaic panels.
- New alternative energy branch of the growth fund researches possible large scale energy systems
- Supports the ‘Road runner’ program that picks up and drops off dozens of Tribal employees
- Manages fish and game populations through permitting
- Stocks and monitors fish
- Outreach and education to area youth
- Tests for chronic wasting disease on every elk killed on the reservation

City of Durango Operations

The City of Durango is involved in the following environmental activities:

Energy Efficiency and Renewable Energy

- The City of Durango has installed solar thermal panels on the Durango Recreation Center at a cost of \$225k with a 15 year return on investment; GHG emissions will be reduced by 60 metric tons yearly
- Use Energy Star computers, monitors, printers and copiers
- Switched electric heat to natural gas
- Installed 122 LED street lights and LED traffic signals at 26 intersections
- Instituted a lights-out-at-night policy
- Retrofitted T-12 lamps to T-8 lamps
- Replaces old water pumps with the most efficient pumps available
- Recycle fleet-generated waste oil to heat warehouse
- Audit power usage in City facilities monthly
- Utilize energy efficient office equipment in city buildings
- HVAC system updated in yearly budget process
- LED and motion-detecting lighting in some city facilities
- Durango Public Library is the first library in Colorado to achieve LEED gold certification
- Durango Transit Center in process of being LEED certified
- Installed solar water heating at the swimming pool
- Purchase 3,847,080 kW of green electricity
- \$186,125 budgeted to be used for light replacements or other high return efficiency projects

Waste Management

- The waste water treatment plant in Santa Rita Park has been converted to a methane cogeneration project at a cost of \$575k.
- Durango provides curbside pickup of recycling
- Divert 18.4 lbs of waste annually per employee from recycling
- Use low-VOC cleaning products
- The City of Durango and San Juan Basin Recycling Association sponsor two, 2-day Electronics Recycling Events each Spring and Fall
- The City of Durango has installed multiple Solar Trash Smashers in their downtown areas that use solar panels to compact trash. They reduce 300 gallons of paper down to 32 gallons and require less maintenance, fuel and labor than the conventional trash can.
- Durango ensures wise water practices by implementing water usage tiers.
- Hosts community events – such as Evenings on Eighth – that follow zero-waste procedures
- Household Hazardous Waste Collection Event scheduled for October 2010
- City currently seeking funds for a large-scale compost facility with In-Vessel system

Transportation and land use

- Hosted a Clean Commute Week in June 2010
- Two full time bicycle police officers, which avoids the use of 110 gallons of gasoline

- Provide bicycles for employees to use
- Limit idling of government vehicles
- Installed a central irrigation control system and use low maintenance landscaping
- Includes hybrid, electric and flex fuel fueled vehicles in city fleet
 - Replaces full-size trucks with compact trucks when applicable
 - Synthetic oils used in fleet

Town of Ignacio

The Town of Ignacio is involved in the following environmental activities:

- 2002-Present: Continuing education about potential energy savings through the town newsletter, coordinating a traveling Solar Demonstration Lab twice from San Juan College for an open house for all citizens, adding priority questions related to energy use on our 2008 Citizen Survey.
- 2004: Water conservation ordinance that rewards citizens who use less water with a lower rate
- 2005-2006: Pursued a coalition to build a solar farm in the southeast district of La Plata County. Worked with LPEA, Salazar committee, local sustainability groups to present the case to various government entities for long term payback. In the end, each government entity has made individual decisions regarding use of solar. The Town of Ignacio has not invested in solar, yet, primarily due to payback that can be achieved immediately for the citizens from other efforts (See next item).
- 2008: Town of Ignacio received a \$50K GEO grant for an energy audit "blitz" of the whole town. 136 homes participated and received specific measures for energy conservation, such as CFL bulbs, low-flow shower heads, programmable thermostats, weather stripping. Participated in CEAP study groups. Conducted energy retrofits for income-qualified homes that included refrigerator and window replacements (when needed) and insulation
- 2008: Presented ideas to the Ignacio School District for energy conservation grants. Worked with local architect to promote Renewable Energy Lab for the School District
- 2009: Joined 4CORE Board, contribute as coalition partner, participated in writing and received a portion of the New Energy Community Grant to "green" government buildings. Worked with RHA and CHI to promote NetZero new home. Looking for buyer. Worked on Road Runner Steering committee to promote ridership. Began Farmer's Market
- 2010: Town is in the middle of upgrading all town buildings for better energy conservation and replacing decorative lights in Ignacio's downtown on Goddard Ave with LEDs.
- 2009-2011: With NEC funds from GEO installed 20 LED deco lights on Goddard Ave, replaced fluorescent lights with T-8 ballasts in three buildings, replaced Town's HVAC with 90% efficiency rated units, replaced garage doors and insulated the maintenance building and the Town Hall
- Town of Ignacio with SUCAP and Ignacio School District involved in analysis with EPA grant for fleet management to reduce fuel, gain energy efficiencies, reduce GHG.
- Adopting internal office solutions to reduce gas and electric use to include:
 - Set thermostats

- Turn off computers at end of day
- Use Ecoline Fluorescent bulbs
- Use both sides of paper to print
- Convert extra one-sided paper into note pads
- Connect all computers to new copier, Konica Minolta Biz Hub, to use less toner than several small printers.
- Natural resources:
 - Local river trail built in early 2000's with high school youth.
 - Remediation of creek with EPA grant in the park with high school youth.
 - Recovery of "dump" into Environmental Viewing Park near Los Pinos River with Seven Rivers 4-H youth.
 - Installation of several xeriscape gardens on undeveloped land.
 - Planning Department Staff attended La Plata County Design Academy to learn about multiple sustainable possibilities

Town of Bayfield

The Town of Bayfield is involved in the following environmental activities:

- \$47,875 budgeted to be used for no specific projects because they must first do an energy audit.
- Have \$12,500 for Senior Center and \$30,000 for ball field lights.

Schools

- La Plata Electric teamed up with Four Corners Solar, BP and Escalante Middle School (School District 9-R) to install a 1.8 kilowatt solar PV system at Escalante Middle School. The system will be used as a teaching tool as well as power for the school's greenhouse. More information here: http://www.lpea.coop/company_info/AnnualReport09.pdf
- Bayfield Middle School also benefited from this collaboration and received a 2 kW Pole Mounted PV system
- Food for Thought Program: local fruit tree planting and harvesting program through the Fort Lewis College Environmental Center
- Fort Lewis College conducted its first-ever greenhouse gas inventory in 2007
- Animas Hall at Fort Lewis College received LEED-gold certification
- Durango High School is using a transpired solar wall
- Durango 9-R School District
 - Insulated roof and installed an energy management control system in the admin building
 - Put high efficiency boilers in most of the schools
 - Heat setback system to 55 degrees at night
 - Conducted an energy audit in 2008
- Fort Lewis College addition to the Student Union Building is complete and includes a solar thermal system and PV modules.

La Plata Electric Association (LPEA)

- LPEA has processed hundreds of rebate and REC payment checks to members of the cooperative for interconnected photovoltaic electrical generation systems during the past five years.
- More than \$500,000 has been paid out in rebates and REC payments to support the local renewable generation industry.
- The net metered accounts are producing over 800,000 kWh each year.
- The local economic impact is more than \$4,000,000 for the photovoltaic systems connected to the LPEA grid in 2010.
- LPEA has provided support to 4CORE and other local energy efficiency organizations and efforts in the past few years.
- LPEA was recognized by the U.S. Department of Energy as the Utility Green Power Program of the Year in 2010 and received the Green Power Leadership Award.
- LPEA has a mature, established and popular energy efficiency credit program
 - Appliances
 - Lighting
 - Etc...
- LPEA has a highly trained staff that provides Energy Use advisement
- LPEA recently contracted out to local contractors and completed a commercial energy audit of offices and warehouse facilities
- LPEA has retrofitted lights in the Durango headquarters office resulting in decreased electric usage (T12 with magnetic ballast to T8 with electronic ballasts) using local contract electricians
- LPEA has installed programmable thermostats throughout the headquarters building
- LPEA has provided thousands of CFL bulbs to the membership as replacements for incandescent bulbs
- LPEA recently received a \$100,000 USDA grant to help members with Energy Efficiency and Renewable Generation
- LPEA recycling efforts include:
 - Drop off sites for CFL bulbs throughout the cooperative's service territory
 - Scrap metal recycling
 - Wood pallet recycling
 - Contract with Phoenix recycling for paper shredding
 - Contract with the city of Durango for paper recycling (bins located throughout the offices)
 - Contract with the city of Durango for plastic recycling
 - Aluminum can recycling with multiple drop off boxes located throughout the company office centers

La Plata Energy Council Members

The La Plata Energy Council members, <http://www.energycouncil.org/members.htm>, reduce GHG emissions as follows:

Climate and Energy Action Plan

- Installed telemetry equipment for automation to reduce number of truck trips to drill sites
- Implemented conservation policies in office buildings and operations centers
- Planted trees to offset emissions
- Donated solar panels, such as to the Durango Smiley Building
- Contributed funds to Energy Efficiency and Renewable Energy projects, such as the Solar Roller and 4CORE.
- Developed “milk run” tactic to bring in products, efficiently reducing the need for repeated truck traffic to well sites.
- Evaluating truck water hauling computer model with 3rd party vendor along with automation to improve trucking efficiency and provide for full loads thereby reducing truck traffic
- Changed out all lease operator vehicles from diesel to gas to reduce air emissions
- Actively pursuing electrification (where feasibly available) of pumping units and compressors to reduce emissions and noise
- Right sizing compressors to match need –reducing gas consumption and emissions
- Completed the change out to non-bleed dumps on equipment to eliminate all fugitive releases of gas
- Green completions - testing of wells into sales lines
- SCADA controls providing alarm notification to lease operators the event of a breach
- Utilizing Infrared Vapor Gun to identify gas leaks prompting an immediate isolation and action plan for repair.

Appendix D Recent Developments and Resources

The Governor's Energy Office (GEO) began a new partnership in September 2010 to add energy and green features to real estate listings as a way to place valuation on a home's energy efficiency and renewable energy features – these features are now integrated into La Plata County's multiple listing system (MLS)

The White House, the Office of Personnel Management (OPM), and the Federal Communication Commission (FCC) are calling for policy changes to help expand telecommuting as a way to address a number of national problems – <http://members.msec.org/hottopics/Lists/Posts/Post.aspx?ID=161>

In August 2010, the EPA released its Sustainable Design and Green Building Toolkit for Local Governments, which is designed to assist local governments in identifying and removing permitting barriers to sustainable design and green building practices – <http://www.greenbiz.com/blog/2010/08/19/behind-epas-new-sustainable-design-and-green-building-toolkit>

Anaerobic digestion is a waste management solution that has the potential to provide a source of renewable energy. Anaerobic digestion technology converts animal waste to methane biogas, which can be utilized as a renewable source of energy. Colorado State University now offers an Anaerobic Digestion Decision Tool: <http://www.engr.colostate.edu/~jlabadie/Decision%20Tree/index.cfm>

Initiated by EcoAdapt and Island Press, the Climate Adaptation Knowledge Exchange (CAKE) is a free online resource where users can access data, tools, and best practices for climate change adaptation. Users can also submit case studies of their own climate adaptation work, find activities in their area, and join the online climate adaptation community. CAKE intends to build a community of climate change adaptation practitioners to share information across sectors and disciplines: <http://www.cakex.org>

EPA Portfolio Manager

(http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager) and EnergyCAP (<http://www.energycap.com/>) are both tools for energy data management

Co-benefits Risk Assessment (COBRA) Screening Model

(Estimates the air quality, human health, and related economic co-benefits of clean energy policies or other actions that potentially reduce air pollution.)

<http://www.epa.gov/statelocalclimate/resources/cobra.html>

Emissions & Generation Resource Integrated Database (eGRID)

(Provides data on environmental attributes of electric power systems in the United States.)

<http://www.epa.gov/egrid>

Environmental Benefits Mapping and Analysis Program (BenMap)

(Estimates health impacts and economic benefits occurring when populations experience changes in air quality.) <http://www.epa.gov/air/benmap/>

EPA Resources to Help State and Local Governments Maximize Clean Energy Opportunities in Economic Recovery (ARRA) Funding

<http://www.epa.gov/statelocalclimate/econ-recovery/index.html>

Greenhouse Gas Equivalencies Calculator

(Translates abstract measurements into concrete terms you can understand, such as “equivalent to avoiding the carbon dioxide emissions of 183,000 cars annually.”)

<http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

Appendix E Potential Actions for Future Reconsideration

Actions that were considered by the GHG mitigation work groups, but that did not receive quantitative analysis and are not initially proposed in this document are available for review online at:

http://fourcore.org/docs/CEAP/Unanalyzed_Actions.pdf

Appendix F Economic Development Priority Scores

The CAPPA software package provides a mechanism for evaluating priorities of proposed actions according to their rankings on six evaluation criteria. These are: (1) Capital Cost, (2) Operation and Maintenance Cost, (3) Return on Investment, expressed as simple payback time, (4) Implementation Timeframe, (5) Government Staff Time required, and (6) Level of Government Control. Table 21 details the numerical Benefit Ranking for each criterion.

Each Benefit Ranking is multiplied by a corresponding Criterion Value and the total is averaged to form a weighted priority score, which in principle could range from 1 to 25. In practice, the range is 7 to 15. The Criteria Values for “government” and “community” actions come from statistical analysis of survey responses by members of the CEAP Steering committee and other government and community leaders on the relative importance they assigned to each criterion.³⁴ Figure shows the results of that survey. Weight values (0-5) indicate the importance of each of the six criteria in each Government and Community sets, with 0 = irrelevant, 1 = low weight, 3 = moderate weight, and 5 = highest weight (paramount).

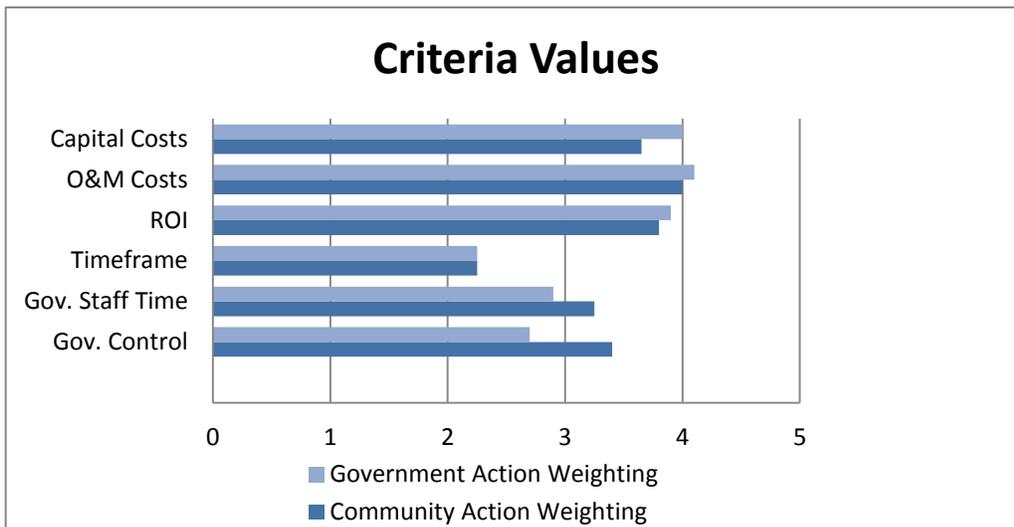


Figure 14: Criteria Values

³⁴ “Government” refers to proposed actions that affect only government operations and “Community” refers to proposed actions that affect the entire community.

Table 21: Action Evaluation Criteria

Benefit Ranking	Scale Used for Ranking
•Initial Implementation Costs (1 through 5):	1 > \$1,000,000 2 \$100,000 – \$1,000,000 3 \$10,000 – \$100,000 4 \$100 – \$10,000 5 < \$100
•Operation and maintenance costs (1 through 5), expressed in terms of Full Time Equivalent (FTE) staff, where all time and money is expressed in the same unit:	1 > 2 FTE 2 1 to 2 FTE 3 1/2 to 1 FTE 4 1/10 to 1/2 FTE 5 < 1/10 FTE
•Financial Return on Investment (1 through 5), expressed in terms of Simple Payback. Simple Payback is the number of years it takes for an action to pay for itself taking into consideration initial implementation cost, and annual cost savings from a reduction in energy use:	1 > 15 years 2 10 to 15 years 3 5 to 10 years 4 2 to 5 years 5 < 2 years
•Implementation timeframe (1 through 5):	1 > 60 months 2 24-60 months 3 12-24 months 4 6-12 months 5 < 6 months
•Level of effort required by local government staff (1 through 5):	1 > 4,000 hrs; or > 2 years FTE 2 1,200 – 4,000 hrs; or 6 months – 2 yrs FTE 3 200 – 1,200 hrs; or 1 – 6 months FTE 4 40 – 200 hrs; or 1 week – 1 month FTE 5 < 40 hrs; or < 1 week FTE
•Degree of implementation control by local government (1 through 5):	1 No control, no influence 2 Offered public education that did not provide incentives or resources 3 Offered programs to community that provided incentives and/or resources 4 Held legislative, code, or zoning influence, but no direct responsibility for implementation 5 Held full responsibility of direct implementation

Appendix G Other entities involved with action implementation

Besides local governments, other public, private, and non-profit entities, as well as residents also have important roles to play in implementing CEAP actions. This Appendix includes suggested actions to be addressed by LPEA, 4CORE, local businesses, the Oil and Gas Industry, school districts and non-profits.

Businesses

- Expand Business Recycling
- Increase Bus Ridership & Service
- Initiate Car Share

Industry

- Green Well Completions
- Low Bleed Controllers
- Emissions Leak Detection
- Electric Wellhead

School Districts

These are all actions for which the school districts would not be primarily responsible for implementation but their involvement would be critical:

- Safe School Routes
- Promote Carpooling & Vanpooling
- Education on Low-Carbon Transportation Options

LPEA

Primary implementation:

- Efficient Lighting Retrofits
- Energy Efficiency Education Targeting Businesses
- Use Solar PV Energy
- Purchase Green Electricity
- Renewable Energy Certificates

The following are actions for which LPEA would not be primarily responsible for implementation but their involvement would be critical:

- Energy Audit at Sale

4CORE

- Education on Low-Carbon Transportation Options
- Energy Efficiency Education Targeting Businesses
- Low-Income Home Weatherization
- Use Solar PV Energy
- Use Solar Hot Water
- Green Building Contractor Education
- Encourage Retrofits of Existing Homes

Local Banks or a Non-Profit

- Energy Efficiency Improvement Loans

Secondary Implementation Non-Profit

- Initiate Car Share
- Bicycling Paths & Facilities

Shared Primary Implementation Residents

- Purchase Green Electricity
- Use Solar Hot Water
- Use Solar PV Energy
- Soil Sequestration Rangeland
- Geexchange Heat Pump & Cooling

Appendix H Links to Action Plan Detail Sheets

Strategy 1. Increase the efficiency of the oil and gas industry

Green Well Completions: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/O&G_FinalReport.pdf

Low Bleed Controllers: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/O&G_FinalReport.pdf

Electric Wellhead: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/O&G_FinalReport.pdf

Leak Detection: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/O&G_FinalReport.pdf

Strategy 2. Develop renewable sources of energy

Use Solar Photovoltaic (PV)

Energy: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/RE_SolarPV.pdf

Purchase Non-Local Renewable Electricity:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/RE_GrnPwrPch.pdf

Renewable Energy Credits: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/RE_Certs.pdf

Geoexchange Heat Pump Heating & Cooling:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/RE_GeoHPmp.pdf

Solar Hot Water: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/RE_SolarH2O.pdf

Renewable Energy Site Feasibility Study:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/RE_Study.pdf

Low-temp Geothermal Study:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/RE_LwTmpGeoStdy.pdf

Strategy 3. Develop Multi-modal transportation system

Emission Testing: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Tr_EmTesting.pdf

Transit Oriented Development (TOD):

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Tr_TransOrientDv.pdf

Initiate Car Share: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Tr_CarShare.pdf

Education on Low-Carbon Transportation Options:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Tr_L-CO2eEd.pdf

Climate and Energy Action Plan

Bicycling Paths & Facilities:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Tr_BikePaths_Walking.pdf

Compressed Natural Gas (CNG) Buses:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Tr_BusesCNG.pdf

Safe School Routes: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Tr_SchoolRoutes.pdf

Promote Carpooling & Vanpooling:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Tr_CarPool.pdf

Increase Bus Ridership & Service:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Tr_BusService.pdf

Walking Friendly Environments:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Tr_BikePaths_Walking.pdf

Strategy 4. Increase the energy efficiency of buildings and infrastructure

Lights Out at Night Policy: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Ef_LtgOffNght.pdf

Residential Energy Code: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/EF_GrnBdgCdR.pdf

Residential Square-footage Offset

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Ef_GrnBdgLgN.pdf

Lighting Occupancy Sensors: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Ef_LtgOccSnsr.pdf

Efficient Lighting Retrofits: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Ef_LtgRetrofit.pdf

Encourage Retrofits of Existing Homes:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Ef_ApplRetrofit.pdf

Low-Income Home Weatherization: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Ef_Wthzn.pdf

Green Building Contractor Education:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Ef_GrnBdgA.pdf

Water Conservation Ordinance:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Ef_H2OCsvnOrd.pdf

Energy Efficiency Improvements Loans:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Ef_EffcyRetroLoan.pdf

Energy Efficiency Education Targeting Businesses:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Ef_BusEffEdcn.pdf

Require Energy Audit at Sale: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Ef_AuditSale.pdf

Strategy 5. Enhance the local agricultural system

Soil Sequestration Rangeland: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Ag_SoilCO2Seq.pdf

Local Healthy Sustainable Food: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/Ag_LocalFood.pdf

Strategy 6. Reduce waste

Waste Water Treatment Methane Capture:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/WR_WwtpCH4.pdf

Zero Waste Pay as You Throw Program:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/WR_ZWPayThrw_ZWReuse.pdf

Expand Business Recycling: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/WR_RcycleBus.pdf

Expand Materials Recycled: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/WR_RcycleCurb.pdf

County Wide Composting Yard:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/WR_CompKch_CompYd.pdf

County Wide Composting Kitchen:

http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/WR_CompKch_CompYd.pdf

Zero Waste Reuse: http://www.fourcore.org/Portals/0/Documents/CEAP/actionplandetailsheets/WR_ZWPayThrw_ZWReuse.pdf

Appendix I Public Participation Process

The CEAP began with a public kick-off meeting on October 23rd, 2008 attended by approximately 150 individuals representing a diverse array of sectors. At this meeting, the issues were identified and the framework was set up for later meetings at which the core work groups and process were developed, and gaps in constituents represented were identified and addressed.

Three rounds of public input forums were held. The first round occurred in 2009 for the Phase 1 CEAP document. With the completion of the draft Phase 2 document, another public input period was held from November 11th, 2010 to March 7th, 2011. The first round of forums in this period was designed to introduce the document to the community, explaining the background and process. The goal of the second round of forums was to create an open house format with small discussion groups in which participants could express all thoughts and opinions on the recommended actions of the CEAP. All comments made were recorded and are available for the public to view online at: <https://spreadsheets.google.com/ccc?key=0As2kH21Lp84fdE93WVJ2c1F1UGhyN1VPenIMUIdLRIE&hl=en#gid=0>

Public input could also be provided through an online survey, by phone, email or paper copy. Draft copies of the document were made available at public libraries, City and Town Halls, the County Courthouse and the 4CORE office. The public input period lasted four months and more than 500 public comments were received.

The CEAP work groups spent months reviewing and responding to all comments received. The CEAP document was then revised and edited based on this public input.