# Park City, Utah

## COMMUNITY CARBON FOOTPRINT AND ROAD MAP FOR REDUCTION

PREPARED FOR
PARK CITY MUNICIPAL
CORPORATION BY

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## Executive Summary

There is widespread consensus among the scientific community that human activities are negatively impacting the Earth's climate through increased greenhouse gas (GHG) emissions, causing the potential for large-scale adverse health, social, economic and ecological effects. Climate change is expected to impact Park City, Utah in a variety of ways. Primarily, Park City's climate is expected to warm substantially, delaying the date when snow starts to fall, and perhaps resulting in no snow accumulation at all by 2100 (Park City Mountain Resort). Decreasing snowpack is also likely to significantly reduce groundwater resources, increasing the frequency of drought and wildfire.

The Community Carbon Footprint and Roadmap to Reduction is the latest effort among Park City's many initiatives to address climate change. Among many other initiatives are Park City Municipal's Environmental Strategic Plan to guide the community's comprehensive sustainability efforts; Park City's signing of the U.S. Mayors Climate Protection Agreement; community engagements such as Save Our Snow; efforts to reduce Park City Municipal's own GHG footprint of internal government operations and the many projects and programs lead by Park City's many environmental non-profits

To develop the Community Carbon Footprint, Park City's GHG emissions were calculated for the baseline year of 2007 as well as for 2005 as a supplemental year, with the aim to compile a complete, consistent, accurate, and transparent inventory using accepted methodologies. Specifically, the inventory draws on well reviewed and accepted methodologies from the International Standards Organization (ISO)14064-1, The Climate Registry (TCR), the Intergovernmental Panel on Climate Change (IPCC), the Environmental Protection Agency (EPA), and methodologies implemented in ICLEI - Local Governments for Sustainability's Clean Air and Climate Protection (CACP) software. The fundamental design of the inventory is based on the guidelines of ISO14064-1 with additional guidance from ICLEI's International Local Government Greenhouse Gas Emissions Analysis Protocol to address issues specific to conducting community inventories.

The footprint includes the following GHGs:

1. carbon dioxide ($CO_2$),
2. methane ($CH_4$),
3. nitrous oxide ($N_2O$),
4. perfluorocarbons (PFCs),
5. hydroflurocarbons (HFCs), and
6. sulfur hexafluoride ($SF_6$),

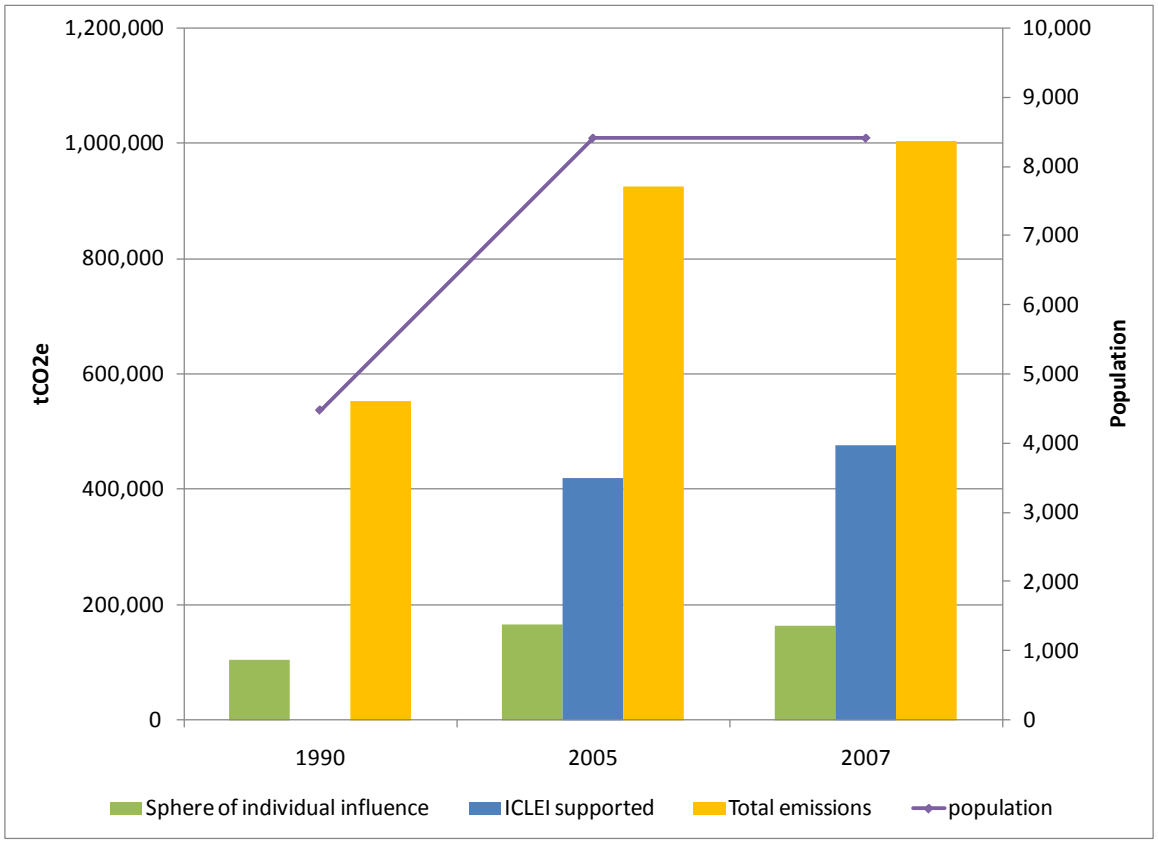
with the large majority of Park City's climate change impact resulting from emissions of the first three gases. Units of carbon dioxide equivalent (CO2e) are used to normalize the global

warming potential of the various GHGs. The inventory seeks to quantify the GHG emissions of all activities within the Park City limits and includes all direct (Scope 1) emissions from natural gas consumption, propane consumption, on-road vehicle transportation, off-road vehicle and equipment use, refrigerant losses, fertilizers, and feedstock. Indirect (Scope 2) emissions from electricity consumption are also included, as are other indirect (Scope 3) emissions from airline travel, solid waste disposal, and wastewater treatment. These represent Park City's Total Emissions. To place an emphasis on personal responsibility and what individual residents can do to reduce their emissions, Sphere of Individual Influence emissions are presented. These emissions include residential energy use and transportation activities - emissions that result from the daily actions taken by individual citizens and therefore within the capacity of the individual to reduce. The inventory boundaries of both approaches are compared to ICLEI's Local Government Greenhouse Gas Protocol in the table below.

| Total Emissions (ISO 14064-1) | ICLEI Supported | Sphere of Individual Influence |
|---|---|---|
| Electricity consumption<br>• Natural gas consumption<br>• Propane consumption<br>• On-road vehicle transportation<br>• Off-road vehicle and equipment use<br>• Airline travel (resident & visitor)<br>• Solid waste disposal<br>• Wastewater treatment<br>• Refrigerant losses<br>• Fertilizers<br>• Livestock | • Electricity consumption<br>• Electricity emission factor changed from Utah specific to northwest regional factor per ICLEI protocol (See electricity section for more information)<br>• Natural gas consumption<br>• Propane consumption<br>• On-road vehicle transportation<br>• Solid waste disposal | • Residential electricity consumption<br>• Residential natural gas consumption<br>• Residential propane consumption<br>• Resident on-road vehicle transportation<br>• Resident airline travel<br>• Solid waste disposal (50% of community total) |

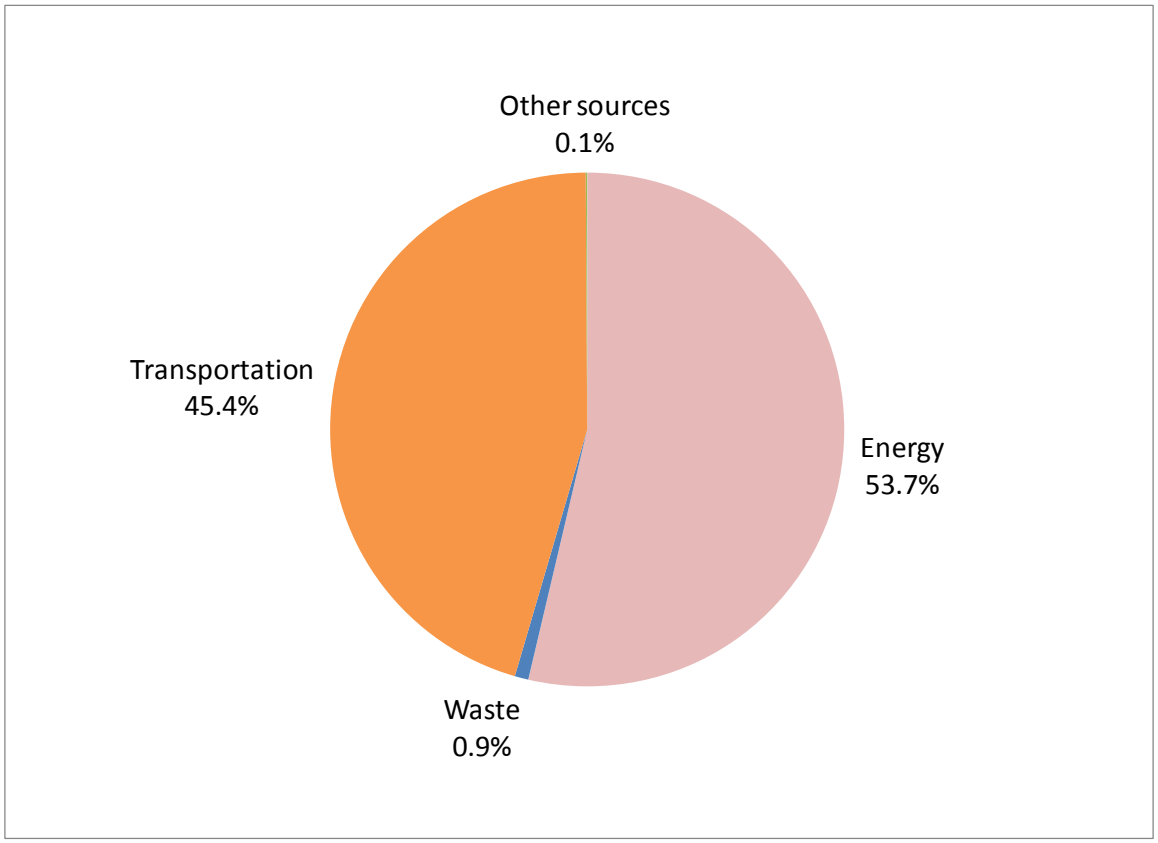
**items in blue are only included in the Total Emissions (ISO 14064-1) totals*

Total Emissions in Park City in 2007 were 1,003,712 $tCO_2e$. The ICLEI supported GHG emissions in 2007 were 475,663 $tCO_2e$ - about 47 percent of the emissions represented in the Total Emissions context. Finally, the emissions in the Sphere of Individual Influence in 2007 were 164,720 $tCO_2e$, or about 16 percent of the Total Emissions in the community.




Aggregate Community Emissions by Context

Energy consumption and transportation were the primary sources of GHG emissions in the community, with small portions contributed by solid waste disposal and other sources, such as losses from refrigeration equipment.




Total Community Emissions by Source

Stationary consumption of energy in Park City - including electricity, natural gas, and propane - represented 53.7 percent of the total emissions in the Park City inventory in 2007. The majority of these emissions are from electricity consumption, with natural gas and propane comprising significantly smaller portions.

Transportation emissions for Park City include on-road vehicles and transit, off-road vehicles and equipment, and airline travel. These emissions accounted for 45.4 percent of total emissions in 2007. The majority of these emissions are from airline travel, followed by on-road vehicle transportation and off-road vehicles and equipment.

Waste disposal activities in Park City - including solid waste disposed at the landfill, construction and demolition waste, and wastewater treatment - represented 0.9 percent of the total emissions of the Park City inventory in 2007. The majority of these emissions are from solid waste disposed of at the landfill.

Other minor GHG emission sources accounted for 867 $tCO_2e$ in 2007, or 0.1 percent of the total emissions. These include refrigerant chemical losses, enteric and manure methane emissions, fertilizer application, and beer production.

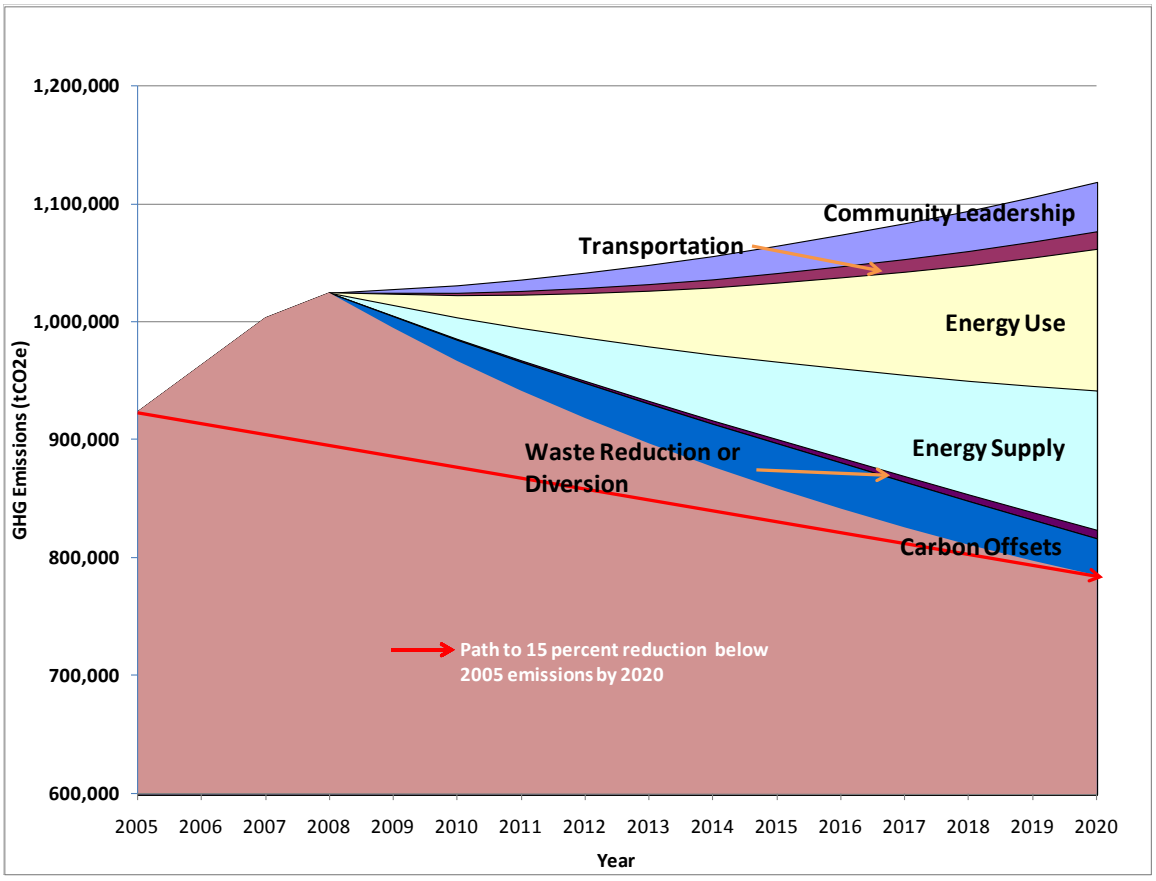
Building from insights gained through the Community Carbon Footprint, a Roadmap to Reduction was developed to provide a pathway for reducing Park City's Community Carbon Footprint. It builds from the momentum of programs and activities already in place within the community and acknowledges Park City's unique qualities while integrating best practices by other cities in their development of similar climate action plans. The Roadmap highlights and positions the baseline Community Carbon Footprint as the cornerstone in an ongoing community process of planning, action, monitoring, and revising actions.

In developing the Community Carbon Footprint and Roadmap for Carbon Reduction, Park City convened a Carbon Advisory Board consisting of knowledgeable and interested stakeholders to help validate the inventory process, identify data sources, document existing community practices that relate to GHG emissions, and develop next steps toward climate protection. To engage the Board in dialogue and developing recommendations, three meetings were held in 2008-2009. To further solicit input from board members, three web-based surveys were administered to members focusing on developing a shared vision and core values, goals and objectives, and strategies.

The Roadmap builds off of the many Park City initiatives that are already planned and/or underway and are beneficial elements for reducing GHG emissions, from existing walking and cycling promotion programs and transit programs to progress on meeting the City's internal GHG reduction goals. The Roadmap's vision is the following:

*"The Park City community is committed to applying significant effort to combat the causes of climate change and to reduce its greenhouse gas emissions. Reducing our carbon footprint is our responsibility as citizens of the nation and the world. Working together, using our community spirit, innovation, and environmental passion, we will ensure for future generations the environmental protection, economic prosperity, and quality of life that makes Park City unique."*

Supporting this vision is the Roadmap's recommended goal to reduce Park City's GHG emissions 15 percent below 2005 levels by 2020. A total of 16 objectives were developed in the categories of community leadership, transportation and land use, energy use, energy supply, waste reduction and diversion, and carbon offsets.




Park City GHG Emissions and Illustrative Roadmap Objectives

Finally, to achieve these objectives, 21 strategies were identified, along with their estimated impacts on GHG reductions and their feasibility. These strategies lay the groundwork for a concerted program to reduce Park City's GHG emissions. A next step toward implementation will be to calculate the GHG reduction benefits with individual measures so that an aggregated, quantifiable GHG reduction target with interim milestones can be established. Additional resources necessary to carry out these strategies will also be pursued.

# 1.0 Introduction and Background

There is widespread consensus among the scientific community that human activities are negatively impacting the Earth's climate through increased greenhouse gas (GHG) emissions, causing the potential for large-scale adverse health, social, economic, and ecological effects. There is an abundance of scientific evidence over the past two decades linking climate change to human activities, and many environmental changes predicted are now occurring. Climate change may already be causing environmental and economic damage to Utah's communities because of the potential for reduced snowpack and earlier snowmelt that will affect local water supply, tourism, and agricultural systems.

> *"There is still time to avoid the worst impacts of climate change, if we take action now…If we don't act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP per year, now and forever."*
>
> --Sir Nicholas Stern, UK Government Economic Service

Climate change is expected to impact Park City in a variety of ways. First, Park City's local economy largely depends on the tourism industry. In 2006 POWDR Corporation's Park City Mountain Resort commissioned a comprehensive scientific study of climate change effects on Park City Mountain Resort and the Utah snow sports industry – the first of its kind. Differing assumptions about emissions result in projected warming ranging from 3.3° to 8.4°C (5.9° to 15.1°F) in Park City by 2100. The report concludes, however, that regardless of these varying assumptions, as atmospheric GHG concentrations rise over this century and the climate continues to change, Park City is likely to warm substantially. The report concluded that the date when snow starts to accumulate at the base area of the resort will be delayed by at least 4 weeks, and some scenarios predict no accumulation at all by 2100. This implies that by 2100, Park City's climate could resemble the current climate of Salt Lake City.

Concurrent with a decrease in Park City's snowpack is an expected significant reduction in groundwater resources. A large percentage of Park City's groundwater comes from winter snows. Already a high desert environment, the risk of drought is significant. The decrease in snowpack and water is also likely to result in an increased frequency of wildfire, a situation that is exacerbated by Park City's proximity to wildland fire zones and significant forest lands.

The cost of delay in addressing the impacts of climate change may result in increasing economic impacts on Park City from year to year. According to a report by Sir Nicholas

Stern, head of the UK Government Economic Service and former Chief Economist of the World Bank:

> *"There is still time to avoid the worst impacts of climate change, if we take action now… If we don't act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP per year, now and forever. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20% of GDP or more… In contrast, the cost of action — reducing greenhouse gas emissions to avoid the worst impacts of climate change — can be limited to around 1% of GDP per year."*

While climate change is a global challenge, the local benefits to Park City from taking action to reduce carbon emissions could be significant. Not only will the community's carbon footprint be reduced, but major gains in efficiency and reduction in associated costs for energy and other resources can be achieved. In doing so, Park City could be a leader in adopting practices and technologies that will save consumers and businesses money, creating new business opportunities in clean and renewable energy and attracting the growing number of tourists who factor environmental considerations into their decisions.

# 2.0 Park City: A History of Climate Protection

This Community Carbon Footprint and Roadmap to Reduction is the latest effort among Park City's many initiatives to address climate change. Major climate-related initiatives are described below.

## 2.1 Environmental Strategic Plan

The Park City Municipal Corporation has developed an Environmental Strategic Plan to guide the community's comprehensive sustainability efforts. City Council adopted the most recent version of this plan in January 2009. The vision of the Environmental Strategic Plan is that:

*"Park City will provide long-term environmental health for the region through efficient use of resources and protection of the quality and diversity of the local environment upon which the community depends. As a guiding principle, the City will consistently strive to sustain its vibrant multi-seasonal destination resort community in a manner that protects and enhances its natural environment."*

This vision is supported by the following goals:

1. Preserve and enhance the ecological diversity of Park City and the region.
2. Encourage the efficient use of all resources in order to ensure a future with a secure and sustainable energy supply, safe/reliable water, and clean air.

3. Encourage environmental stewardship and protection of Park City's natural environment by sharing information and collaborating with the community and community groups, as well as local, state, and federal agencies.
4. Incorporate environmental considerations as an integral part in assessing growth management options, land use plans, transportation strategies and development proposals, and overall sustainable community design.
5. Continue to review and investigate best practices that have the potential of substantially improving the environment.
6. Continue to monitor the environment with representative air, water, and soil sampling protocols.

A number of policies support the vision and these goals, including policies related to wildlife habitat and open space, surface water quality and water conservation, green building practices, recycling, urban design, and alternative transportation. Finally, an action plan details specific actions to accomplish each goal, including top priorities.

Several of these goals, objectives, policies, and projects lend their support to the Roadmap for Reduction by encouraging resource efficiency, collaboration and sharing of information; and best management practices and monitoring.

## 2.2 Mayor's Climate Protection Agreement

As an initiative of the City Council, in 2005 Mayor Dana Williams signed the US Mayors' Climate Protection Agreement, which sets a goal of meeting the Kyoto Protocol of reducing Park City's GHG emissions 7 percent below 1990 levels by 2012. Founded by Seattle Mayor Greg Nickels, the Agreement seeks to advance the goals of the Kyoto Protocol through leadership and action. The US Conference of Mayors Climate Protection Center administers and tracks individual Agreement signatories, which numbered more than 710 as of 2007. Under the Agreement, participating cities commit to take the following three actions:

1. Strive to meet or beat the Kyoto Protocol targets in their own communities through actions ranging from revised land-use policies to urban forest restoration projects to public information campaigns.
2. Urge state governments and the federal government to enact policies and programs to meet or beat the GHG emission reduction targets suggested for the United States in the Kyoto Protocol.
3. Urge the US Congress to pass the bipartisan GHG reduction legislation, which would establish a national emissions trading system.

## 2.3 Community Engagement

On January 9, 2007 POWDR Corporation, Park City Mountain Resort and KPCW radio co-hosted a community event called Save Our Snow. The results of the study of the impact of global warming on Park City Mountain Resort's snowpack were presented, as well as a presentation on climate change by Kathy Mattea, an Al Gore trainee. Held at the 1,270-seat Eccles Center, the event was well-received by a standing room only crowd.

The Park City Foundation received funding to host a Save Our Snow II event in the fall of 2009. As part of this effort, Park City Mountain Resort will likely update the forecast of the impact of climate change on its snowpack.

## 2.4 Municipal Carbon Footprint

In August 2008 the Park City Municipal Corporation completed its first Municipal Greenhouse Gas Emissions Inventory. The inventory covers carbon emissions for all government operations during the calendar year 2007. A 1990 carbon footprint was also calculated to provide insight for the Park City Council to set carbon reduction goals specifically for municipal operations. The results will assist City Council members and municipal employees in identifying opportunities for the Park City Municipal Corporation to become more economically and environmentally sustainable. Using the International Standards Organization (ISO) 14064 Offset Standard Protocol, the inventory includes required direct emissions (building natural gas use, City vehicle fleet, transit system), indirect sources (building electricity), and other optional indirect sources specified under the protocol (solid waste disposal, recycling, employee commuting, business travel). Section 3.0 of this report discusses these inventory results in more detail.

## 2.5 Municipal Carbon Reduction Action Plans

Based on the completed Municipal Greenhouse Gas Emissions Inventory, Park City is currently working with municipal departments to develop department-specific carbon emission reduction plans. Among the ongoing initiatives are the following:

- The City has invested time and money to help develop a local green building program (www.thegbi.org/residential/featured-projects/utah). Based on City Council direction received in January 2009, the City's Planning Department is currently conducting a comprehensive review of the land use plan to identify any part of the code that might prohibit desired green building practices, such as code that may prohibit solar panels or small-scale wind turbines.

- The City has invested $1.4 million in a municipal facility energy and water efficiency project that will reduce municipal emissions by 13.5 percent. The project included energy and water use audits of all 23 municipal buildings and is scheduled to be completed summer 2009.

- The City has developed regulations that allow for a 4 percent increase in total building costs to integrate higher-cost green features into municipal new construction and remodels. The City has also allocated funds to purchase more sustainable office products.

# 3.0 Community Greenhouse Gas Inventory

The following section provides Park City's community GHG inventory for the 2007 baseline year, as well as for the year 2005. It discusses the overall objectives of the inventory and the methodology used to compile the inventory, shares the individual components and overall conclusions of the inventory, and provides a benchmark of Park City's emissions compared to similar communities.

## 3.1 Objectives

This inventory aims to achieve the following objectives with respect to Park City community GHG emissions:

- Completeness – to address all relevant GHG emissions.
- Consistency – to enable meaningful comparison between emissions from the various sources in Park City and to fully document the inventory so that the implications of comparing Park City's GHG emissions to those of other communities can be understood.
- Accuracy – to reduce uncertainties as far as is practical with available data.
- Transparency – to disclose sufficient documentation of the inventory to allow users to make decisions and to enable future inventory users to understand and maintain the inventory.

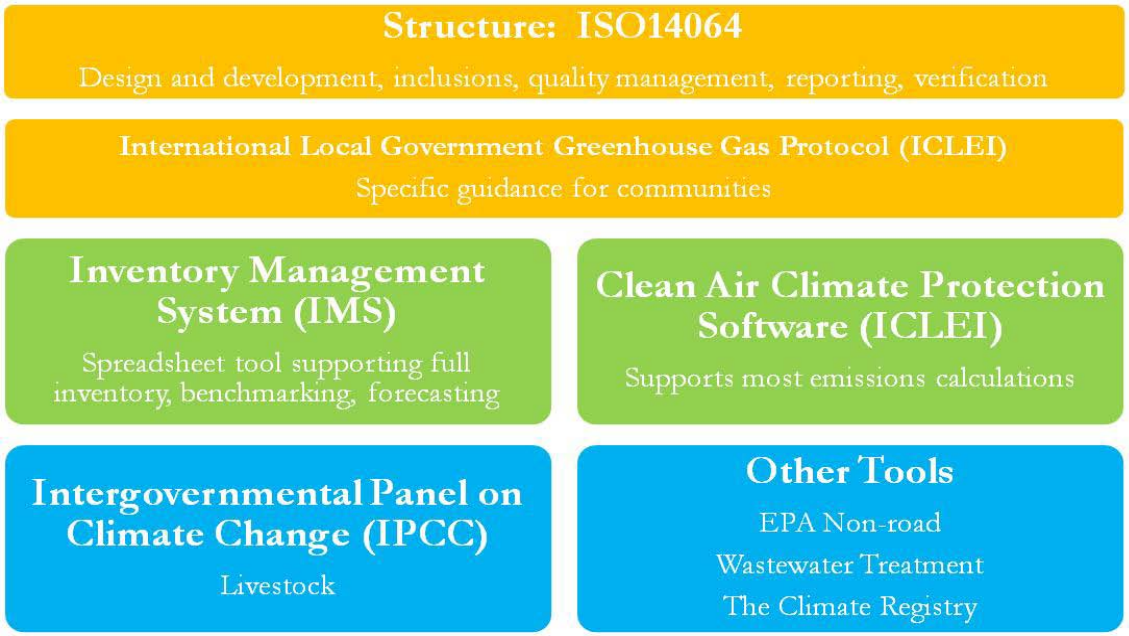
These objectives are achieved by applying accepted methodologies in designing the inventory and calculating emissions from activity data.

## 3.2 Methodology and Tools

GHG emission inventories are rarely, if ever, based on direct measurement of emissions. Instead, emissions are estimated based on accepted models and methodologies. This inventory prioritizes emissions estimates based on data pertaining to actual activities in Park

City (e.g., utility bills for electricity consumed) over modeled data. However, in some cases, the results of modeling are the only option upon which to base a calculation (for example, determining emissions from on-road vehicle transportation requires modeling the number of vehicle miles traveled [VMT]).

This inventory draws on well reviewed and accepted methodologies from ISO14064-1, The Climate Registry (TCR), the Intergovernmental Panel on Climate Change (IPCC), the Environmental Protection Agency (EPA), and methodologies implemented in ICLEI - Local Governments for Sustainability's Clean Air and Climate Protection (CACP) software.




The fundamental design of the inventory is based on the guidelines of ISO14064-1 with additional guidance from ICLEI's Local Government Greenhouse Gas Protocol to address issues specific to conducting community inventories. Table 1 describes the key requirements of ISO14064-1 and the alignment of this inventory's approach.

Table 1. Alignment with Key ISO 14064 Requirements

| ISO14064-1 Requirement | Alignment |
|---|---|
| **Organizational Boundary**<br>GHG emissions shall be consolidated based on an organization's operational or financial control of the source. | Since the community of Park City has no single body that operationally or financially controls all the activities generating emissions in the community, a **geopolitical organizational boundary** is established based on guidance from ICLEI. This allows the inventory to encompass all community activities within the boundaries of the city of Park City. |

| | |
|---|---|
| **Operational Boundary**<br>GHG emission sources shall be identified and categorized by scope as direct, energy indirect, or other indirect emissions. | The following section identifies the GHG emissions sources included in this inventory and their respective scopes. |
| **Quantification of GHG emissions**<br>The organization shall select quantification methodologies, select and collect activity data, select emission factors, and calculate GHG emissions. | The narrative included with each emission source in Park City's inventory includes a discussion of the selected methodologies, activity data, and factors. Methodologies from ICLEI, IPCC, The Climate Registry, and EPA are applied. |
| **Base-year GHG inventory**<br>The organization shall select and quantify emissions for a base year for which data are available. | The Park City inventory base year is 2007, the most recent year for which complete data were available at the time the inventory was prepared. An inventory is also prepared for the year 2005 to allow Park City to track progress against State of Utah and Western Climate Initiative targets that are based on 2005 emissions. The emissions for 1990 are estimated, based largely on population data due to a lack of available data for that year. |

Most of the calculations that comprise this inventory were carried out in an Inventory Management System (IMS), a Microsoft Excel-based spreadsheet that collects into one tool the original data, methodology applied, emission factors selected, and a summary of GHG emission results. The IMS also provides charting, forecasting, and benchmarking capabilities.

To compliment the IMS, calculations for portions of this inventory were also carried out using ICLEI's CACP software tool. The CACP software compliments the IMS in a number of ways:

- Provides a quality control check on many of the calculations carried out in the spreadsheet.
- Facilitates ready comparison to other ICLEI communities – ICLEI default emission factors have been maintained for more direct comparison.
- Accepted methodology is embedded in the software.
- Ongoing support is available from ICLEI.
- Has built-in capacity for reduction modeling.
- Is available to Park City Municipal employees as a member of ICLEI.

The purpose of this report is to convey the approaches used and the results of the inventory. Therefore, it is not burdened with excessive details of methodology. Full documentation of

data sources, emission factors, methodologies, and results can be found in the IMS. Appendix A is targeted at the audience that will be maintaining the inventory and describes the general structure of the inventory, including directory structure, data sources, spreadsheets, and how they are coordinated into a cohesive inventory.

## 3.3 Included Greenhouse Gases, Units, and Terminology

### Included Greenhouse Gases

ISO14061-1 requires the reporting of the following GHGs:

1. carbon dioxide ($CO_2$),
2. methane ($CH_4$),
3. nitrous oxide ($N_2O$),
4. perfluorocarbons (PFCs),
5. hydroflurocarbons (HFCs), and s
6. sulfur hexafluoride ($SF_6$).

The majority of Park City's climate change impact is a result of emissions of the first three gases as documented in the following sections. PFCs and HFCs are primarily released as the result of normal operation and maintenance of refrigeration, air conditioning, and fire suppression systems and are documented here as well. Sulfur-hexafluoride is found primarily in large electrical equipment, such as transformers, and was determined to be a minimal source in Park City.

### Units

All units presented in the body of this report are short tons (1 short ton = 2,000 pounds) unless otherwise noted.

Units of carbon dioxide equivalent ($CO_2e$) are used to normalize the global warming potential of the various GHGs. As portrayed in Figure 1, the emission of 1 ton of $N_2O$ has a global warming potential (GWP) 310 times larger than that of the emission of 1 ton of $CO_2$. Similarly, the emission of 1 ton of $CH_4$ has a GWP 21 times that of $CO_2$. To avoid confusion between emissions of the different types of gases and their respective GWPs, all emissions are reduced to the common unit of $CO_2e$, or 'carbon dioxide equivalent'.

**What is a ton of GHG?**

The concept of GHG emissions can be quite abstract. To place these emissions in some context, it can be helpful to illustrate with equivalent daily actions. Some equivalencies for 1 ton of carbon dioxide equivalent include:

- Driving from Park City to Kimball Junction and back 135 times.
- Driving from Park City to Salt Lake City and back 19 times.
- About one round-trip by commercial airline from Salt Lake City to Los Angeles.

Thus, the emission of 1 ton of $N_2O$ is expressed as the emission of 310 tons of $CO_2e$. Tons of $CO_2e$ will be labeled as $tCO_2e$.

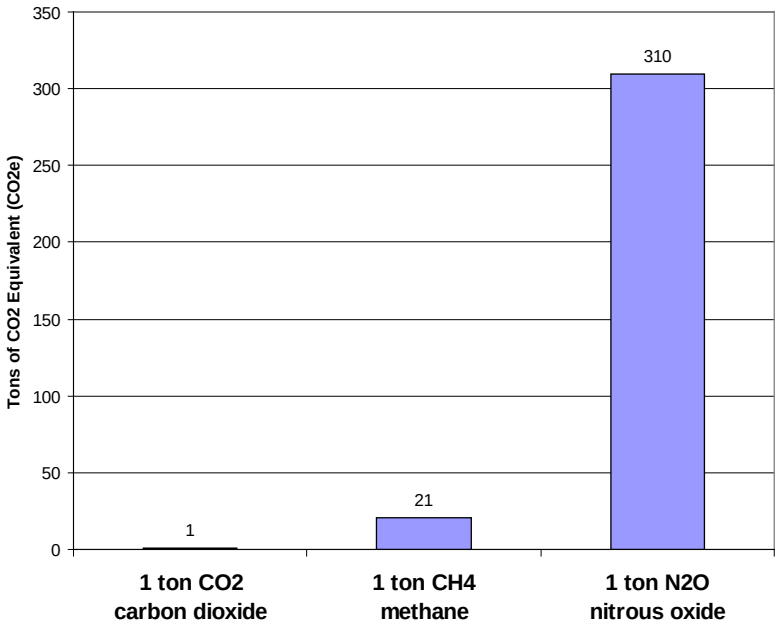



Figure 1. Units of GHG Representation

## Terminology

The following terminology is used throughout this report:

- The terms inventory and footprint will be used interchangeably to refer to the results of this effort to document emissions in the community.
- GHG emission, or just emission, refers to the release of $CO_2$, $CH_4$, or any other GHG described in the previous section to the atmosphere.
- RCI refers to the source sectors of residential, commercial, and industrial.
- IMS refers to the Inventory Management System, the spreadsheet that supports the collection of data, analysis of emissions, and graphical presentations found in this report.

## 3.4 Geopolitical Organizational Boundary

The Park City limits, as defined by the brown line in Figure 2, were selected as the geopolitical organizational boundary for this GHG inventory. The inventory seeks to

quantify the GHG emissions of all activities within this boundary. The emissions from Park City Municipal Corporation's operations are included in this inventory.


Figure 2. Geographic Boundary of Inventory

## 3.5 Greenhouse Gas Emission Sources

ISO14064-1 requires the entity to inventory all Direct (Scope 1) and Energy Indirect (Scope 2) GHG emissions. Other Indirect (Scope 3) emissions are reported at the discretion of the entity. As shown in Table 2, Park City has elected to include airline travel, solid waste disposal, and wastewater treatment.

Table 2. Park City Emission Sources

| Direct (Scope 1) | Energy Indirect (Scope 2) | Other Indirect (Scope 3) |
|---|---|---|
| • Natural gas consumption<br>• Propane consumption<br>• On-road vehicle transportation<br>• Off-road vehicle and equipment use<br>• Refrigerant losses<br>• Fertilizers<br>• Livestock | • Electricity consumption | • Airline travel<br>• Solid waste disposal<br>• Wastewater treatment |

Emission sources not included in this inventory include upstream energy and process emissions embodied in the goods and services that enter Park City from outside of the geopolitical boundary. For example, the emissions generated to produce an aluminum can (extracting raw material, processing, machining, and transporting to the Park City limits) are not included in this inventory. Also, because this is a "carbon footprint" and not an "ecological footprint", items such as food and consumer goods are not considered.

## 3.6 Greenhouse Gas Inventory and Projections

### Aggregate Community Emissions

The GHG emissions of any community can be considered in a number of contexts. For Park City, the objective of thoroughness was addressed by identifying GHG emissions from as many sources as could be reasonably quantified. These are represented as the Total Emissions of Park City. In doing so, Park City accounts for a number of GHG emission sources that are not often addressed in community inventories, including the airline travel of residents and visitors to the community. For a more equitable comparison to other communities, Park City's GHG emissions are also represented in an ICLEI Supported context as they would be calculated for those GHG emission sources supported by ICLEI's CACP community inventory software. Finally, in developing the Community Carbon Footprint and Roadmap for Reduction, a strong theme of individual responsibility and willingness to take action emerged from community dialogue. The final context presented for the aggregate community GHG emissions are those that are in the direct Sphere of Individual Influence. These are the GHG emissions in the community that are the result of daily actions taken by individual citizens and therefore within the capacity of the individual

to reduce. Table 3 summarizes the GHG emission sources or differences in approach included in each of these three contexts.

Table 3. Differences in Approaches to GHG Emission Sources

| Total Emissions (ISO 14064-1) | ICLEI Supported | Sphere of Individual Influence |
|---|---|---|
| Electricity consumption<br>• Natural gas consumption<br>• Propane consumption<br>• On-road vehicle transportation<br>• Off-road vehicle and equipment use<br>• Airline travel (resident & visitor)<br>• Solid waste disposal<br>• Wastewater treatment<br>• Refrigerant losses<br>• Fertilizers<br>• Livestock | • Electricity consumption<br>• Electricity emission factor changed from Utah specific to northwest regional factor per ICLEI protocol (See electricity section for more information)<br>• Natural gas consumption<br>• Propane consumption<br>• On-road vehicle transportation<br>• Solid waste disposal | • Residential electricity consumption<br>• Residential natural gas consumption<br>• Residential propane consumption<br>• Resident on-road vehicle transportation<br>• Resident airline travel<br>• Solid waste disposal (50% of community total) |

**items in blue are only included in the Total Emissions (ISO 14064-1) totals*

The Total Emissions in the Park City inventory in 2007 were 1,003,712 $tCO_2e$. The ICLEI supported GHG emissions in 2007 were 475,663 $tCO_2e$ about 47 percent of the emissions represented in the Total Emissions context. Finally, the emissions in the Sphere of Individual Influence in 2007 were 164,720 $tCO_2e$, or about 16 percent of the Total Emissions in the community. Each of these contexts is presented in Figure 3 along with similar results for the years 1990 and 2005. Most 1990 emissions are estimated based on 2005 per capita emissions and population due to lack of available data; therefore, the ICLEI supported context is not included for this year.

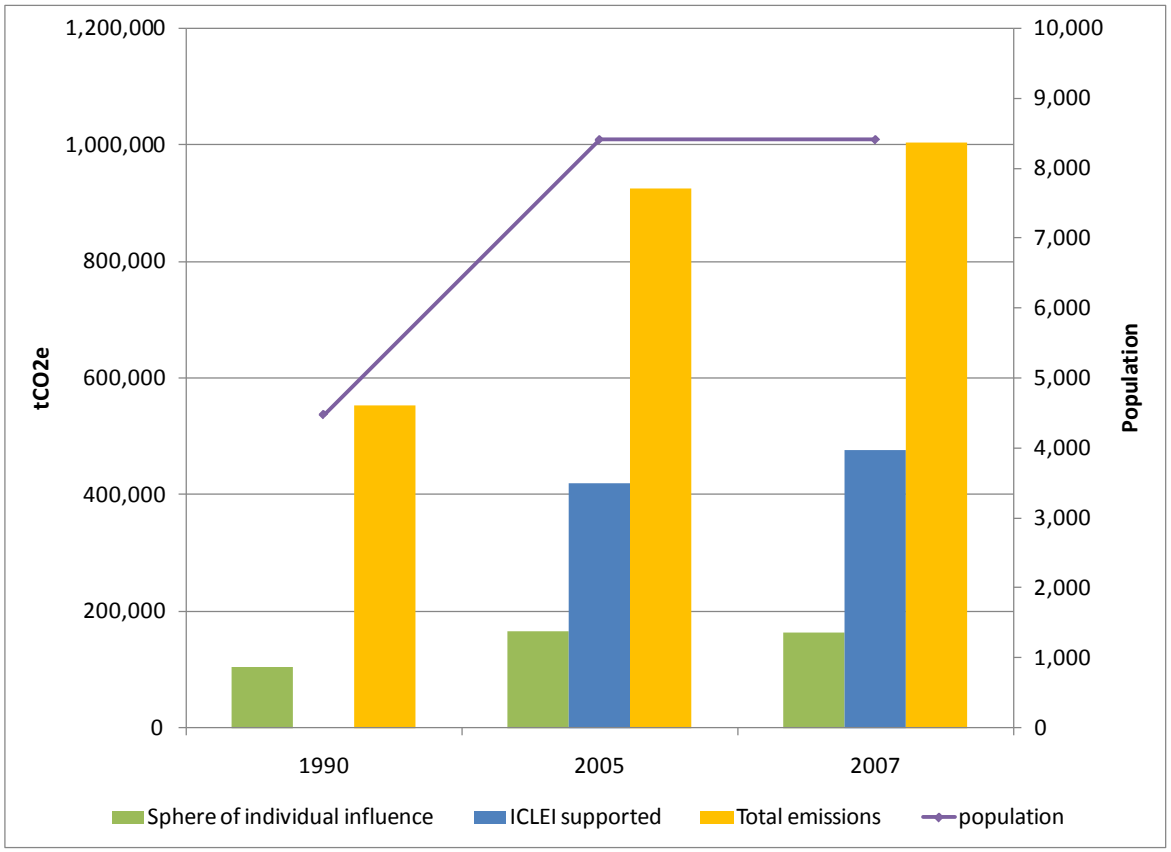



Figure 3. Aggregate Community Emissions by Context

Energy consumption and transportation are the primary sources of GHG emissions in the community, with small portions contributed by solid waste disposal and other sources, such as losses from refrigeration equipment. These sources are presented in Figure 4.

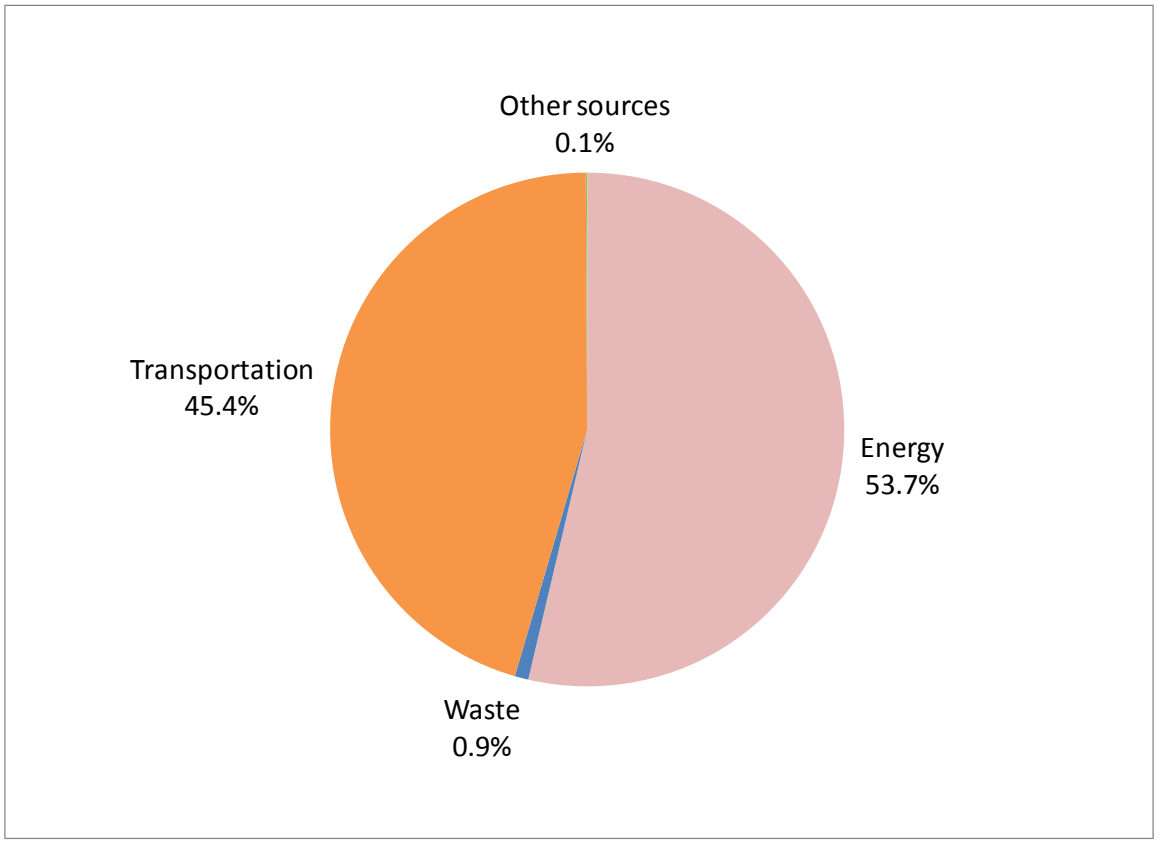



Figure 4. Total Community Emissions by Source

The following sections describe the sources of these GHG emissions and the data and methods used to quantify their impact.

## Energy

Stationary consumption of energy in Park City, including electricity, natural gas, and propane, represented 53.7 percent of the total emissions in the Park City inventory in 2007. The majority of these emissions are from electricity consumption (Figure 5).

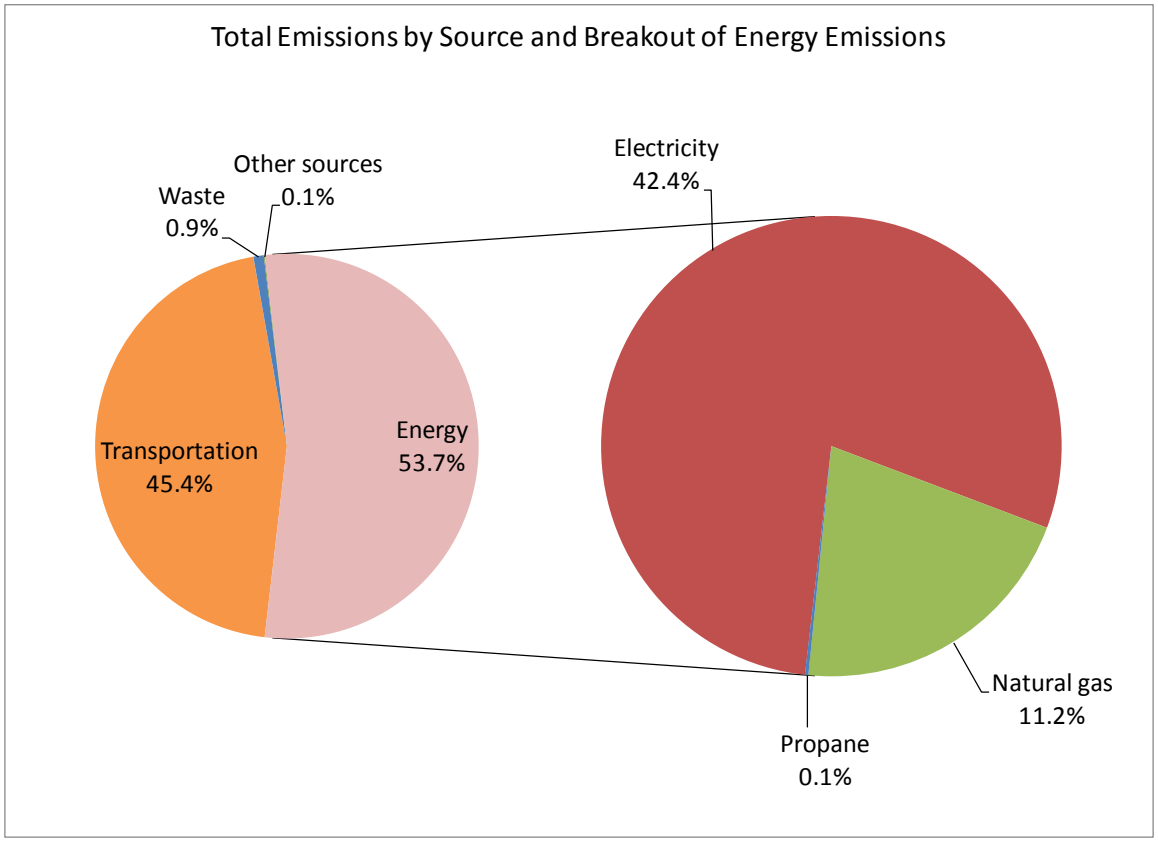



Figure 5. Source of Energy Emissions Compared to Total Inventory

### *Electricity*

GHG emissions from electricity consumption are indirect, occurring at the source of the electricity generation, but are attributed to the consumer of the electricity. Emissions from Park City's electricity consumption were 425,194 $tCO_2e$ in 2007, or 42.4 percent of the total inventory. As indicated in Figure 6, residential and commercial/industrial electricity consumption contribute about 24 percent and 76 percent, respectively, of emissions from electricity. Most commercially owned or operated lodging is in the commercial/industrial sector.

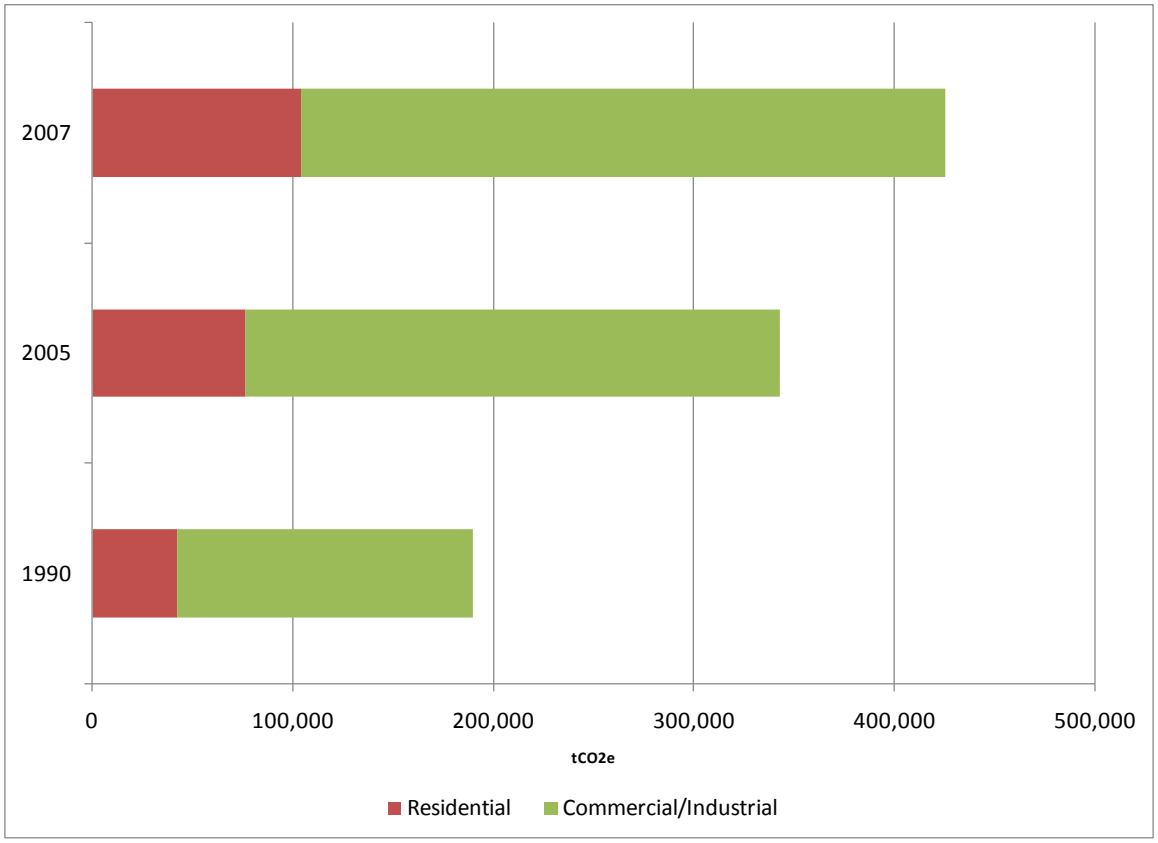



Figure 6. Community Emissions from Electricity by Sector

The increase in emissions between 2005 and 2007 is likely attributed to new construction in Park City.

Emissions from electricity generation are calculated using an emissions factor that accounts for the mix of resources used to generate the electricity and the particular GHG emission rates of those resources. For the Park City inventory, a Utah-specific factor from the EPAs eGRID 2007 application was applied. Regional factors were considered per the guidance of ICLEI and TCR but were not applied because the region that encompasses Park City includes the significant hydroelectric resources of the Northwest, thereby greatly reducing the emission factor (Figure 7). Therefore, the Utah factor that more fully represents the impact of coal generation in the intermountain region was selected to accurately represent the impact of Park City's electricity consumption. The calculation of emissions was carried out in the IMS and confirmed with ICLEI's CACP. It includes factors for $CO_2$, methane $CH_4$, and nitrous oxide $N_2O$.

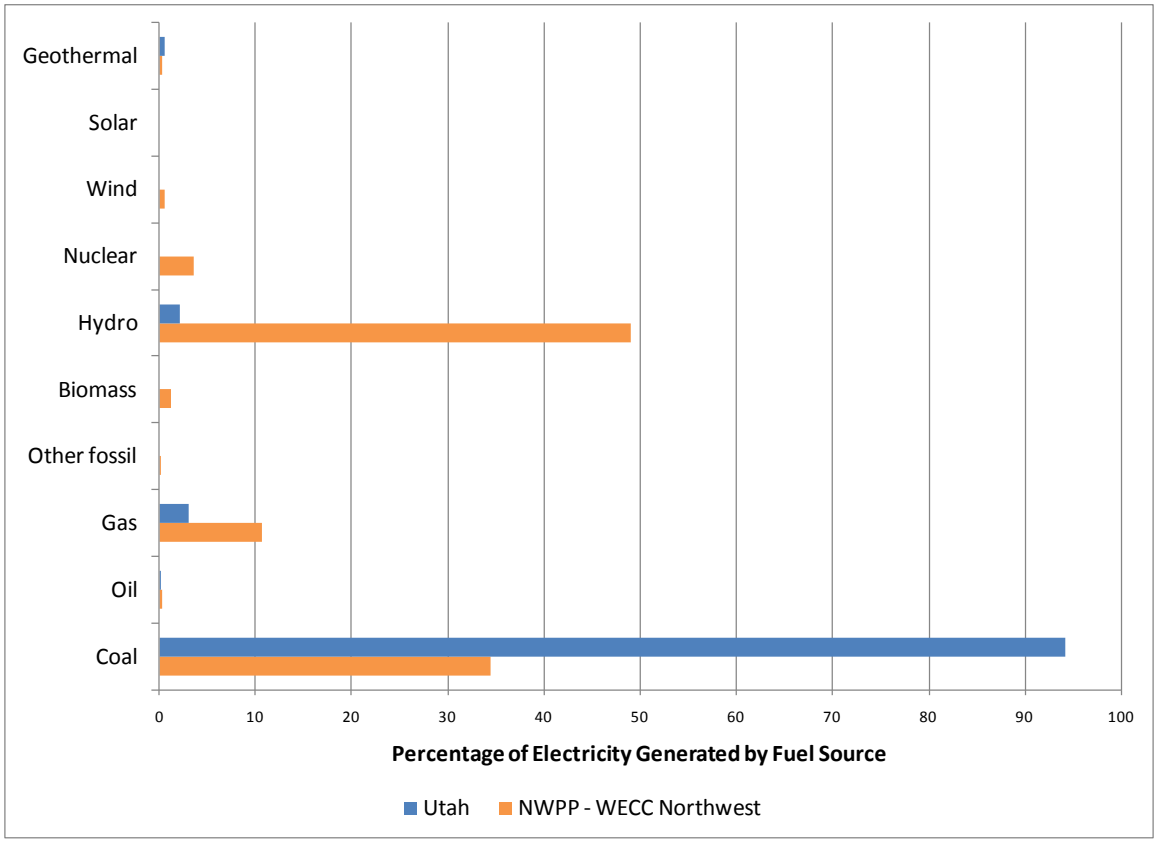



Figure 7. Comparison of State of Utah and Regional Electricity Generation Portfolios

Electricity consumption data for 2005 and 2007 were provided by Rocky Mountain Power, the sole electricity provider to the community, and included segregation of residential and commercial/industrial uses. Electricity consumption for 1990 was estimated based on population. This is likely an underestimate because it credits 1990 with the building and technology efficiency improvements that have occurred since 1990.

### *Renewable Energy*

In general, GHG reporting protocols such as The Climate Registry do not recognize renewable energy credits (e.g., those purchased from Rocky Mountain Power's Blue Sky program) as deductions against an entity's GHG inventory. Due to measurement and accounting challenges, only renewable energy that is used directly by an entity, such as that installed on the site or behind the meter, can currently be deducted from an inventory. As a result, despite the Park City community's strong participation in renewable energy programs (about 11 percent of the residential accounts and 5 percent of business accounts participated in the Blue Sky program in 2007, significant purchases made by Park City Municipal

Corporation, and Park City Mountain Resort's offset of 100 percent of its electrical energy consumption with renewable energy credits [RECs] starting in 2008), the emissions from electricity purchases still represent total purchases made from the grid.

Though it is not deducted from the community GHG inventory, purchasing renewable energy and RECs supports the increasing uptake of renewable energy technology and reduces GHG emissions elsewhere on the electrical grid. These purchases represent a powerful statement of the Park City community's commitment to addressing climate change.

### *Natural Gas*

GHG emissions from natural gas consumption are direct, occurring at the site when the gas is combusted for uses such as heating in homes and businesses. Emissions from Park City's natural gas consumption were 112,277 $tCO_2e$ in 2007, or 11.2 percent of the total inventory. As indicated in Figure 8, residential consumption contributed about 65 percent of emissions while commercial/industrial sources, which include most commercially owned or operated lodging, contributed 35 percent of emissions.

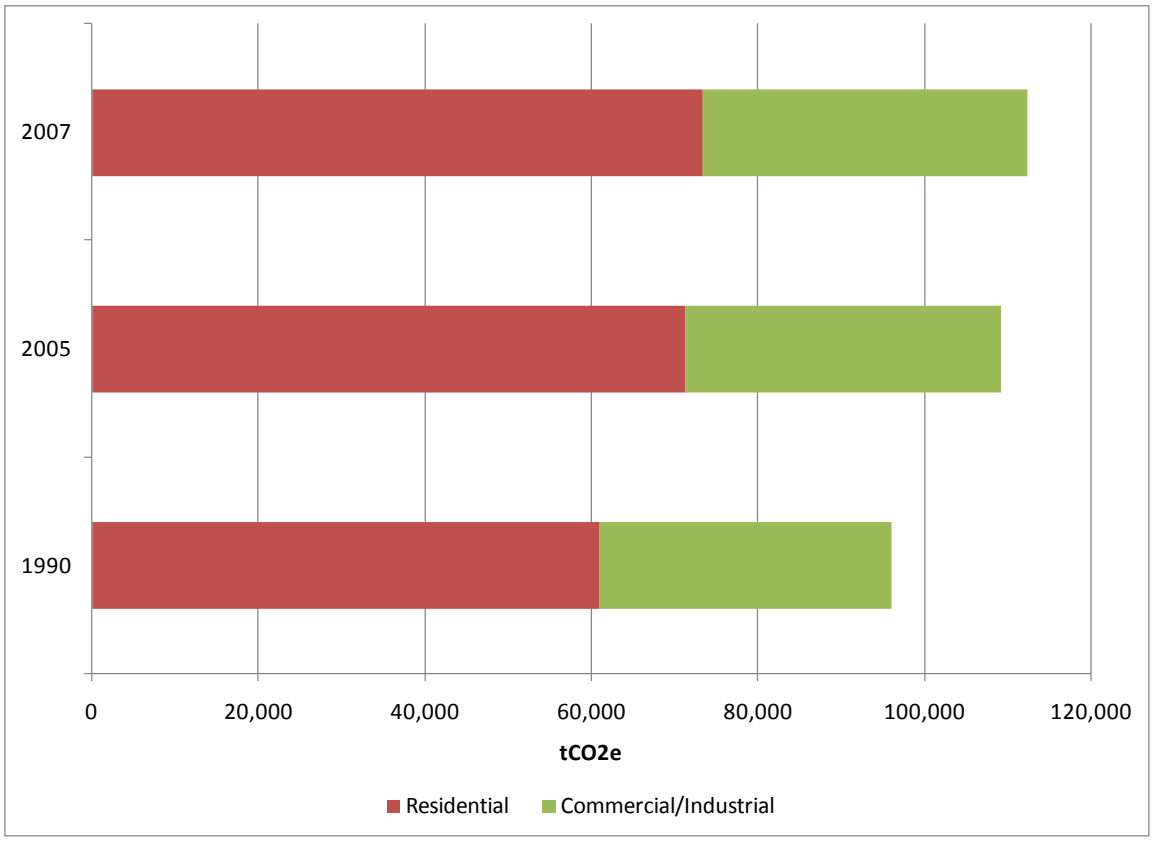



Figure 8. Community Emissions from Natural Gas by Sector

Emissions from natural gas combustion were calculated using an emissions factor from ICLEI. The calculation of emissions was carried out in the IMS and confirmed with ICLEI's CACP. It includes factors for $CO_2$, $CH_4$ and $N_2O$.

Natural gas consumption data for 2005 and 2007 were provided by Questar, the sole natural gas provider to the community, and included segregation of accounts into residential and commercial/industrial uses. Natural gas consumption for 1990 was estimated based on population and historical per capita use rates, which account for more recent improvements in building and technology efficiency.

### *Propane*

Like natural gas, greenhouse gas emissions from propane consumption are direct, occurring at the site when the gas is combusted for uses such as heating. Emissions from Park City's propane consumption were at least 1,334 $tCO_2e$ in 2007, or 0.1 percent of the total inventory (Figure 9). The distribution of users between residential and commercial/industrial sectors was not available, but most of the use is likely residential based on correspondence with propane providers.

Propane consumption data were provided by two propane providers for 2007 but only one of these providers had data for 2005. At least four additional propane providers identified in the Park City region did not provide data, so these emissions data only account for a portion of total propane consumption. Due to the lack of available data, propane consumption for 1990 and 2005 was estimated based on the rate of consumption in 2007 and population.

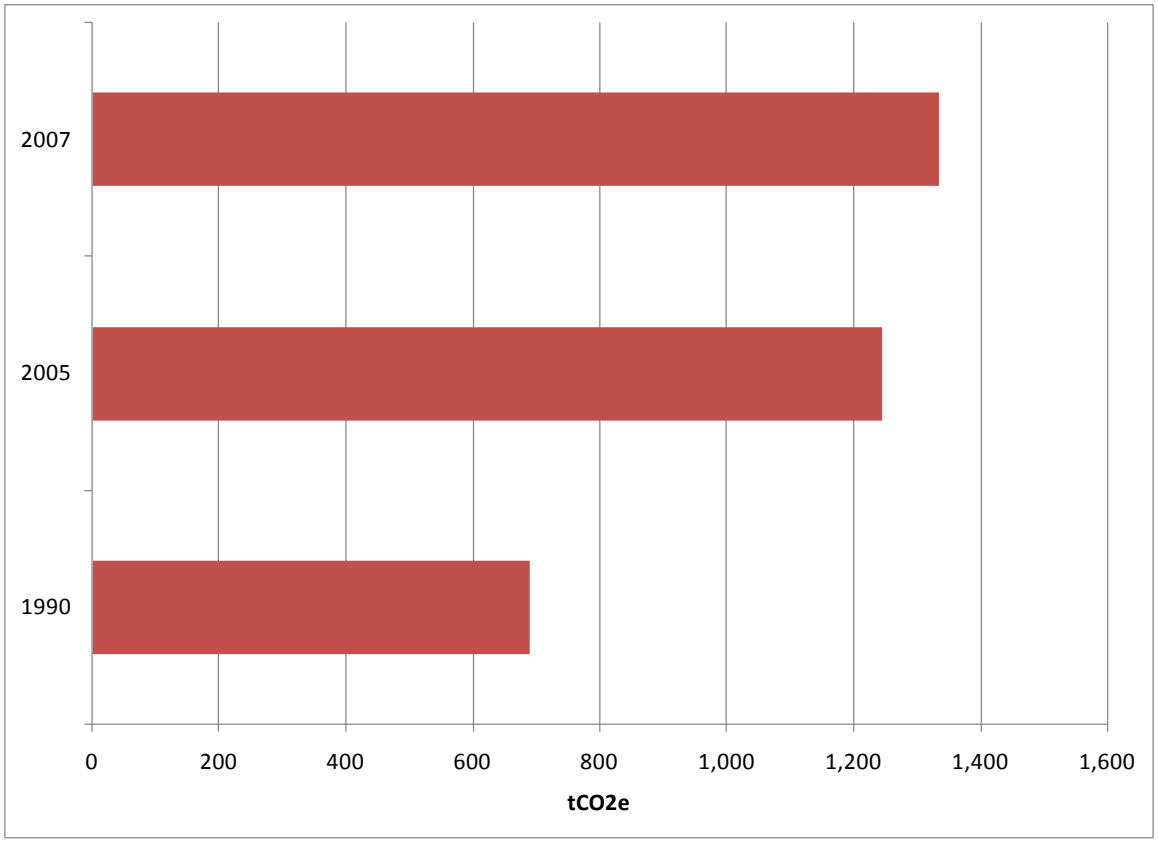



Figure 9. Community Emissions from Propane

Emissions from propane combustion were calculated using an emission factor from ICLEI. The calculation of emissions was carried out in the IMS and confirmed with ICLEI's CACP. It includes factors for $CO_2$, $CH_4$, and $N_2O$.

### *Biomass Combustion*

In Park City, the predominant biomass combustion activity is burning wood in heating stoves in both residential and commercial properties. Due to the highly competitive nature of the market for firewood in Park City, data on the quantity of firewood sold are proprietary and were not available for this analysis. Fortunately, this lack of data does not impact the completeness of the Park City inventory because protocol does not require these emissions to be reported.

Most protocols, including TCR, recognize the predominant emission from biomass combustion, $CO_2$, as a biogenic emission source. Biogenic carbon emissions are the result of carbon that was recently sequestered during the growth of the biomass and will subsequently be subject to uptake by new biomass growth. Therefore, as a matter of protocol, these

emissions are not included in an inventory and are typically reported separately. Compared with the magnitude of emissions from other energy sources, such as electricity, natural gas and propane, the emissions from wood burning are likely to be negligible.

## Transportation

Transportation emissions for Park City include on-road vehicles and transit, off-road vehicles and equipment, and airline travel. These emissions accounted for 42.6 percent of total emissions in 2007. The majority of these emissions are from airline travel (Figure 10).

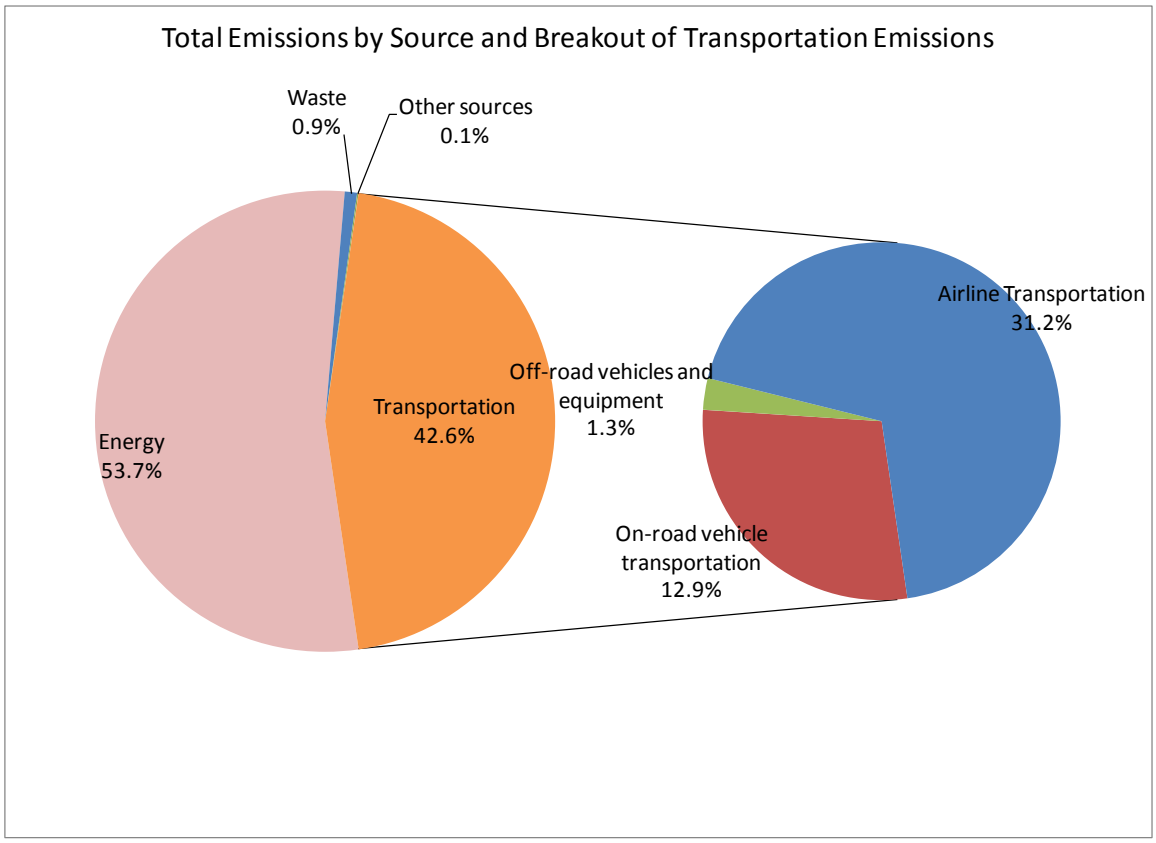



Figure 10. Source of Transportation Emissions Compared to Total Inventory

### *On-road Vehicle Transportation*

The GHG emissions resulting from on-road vehicle travel are direct, occurring at the tailpipe of the vehicle as the result of fossil fuel combustion in the vehicle's engine. These vehicles include cars, light trucks, heavy trucks, and transit buses. Emissions from on-road vehicle travel in Park City were 129,059 $tCO_2e$ in 2007, or 12.9 percent of the total inventory.

Fehr & Peers Transportation Consultants provided the results of VMT modeling for 1990, 2005, and 2007 to support the calculation of emissions from on-road vehicle travel (Figure

11). The VMT modeling includes resident and overnight visitor on-road travel, including visitor travel from Salt Lake City, but does not include the mileage contribution of 1-day visitors to Park City.

An alternative approach was also undertaken to corroborate the VMT modeling based on annual average daily traffic (AADT) on major roadways. These traffic counts are generated by the familiar black strips often seen lying across the roadway. Using the traffic counts and length of the road segments, an alternative measure for VMT can be generated. This measure includes all traffic crossing the sensors, including 1-day visitors to Park City. However, this measure only covers the major arterial streets.

Ultimately, VMT estimates based on AADT counts are about half of that modeled for 2005 and 2007 by Fehr & Peers. The method applied by Fehr & Peers was selected for the inventory because it is preferred by ICLEI and represents a conservative approach to modeling emissions.

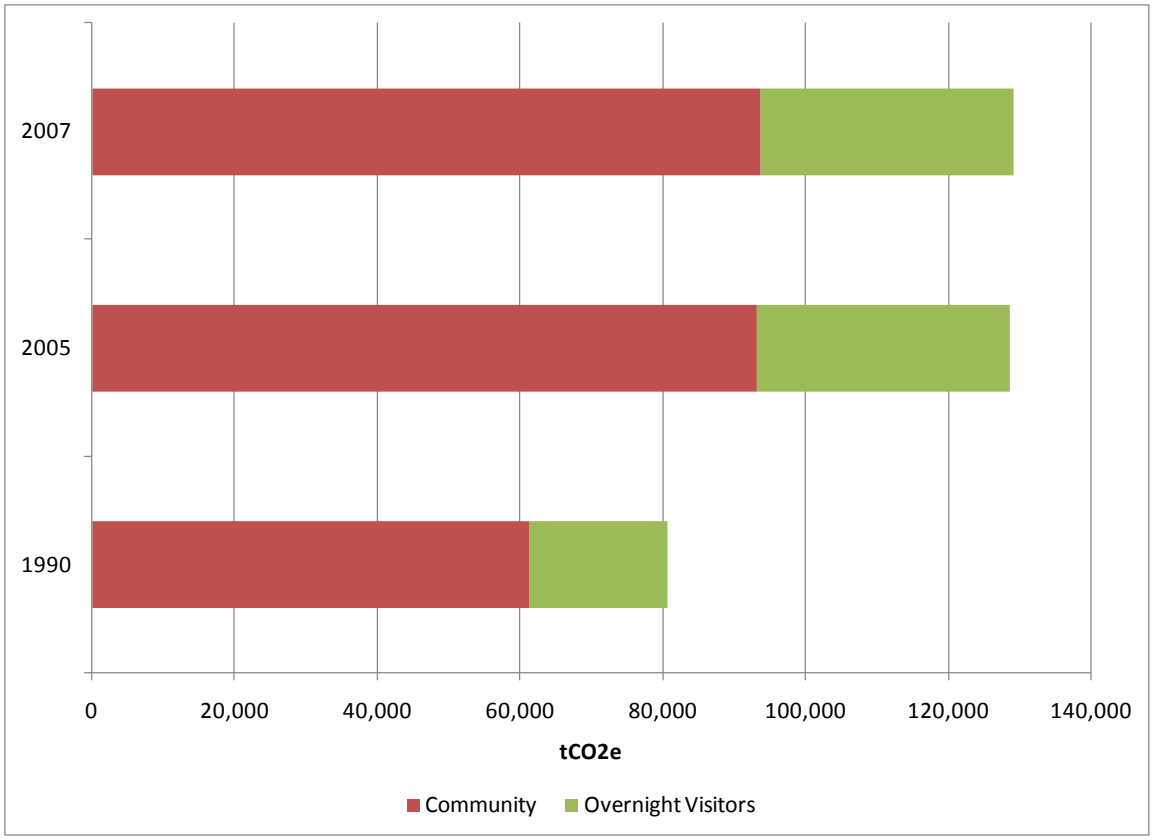



Figure 11. Community Emissions from On-road Transportation

Emissions from on-road vehicle travel were calculated using average fleet fuel economies and composition of vehicle types from the Energy Information Administration and Tellus.

These factors allow the conversion of total VMT to an estimated quantity of fuel consumed, which is converted to GHG emissions using factors from the EPA. Emissions were calculated using CACP, and details of the methodology can be found in that software's documentation.

### *Airline Travel*

GHG emissions from airline travel are direct, occurring at the aircraft's engine as a result of fossil fuel combustion. Emissions from Park City residents and visitors traveling through Salt Lake City International Airport were estimated to be 313,255 tCO2e in 2007, or 31.2 percent of the total inventory (Figure 12).

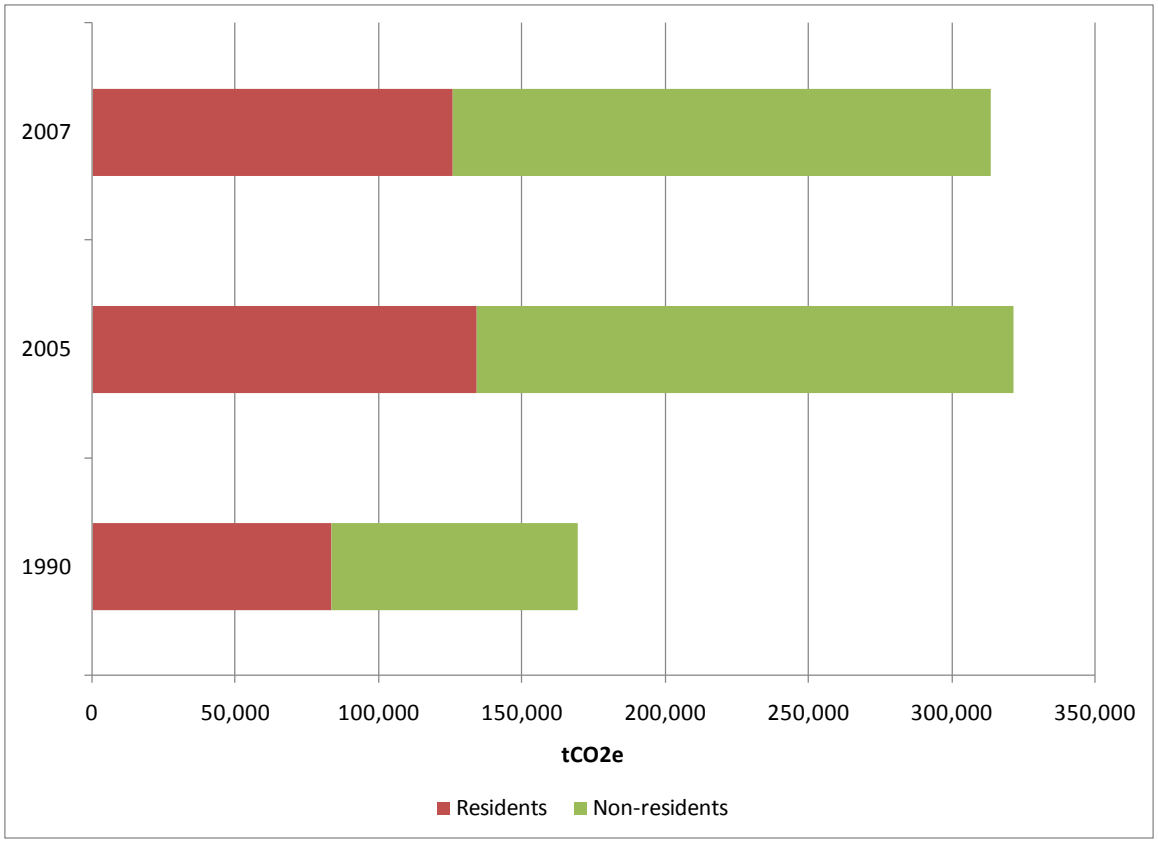



Figure 12. Resident and Non-resident Airline Travel Emissions

The calculation of emissions from aviation activities is not directly supported by the CACP software. Salt Lake City International Airport provided statistics on the following to facilitate estimating the emissions from airline travel:

- Total enplaned/deplaned passengers.

- Percentage of local passengers with a destination or origin at Salt Lake City International (e.g., passengers that are not connecting).
- Percentage of local passengers originating or destined to Park City/Summit County.
- The statewide ratio of residents to non-residents enplaned/deplaned.
- The Top 50 Originating and Destination markets served by Salt Lake City International to determine a weighted average trip length.

These data were complimented by the following demographic data:

- Visitor nights in Park City to estimate how many travelers to Summit County are destined for Park City.
- Park City overnight visitor origins to estimate how many visitors arrive by airline.

Using the above data it was possible to estimate the number of airline trips by residents of Park City and the number of non-residents arriving with Park City as a destination. The airline miles traveled by these passengers were estimated based on a weighted average of the top 25 origination and destination markets.

The resulting $CO_2$ emissions were estimated using an emission factor for short haul flights provided by the World Resource Institute's Business Travel Tool v2.0. Airlines are also understood to have a greater impact on global warming than that of their $CO_2$ emissions due to other effects, such as changes in concentration of ozone, methane, aerosols, and the formation of clouds. As a result, a factor called a radiative forcing index (RFI) is applied to account for this additional impact specifically associated with airline travel.

### *Off-road Vehicle and Equipment Use*

GHG emissions from off-road vehicles and equipment include fossil fuel combustion related to a variety of activities, including the following:

- Recreational vehicles, such as all-terrain vehicles, snowmobiles, and snow grooming equipment.
- Logging equipment, such as chainsaws.
- Agricultural equipment, such as tractors.
- Construction equipment, such as graders and backhoes.
- Industrial equipment, such as fork-lifts, airport grounds equipment, and sweepers.
- Residential and commercial lawn and garden equipment, such as leaf and snow blowers.

- Stationary combustion of fuels in applications such as back-up generators.

As indicated in Figure 13, emissions from these activities in Park City were 13,015 $tCO_2e$ in 2007, or 1.3 percent of the total inventory. These emissions are predominately from construction equipment and are therefore assumed to be primarily of commercial origin.

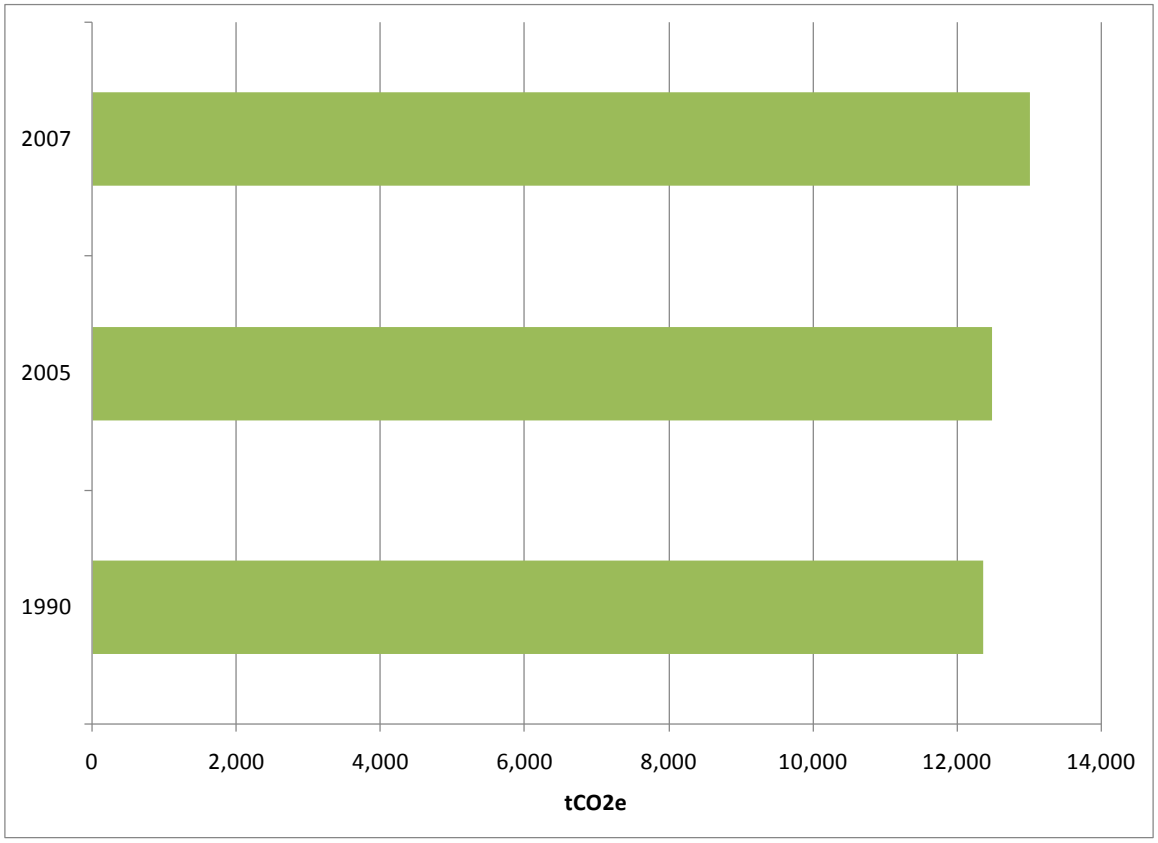



Figure 13. Community Emissions from Off-road Vehicles and Equipment

The CACP software does not directly support calculating emissions from these activities and other data that would support the calculation were not readily available. Therefore, the EPA's NONROAD2005 Model was employed to estimate these emissions. The NONROAD2005 Model includes the following data sets, with resolution to the county level:

- Equipment population for the base year distributed by age, power, fuel type, and application.
- Average load factor expressed as an average fraction of available power.
- Available power in horsepower.
- Activity in hours of use per year.

- Emission factor with deterioration and/or new standards.

Emissions were determined for Park City by modeling emissions for Summit County and prorating by population ratio or known use types for each equipment type category. For example, watercraft emissions for Park City were assumed to be zero since there are no major water bodies in the Municipal Corporation limits. The model's data sets support emission estimations for all three target years: 1990, 2005, and 2007.

## Waste

Waste disposal activities in Park City, including solid waste disposed at the landfill, construction and demolition waste, and wastewater treatment, represented 0.9 percent of the total emissions of the Park City inventory in 2007 (Figure 14). The majority of these emissions are from solid waste disposed at the landfill.

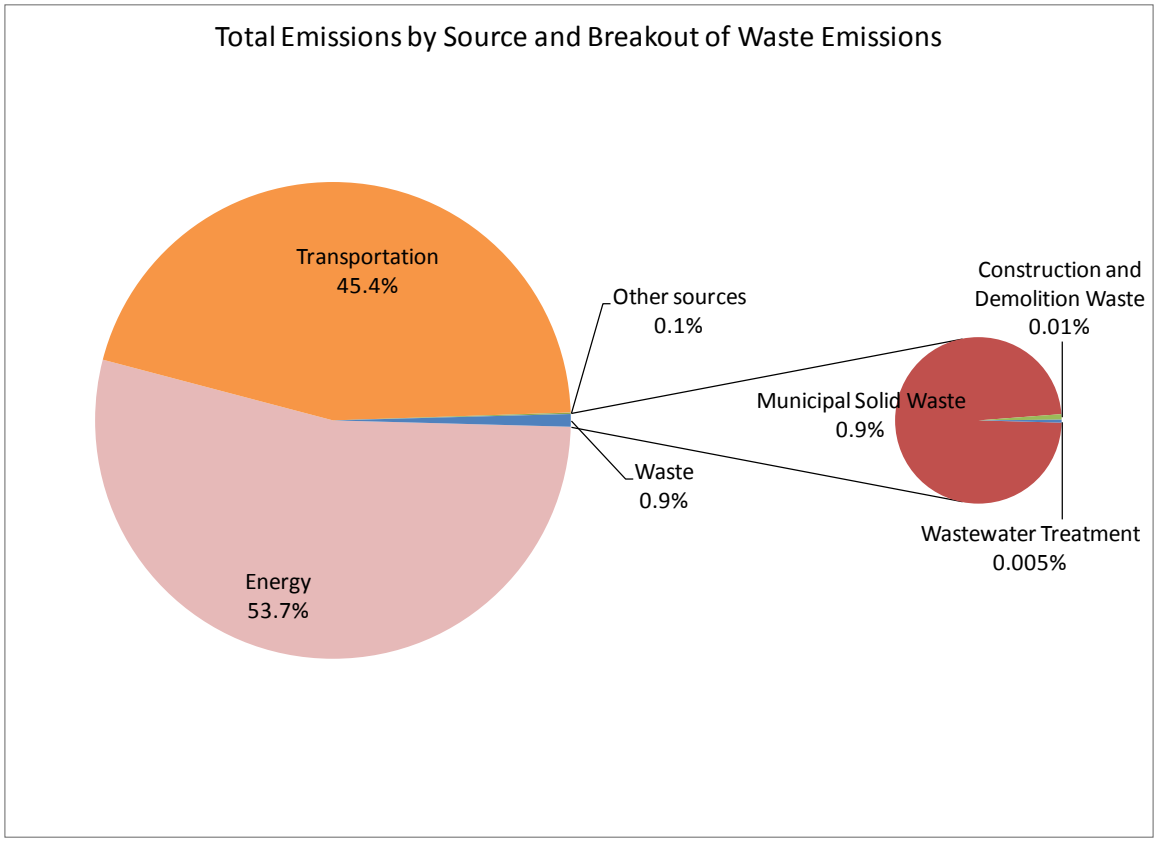



Figure 14. Source of Waste Emissions Compared to Total Inventory

### *Municipal Solid Waste*

GHG emissions from solid waste disposal are considered indirect and occur as a result of material decomposition at the landfill. All municipal solid waste in Summit County is collected at the Three Mile Landfill, which has no methane capture. Emissions from

municipal solid waste disposal from Park City were 8,569 $tCO_2e$ in 2007, or 0.9 percent of the total inventory (Figure 15).

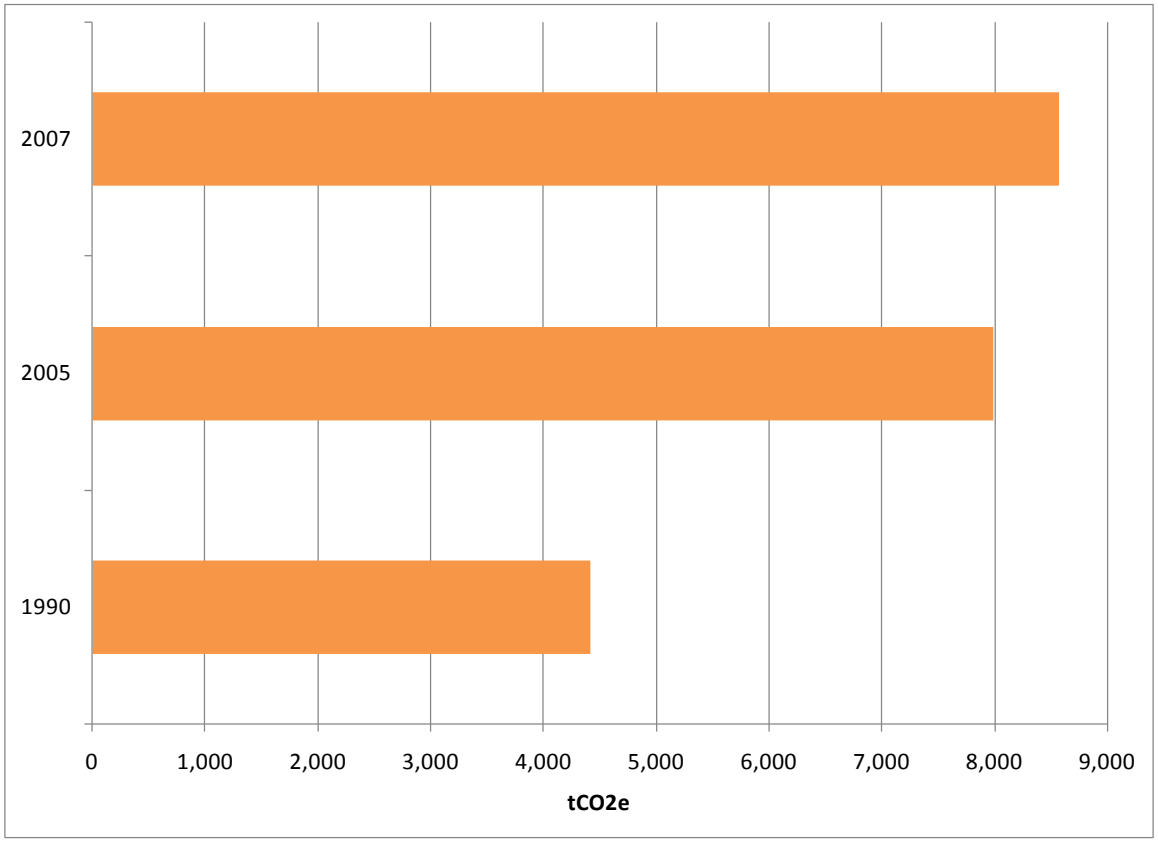



Figure 15. Community Emissions from Municipal Solid Waste

Emissions from disposal of solid waste were calculated using emission factors from ICLEI. The Summit County Integrated Solid Waste Management Plan (SCISWMMP) provided the waste disposal rate and composition of waste types for Summit County in 2007. These rates were prorated to Park City based on a combination of resident population and visitor nights. The calculation of emissions was carried out in the IMS and confirmed with ICLEI's CACP. Waste disposal rates for 1990 and 2005 were estimated based on population.

### *Construction and Demolition Waste*

GHG emissions from construction and demolition (C&D) solid waste disposal are considered indirect and occur as a result of material decomposition at the landfill. Most C&D waste in Summit County is collected at the Henefer Landfill, although some is disposed of outside Summit County. Emissions from C&D disposal from Park City were 92 $tCO_2e$ in 2007, or 0.01 percent of the total inventory (Figure 16).

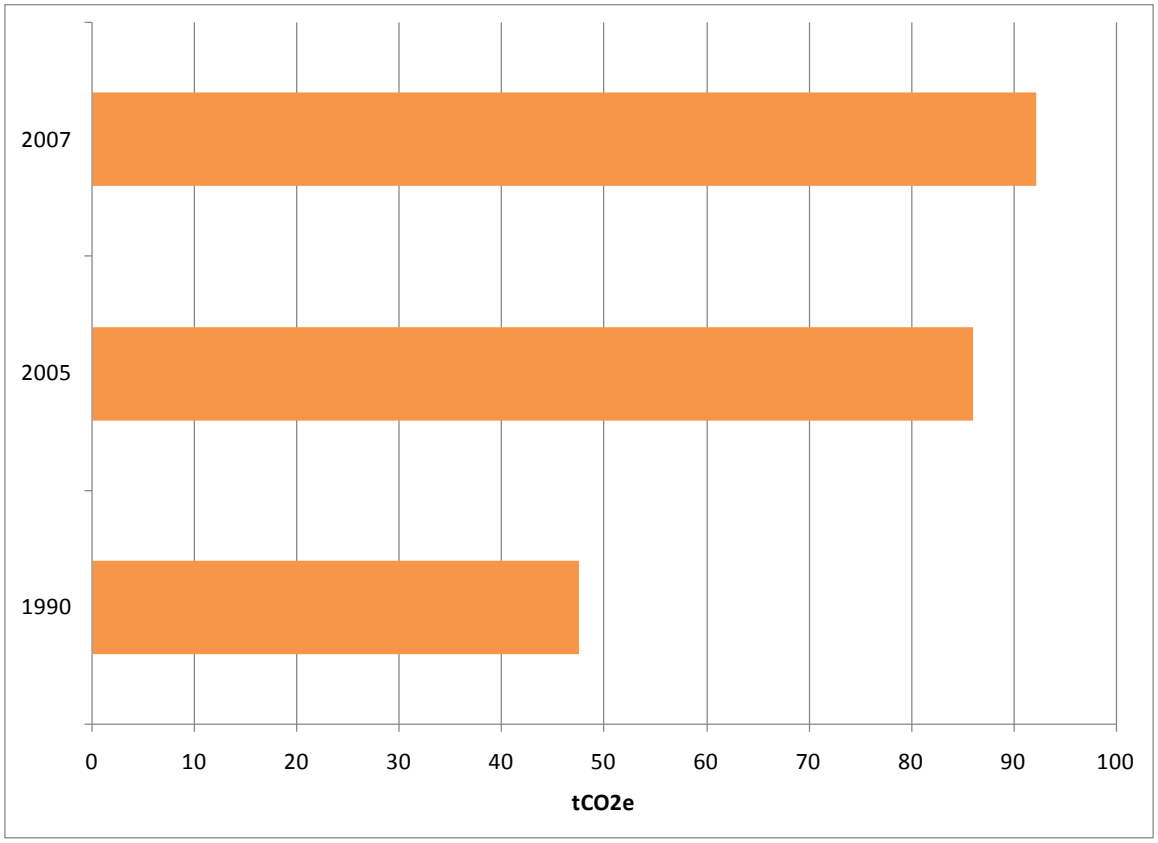



Figure 16. Community Emissions from Construction and Demolition Waste

Emissions from disposing C&D waste are not explicitly covered by emission factors from ICLEI. Furthermore, the SCISWMMP does not provide a waste composition analysis for the C&D stream. Therefore, emission factors from the EPA's Waste Reduction Model (WARM) and a waste composition ratio from an EPA report ("Analyzing What's Recyclable in C&D Debris") were used to develop a weighted emission factor for the C&D waste stream. For the most part, materials in this waste stream do not decompose in the landfill (e.g., concrete, asphalt roofing, metals, bricks, plastic) and therefore produce no landfill GHG emissions. The only major component of this stream that does decompose is wood.

The SCISWMMP provided the C&D waste generation rate and composition for Summit County in 2007. These rates were prorated to Park City based on a combination of population and visitor nights. The calculation of emissions was carried out in the IMS. Waste generation rates for 1990 and 2005 were estimated based on population.

### Recycling

In 2007, approximately 9,110 tons of solid waste was recycled in Summit County yielding a County-wide diversion rate of about 18 percent. According to surveys conducted by Recycle Utah, as much as 50 percent of this diversion was generated by Park City.

Recycling has a two-fold benefit with respect to GHG emissions. First, biodegradable materials, such as cardboard and paper, that are diverted by recycling are prevented from decomposing at the landfill and generating GHG emissions. This diversion results in a direct reduction in the community's GHG inventory. Furthermore, diverting recyclables decreases the worldwide market for virgin materials. For almost all materials, the GHG emissions that occur in returning recycled material to market are much less than those that occur bringing virgin material to market. Therefore, recycling has an impact on reducing GHG emissions both in Park City as well as in upstream materials markets.

### Wastewater Treatment

Park City's wastewater is managed by the Snyderville Basin Reclamation District (SBRD) in a facility described as:

*"An advance tertiary water reclamation facility employing biological and chemical phosphorus removal processes, ultra violet (UV) disinfection, tertiary filters and beneficial use of biosolids."*

The emissions from this process were calculated to be 50 $tCO_2e$ in 2007, or about 0.005 percent of the total inventory (Figure 17).

GHG emissions from wastewater treatment vary depending on the type of treatment process used. Of the potential emission sources identified by the California Climate Action Registry Local Government Operations Protocol for wastewater treatment, the only one that is applicable to the described process is $N_2O$ emissions from the nitrification/denitrification process. The calculation of emissions was carried out in the IMS.

The SBRD and US Census Bureau provided visitor and resident population data necessary to calculate these wastewater emissions for 2005 and 2007. Emissions for 1990 were estimated based on population.

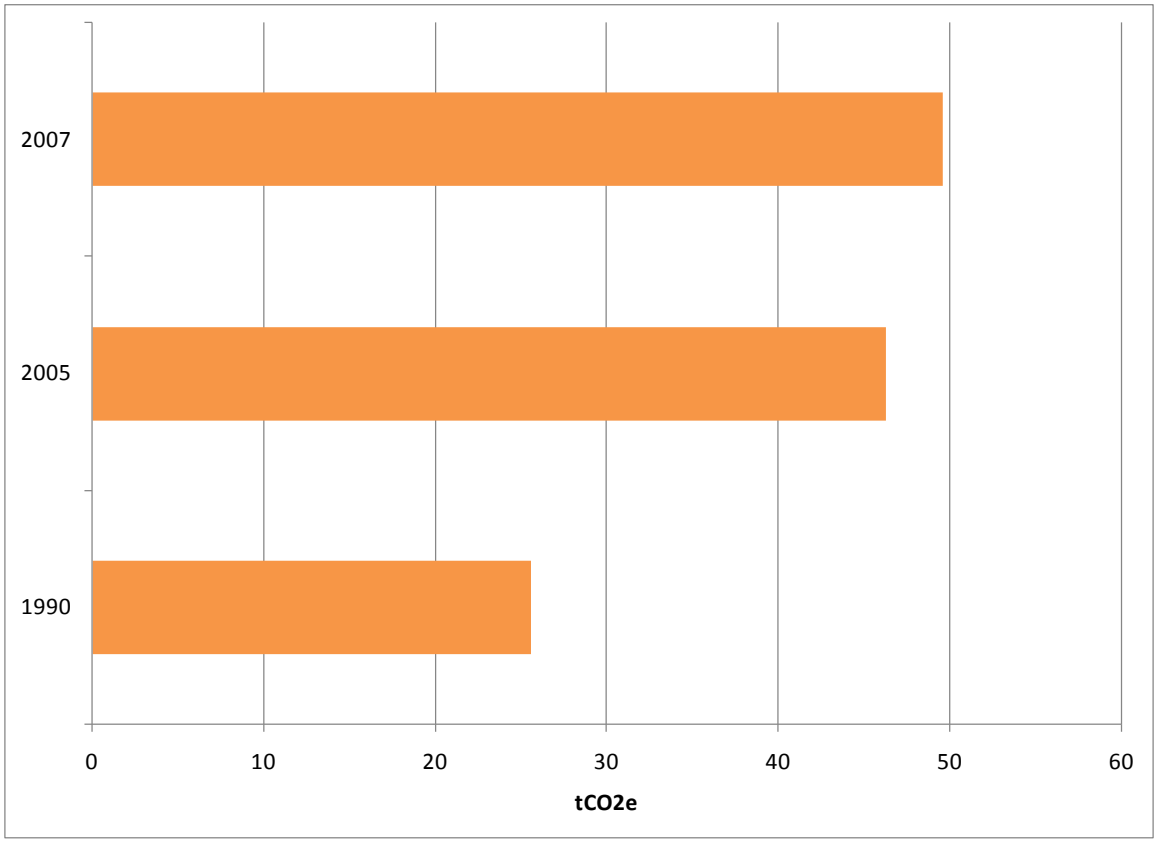



Figure 17. Community Emissions from Wastewater Treatment

## Other Sources

There are a number of other minor GHG emission sources in Park City that accounted for 867 $tCO_2e$ in 2007, or 0.1 percent of the total emissions. These sources include:

- Leaking refrigerant chemicals from air conditioning and food refrigeration systems.
- Enteric and manure methane emissions from the presence of minimal livestock.
- Fertilizer.
- Beer production.

The majority of emissions in this category are from refrigerant losses during normal system operation and maintenance. More information on the estimation of emissions from these sources is available in Appendix C.

## 3.7 Benchmarks

Another way to provide context for a community's GHG emissions is to benchmark against other communities and regions. However, benchmarking is challenging for a number of reasons. Though protocols exist for carrying out GHG inventories, covering topics from establishing boundaries to quantifying emissions from a particular source, there is still a lack of standardization among these protocols. Each community will make assumptions based on its unique circumstances and the data available with which to construct the inventory. The benchmarking effort is further complicated by the inherent differences in climate, demographics, economies, and geographic location that inevitably influence how a community uses resources and emits GHGs.

Ultimately, the best comparison for Park City as it strives to reduce its GHG emissions will be itself.

Table 4. Per Capita GHG Emissions by Context and Measure of Population

| **Park City's 2005 per Capita Emissions (tons CO2e/capita) based on…** | | | |
|---|---|---|---|
| | **Total Emissions** | **ICLEI Supported** | **Sphere of Individual Influence** |
| Full-time resident population of 8,399 persons | 110 | 50 | 20 |
| Estimated equivalent full-time population including visitors of 19,388 persons | 48 | 22 | n/a |
| **Park City's 2007 per Capita Emissions (tons CO2e/capita) based on…** | | | |
| | **Total Emissions** | **ICLEI Supported** | **Sphere of Individual Influence** |
| Full-time resident population of 8,399 persons | 119 | 57 | 20 |
| Estimated equivalent full-time population including visitors of 20,724 persons | 48 | 23 | n/a |

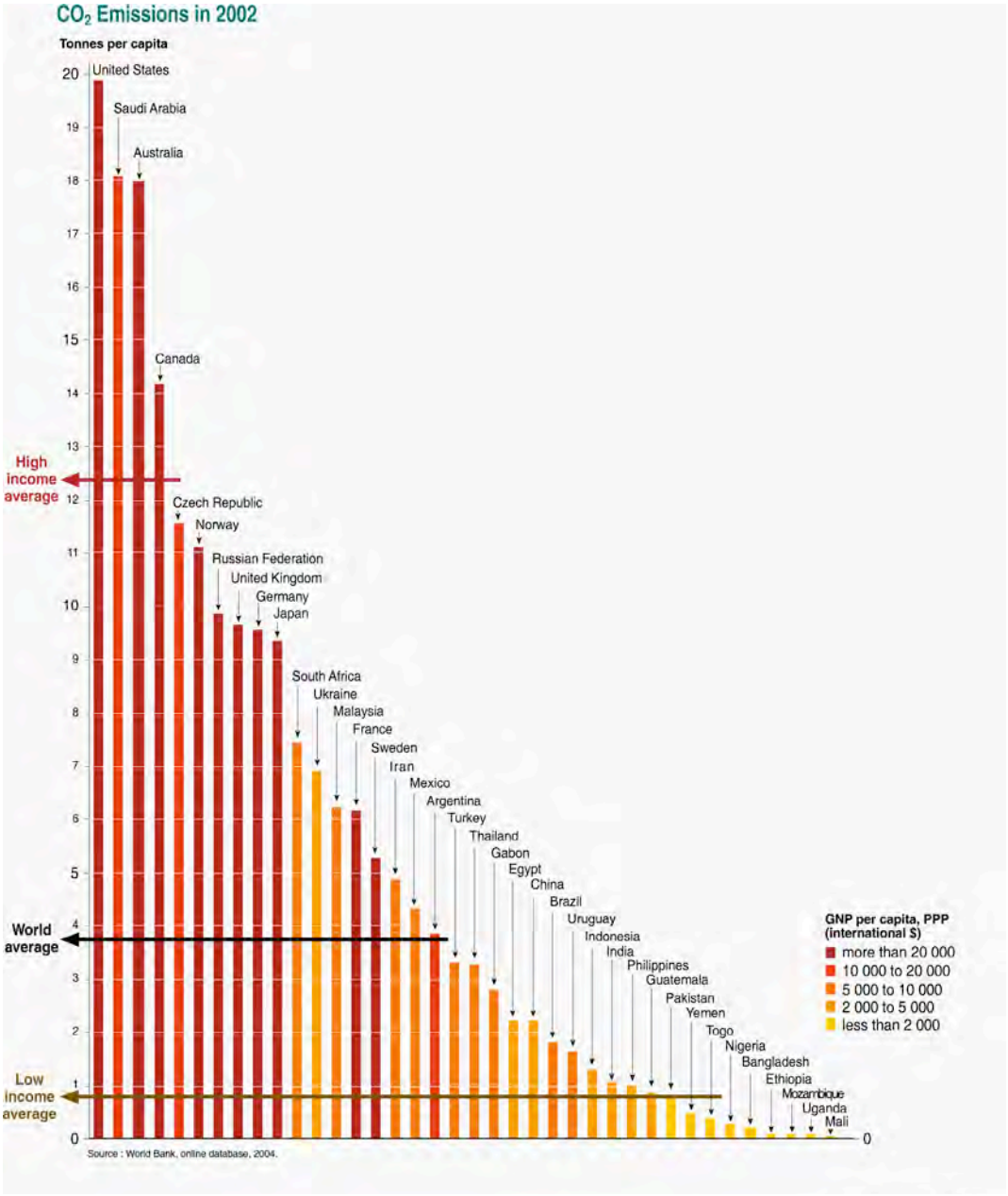



Figure 18. National $CO_2$ Emissions Per Capita. (2005).

Source: In UNEP/GRID-Arendal Maps and Graphics Library. Retrieved 22:19, February 23, 2009 from http://maps.grida.no/go/graphic/national_carbon_dioxide_co2_emissions_per_capita

The United States leads the world in per capita emissions at about 22 tons $CO_2$ (20 metric tons $CO_2$) per year (Figure 18). The per capita emissions in the Sphere of Individual Influence in Park City are similar to the national average. Total per capita emissions in Park

City are higher than the national average due to several factors including but not limited to the following:

- Tourist economy – Park City has the infrastructure to support a visitor population of over 30,000 people, which well exceeds Park City's resident population. This infrastructure includes ski areas, lodging, restaurants, and associated services. Much of this infrastructure consumes energy even during periods of lower occupancy, thereby increasing Park City's per capita emissions even when the population is adjusted to include visitor nights.
- A high-altitude mountain climate – Park City has a high-altitude mountain climate and therefore additional energy is consumed for heating when compared with many areas of the country.

In order to account for some of these factors, a number of potential peer communities or regions were identified based on the availability of GHG inventory data, the presence of a tourism economy, the presence of the ski industry, and similar mountain climates (Table 5). These communities and regions include the following:

- State of Utah – The State of Utah was selected because it encompasses Park City. However, state-wide, there clearly is not the same intensity of tourism economy, ski industry presence, or heating-centric climate that is found in Park City. (http://www.deq.utah.gov/BRAC_Climate/docs/Final_Report/Sec-B-GHG_INVENTORY.pdf)
- City of Aspen, Colorado – Aspen is perhaps the most similar community available for benchmarking GHG emissions. Aspen has completed a comprehensive GHG inventory, features a similarly tourism-centered economy, and has three smaller ski areas within the inventory boundaries and a similar climate. (http://www.canaryinitiative.com/pdf/emission_inventory_2004.pdf)
- Town of Frisco, Colorado – Frisco has also completed a comprehensive GHG inventory, has a prominent tourist economy (though not of the scale of Park City and Aspen), and has a similar high-altitude mountain climate. However, there are no ski areas within the boundary of Frisco's inventory. (http://www.townoffrisco.com/uploadedFiles/Home_and_News/Frisco_News/GreenhouseGasEmissionsInventoryPt.1.pdf)
- Town of Carbondale, Colorado – Carbondale, like Frisco, has a prominent tourism-based component to its economy and a high-altitude mountain climate. It does not have any ski areas within its inventory boundary. (http://www.aspencore.org/carbondale/04_baseline_GHG_report_TOC.pdf)

- La Plata County, Colorado – La Plata County, with the town of Durango as a county seat, has a prominent tourism-based component to its economy and a high-altitude mountain climate. It has a few ski areas within its inventory boundary. The natural gas production industry is also very active in La Plata County, but emissions from that industry are not included in this comparison. (http://co.laplata.co.us/plan/CurrProjects/061208BaselineGreenhouseGasEmissionProfileandForecast.pdf)

Among these relatively similar communities and regions, the GHG inventories compared were conducted in various years between 2004 and 2006. There are also a number of different protocols applied in calculating these inventories (Table 5).

Table 5. GHG Inventories of Peer Communities

| Community | Park City, UT | State of Utah | Aspen, CO | Frisco, CO | Carbondale, CO | La Plata County, CO |
|---|---|---|---|---|---|---|
| **Year of Inventory** | 2005/2007 | 2005 | 2004 | 2006 | 2004 | 2005 |
| **Methodology Applied** | ISO14064/ ICLEI/ Various | EPA State Greenhouse Gas Inventory Tool | Various | Various | ICLEI | ICLEI |
| **Population in Inventory Year** | 8,399 | 2,501,262 | 5,809 | 2,482 | 5,649 | 47,825 |

Figure 19 compares the total emissions presented in each respective inventory divided by the community/region's US Census population for that year to identify per capita emissions. The populations were not adjusted for the impact of tourism because each of these communities has a significant tourism economy. The results of this comparison should be considered with great care as each of these inventories used slightly different approaches and applied different boundaries to the emission sources that were included.

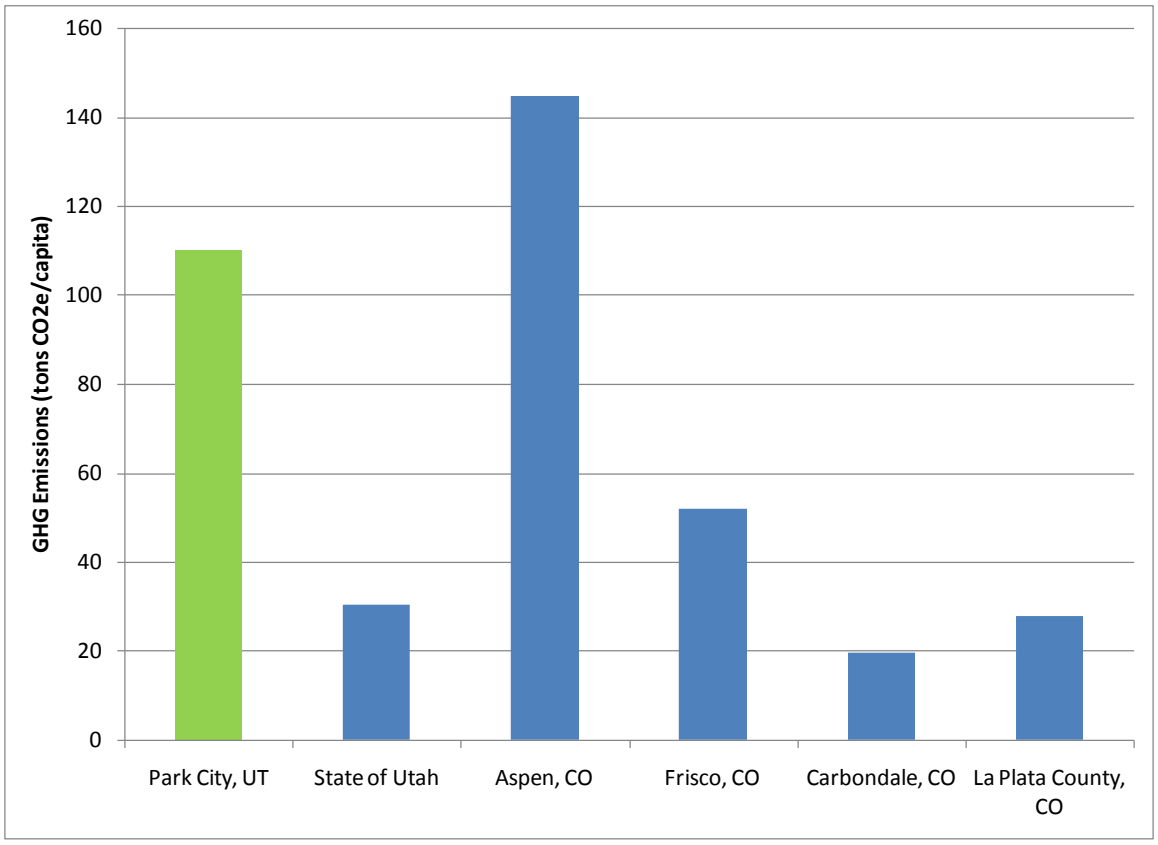



Figure 19. Total Per Capita GHG Emissions Compared to Other Communities and Regions

(NOTE: Boundaries and approaches not necessarily equivalent)

A more relevant comparison might be between the ICLEI supported component of the Park City inventory and the inventories of Carbondale and La Plata County, which also largely applied ICLEI approaches and software (Figure 20). For Park City, the ICLEI supported approach removes certain emission sources from the inventory, predominantly airline transportation, that are not directly supported in the ICLEI CACP software. (See Table 3 for more detail on this distinction.)

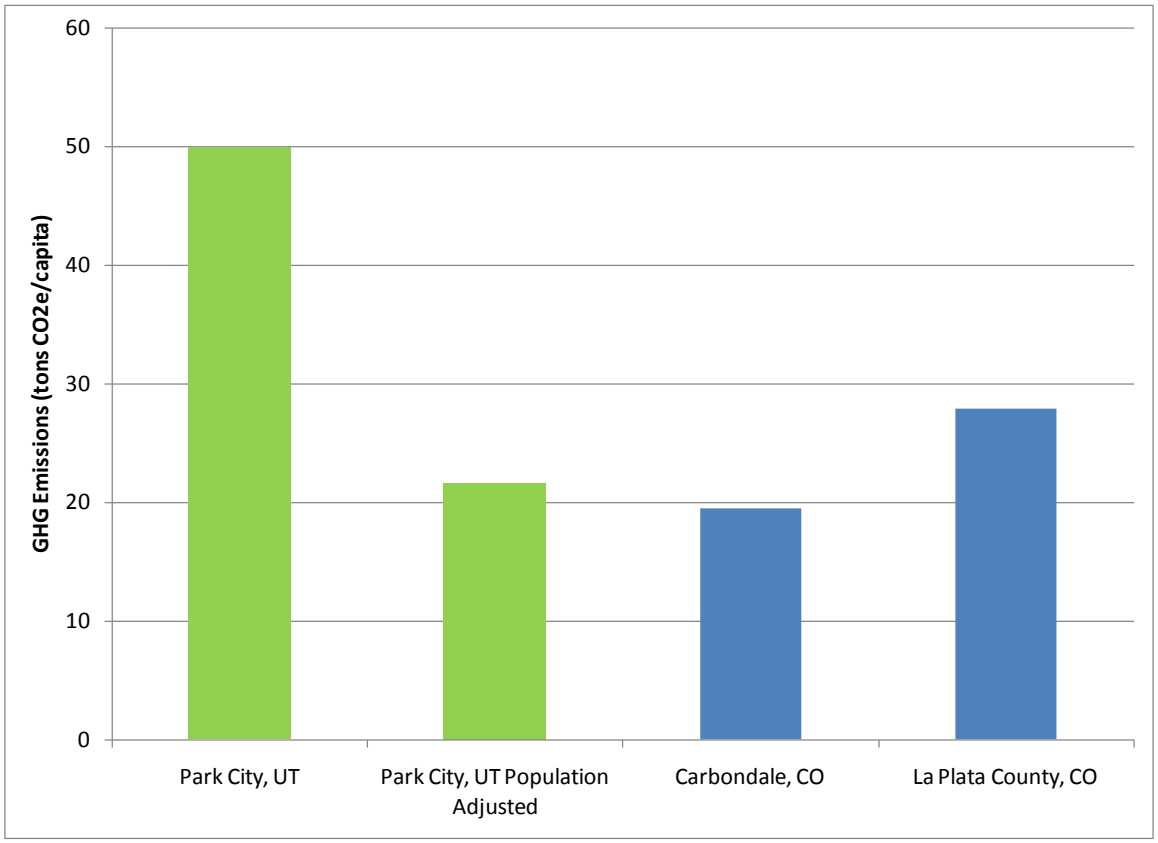



Figure 20. ICLEI Supported Per Capita GHG Emissions Compared to Other Communities and Regions

Under the ICLEI supported comparison represented in Figure 20, Park City's emissions are more consistent with those of other communities. By adjusting for the equivalent full-time resident population that Park City's second home owner and visitor population represents (indicated by the second bar) the difference between these communities is further decreased.

The Park City inventory was also benchmarked against these potential peer communities on specific GHG emission sources, including electricity, natural gas, and on-road transportation.

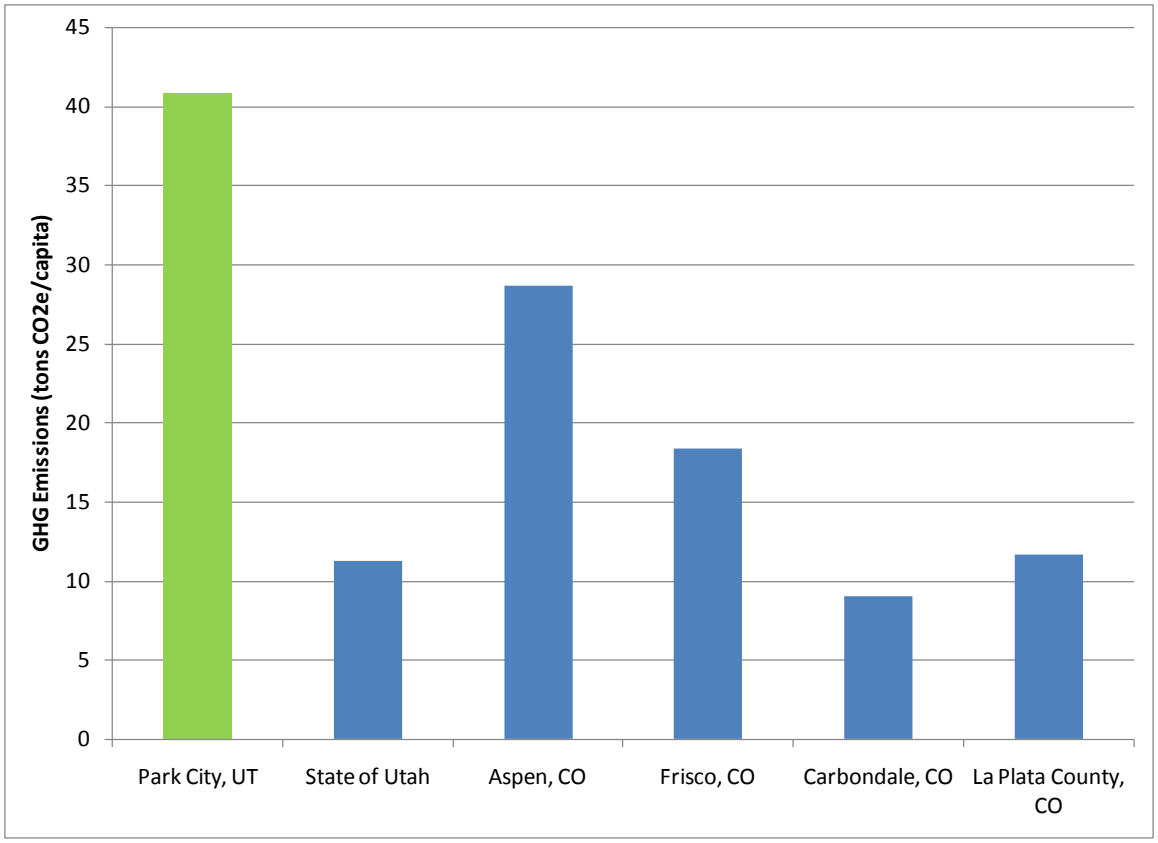



Figure 21. Per Capita GHG Emissions from Electricity Consumption Compared to Other Communities and Regions

As indicated in Figure 21, the tourism dominated economies once again emerge with higher GHG emissions from electricity consumption than those of other communities. Other factors that may influence the differences include the popularity of electricity as a heating source instead of natural gas or propane, the electricity consumption of local industries, and the carbon intensity of the electricity generation portfolios that serve the respective communities. Park City has a higher concentration of ski area acreage served by lifts and snowmaking within its inventory boundary than any of these other communities. Furthermore, Park City's electricity comes predominantly from carbon-intensive coal while Aspen has access to a higher percentage of local, lower carbon hydroelectric resources. So, while Park City's per capita electricity consumption is only 13 percent higher than Aspen's (Figure 22), the resultant difference in GHG emissions, as represented in Figure 21, is about 33 percent.

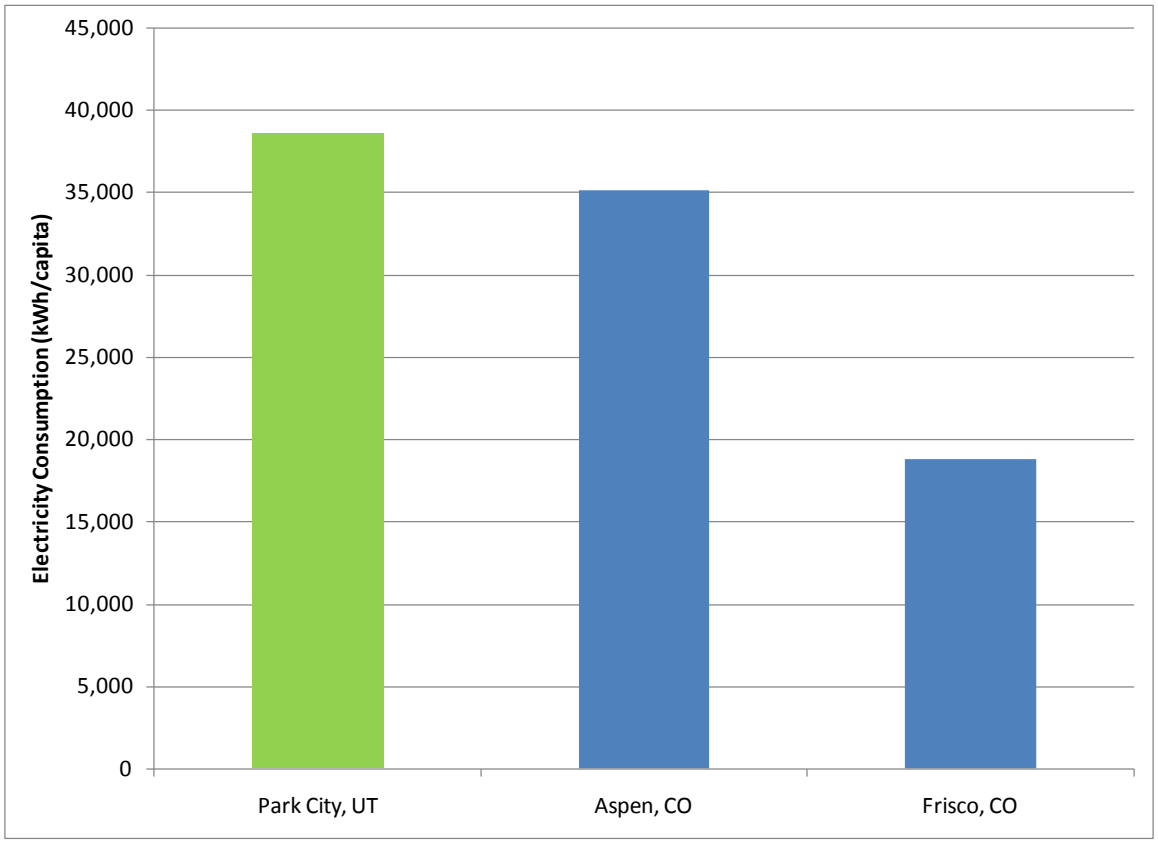



Figure 22. Per Capita Electricity Consumption Compared to Other Communities and Regions

The peer communities are also benchmarked on GHG emissions from natural gas consumption (Figure 23).

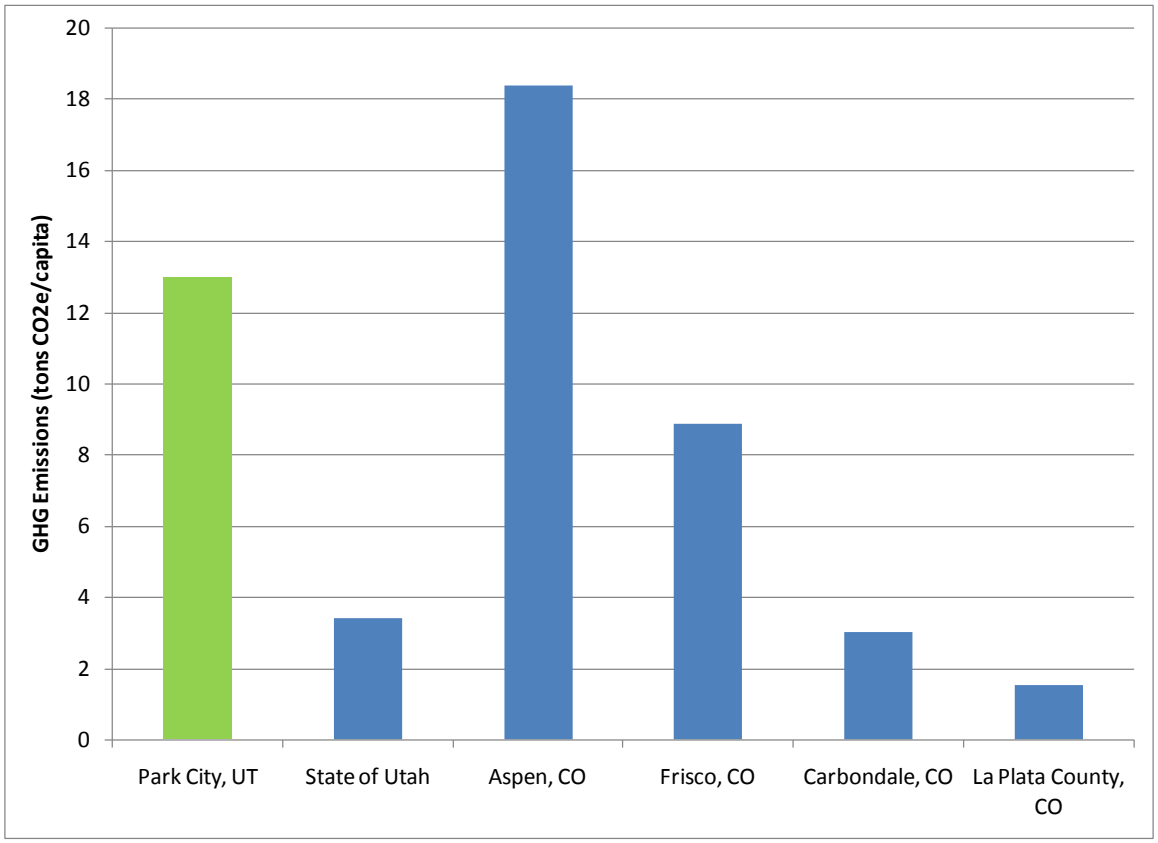



Figure 23. Per Capita GHG Emissions from Natural Gas Consumption Compared to Other Communities and Regions

The differences in per capita GHG emissions from natural gas, as represented in Figure 23, are impacted by similar factors as those affecting the electricity emissions. The popularity of natural gas as a heating energy source when compared with electricity and propane and differences in climate are both possible factors.

Finally, GHG emissions from on-road vehicle transportation provide a last comparison between communities (Figure 24).

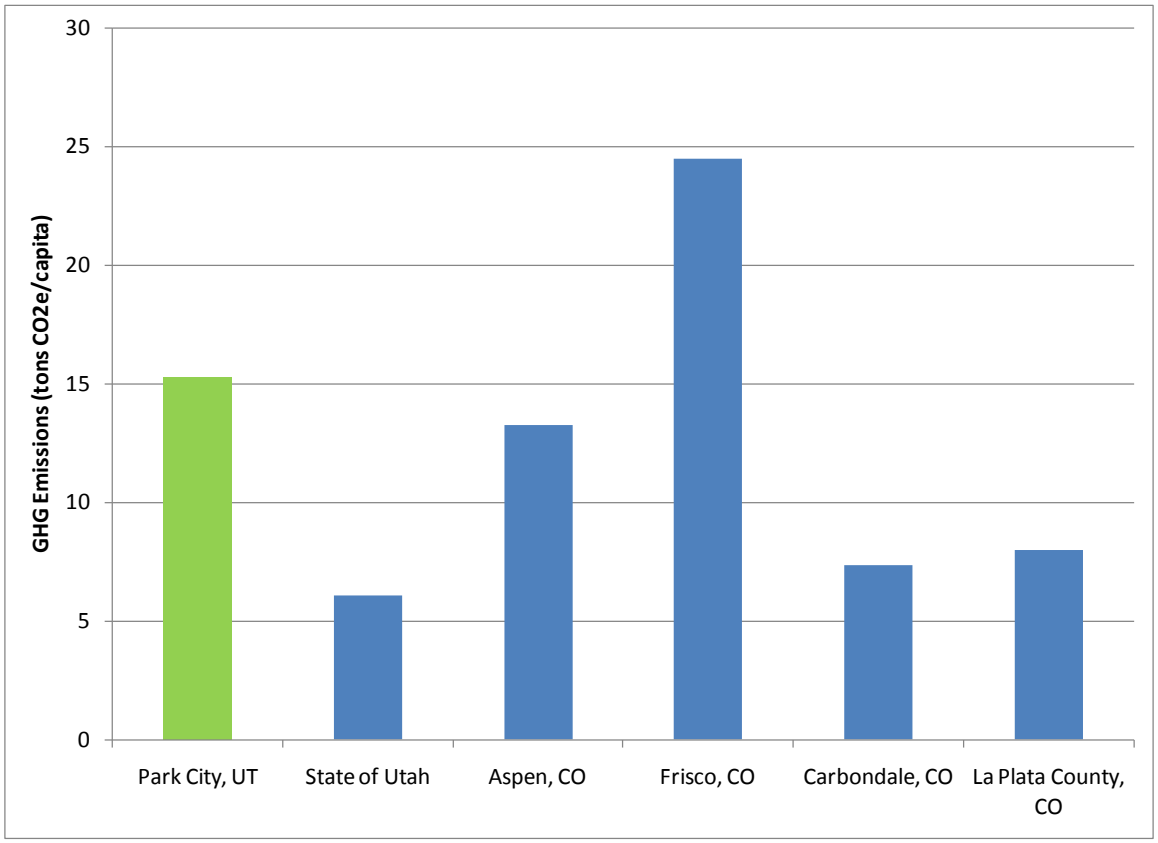



Figure 24. Per Capita GHG Emissions from On-road Transportation Compared to Other Communities and Regions

Once again, as indicated in Figure 24, the per capita GHG emissions of the strongly tourism centered economies are greater than those for the communities and regions that have more diverse economies because of added vehicle traffic from visitors to the community. In this comparison, Aspen and Park City have similar emissions rates per capita. Frisco has higher per capita emissions because a portion of Interstate 70 passes through the inventory boundary.

# 4.0 The Roadmap to Reduction

Building off insights gained from the Community Carbon Footprint (Section 3.0 of this report), the following Roadmap to Reduction provides a pathway for reducing Park City's Community Carbon Footprint. It builds from the momentum of programs and activities already in place within the community and acknowledges Park City's unique qualities, while integrating best practices by other cities in their development of climate action plans. The Roadmap highlights and positions the baseline Community Carbon Footprint as the cornerstone in an ongoing community process of planning, action, monitoring, and revising actions.

## 4.1 Community Carbon Advisory Board

In developing the Community Carbon Footprint and Roadmap for Carbon Reduction, Park City convened a Carbon Advisory Board consisting of knowledgeable and interested stakeholders to help validate the inventory process, identify data sources, document existing community practices that relate to GHG emissions, and develop next steps toward climate protection. As well, the Carbon Advisory Board has played and will play a valuable continuing role in engaging the wider Park City community about the importance and meaning of the Community Carbon Footprint Analysis and Roadmap for Carbon Reduction. The Carbon Advisory Board consists of representatives of several organizations including the following:

- Build Green Utah: www.buildgreenutah.org
- Deer Valley Resort:www.deervalley.com
- Historic Main Street Business Alliance: http://www.rightonmain.org/index.htm
- KPCW: www.kpcw.org
- Mountain Trails Foundation: www.mountaintrails.org
- Park City Board of Realtors: www.pcboardofrealtors.com
- Park City Chamber and Visitors' Bureau: www.parkcityinfo.com
- Recycle Utah: www.recycleutah.org
- Rocky Mountain Power: www.rockymountainpower.net
- Snyderville Basin Water Reclamation District: www.sbwrd.org
- Summit County: www.co.summit.ut.us
- Summit Land Conservancy: www.summitlandconservancy.org
- Sundance Institute: www.sundance.org
- Swaner Eco Center: www.swanerecocenter.org
- The Canyons: www.thecanyons.com

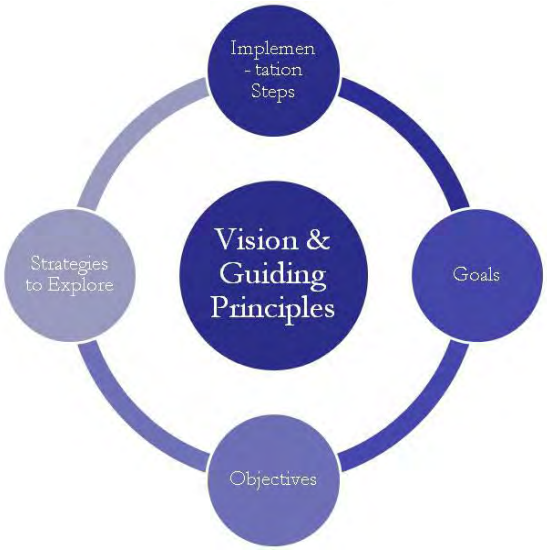
- Park City Mountain Resort: www.parkcitymountain.com
- Park City Municipal Corporation: www.parkcity.org
- Park City Performing Arts Foundation: www.ecclescenter.org
- Park City School District: www.pcschools.us
- Questar: www.questargas.com
- The Park City Foundation: www.theparkcityfoundation.org
- The Park Record: www.parkrecord.com
- Uinta Headwaters RC&D: www.uintaheadwaters.org
- Utah Moms for Clean Air: www.utahmomsforcleanair.org

## 4.2 Park City's Actions to Date

The Roadmap builds off of the many Park City initiatives that are already planned and/or underway and are beneficial elements for reducing GHG emissions. These include the following:

- An existing walking and cycling promotion program.
- Strong participation in available green energy purchase programs.
- A Buy Local program to promote patronage of local businesses, thereby reducing community Vehicle Miles Traveled (VMTs).
- Ongoing work on a cleaner mass transit alternative between Salt Lake City and Park City.
- Removal of barriers to renewable energy development from the municipal code.
- Ongoing work on developing and meeting GHG goals for City operations.
- Progress on developing a community carbon web site to provide guidance, tools, and motivation to residents and businesses to take actions to reduce their GHG emissions.
- Incorporation of environmentally sustainable building practices and systems into municipal construction projects.
- Progress on a student trip reduction program to promote carpooling, bike to school days, and similar activities.
- A Municipal Corporation fleet anti-idling program, with a school anti-idling program in progress.
- Maximized fuel efficiency of transit service through scheduling and route planning.
- Ongoing work to develop a new near net-zero community housing project.

## 4.3 Framework for Continuing Progress




Park City already has several valuable programs and organizational components in place for addressing climate change in the community. The purpose of the Roadmap is to provide a framework for linking these existing components and building on additional needs to reduce the community's carbon footprint on a systematic and comprehensive scale. This framework can also be used to eventually create a more detailed climate action plan that would ultimately include additional community input along with a quantitative assessment and prioritization of reduction strategies, funding scenarios, a phasing plan for adopting policy measures, and roles and responsibilities for ongoing monitoring and reporting.

Based on the continuous improvement model (plan, do, check, act) as well as approaches employed by other cities embarking on local climate action plans, the following framework is provided as a guide for Park City:

- A unifying shared vision and guiding principles.
- Short and long-term goals for reducing community GHG emissions.
- More specific objectives to meet these goals.
- Specific strategies that support each goal.
- Implementation steps for moving forward.
- A process for monitoring and reporting results.

## 4.4 Process

To engage the Carbon Advisory Board in dialogue and in developing the roadmap, three meetings were held in 2008-2009. The first meeting served as a kickoff and introduction to board members, while the second meeting focused on a review of the draft community GHG inventory and a discussion of next steps in developing the Roadmap. The third meeting involved reviewing the Roadmap goals, objectives, and recommended strategies that were developed in part via three web-based surveys administered to members. Topics of each survey are described below:

**Survey 1:** Survey 1 focused on developing a shared vision and core values for the Roadmap among board members. The purpose of this survey was to start to shape a shared picture for what a successful carbon reduction roadmap looks like, with an emphasis on the underpinning philosophies and community values that drive the roadmap.

**Survey 2**: The purpose of Survey 2 was to obtain input from board members on possible scenarios that would lead Park City toward meeting the recommended goal of 15 percent reduction over the 2005 baseline by 2020. This was the goal board members most strongly identified with in Survey 1. Laying out 16 objectives designed to put Park City on a path to meet this goal, the survey allowed respondents to select the appropriate level of aggressiveness on each objective. These objectives were grouped into the following categories:

- Community Leadership
- Transportation and Land Use
- Energy Use
- Energy Supply
- Waste Reduction and Diversion
- Cross-cutting Issues (e.g., adaptation, water)
- Carbon Offsets

**Survey 3:** The purpose of the final survey was to allow board members to help identify possible strategies to meet the 16 objectives outlined in Survey 2. Potential strategies were compiled from successful strategies in other communities, Board responses to Surveys 1 and 2, and knowledge of Park City's unique inventory and circumstances.

For each strategy, the survey qualitatively assessed the magnitude of the GHG reduction from implementing the strategy (high-medium-low) as well as the feasibility (political,

financial, technical) of implementation (high-med-low). This assessment was based on reported strategies from other communities and a basic judgment about their replicability for Park City. Each strategy was also identified by type (regulatory, incentive, direct action, or education) and the particular topic area the strategy would support (energy, transportation, waste, etc.).

Carbon Advisory Board members were presented with a total of 63 different strategies. A multi-voting technique was used to determine areas of top interest and priority to the group. From the Board's responses, the top 21 strategies were identified.

## 4.5 Vision and Guiding Principles

Fort Collins Climate Task Force: Sample Vision Statement

*"Fort Collins will be a carbon neutral, environmentally sustainable, economically healthy community that offers its citizens a high quality of life. We will build on our culture of 'heroic pragmatism' to lead by example and do our part to thwart the known global environmental threat of climate change. We are inspired to action now so that as future generations look back on this period, they too can be inspired and know that we did everything in our power to create a future world that is thriving, vibrant, sustainable and full of possibility."*

A vision consists of a shared community statement about what the future success of implementing the Roadmap looks like, including guiding principles for conducting itself along the way and other expected co-benefits from coming together to address the global challenge of climate change at the community level. How should government and community actions be balanced? What is the appropriate mix of short- and long-term strategies? What is the right mix of mandates versus incentives?

Board members were surveyed about these and other fundamental questions to help shape a shared vision and guiding principles for the Roadmap. Overall, board members felt that the Park City community should apply itself at significant effort and cost to addressing climate change. A majority of board members also felt that Park City Municipal Corporation's role in providing government policy and leading by example should be significant.

Based on Board input, the following suggested vision statement is offered for the Roadmap:

*"The Park City community is committed to applying significant effort to combat the causes of climate change and to reduce its greenhouse gas emissions. Reducing our carbon footprint is our responsibility as citizens of the nation and the world. Working together, using our community spirit, innovation, and environmental passion, we will ensure for future generations the environmental protection, economic prosperity, and quality of life that makes Park City unique."*

To support this vision, board members offered input to develop the following recommended guiding principles:

- The municipality will be a strong partner in efforts to reduce community GHG emissions, leading by example and providing policy guidance while promoting personal accountability and community responsibility.
- Park City should explore a range of regulations and incentives to reduce GHG emissions.
- Transparency and technical credibility should be maintained throughout the process.
- Park City should be a leader to help other ski communities address climate change.
- Education is key in determining what level of commitment Park City makes to reducing its impacts on climate change.

The vision and these guiding principles anchor the remaining components of the Roadmap and provide direction for developing goals, implementing strategies, creating partnerships, and involving the community in moving the Roadmap forward.

## 4.6 Goals

Numerous collaborations and regions throughout the world are inventorying their GHG emissions and setting reduction targets. These reduction targets unify communities around a common goal and provide a context for developing appropriate strategies to achieve GHG reductions. A few relevant targets are presented in Figure 25 below, as well as the implications for Park City should it choose to adopt one of these target goals. In the first survey, a majority of board members supported pursuing a goal of 15 percent reduction below 2005 emissions by 2020, which is in alignment with the goals established by the Western Climate Initiative. See Appendix D of this report for the methodology used in forecasting Park City's GHG emissions and determining reductions necessary to meet the following targets.

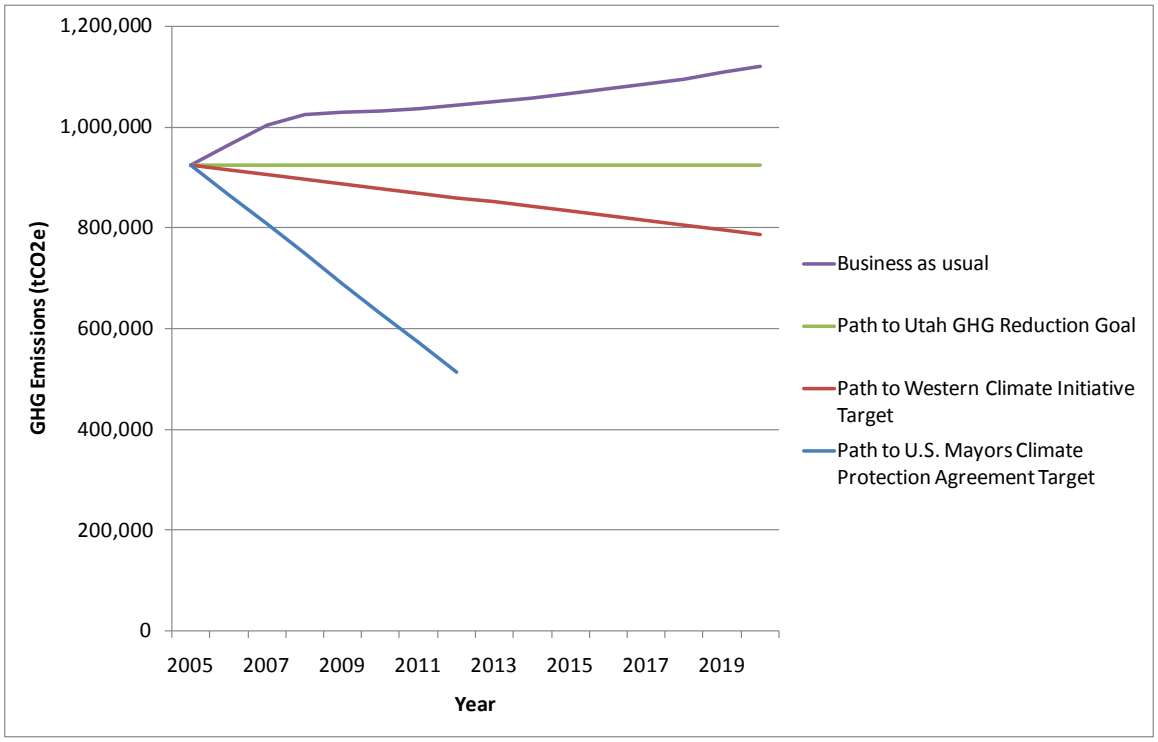



Figure 25. Forecast Park City GHG Emissions and Possible Reduction Targets

## US Mayors Climate Protection Agreement

In May 2005, with the support of City Council, Mayor Dana Williams of Park City signed the US Mayors Climate Protection Agreement. The Agreement urges federal and state governments to take action to meet or exceed the target of reducing GHG emissions to 7 percent below 1990 levels by 2012.

Park City's GHG emissions in 1990 were estimated by determining per capita emissions in 2005 or 2007 and applying those per capita rates to the community's population in 1990. To achieve this reduction target, Park City would need to reduce emissions in 2012 to approximately 514,000 tCO2e. This represents a reduction of 45 percent over projected emissions in 2012.

## Western Climate Initiative

In 2007, the Western Climate Initiative was launched by the Governors of Arizona, California, New Mexico, Oregon, and Washington to collaborate in developing regional strategies to address climate change. The Initiative has established a goal of reducing emissions by 15 percent below 2005 levels by 2020.

To achieve this reduction target, the Park City community would need to reduce projected emissions in 2020 to approximately 785,000 tCO2e. This represents a reduction of 30 percent over projected emissions in 2020.

### Utah Greenhouse Gas Reduction Goal

The Utah Greenhouse Gas Reduction Goal was proposed by the Blue Ribbon Advisory Council on Climate Change. It sets an interim target of reducing Utah's emissions to 2005 levels by 2020 (Appendix B).

To achieve this reduction target, the Park City community would need to reduce projected emissions in 2020 to approximately 924,000 tCO2e. This represents a reduction of 17 percent over projected emissions in 2020.

## 4.7 Objectives by Sector

To achieve the goal of reducing emissions 15 percent below 2005 emissions by 2020, the Board examined the potential benefits of reducing emissions across six major categories:

1. community leadership,
2. transportation and land use,
3. energy use,
4. energy supply,
5. waste reduction and diversion, and
6. carbon offsets.

A series of 16 objectives were then developed based on the work of other communities, input from the Carbon Advisory Board, and application of Park City's unique conditions (Table 6).

Table 6. Proposed Objectives to Reduce GHG Emissions

| Proposed Objective | Primary Sector Addressed |
|---|---|
| **Community Leadership** | |
| Develop frameworks within local government to assure that GHG emissions are considered in decision making (not quantified). | Municipal Operations |
| Educate individuals in the community on their contributions to community emissions and support them in efforts to reduce emissions (goal/assumption: 2% reduction of residential energy portion of inventory). | Residential |

| | |
|---|---|
| | |
| Form a strong partnership with local businesses on reducing emissions (goal/assumption: 10% reduction of commercial energy portion of inventory). | Commercial |
| **Transportation and Land Use** | |
| Reduce the vehicle miles traveled by residents and visitors through continued promotion and development of transit services and land-use planning (goal/assumption: 2% reduction in VMT). | Residents, Visitors |
| Create a mass transit-oriented transportation alternative from Salt Lake City (goal/assumption: 10% reduction in visitor VMT). | Visitors |
| Increase the fuel efficiency of vehicles in Park City (goal/assumption: 2% reduction in vehicle emissions). | All |
| Reduce air travel by residents through education and remote work infrastructure (goal/assumption: 4% reduction in resident airline travel). | Residential, Commercial |
| **Energy Use** | |
| Require all new construction (commercial & residential) to be 20% more energy efficient than code. | Residential, Commercial |
| Encourage and incentivize existing building owners (commercial & residential) to reduce energy use by 20% below 2005 levels. | Residential, Commercial |
| **Energy Supply** | |
| Generate and/or purchase 25% of Park City's community electricity from renewable resources by 2020 (goal/assumption: more aggressive than Utah target of 20% renewables by 2025). | All |
| **Waste Reduction and Diversion** | |
| Achieve overall solid waste diversion rate of 50% by 2020 (goal/assumption: from Summit County Integrated Solid Waste Master Plan). | All |
| **Carbon Offsets** | |
| Provide a reliable, effective, and preferably local option to offset GHG emissions (goal/assumption: assumed to provide remainder of reductions to achieve goal, about 9% in this scenario). | All |

Figure 26 illustratively shows how applying these objectives across the six major categories can cumulatively contribute to Park City achieving the GHG reduction target of 15 percent below 2005 levels by 2020. A more or less aggressive approach to any of these objectives

can qualitatively demonstrate how GHG efforts can be allocated between categories to identify alternative paths to achieving the proposed goal.

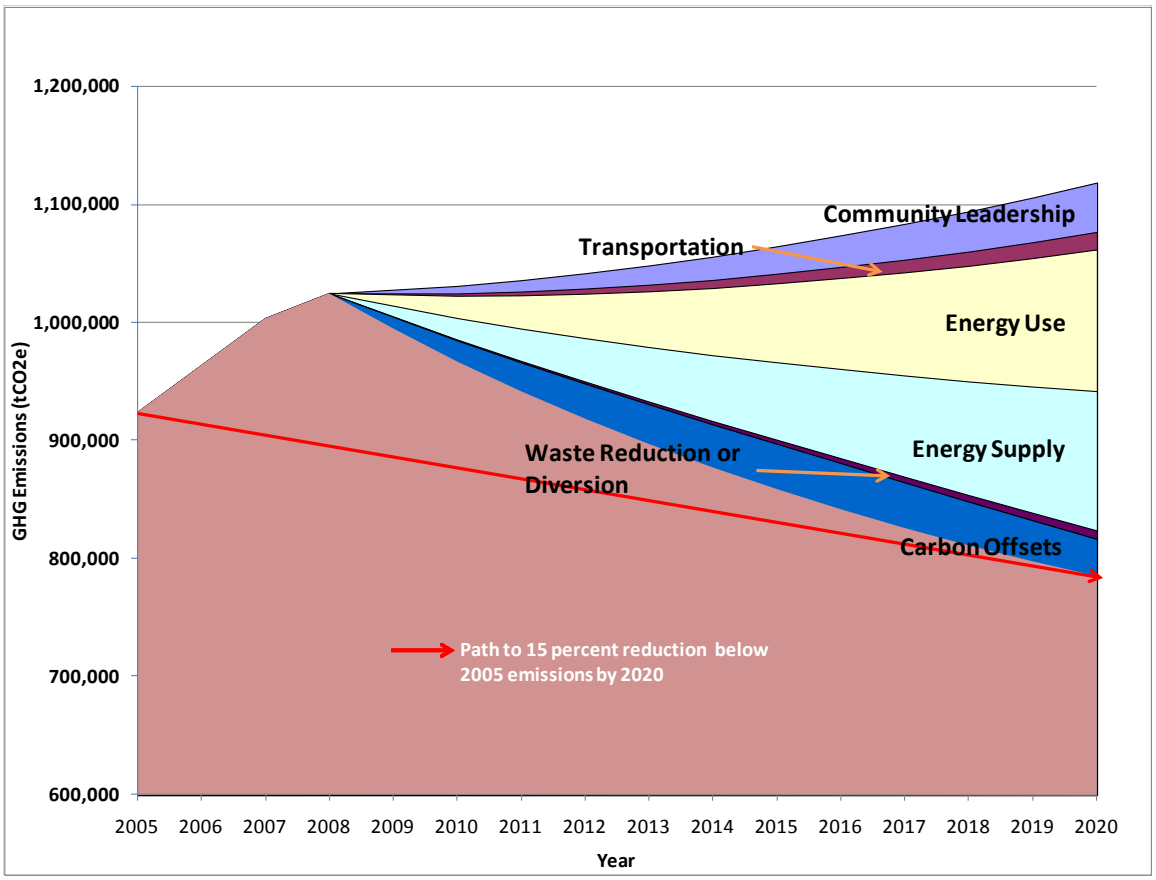



Figure 26. Park City GHG Emissions and Illustrative Roadmap Objectives

## 4.8 Strategies

Finally, to achieve these 16 objectives, a total of 63 potential strategies were identified and qualitatively evaluated for their potential to reduce GHG emissions and help meet the goal of reducing emissions by 15 percent below 2005 levels by 2020 across the 6 primary categories. These strategies represent a mix of strategy types, including direct actions, education, incentives and regulation, covering all sectors contributing to Park City's GHG emissions.

These 63 strategies were initially qualitatively screened for their potential to reduce GHG emissions, in tons, by 2020 (low-medium-high) as well as for their feasibility in terms of political, technical, financial, and other terms (low-medium-high). From this screening and feedback from the Board, a total of 21 priority strategies were identified for inclusion in the Roadmap (Table 7).

While these strategies have varying costs and implementation challenges associated with them, many will also result in cost savings from increases in efficiency as well as several other co-benefits. For example, residential and commercial energy assessments can reduce energy costs for heating, cooling, and lighting. Greater vehicle fuel efficiency will lead to reduced costs for fuel use. A more diverse energy supply for the community can help to reduce loads on the electrical transmission system and reduce the need to build more power plants. More efficient energy use and use of cleaner fuels will benefit air quality. Finally, all of these and other strategies together can provide opportunities for Park City's efforts to be recognized regionally, at the state level and nationally.

Table 7. Proposed Roadmap Strategies

| **Number** | **Strategy Name** | **Category** | **Type** | **Tons CO2e Reduced in 2020** | **Feasibility by 2020** (political, technical, implementation, financial) |
|---|---|---|---|---|---|
| 1 | Develop community-wide climate challenge: personal, per capita GHG reduction targets, specific challenges (e.g., replace incandescent light bulbs with CFLs) | Community Leadership | Incentive | Medium | Medium |
| 2 | Offer free residential energy assessments | Community Leadership | Incentive | Medium | Medium |
| 3 | Provide low- or no-cost commercial building energy, water, solid waste assessments/audits | Community Leadership | Incentive | Medium | High |
| 4 | Work with Rocky Mountain Power to develop enhanced Blue Sky program - more renewable energy generation in Park City (premium tier that brings funds back to Park City) | Energy Supply | Action | Medium | Medium |
| 5 | Partner with utilities, state to offer building operator training on energy management for larger businesses | Community Leadership | Education | Medium | High |

| Number | Strategy Name | Category | Type | Tons CO2e Reduced in 2020 | Feasibility by 2020 (political, technical, implementation, financial) |
|---|---|---|---|---|---|
| 6 | Target education and incentives at second home owners to reduce energy - e.g., improved occupancy-based controls | Energy Use | Incentive | Medium | High |
| 7 | Expand existing utility rebates/incentives - collaborate with potential funding organizations | Energy Use | Incentive | Medium | Medium |
| 8 | Increase awareness of existing utility rebate programs | Energy Use | Incentive | Low | High |
| 9 | Encourage residential and commercial smart metering - electrical meters to provide real-time energy consumption | Energy Use | Action | Medium | Medium |
| 10 | Use community carbon web site to promote neighborhood "meetups" to discuss ideas, challenges for reducing emissions | Community Leadership | Incentive | Low | High |
| 11 | Pursue direct power purchase options with Rocky Mountain Power for renewable energy | Energy Supply | Action | High | Medium |
| 12 | Incorporate GHG goals into land use planning - evaluate land use impacts on GHG emissions | Transportation and Land Use | Action | Medium | Medium |
| 13 | Work with Rocky Mountain Power to benchmark individual energy use on utility bills, carbon web site with that of neighbors, neighborhood to encourage conservation | Energy Use | Incentive | Low | Medium |

| Number | Strategy Name | Category | Type | Tons CO2e Reduced in 2020 | Feasibility by 2020 (political, technical, implementation, financial) |
|---|---|---|---|---|---|
| 14 | Develop employee outreach program focused on large employers | Community Leadership | Incentive | Medium | Medium |
| 15 | Develop tiered rates for energy use - work with Rocky Mountain Power | Energy Use | Action | Medium | Medium |
| 16 | Develop community revolving grant/loan program for energy efficiency projects | Energy Use | Incentive | Low | Medium |
| 17 | Engage largest employers to expand commercial recycling | Waste Reduction and Diversion | Action | Low | High |
| 18 | Encourage Rocky Mountain Power to fund local Smart Grid pilot project | Energy Use | Action | Low | Medium |
| 19 | Provide incentives for participation in green building labeling system for existing, leased, and new buildings (e.g., ENERGY STAR, LEED, Built Green, NAHB, etc.) | Energy Use | Incentive | Low | high |
| 20 | Provide incentives for residential and commercial renewable energy (e.g., tax credits, rebates) | Energy Use | Incentive | Low | Medium |
| 21 | Develop shared community teleconferencing facility to host meetings, encourage reduced air travel | Transportation and Land Use | Incentive | Medium | Medium |

These strategies are discussed in more detail below:

**Strategy 1: Develop community-wide climate challenge: personal, per capita GHG reduction targets, specific challenges (e.g., replace incandescents with CFLs)**

| | | |
|---|---|---|
| **Type:** Incentive | **GHG Reductions:** Medium | **Feasibility:** Medium |

This strategy consists of developing a Park City Community Climate Challenge, an incentive program focusing a broad-based educational campaign to promote personal GHG reductions. Such a challenge could be tailored to focus on various sectors in the community: youth, the lodging industry, neighborhoods, and other identifiable community groups. Park City's planned Community Carbon & Water Web Site could support the campaign with information, links, and tracking tools.

**Strategy 2: Offer Free or Low Cost Residential Energy Assessments**

| | | |
|---|---|---|
| **Type:** Incentive | **GHG Reductions:** Medium | **Feasibility:** Medium |

Under this strategy, Park City could offer free energy assessments to residents or develop an arrangement where the resident would only pay a small portion of the cost of the assessment. Following each assessment, residents would be provided with opportunities to reduce their energy use by conducting lighting upgrades, HVAC improvements, and other measures. With approximately 3,100 full-time resident households in Park City, a program that reached 100 homes per year could address approximately one-third of Park City's residential units by 2020.

**Strategy 3: Provide low- or no-cost commercial building energy, water, solid waste assessments/audits**

| | | |
|---|---|---|
| **Type:** Incentive | **GHG Reductions:** Medium | **Feasibility:** High |

This strategy would consist of a voluntary business outreach program that offers technical assistance and recognition to business partners who reduce their GHG emissions and report progress. Technical assistance could consist of onsite assessments and/or other technical support to help businesses identify and reduce their GHG emissions through increased energy and water efficiency and an increase in solid waste diversion rates. Personnel and resources would be required to provide direct hands-on assistance to partners. There may be potential to leverage existing assessment programs run by Rocky Mountain Power and Questar.

**Strategy 4: Work with Rocky Mountain Power to develop enhanced Blue Sky program - more renewable energy generation in Park City (premium tier that brings funds back to Park City).**

| | | |
|---|---|---|
| **Type:** Action | **GHG Reductions:** Medium | **Feasibility:** Medium |

Rocky Mountain Power's Blue Sky program allows customers to pay additional costs on their monthly utility bill to purchase renewable energy. This program has a high participation rate in the Park City community. Under this strategy, Park City would work with Rocky Mountain Power to develop an expanded/enhanced Blue Sky program to fund additional renewable energy projects in Park City by allowing customers to pay a premium to bring more renewable energy to Park City.

**Strategy 5: Partner with utilities, state to offer building operator training on energy management for larger businesses**

| | | |
|---|---|---|
| **Type:** Education | **GHG Reductions:** Medium | **Feasibility:** High |

Larger businesses can benefit from training facility managers on how to improve energy management practices, such as scheduling, optimizing use of existing equipment, and load management. Such training could be delivered by qualified energy managers in the region or through partnerships with Rocky Mountain Power and Questar without significant commitment of additional resources by the Municipal Corporation.

**Strategy 6: Target education and incentives at second homeowners to reduce energy - e.g., improved occupancy-based controls.**

| | | |
|---|---|---|
| **Type:** Incentive | **GHG Reductions:** Medium | **Feasibility:** High |

This strategy would target the community's second home owners with education and incentives to reduce energy. Due to the intermittent nature of second home occupancy, this strategy assumes that there are opportunities to promote technologies like programmable thermostats that can be adjusted to home occupancy, as well as interior and exterior lighting controls, and basic homeowner energy management best practices.

**Strategy 7: Expand existing utility rebates/incentives - collaborate with potential funding organizations.**

| | | |
|---|---|---|
| **Type:** Incentive | **GHG Reductions:** Medium | **Feasibility:** Medium |

Under this strategy, Park City would work with Rocky Mountain Power and Questar to partner with organizations that can provide supplemental funding to expand utility rebates and incentives to customers for increasing energy efficiency.

**Strategy 8: Increase awareness of existing utility rebate programs**

| | | |
|---|---|---|
| **Type:** Incentive | **GHG Reductions:** Low | **Feasibility:** High |

Rocky Mountain Power and Questar currently provide rebates to customers for appliances and lighting, home improvement, and heating and cooling. This strategy would ensure that residents are aware of available rebates through increased dissemination of rebate program information. The Community Carbon & Water website can assist in increasing awareness of these programs.

**Strategy 9: Implement residential and commercial smart metering to promote awareness of real-time energy consumption.**

| | | |
|---|---|---|
| **Type:** Action | **GHG Reductions:** Medium | **Feasibility:** Medium |

Under this strategy, smart meters would be installed for commercial and residential customers. Smart meters allow customers to take actions and better manage electricity use and costs, and they provide more detailed information on electricity use patterns. Smart meters can provide additional benefits, including sending notification when a customer's bill reaches a certain amount and controlling smart appliances in homes or businesses through the Internet.

**Strategy 10: Use the community carbon web site to promote neighborhood face-to-face meetups to discuss ideas, challenges for reducing emissions.**

| | | |
|---|---|---|
| **Type:** Incentive | **GHG Reductions:** Low | **Feasibility:** High |

Face-to-face neighborhood meetup groups are increasingly being used to encourage dialogue and exchange of ideas for reducing GHG emissions and increasing resource efficiency. Such a program would complement Park City's planned Community Carbon & Water web site, which will provide individuals ways to measure their GHG emissions as well as ideas for reducing emissions.

**Strategy 11: Pursue direct power purchase options with Rocky Mountain Power for renewable energy**

| | | |
|---|---|---|
| **Type:** Action | **GHG Reductions:** High | **Feasibility:** Medium |

In addition to allowing individual residents and businesses to participate in an expanded Blue Sky program with Rocky Mountain Power, this strategy would entail Park City purchasing

renewable energy directly from Rocky Mountain Power. This action could result in significant reductions of community GHG emissions.

**Strategy 12: Incorporate GHG emission goals into land use planning to help evaluate land use impacts on GHG emissions.**

| | | |
|---|---|---|
| **Type:** Action | **GHG Reductions:** Medium | **Feasibility:** Medium |

Differing land use and growth patterns can vary in their impacts on GHG emissions. Lower density development may require more infrastructure investment and lead to greater impacts from VMT. Factoring these impacts and their associated GHG emissions into land use planning could help to reduce community GHG emissions from future development.

**Strategy 13: Work with Rocky Mountain Power to add individual energy use to utility bills and the Community Carbon Web Site to allow benchmarking with neighbors and encourage conservation.**

| | | |
|---|---|---|
| **Type:** Incentive | **GHG Reductions:** Low | **Feasibility:** Medium |

Select utilities in the country are now providing additional information on customer utility bills that compares their energy consumption to that of their neighbors. Under this strategy, Park City would work with Rocky Mountain Power and Questar to provide such information. Such benchmarking information has been shown to motivate some customers to reduce their energy consumption.

**Strategy 14: Develop an employee outreach and education program focused on large employers.**

| | | |
|---|---|---|
| **Type:** Incentive | **GHG Reductions:** Medium | **Feasibility:** Medium |

In addition to working directly to train facility managers, outreach and education for employees can also help reduce resource consumption and associated GHG emissions. Such programs could include business or building energy challenges whereby employees in a building or business compete against other buildings or businesses to reduce energy use over a period of time. Such a program could also include individual best practices, such as equipment power management settings on computers and other equipment.

**Strategy 15: Work with Rocky Mountain Power to develop tiered rates for energy use.**

| | | |
|---|---|---|
| **Type:** Action | **GHG Reductions:** Medium | **Feasibility:** Medium |

Under a tiered energy use rate structure, the more energy a customer used, the more they would pay per kilowatt-hour of electricity use. Each household or business would be allocated a specific amount of electricity use per month in Tier 1. Once that consumption threshold is exceeded, electricity use would be charged at a second, higher tier rate. Such a structure would help to reduce electricity consumption and associated GHG emissions.

**Strategy 16: Develop a community revolving loan program for energy efficiency projects.**

| | | |
|---|---|---|
| **Type:** Incentive | **GHG Reductions:** Low | **Feasibility:** Medium |

Under this strategy Park City would establish a community grant or revolving loan fund to provide funding for community energy efficiency projects. Seeded with one-time funding, such a program would be sustained by savings from investments in efficiency project. Cost savings from efficiency gains would be split between the applicant and the fund until the cost of the project is repaid. After that time, the applicant would benefit from ongoing annual savings.

**Strategy 17: Engage Park City's largest employers to expand commercial recycling.**

| | | |
|---|---|---|
| **Type:** Action | **GHG Reductions:** Low | **Feasibility:** High |

Commercial recycling activities would be expanded under this strategy, thereby reducing emissions by increasing solid waste diversion rates. Park City would collaboratively work with large employers, private waste & recycling haulers, and Recycle Utah to develop and implement such a program.

**Strategy 18: Encourage Rocky Mountain Power to fund a local Smart Grid pilot project.**

| | | |
|---|---|---|
| **Type:** Action | **GHG Reductions:** Low | **Feasibility:** Medium |

Smart Grid technologies are emerging to more effectively manage electricity use and integrate distributed and renewable energy technologies into local and regional electricity grids. Several utilities around the country have embarked on pilot smart grid projects to test technologies in an effort to increase energy efficiency and reduce GHG emissions. Under this strategy, Park City would work with Rocky Mountain Power and other stakeholders to develop and implement a Smart Grid pilot project.

**Strategy 19: Provide incentives for participating in green building labeling programs for existing, leased, and new buildings (ENERGY STAR, LEED, Built Green, etc.)**

| | | |
|---|---|---|
| **Type:** Incentive | **GHG Reductions:** Low | **Feasibility:** High |

Participating in existing state and national level green building labeling/certification programs can encourage high performing, resource efficient new building construction and renovation projects, helping to reduce GHG emissions. While Park City is largely built out, this strategy would encourage green building in both new and existing buildings by providing incentives such as education, recognition, or assistance with labeling/certification.

**Strategy 20: Provide incentives for residential and commercial renewable energy (e.g., tax credits, rebates).**

| | | |
|---|---|---|
| **Type:** Incentive | **GHG Reductions:** Low | **Feasibility:** Medium |

Park City's existing utility currently provides minimal incentives for direct residential or commercial renewable energy projects. Under this strategy, Park City could work with utilities to develop such an incentive program as well as explore a means to fund and promote it in Park City to encourage more solar PV, solar thermal, wind, and other renewable energy projects.

**Strategy 21: Develop a shared community teleconferencing facility to host meetings and reduce air travel.**

| | | |
|---|---|---|
| **Type:** Incentive | **GHG Reductions:** Medium | **Feasibility:** Medium |

Some residents of Park City routinely travel by air for business purposes, resulting in as much as 5 percent of Park City's GHG emissions. Under this strategy, the Municipal Corporation would take the lead on developing a shared community teleconferencing facility to provide an alternative to business air travel.

## 4.9 Implementation

While the 21 strategies in the Roadmap lay the groundwork for a concerted program to reduce Park City's GHG emissions, at this stage they do not include quantitative analyses of reduction in tons of $CO_2e$. A next step toward implementation would be to calculate the GHG reduction benefits with individual measures so that an aggregated, quantifiable GHG reduction target with interim milestones can be established.

In addition, Park City must consider the additional resources necessary to carry out these strategies, from increased staffing to administer new programs to new sources of funding.

## 4.10 Measuring Progress Toward Emission Targets

The role of the Community Carbon Footprint and Roadmap to Reduction in measuring future progress toward emission targets should be considered in light of other factors that can cause year-to-year variation in emissions. Annual variations in the inventory caused by weather, changes in the economy, fluctuations in commercial activity, and other factors generally create a level of uncertainty that will obscure the impact of most individual GHG reduction activities. Only a concerted, community-wide effort across many source categories taken in aggregate will produce the magnitude of reductions that will be readily discerned at the inventory level.

Once quantitative measures are developed, a hybrid approach can be applied that maintains an updated inventory as well as estimating the GHG reduction impacts on a measure-by-measure basis. A frequently updated inventory can help to identify trends in Park City emissions that may impact the outcome of an adopted target and will, if concerted efforts at reduction take place, reveal progress toward that target. Simultaneously, the aggregated impacts of individual measures that Park City adopts to achieve emission reductions should be tracked to more directly measure the success of the many strategies that will likely comprise a successful climate action plan. The IMS and CACP tools are designed to accommodate ongoing updates of the inventory as well as to track common GHG reduction measures.

## 4.11 Reporting

In October 2008 Park City began working with the international Carbon Disclosure Project (CDP) to report its GHG reduction activities. The CDP is an independent non-profit organization that has been acting as an intermediary between shareholders and corporations on all climate change related issues, providing primary climate change data from the world's largest corporations to the global market place. Under the new CDP Cities Program, at least 30 cities in the US will use the CDP system to assess their carbon footprint and better understand the risks and opportunities posed by climate change. The CDP is partnering on the project with ICLEI - Local Governments for Sustainability USA, an international association of local governments, which is driving emissions reductions and sustainable development with more than 450 members in the US. Each city will assemble comparable carbon emissions data within their jurisdiction's operations and follow CDP systems to assess and disclose climate change-related risks and opportunities relating to the whole city.

# Appendix A: Maintenance of the Inventory

Aside from this written report, the Park City Inventory deliverable includes all the data files, spreadsheets, documentation, and CACP data files necessary for the ongoing maintenance of the inventory. The purpose of this section is to provide a map to orient the maintainer or reviewer of these resources.

The directory structure includes a directory for each of the source categories identified in the inventory. Within each directory are the following files, as appropriate:

- Original raw data file as provided from the source
- Documentation supporting applied methodologies or emission factors

This original data is compiled into a spreadsheet (Microsoft Excel) based Inventory Management System (IMS). This System captures basic information regarding the definition of the inventory, a list of applicable emission sources, and calculations for the inventory. Forecasting and charting functions also reside in the IMS.

CACP plays a similar role to the IMS but maintains all ICLEI default emission factors for ready comparison to other ICLEI member communities. The CACP tool is available to ICLEI members for download at http://www.cacpsoftware.org/. ICLEI may provide access to the tool for additional non-member consultants or organizations that support Park City in maintaining the inventory. Included in the deliverable is a backup of the CACP data file that was used to prepare the inventory. This file can be restored into a newly installed version of the CACP software when Park City takes over the inventory.

The CACP tool supports forecasting emissions and generating reports and graphs. However, to achieve greater transparency and flexibility in these activities, the IMS and data contained therein also support these activities.

The following two opportunities for improving the quality of activity data and reducing uncertainty in inventory results were identified during the inventory process and should be considered in future inventory updates.

- Obtain propane consumption data from more than two of the six potential providers.
- A more direct and current measure of the number of visitors to Park City arriving by airline would improve the estimate of airline travel emissions. The current estimate is based on an outdated survey from 1993 that indicated the percentage of total Salt Lake City International passengers originating or destined to Summit County. The portion of these travelers destined to or originating from Park City in particular is calculated based on the ratio of full-time equivalent population of Park City to Summit County population. Though this number is corroborated with data on the

number of visitor nights and average length of stay, there is still room for improvement in this approach.

# Appendix B: Utah Blue Ribbon Advisory Council on Climate Change Report

Excerpt from Blue Ribbon Advisory Council on Climate Change Final Report. For more on the report, visit http://www.deq.utah.gov/BRAC_Climate/final_report.htm.

## I. EXECUTIVE SUMMARY

The Blue Ribbon Advisory Council on Climate Change (BRAC) was organized by Governor Jon M. Huntsman, Jr. on August 25, 2006, to provide a forum where government, industry, environment, and community representatives[1] could identify proactive measures that Utah might take to mitigate the impacts of greenhouse gases (GHG).

Governor Huntsman provided the following charge to the Council:

1. Consider science, economics, and policy around climate change in a forum where we as a State – industry, environment, community – could have productive dialogue;
2. Understand and recognize what we are trying to leave for the next generation; and
3. Bring back information and policy recommendations for review and consideration.

This report provides a summary of the work the BRAC and Stakeholder Working Group (SWG) have conducted to date. The BRAC has completed a number of significant tasks as charged by the Governor. The Science Report is summarized in this Executive Summary and the entire Science Report is included as Appendix A of this report. A number of policy options are summarized and included in this report. The policy options are ambitious but achievable if the necessary resources are provided to implement them. Because of the volunteer nature of the BRAC and the limited time the BRAC has had to follow the Governor's charge, the BRAC has not independently conducted any economic cost/benefit analyses on the policy options. Such analyses may be necessary prior to implementation of some of the options.

In June 2007, Governor Huntsman requested that the BRAC also evaluate options for a Renewable Energy Initiative. The BRAC established a work group and will prepare final recommendations for the Governor in October 2007. Those recommendations will be included in this report in Appendix E.

# Appendix C: Other Sources of GHG Emissions

There are a number of other minor GHG emission sources in Park City that accounted for 867 $tCO_2e$ in 2007, or 0.1 percent of the total GHG emissions. These sources include the following:

- Leaking refrigerant chemicals from air conditioning and food refrigeration systems
- Enteric and manure methane emissions from the presence of minimal livestock
- Fertilizer
- Beer production

The following sections describe in more detail the estimation of emissions from these sources.

## Refrigerants

Chlorofluorocarbon (CFC) and hydrocholoroflouorocarbon (HCFC) based refrigerant gases used in air conditioning, refrigeration, and sometimes fire suppressant systems also are GHGs. It is common to exclude CFCs from a GHG inventory because they are regulated by the Clean Air Act and currently are being phased out. However, the impact of HCFCs remains.

In the course of normally operating such equipment, some of these gases will be emitted to the atmosphere through leaks and normal maintenance activities. GHG emissions from these losses in Park City are estimated to be less than 709 $tCO_2e$ in 2007, or 0.1 percent of the total inventory.

The CACP software does not directly support the calculation of emissions from operating refrigeration equipment, so an estimate was made based on loss rates from the EPA's Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance. The Protocol suggests three approaches to calculating emissions from refrigeration systems, all of which require detailed information on the equipment and/or the flux of refrigerants in equipment installation, maintenance, and decommissioning. Since those data could not be obtained within the scope of this project, the estimation was made based on commercial square footage in the community.

It is assumed that commercial air conditioning equipment is the largest user of refrigerants in the community and total square footage was obtained from a real estate inventory. Assumptions were made for the quantity of cooling per square foot, the quantity of refrigerant gas required to supply that cooling, and the refrigerant gas installed. Despite the likely overestimate resulting from assuming that 100 percent of the commercial square footage is cooled, the emissions from this source category are still very small.

## Fertilizers

Applying nitrogen as a fertilizer leads to emission of the GHG nitrous oxide ($N_2O$) by three mechanisms. A portion of the nitrogen fertilizer converts to nitrous oxide on application, and before uptake, and is then directly emitted. Additional fractions are emitted indirectly through nitrogen that is volatilized into gaseous form and re-deposited nearby and then converted to nitrous oxide and nitrogen that leaches into surface or groundwater before conversion to nitrous oxide.

Another source of GHG emissions related to soil management comes from the practice of liming. Liming reduces soil acidity and aids plant growth by adding a carbonate to the soil. Emission of carbon dioxide is the eventual outcome of the carbonates dissolving.

Data was collected for what are likely to be the most significant fertilizer and lime applications in Park City. In 2007, the emissions were estimated to 110 $tCO_2e$.

## Livestock

Livestock contribute to GHG emissions through digestive processes and the production of manure. Methane ($CH_4$) is produced through enteric fermentation due to the digestion of feed by livestock. Additional methane and nitrous oxide are also produced by manure.

Park City has a small population of horses based on communication with local veterinarians. These horses are managed in pasture/range systems that minimize methane production from manure and produce negligible nitrous oxide emissions. In 2007, the emissions from this population were estimated to 35 $tCO_2e$.

## Beer Production

The fermentation process used to produce beer involves converting sugars into alcohol using yeast. A byproduct of this process is carbon dioxide. Based on beer production volumes in Park City, GHG emissions from this activity were estimated to be 13 $tCO_2e$ in 2007, or 0.001 percent of the total inventory. This is less than the per capita annual emissions of a single resident.

# Appendix D: Emission Growth Rates

To facilitate Park City in setting realistic reduction targets for GHG emissions and to understand those goals in the context of targets set by other entities, it was necessary to develop a forecast for the emissions inventory.

To forecast emissions in Park City from 2008 through 2020 requires making assumptions about the growth rate of emissions in each source category. Future improvements in practices and technology are not included in this forecast. Therefore this forecast leads to a worst-case scenario for the reductions necessary to achieve various GHG emission reduction targets. For all emission sources except solid waste and construction waste, an average annual growth rate of 0.8 percent per year was assumed based on modeling done by the Snyderville Basin Wastewater Reclamation District. This modeling is based on the build-out of existing parcels in Park City. The growth of solid waste and construction waste was estimated at 4.0 percent per year based on estimates used in the Summit County Integrated Solid Waste Management Master Plan.

# Appendix E. Strategies Considered But Not Selected

| Measure Name | Category | Type | Tons CO2e Reduced in 2020 | Feasibility by 2020 (political, technical, implementation, financial) |
|---|---|---|---|---|
| Institutionalize reviews of opportunities to reduce GHG emissions as part of planning department's review of new development applications | Transportation and Land Use | Incentive | Low | High |
| Develop and implement pay-as-you-throw waste fee structure | Waste Reduction and Diversion | Regulatory | Low | Medium |
| Develop unifying climate initiative and coalition in non-profit community | Community Leadership | Action | Low | High |
| Develop residential weatherization incentive program | Energy Use | Incentive | Low | High |
| Develop transit service innovations and improvements (e.g., route streamlining/timing, alt. fuels) | Transportation and Land Use | Action | Medium | Medium |
| Develop student trip reduction program - carpooling, bike to school days, challenges | Transportation and Land Use | Action | Low | High |
| Increase visitor education on alternatives for reaching Park City and traveling in the City | Transportation and Land Use | Incentive | Low | High |
| Develop local carbon fund for local offset projects | Carbon Offsets | Action | Medium | Medium |
| Establish educational outreach position providing service to all sectors | Community Leadership | Education | Low | Low |
| Establish tax incentive financing for energy efficiency in new buildings | Energy Use | Incentive | Low | Medium |
| Incentivize alternative fuel and high efficiency vehicles with tax credits, grants, infrastructure etc. - biodiesel, natural gas, electric charging stations | Transportation and Land Use | Incentive | Medium | Low |
| Provide more public sites for recycling | Waste Reduction and Diversion | Action | Low | Medium |

| Measure Name | Category | Type | Tons CO2e Reduced in 2020 | Feasibility by 2020 (political, technical, implementation, financial) |
|---|---|---|---|---|
| Require zero waste City events (City, on City land, provide education) | Waste Reduction and Diversion | Regulatory | Low | High |
| Develop single serving water bottle reduction program - work with lodging, retail industry | Waste Reduction and Diversion | Incentive | Low | High |
| Employ new biomass energy applications | Energy Supply | Action | Medium | Low |
| Provide technical assistance for high-performance buildings - leverage existing resources from utilities, green building organizations, etc. | Energy Use | Incentive | Low | Medium |
| Seek opportunities for combined heat and power | Energy Use | Action | Low | Medium |
| Develop RideShare program (employers, retailers fund incentive for ride-sharing) | Transportation and Land Use | Incentive | Low | Medium |
| Implement car sharing program (Flexcar, Zipcar) | Transportation and Land Use | Action | Low | Medium |
| Develop composting program for restaurants | Waste Reduction and Diversion | Action | Low | Medium |
| Institute carbon tax based on energy consumption | Community Leadership | Regulatory | Medium | Low |
| Require new homes above a certain size to have a percentage of onsite energy generation | Energy Supply | Regulatory | Low | Low |
| Develop and provide grant for a net-zero commercial/residential pilot building | Energy Use | Incentive | Low | Medium |
| Develop mandatory recycling program | Waste Reduction and Diversion | Regulatory | Low | Medium |
| Develop new small hydroelectric applications | Energy Supply | Action | Low | Low |
| Develop time of sale energy conservation ordinance | Energy Use | Regulatory | Low | Medium |
| Provide preferential parking in town for low emission vehicles | Transportation and Land Use | Incentive | Low | Medium |

| Measure Name | Category | Type | Tons CO2e Reduced in 2020 | Feasibility by 2020 (political, technical, implementation, financial) |
|---|---|---|---|---|
| Hire waste hauler to collect commercial recyclables | Waste Reduction and Diversion | Action | Low | Medium |
| Require all new homes to have solar hot water | Energy Supply | Regulatory | Low | Low |
| Develop a wasting energy ordinance | Energy Use | Regulatory | Low | Medium |
| Provide incentives for electric or push mowers | Transportation and Land Use | Incentive | Low | Medium |
| Develop voluntary travel offset program | Transportation and Land Use | Incentive | Low | Medium |
| Provide energy education hotline | Energy Use | Education | Low | Medium |
| Implement neighborhood electric vehicle (NHEV) pilot program | Transportation and Land Use | Action | Low | Medium |
| Lobby for variable priced insurance for high efficiency vehicles | Transportation and Land Use | Action | Low | Low |