



Sustainable Santa Fe Plan



Building a More Sustainable Future by Looking to the Past



Adopted October 29, 2008



SYMBOLISM OF SUSTAINABLE SANTA FE LOGO

The turtle, in Native American teachings, represents Mother Earth. The leaves on the tree of life in the center of the turtle's shell are formed from the shapes of the continents, representing the globe. Santa Fe is called out by a yellow dot. The shapes bordering the globe represent earth, water and sky.

NOTICE

Photo: *Santa Fe Plaza and the Cathedral*, Courtesy of the Palace of the Governors (MNM/DCA)

Negative Number	103021
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Sustainable Santa Fe

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CITY OF SANTA FE GREEN TEAM

Katherine Mortimer
Nick Schiavo
Anne Lovely
Claudia Borchert
Kathy McCormick
Lou Baker
Jim Salazar
Marissa Barrett
Jack Hiatt

OTHER CONTRIBUTORS

Santa Fe Water Conservation Committee
Scott Pittman
Amy Pilling
Hugh Driscoll
Faren Dancer
Robert Rodarte
Patricia Hodapp
Richard Fiedler
Bianca Sopoci-Belknap

Logo and Graphic Design by Valerie Chelonis.







GUIDING PRINCIPLES

Resolution 2007-31 directs the Sustainable Santa Fe Commission to prepare a Sustainable Santa Fe Plan by October 11, 2007 that “shall include, but not be limited to, climate change, energy efficiency, building code and construction standards, carbon emission reduction efforts striving towards being a carbon neutral city, water reuse and conservation, urban agriculture, ecological restoration, and the establishment of city wide environmental sustainability standards.”

Resolution 2006-54 endorses the U.S. Conference of Mayor’s Climate Protection Agreement, as amended at the 73rd annual U.S. Conference of Mayors meeting, which in turn calls for reducing greenhouse gas emissions to 7% below 1990 levels by 2012 and provides 12 actions for local governments to reduce the emissions from our own operations and in the community:

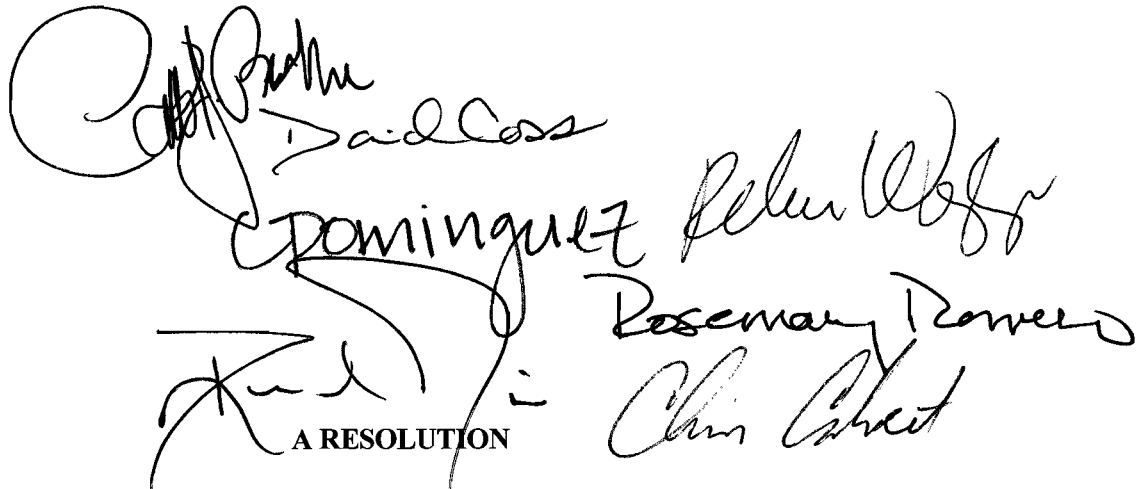
1. Inventory global warming emissions in City operations and in the community, set reduction targets and create an action plan;
2. Adopt and enforce land-use policies that reduce sprawl, preserve open space, and create compact, walkable urban communities;
3. Promote transportation options such as bicycle trails, commute trip reduction programs, incentives for car pooling and public transit;
4. Increase the use of clean, alternative energy by, for example, investing in “green tags”, advocating for the development of renewable energy resources.
5. Make energy efficiency a priority through building code improvements, retrofitting city facilities with energy efficient lighting and urging employees to conserve energy and save money;
6. Purchase only Energy Star equipment and appliances for City use;
7. Practice and promote sustainable building practices using the U.S. Green Building Council’s LEED program or a similar system;
8. Increase the average fuel efficiency of municipal fleet vehicles; reduce the number of vehicles; launch an employee education program including anti-idling messages; convert diesel vehicles to bio-diesel;
9. Evaluate opportunities to increase pump efficiency in water and wastewater systems; recover wastewater treatment methane for energy production;
10. Increase recycling rates in City operations and in the community;
11. Maintain healthy urban forests; promote tree planting to increase shading and to absorb CO₂; and
12. Help educate the public, schools, other jurisdictions, professional associations, business and industry about reducing global warming pollution.



CITY OF SANTA FE, NEW MEXICO

RESOLUTION NO. 2008-93

INTRODUCED BY:

The block contains several handwritten signatures in black ink. From top to bottom, the signatures appear to be: a large circular signature, a signature that reads "Dad Cass", a signature that reads "Dominguez", a signature that reads "Rosenberg", a signature that reads "Rosemary Powers", and a signature that reads "Chris Christ". Below the signatures, the text "A RESOLUTION" is printed in a small, bold, sans-serif font.

ADOPTING THE SUSTAINABLE SANTA FE PLAN

WHEREAS, the US Mayors Conference Agreement on Climate Change was adopted by resolution in 2006 (Resolution No. 2006-54); and

WHEREAS, the Sustainable Santa Fe Commission was re-established by resolution in April 2007 (Resolution No. 2007-31); and

WHEREAS, Resolution No. 2007-31 directed the re-established Sustainable Santa Fe Commission to prepare a Sustainable Santa Fe Plan within six months of the adoption of the Resolution; and

WHEREAS, a draft Sustainable Santa Fe Plan was presented to the Governing Body on October 10, 2007; and

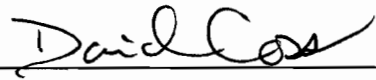
WHEREAS, subsequently, the draft plan has been revised based on guidance from the Governing Body and input from the Santa Fe community and various City committees and commissions; and

WHEREAS, the Sustainable Santa Fe Plan addresses both the City's municipal and

1 community-wide contributions to global warming and how the community should prepare for the
2 effects of global warming.

3 **NOW, THEREFORE, BE IT RESOLVED BY THE GOVERNING BODY OF THE**
4 **CITY OF SANTA FE** that the city of Santa Fe hereby adopts the Sustainable Santa Fe
5 Community Plan, attached hereto as Exhibit "A", in its entirety.

6 **PASSED, APPROVED and ADOPTED this** 29 **day of** October **, 2008.**

7
8 

9 **DAVID COSS, MAYOR**

10
11 **ATTEST:**

12
13 
14 **YOLANDA Y. VIGIL, CITY CLERK**

15 **APPROVED AS TO FORM:**


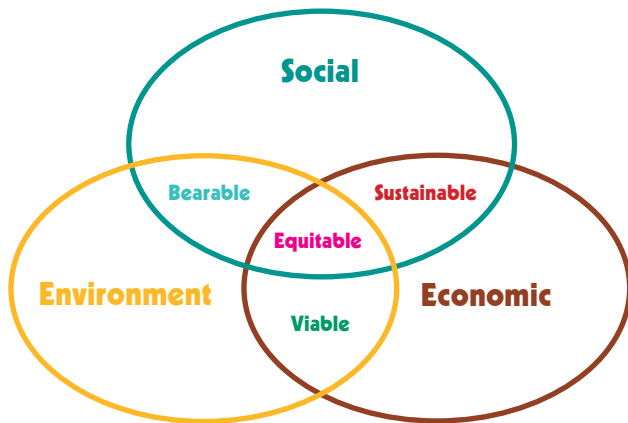
16 
17
18 **FRANK D. KATZ, CITY ATTORNEY**

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INTRODUCTION

Sustainability can be defined as taking care of the needs of the present generation without compromising the ability to meet the needs of future generations. It also can be defined as the intersection between three principals; environmental stewardship, economic health; and social justice.



This plan acknowledges all three of these principles by incorporating values beyond just the reduction of greenhouse gas emissions.

Plans that have been prepared for other communities to reduce greenhouse gas emissions typically begin with an analysis of the sources of such emissions within the community. An analysis of the municipal operations has been completed, however, that information is not yet available for the larger Santa Fe community. This plan was, therefore, prepared based on assumptions about the greenhouse gas emission characteristics of Santa Fe. Once the existing emissions inventory is complete, the implementation of the plan will be revisited to see if adjustments to the priorities are warranted.

This plan addresses more than just greenhouse gas emissions. It looks to the history and culture of Santa Fe and incorporates other values of this community. By doing this, it takes a plan that would normally have a single focus and uses it as a catalyst to promote “community sustainability” by also considering other social and economic goals. It attempts to distribute the benefits and costs of moving towards sustainability in an equitable way.

In addition to looking at how the City of Santa Fe can reduce it’s contribution to GHG emissions, this plan addresses how the City can prepare to be more resilient to respond to the impacts of global warming on the community. This plan anticipates the effects of higher fuel prices and possible reductions in the availability of potable water that are expected in the coming years.

This plan draws from other studies that have been conducted by the City as well as the initiatives and priorities included in the City Council Strategic Plan. This plan is consistent with the City’s Economic Development Strategy¹ which calls for Santa Fe to become the “clean energy capital of the U.S.” along with attracting and developing associated small businesses in the City. This plan is also consistent with the goals of providing good jobs and workforce development and education. Each of these goals speaks to the value of making Santa Fe more economically healthy, with an eye towards providing employment opportunities for the young people growing up here, so they can stay here.

The first City Council Strategic Plan initiative is to “Support Sustainable Development and a Green City”. The priorities for this initiative that are consistent with this plan include:

- Adopt and enforce land use codes and policies that promote sustainable, energy-efficient, carbon-neutral development.
- Provide for alternatives to the automobiles.
- Keep neighborhoods livable and protect rural areas from sprawl.
- Provide economic opportunity throughout the city.
- Restore and maintain watershed conditions that provide for healthy parks and open spaces, better management of storm water from all hard surfaces, water harvesting at every opportunity, and an living river system to include the Santa Fe River, and its tributaries and associated uplands.
- Implement a smart growth strategy for Santa Fe, including a water acquisition plan through 2040.

Other initiatives that this plan is consistent with include:

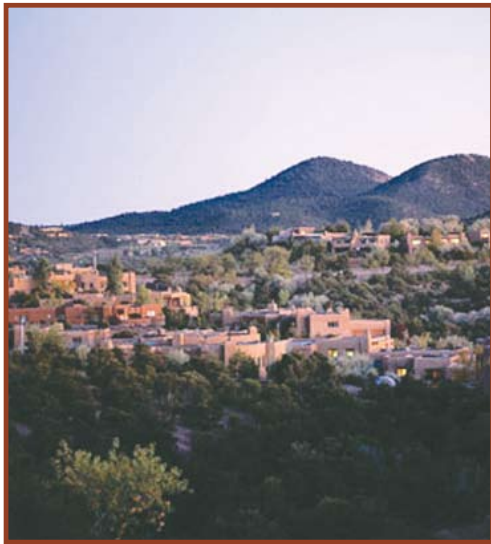
- Work towards a Unified Santa Fe
- Ensure Future for Youth
- Provide for a Safe Community
- Celebrate and Preserve Santa Fe’s History, Culture and People
- Embrace Technology

¹ AngelouEconomics, Cultivating Santa Fe’s Future Economy: Economic Development Strategy, April 2004



APPROACH

Cities across the country and around the world are preparing plans to reduce greenhouse gases (GHG) in response to global warming. While reviewing what other community action plans is useful, each community has a different set of cultural values which guide how best to move forward to reverse this dangerous trend. Santa Fe has a rich heritage of walking softly on the earth by using local materials to live a low-impact existence within this particular ecosystem. Not that all historic land use has been sustainable; overgrazing affected the local ecosystems such that they have never fully recovered. However, by examining what has worked well historically, we can imagine a future that takes the best lessons from the past and incorporates them into the present and future. Modern expectations of comfort and convenience can be obtained while neither unduly affecting the environment nor saddling future generations with the impacts of our excesses.



The Sustainable Santa Fe Commission identified the components to be included in the Plan by reviewing resolutions passed by the City Council and organizing them into topics. Measures for reducing GHG within each topic area are provided with specific goals and methods for measuring progress, where available. Success in the large range of topics covered by this plan will require commitment from the entire Santa Fe government and community including the decision-makers, administration, staff, local non-profits, businesses, schools and individual community members.

In order to assess the Plan's progress, the City needs to conduct a "Baseline Emissions Inventory" against which the efficacy of the measures implemented in this Plan can be measured. It will also

allow the City to hone in on those activities that emit the most green house gases to focus efforts where it will have the biggest impact. However, in absence of a complete Baseline Emissions Inventory, the City can and should begin implementing measures that we know from experience learned in other communities, will begin moving us in the right direction.

To provide an example and inspire others, the City government should set the best example. Measures to reduce GHG from City municipal operations should lead the rest of the community. Taking the first step provides an opportunity to test the efficacy of programs before applying them city-wide. The City can also use City building and infrastructure projects to demonstrate how best to accomplish a range of city goals including how to develop housing that is both affordable and sustainable, how to leverage economic development opportunities for local green businesses, how to be sustainable while preserving historic and cultural resources and practices, and other City-held values.

This document is intended to be a "living" document. It will be updated to reflect progress in its implementation and changes in technology and lessons learned here and elsewhere. This will enable Santa Fe's sustainability program to respond to evolving conditions and new approaches in this fast-changing area.

As the City moves forward with the initiatives proposed in this plan, it is the intention to work in concert with the County, and other entities within the region, to create a regionally coordinated approach. Many of the initiatives require a regional approach and many would benefit from the economy of scale afforded by such cooperation.



1. GREENHOUSE GAS EMISSIONS INVENTORY

INTRODUCTION

In order to assess progress towards reducing GHG emissions from both City operations and from the larger community we have to have a baseline which is used to measure emission reductions as the Plan is implemented. There are several decisions that effect how progress is measured. First, the baseline year needs to be established. The Kyoto Protocol² suggest using 1990 as the base year and that cities like Santa Fe reduce our greenhouse gas emissions to 7% below that level by 2012. In some cases the data from 1990 has not been available and staff has had to estimate GHG levels. As an example, the City is using financial data from 1990 to approximate emissions from City operations. Obtaining community-wide data has proven to be more challenging. We are working with both the State of New Mexico and Public Service of New Mexico to get an approximation of GHG emission levels for both the current year and the 1990 base year.



Another decision is how to calculate emissions. By far the most common method is to use software produced by the International Center for Local Environmental Initiatives (ICLEI). ICLEI is a membership organization of local governments that provides the software and technical support free to members. The State of New Mexico Local Government Division paid for one year's membership to all local New Mexico governments that have adopted the US Conference of Mayor's Climate Protection Agreement, as Santa Fe has. The City is now paying for this membership and is preparing the Baseline Emissions Inventory as data becomes available.

A preliminary draft of the analysis for City municipal operations has been completed and shows that the City produces about 8.5%

more greenhouse gas emissions than it did in 2000. To reach the goal of reducing emissions to 7% below the 1990 level by the year 2012, we will have to reduce our current emissions by 18.9%.

Proposed Actions

- 1-1. Acquire the data needed to complete the Baseline Emissions Inventory.
- 1-2. Use the software and other measures to assess the efficacy of measures recommended in this Plan.
- 1-3. Set priorities for implementation of plan actions based on their calculated efficacy, cost, requirements and additional benefits.

² The United Nations held a convention in 1997 in Kyoto Japan to address the concerns of global warming. Almost all of the world's nations signed the protocols which resulted from the conference, though the United States did not. However, many local governments and some states have committed to reducing global warming and most look to the Kyoto Protocols for guidance on how to set goals for GHG reductions.



2. CITY OPERATIONS

INTRODUCTION

To effectively reduce greenhouse gas emissions, significant changes to a range of functions in the municipal government operations including energy efficiency, fuel efficiency, purchasing choices, and equipment operation among others, need to occur. The City plans to lead by example with improvements throughout the City's departments, facilities and functions.

What's Being Done So Far

The following are initiatives already in place at the City of Santa Fe:

New or Renovated City Buildings: City of Santa Fe Resolution 2006-55 endorses the U.S. Conference of Mayors Climate Protection Agreement adopting high performance energy efficient building standards. The resolution requires city-funded new or renovated building construction in excess of 5,000 square feet or projects comprising upgrades or replacement of two or the three major systems (HVAC, lighting, and plumbing) be designed to and achieve a minimum delivered fossil-fuel energy consumption performance standard of one half of the U.S. average for that building type as defined by the U.S. Department of Energy. All other new construction, renovations, repairs, and replacement of city buildings shall employ cost-effective, energy efficient, green building practices to the maximum extent possible.

The Southside Library was designed with a number of sustainable features including the use of adhesives and paints that have low-VOC (volatile organic compound) content (VOCs are a greenhouse gas); high recycled content materials were used throughout the building; native and low water use plants were used in the landscaping; four cisterns around the building harvest rain water; extensive use of natural light and passive solar gain require less use of electricity and heating; a concrete floor on the south side of the building serves as a heat sink in the winter and in the summer is shaded by a carefully placed awning, thus cutting energy needs; radiant heat cuts down on energy usage; an automatic control system dims artificial lighting when not in use; state of the art waterless urinals reduce water consumption and; low "e" operable windows provide for natural ventilation.

The Santa Fe Community Convention Center project has also been designed with a number of sustainable features such that it will receive a Leadership in Energy Efficient Design (LEED) silver designation.

Existing City Buildings: The City is in the process of contracting for energy audits of City facilities. Once the audits have been performed, recommendations will be brought to the Council for



action. The City has replaced all incandescent bulbs with compact fluorescent at city hall, and as the magnetic ballasts fail in the existing fixtures they are replaced with energy star electronic type ballasts. The carpet recently installed at City Hall has a low VOC content and the paint the City uses also has low VOC content.

City Vehicle Fleet: The City is in process of becoming a Plug-in Partner. The program confirms the City's commitment to participate in the use of plug-in hybrids when the vehicles become available. The City will place a soft order for a few of the plug-in hybrids to show that there is a demand for the vehicles. Also, the City is working to obtain a compressed natural gas (CNG) solid waste vehicle as part of a pilot project. CNG Vehicles reduce greenhouse gas emissions by 23% for heavy duty vehicles on a "well to wheels" basis.

The City has recently instituted a new vehicle purchasing policy that requires new vehicles meet minimum fuel efficiency standards. In order to purchase a vehicle that exceeds these standards, the department must prove the need for a more fuel consumptive vehicle.

Solid Waste Source Reduction, Reuse & Recycling: The City works in conjunction with Santa Fe County to recycle solid waste materials. During 2006 the City's recycling program diverted approximately 3,400 tons of material from the regional landfill.

Water Division: At the April 2, 2008 Public Utilities Committee meeting it was recommended that an energy audit be conducted at the Water Division.



Wastewater Management Division Methane Recovery:

The City has a grant through New Mexico Mineral and Natural Resources to analyze the digester gas which is being generated from its anaerobic digesters. Results over the last eleven (11) months show the digester gas to have approximately 60% methane by volume. A possible action would be for the digester gas to be dewatered, filtered, and compressed and then used as a replacement for the natural gas currently being used to heat the anaerobic digesters.



Replacing Traffic Signal Bulbs with LEDs: The City is completing a project to replace all traffic signal lighting for the City. The payback for this kind of bulb replacement is typically around 18 months.

Replacing Street Light Bulbs with LEDs: The City is reviewing literature for LED street lighting. At the April 2, 2008 Public Utilities Committee meeting it was proposed that all new developments be required to have metered LED street lighting. That street lighting would then be turned over to the City for maintenance. Currently the City pays for street lighting based on the number of lights and an assumption about how much energy they use as well as the cost for PNM to maintain them. Under this new system, the City would just pay PNM for the energy used and take on the maintenance responsibility.

Proposed Actions

In addition to the recommendations in the other chapters, the City will:

- 2-1. Develop a workplace training program to help city staff reduce the impacts of their daily operations.
- 2-2. Follow the recommendations of the energy audits once completed.
- 2-3. Review the City's purchasing manual and propose revisions that would reduce the impact of city purchases including: reduced packaging, reduced toxicity, increased local and organic food, increased recycled material content, leveraged purchasing power of sustainable products through partnerships with the County and/or the State, increased local and low-mileage purchases, increased waste reduction (reduced disposables), increased recycling, increased water harvesting, and increased energy efficiency.
- 2-4. Move towards plug-in electric hybrid technology for all appropriate fleet vehicles paired with solar photovoltaic recharge stations.
- 2-5. Maximize hydro-electric generation capability for the City's water system.



3. GREEN BUILDING CODE

INTRODUCTION

Buildings are a major source of demand for energy and building material manufacture and transportation produce greenhouse gases (GHG). Buildings not only use the majority of electricity produced but also contain large amounts of embodied energy, that is, the energy required to extract the resources, to process the resources into building materials, to ship the typically heavy building materials, and then to construct the building. The building sector is, therefore, a major component of this sustainability plan.



Background

Building codes, historically, by their very nature have been “prescriptive”, meaning that their language has been in the nature of, “shall do this” or “shall not do that”. Green codes, however, have been almost universally “performance” based, which means a measurable target is set and a menu of prescriptive elements are available to choose how one gets to the target. Within the menu of prescriptive choices it is common to make some mandatory, which means they technically could be considered “prescriptive” code items, but they alone typically are not enough to hit the desired target levels.

This paradigm shift in “code” definition has been difficult for many stakeholders to grasp, especially given the complexity of choices and trade-offs. Indeed the better designation is to think of them as mandatory “programs” rather than as the strict definition of “codes”.

Another important component of the development of these programs is the recognition that they must become ever more stringent over time and that the City’s commitment to achieve zero energy buildings by 2030 must be met to be consistent with adopted policies.

What is Being Done

The City of Santa Fe was the first city to adopt the “2030 Challenge” which calls for progressively reducing greenhouse gas emissions from buildings until they produce zero emissions in the year 2030. This challenge has subsequently been widely adopted by cities, counties, states and other countries working for emission reductions.

The genesis of this effort began with simultaneous actions in 2006 by both the City and the Santa Fe Area Home Builders Association (SFAHBA) as awareness increased of the urgent need to change “business as usual” construction techniques.

SFAHBA began their efforts by adopting the Build Green New Mexico Guidelines, a program developed by the National Association of Home Builders and regionally adapted by the HBA of Central New Mexico (Albuquerque). SFAHBA also formally endorsed the 2030 Challenge.

The City of Santa Fe formed a Green Building Code Work Group in the summer of 2007. Membership on the task force is comprised of City staff, home builders, architects, energy raters, code experts, and community members. Experts in areas of concern were invited to participate and offer guidance.

The Santa Fe Green Building Code Work Group weighed the benefits and drawbacks of using “prescriptive” versus “performance” codes and decided that the flexibility of a Santa Fe-based performance code allowed for more creativity and innovation and was more desirable than a prescriptive approach. It also provides the means to keep raising the bar of energy efficiency over time, in keeping with the goals of the 2030 Challenge. In this area the City of Santa Fe intends to emerge and remain as a leader in Green Building at the national level.

The Work Group also chose to start with the guidelines of Building Green New Mexico (BGNM), a version of the national guidelines which had been tailored to the New Mexico climate and environmental setting. The Santa Fe Green Building Code Work Group analyzed that document, line by line, to regionally adapt it to the Santa Fe area micro-climate and to give credit to traditional Santa Fe design and construction techniques, many of which date back to before the arrival of Europeans on the continent.

A draft of the Santa Fe Residential Green Building Code is currently undergoing review and approval by the City. Like other similar programs it addresses a number of areas of concern, not just energy efficiency.



There are seven guiding principles of the program.

1. Lot design, preparation, and development.
2. Resource efficiency
3. Energy Efficiency
4. Water Efficiency
5. Indoor environmental quality
6. Operation, maintenance, and homeowner education
7. Global impact

Within each of the categories are a variety of measures for builders to choose. Each choice is assigned a point value. A minimum number of points are required from each section to achieve a cumulative score. The score is judged to achieve either a silver, gold, platinum or emerald level. The more points gathered the higher the score and the better the building.

Significant information and point systems for full passive solar design have been added to the guidelines to take advantage of the 300+ sunny days that Santa Fe enjoys and reflect passive solar combined with mass for storage, which was developed here in Santa Fe in the 1970s.

The BGNM guidelines are regionally appropriate for Albuquerque but are not entirely suited to Santa Fe because of a fundamental difference in climates of these locations. Whereas Albuquerque is considered a cooling climate, meaning more energy is expended to cool buildings, Santa Fe is considered a heating climate, where the reverse is true. While many other principles remain intact, that difference is significant. When one looks at the national thermal map, the dividing line winds around the upper Midwest then dips down in a loop around Santo Domingo Pueblo before heading back north deep into the western Rockies, placing Santa Fe in the same zone with southern Colorado rather than with Albuquerque.

Cold as we may be, we are getting hotter. PNM reports steady annual increases in summertime electrical demand by our market as homeowners opt for electrical air-conditioning. Long time Santa Fe builders attest to that rising expectation among clients. Since the lifespan of the buildings that will be built under this program, it is likely they will be affected by that warming trend. Therefore, the plan must consider the likelihood of an increase in the number of heating days.

Santa Fe's mandatory minimum levels are likely to be more stringent than the baseline of BGNM. In the energy section, for instance, the BGNM bronze level is considered to be 15% better than the 2003 International Energy Conservation Code (IECC). Santa Fe is looking at 30% better than IECC 2006 as a minimum standard.

A draft of the Santa Fe Residential Green Building Code has recently been made available for comment. Upon completion of the public review process, it will be submitted for consideration by the City. It is anticipated that codes for other construction types will follow shortly using this first code as a model.

Proposed Actions

- 3-1. Implement performance based Santa Fe Green Building Codes (Program) that recognize the need for phased-in mandatory minimums and offer incentives to builders for performance significantly above the mandatory thresholds.
- 3-2. Codify long-range commitments and date benchmarks included in the "2030 Challenge".
- 3-3. Develop green building codes and incentive programs for:
 - Existing building remodels and retrofits;
 - Commercial buildings; and
 - Structures in historical districts, both new and existing.

Expected Outcome

If the city council approves the proposed Residential Green Building Code it will radically change standard construction practices for residences in Santa Fe. The changes will undoubtedly cause consternation within the building community, but it will serve to level the playing field for new construction. Training is recommended for those implementing the new code, including building inspectors, architects and contractors. (See the Education and Outreach section.)

Because buildings contribute so significantly to greenhouse gas emissions, the Green Building Program will begin to have an immediate impact. Since the standards will become increasingly stringent over time to keep pace with the requirements of the 2030 Challenge, the benefits will increase over time.

By examining the life-cycle costs and benefits of more efficient buildings, it can be shown that these structures are also more affordable over time. The utility costs are lower and eventually pay for the initial investment leaving a net savings for the remaining life of the structure.

Once non-residential and existing building codes are revised, even more benefits will accrue.



4. DEVELOPMENT AND ZONING CODE

Introduction

The City's Development Code impacts both greenhouse gas emissions and our ability to adapt to climate change. The layout of cities and the distribution of land uses can effect how much people need to travel. When locations of jobs, schools, shopping, and services are nearby, vehicular travel can either be shortened or replaced with alternatives modes. Also, the layout of streets, parcels, and the placement of structures on their sites effects the ability to take advantage of energy efficient design and to deliver alternative transportation modes. The City's Development Code (also known as "Chapter 14"), dictates how parcels and streets are laid out, how stormwater is handled and the use of landscaping materials. The Development Code includes the Zoning Code which dictates where different land uses are allowed, how structures are placed on their lots, and how tall structures can be built. The Development Code, including the Zoning Code, need to be reviewed for opportunities for GHG emission reductions and to facilitate adaptation to the effects of climate change including transportation, solar gain and shading, food growing, and water harvesting and usage.

Proposed Actions

The following changes to the City's development and zoning codes are recommended:

- 4-1. Amend the Development Code to make access to solar exposure a property right thereby encouraging investments in solar equipment and design.

Issues to address include:

- Protection for water heating panels and photovoltaic panels are different;
- Flexibility of building setbacks to allow for maximizing solar access; and
- Should protection for solar design be actualized prior to their granting or should there be a protection for future design or installation.

The State of New Mexico has a solar access regulation that was strengthened during the 2007 legislation. However, it only protects equipment, both passive and active, that has been installed and that has been documented and filed with the County. Additionally, the only recourse if someone's solar rights have been violated is to seek remediation with the courts, an expensive and potentially lengthy process. The current City Development Code



does not address solar access explicitly. Protecting solar design options needs to be coordinated with the Building Section of this document.

- 4-2. Amend the Development Code to encourage use of gray water for landscape watering and other uses such as toilet flushing.

Using gray water reduces tap water use. The current building code does not preclude the use of gray-water systems, however, there are several issues that need to be addressed in order to encourage the use of gray-water including:

- Expense of retrofitting existing structures.
- Specifications of what is allowed.
- Health and safety codes effecting reuse of grey-water, including those administered by the State.

- 4-3. Amend the Development Code to encourage use of cisterns and other water harvesting techniques that use rainwater to reduce use of tap water for landscape watering.

Issues that need to be addressed in order to implement this measure include:

- Increased cost of construction. (However, the County already requires cisterns in new construction).
- Cisterns as part of a new program to replace the current toilet retrofit program when it is ended.
- Designs of streets and other infrastructure maximize water harvesting opportunities.

- 4-4. Amend the Development Code to encourage natural vegetation shading of buildings and hardscape surfaces as vegetation both absorbs CO₂ and provides shading



from unwanted solar gain in the summer, reducing the need for mechanical cooling.

- 4-5. Amend the Development Code to require subdivisions be laid out to enable maximum feasible use of solar design, solar equipment, and the ability to use stormwater to reduce water demand.
- 4-6. Amend the Development Code to encourage locally grown food to both reduce GHG emissions and prepare for future rises in fuel costs to transport food into the area.
- 4-7. Encourage Passive Solar Building Design.

This overlaps with building code issues and would, therefore, need to be coordinated with that effort, however, guaranteeing solar access as described above would remove risks to those who want to build passive solar buildings.

- 4-8. Amend the zoning code to incorporate some aspects of performance zoning to allow for a greater variety of compatible uses which reduce the number and length of vehicle trips.

Traditional “Euclidian” zoning separates uses into distinct areas called zoning districts. The mixed use zoning district has limitations which don’t work for all mixed use projects. Reviewing zoning may include incorporation of some aspects of performance zoning. Performance zoning allows a greater variety of compatible uses which, in turn, reduces the number and length of vehicle trips.

- 4-9. Encourage Development of Affordable Energy Efficient Housing.

The city’s affordable housing requirement ensures that affordable housing is available throughout the city. This reduces the travel time for workers of lower income who might otherwise have to “drive until they qualify” for housing options. The more diverse the housing choices for all income levels and the more those choices are spread throughout the community, the more opportunities people have to drive less and use alternative modes of transportation more.

- 4-10. Amend the Development Code to require large development projects and subdivisions to provide safe bicycle and pedestrian infrastructure.



5. CLEAN RENEWABLE ENERGY

Introduction

Thoughtful selection of energy choices can reduce green house gas emissions, grow the local economy, and protect consumers from volatile energy prices. Fossil fuel power plants are one of the largest emitters of greenhouse gases. Reducing our dependence on fossil fuel will go a long way to achieving our goals of reducing climate change. There are two basic ways of achieving this goal, through efficiency to reduce demand and through clean, renewable forms of energy that generate far less greenhouse gas than conventional sources.

In addition to avoiding the use of energy from coal-fired plants, this plan calls for avoiding the use of nuclear power. Nuclear power, while emitting less greenhouse gas than coal-fired plants, creates issues of social justice from the environmental impacts of uranium extraction, which disproportionately effects native and poor communities, and has long term environmental impacts associated with the storage of spent fuels. Additionally, this source is not economically viable and relies on extensive government subsidies.

On the other hand, there are clean, renewable sources of energy that do not have these negative impacts which can be used to meet our energy needs. For example, solar farms with a total area of 3 by 5 miles would power all of New Mexico (including at nighttime, using thermal energy storage). This option has not been pursued to date because there has been almost no investment by either the government or the utility companies, however, the economics of this option are very viable. (see Appendix A)

Setting

The City of Santa Fe currently gets its electricity from Public Service Company of New Mexico (PNM). PNM is an investor-owned utility company which supplies energy in accordance with the rules set out by the New Mexico Public Regulation Commission (PRC). PRC sets the rates that PNM can charge and requires PNM to meet certain business goals including providing a mix of renewable energy sources within its portfolio and providing programs to reduce energy demand through efficiency programs. The PRC and PNM are subject to federal energy laws administered by the Federal Energy Regulatory Commission (FERC). These laws include a requirement that the capacity of the utility be sufficient such that the peak load on their system not exceed 75% of their capacity. It is this peak load that drives the demand for new power sources and is the greatest risk that PNM will endeavor to construct new coal or nuclear power plants. This peak typically only occurs



100 hours per year, between June and September, between 2 p.m. and 8 p.m. This is when the demand for cooling buildings is the highest. The extent to which we can reduce energy demand during these critical hours will help reduce the likelihood of new non-sustainable power plant construction until clean, renewable sources can be developed.

Low income people are particularly at risk as energy prices increase. Either with fossil fuels, nuclear, or a switch to clean, renewable energy, it is likely that energy prices will increase in the interim until the prices for renewable energy drops as demand increases and transmission lines are installed and paid off. Loss of energy for this vulnerable population can be fatal. Any plan must address this issue and provide a safety net for low-income people to have access to energy at rates they can afford.

What's Being Done So Far

The City government has done, and is doing, a number of things aimed at reducing the energy demands and greenhouse gas emissions from city operations. These are outlined under City Operations, Section 2 of this document. In addition, there are various green power and renewable energy credit programs emerging.

Proposed Actions

5-1. Reduce Santa Fe's demand for energy through efficiency.

The main obstacle to energy efficiency is the upfront cost. The payback time for different efficiency efforts varies. The longer the payback, the harder it is to obtain financing. A comprehensive approach to tackling these challenges for both the City and its residents would be to establish an independent "Efficiency Utility" (as states such as Vermont have done³). PNM and other investor owned utilities in New Mexico are (by law) starting "utility-based"

³ <http://www.newrules.org/electricity/efficiencyrt.html>



efficiency programs, but unfortunately compromises in the law allow PNM to recover any lost revenues deriving from efficiency gains as well as the costs of efficiency programs, which could potentially deprive the City and residents of the financial benefits of efficiencies. The City could instead run its own program, or contract with a nonprofit to offer such services. There are several funding options for such a program.

The first step is to identify opportunities for further efficiencies to City operations. The City Council has allocated funds for this purpose

5-2. Reduce energy demand during peak hours.

- a. Conduct an energy audit which tracks uses of energy by time of day and time of year. Identify those demands that coincide with PNM's peak hours (June to September, 2 p.m. to 8 p.m.) and explore options for reducing those peaks.

Such options might include using off-peak energy to freeze and store ice until the peak and then shut off air conditioners and use fans to run air through the ice and into buildings during those peak hours or configuring smart buildings to disconnect certain large loads during peak times. Also, other techniques such as solar screens can reduce interior heat build-up in summer.

5-3. Conduct community outreach, such as informational campaigns and "give-aways" of things like compact fluorescent light bulbs and other energy or water saving devices (water pumping requires a lot of energy so water savings also reduce energy demand). This could be done through a new efficiency utility.

Public education is needed to get people to understand how they can play a part in reducing energy use. By linking "give-aways" with other public education efforts, you can reach people who come out with self-interest as their motivation. This could be coupled with issuing challenges or competitions with prizes for people who either greatly reduce their energy demand or come up with a clever way of reducing energy demand. See the Education section.

5-4. Encourage more renewable energy and distributed generation, including concentrated solar, photovoltaic systems (PV), wind power, microturbines and cogeneration, and possibly larger distributed generation and energy storage projects that could be used to "firm"

renewables and lower the need for new power plants and power lines.

Distributed generation is power that is generated in small amounts throughout the distribution grid such as solar panels on rooftops. Photovoltaics are particularly attractive in Santa Fe due to the number of sunny hours and the coincidence of sunny times with peak loads. Microturbines with cogeneration can utilize natural gas with efficiencies of 80% or more. Large, high efficiency diesel generators could provide energy when the intermittent energy of solar or wind is low. Thousands of

PV and wind systems are now available, and these can be backed up with generators powered with biodiesel (which can be produced from algae very efficiently in New Mexico and is anticipated to be available commercially). In this way the fuel-based distributed generators keep the grid reliable and somewhat cleaner, while the renewables dramatically reduce the fuel demand of the fuel-based generators.

The State of New Mexico now offers income and sales tax incentives to residents who install solar, and the PRC allows residents to feed their renewable power back into the grid for retail credit. Some recommended actions that would encourage further investment in distributed generation include:

- a. Provide assistance to individuals and local businesses to understand any existing incentives to installing distributed generation within the City and guide them through the process including any forms or contacts with state offices that are needed.
- b. Add a solar rights ordinance to the City's Development Code (Chapter 14) to ensure that investments in solar technology, both passive and active, are protected and are easily defended. (Current state law requires people to register their solar right with the county and they then must sue a neighbor that violates that right through the civil court system) (See Section 4, Development Code)

Encouraging more distributed generation also has the benefit of developing local businesses that install and maintain those systems. This is consistent with the City's Economic Development Strategy prepared by AngelouEconomics and adopted by the City in 2004.

5-5. Develop programs to help people install renewable energy systems.



The greatest impediment to installation is typically the upfront costs. Specific ways the City could consider to facilitate such installations include:

- a. Implement a loan program that would provide residents with low interest loans to facilitate the purchase of renewable energy sources and energy equipment and energy efficiency upgrades for buildings.
- 5-6. Examine how the City gets its energy and consider alternatives that would reduce dependence on fossil or nuclear fuels to a much greater amount than is currently required by the NM PRC.

The PRC recently passed a requirement that PNM (and other utility companies) provide 15% of its energy by renewable sources by 2015 and 20% by 2020. While this is moving in the right direction, it falls short of what is possible. Clean, renewable energy goals are needed to avoid new conventional power plants and make a real difference in climate change. The City can be a leader in requiring more aggressive goals to ensure that no new coal or nuclear plants are constructed and that the greenhouse gas emissions from the City meet or exceed the Kyoto protocols and the intent of the U.S. Conference of Mayors Agreement on Climate Change. Possible avenues for pursuing these goals include:

- a. Encourage private or public/private partnerships to develop small-scale renewable energy and distributed generation projects within the City.
 - b. The City could consider entering into power purchase agreements (PPA) in order to purchase renewable energy.
- An agreement of this type would allow the city to obtain renewable energy at a lower cost (Third party can take advantage of tax credits and pass the savings to the City).
- c. Consider the development of a regional municipal power utility that could offer efficiency programs and distributed generation, and possibly larger renewable systems, including utilizing more efficient and more ecological High-Voltage DC (HVDC) transmission lines, while still using PNM for base and backup energy supplies, with the goal of avoiding need for new generation and transmission.
 - d. Lobby the state government to pass laws that would allow communities to aggregate their loads and choose their own power suppliers who are providing clean, renewable energy as is being done in California with the Community Choice Aggregation program.⁴

- 5-7. Ensure that as energy rates rise, the low-income families in the community are not left without the means to pay for basic energy needs.

PNM can currently shut off electrical and heating service in the winter to low-income residents who are behind on their bills unless they have already been certified by the state to be eligible for LIHEAP (Low Income Heating Assistance Program), which only very few low-income families manage to obtain. Moreover, a new law may allow PNM to shut off service after two years even if they are certified by LIHEAP based on their payment record. The City of Santa Fe could:

- a. Require any utility serving Santa Fe, prior to disconnecting a City resident, to notify the city's affordable housing office and provide the opportunity to determine if the household meets the criteria that would prevent their utilities from being disconnected.
 - b. If the resident earned too much to qualify but still not enough to pay the bills, the City could identify non-profits or develop a funding source to assist such residents.
- 5-8. Enhance the State of New Mexico's program for assisting low-income families with weatherization with complementary programs, including energy-efficiency.

The State has a weatherization program which reduces the cost of weatherization projects for people with low-incomes. However, many such people do not own their homes and cannot do some of the more invasive weatherization projects that could reduce their energy demands. Moreover the State's Program is very small and largely dependent on inconsistent federal funding. The City could:

- a. Establish a minimum weatherization standard that existing structures would be required to meet either at sale and/or by a specific time in the future. Low-income owners and owners that commit to renting to low-income tenants could be provided assistance either from the State or some other mechanism.
- b. Lobby the State Legislature for increased funding of low-income weatherization programs.
- c. Investigate alternative low-cost methods of weatherization and efficiency, and promote the preferable methods.

⁴ <http://www.communitychoiceenergy.org>



6. TRANSPORTATION

Introduction

Transportation is one of the largest sources of human-made greenhouse gases (GHG) emissions according to the U.S. Department of Energy and the Environmental Protection Agency.^{5,6} The New Mexico Environmental Department estimates that, vehicles account for about 17% of GHG produced in New Mexico.⁷ Transportation is a broad topic which includes both the transportation of people and the shipping of goods and materials both into and out of the community.

Aviation emissions are significantly greater than with other modes of transportation for both people and freight. International agreements are pending on how to calculate aviation emissions. Calculations will eventually need to be incorporated into our emissions reduction plan, but for now, reducing air travel is only a generic, un-quantified goal.

In terms of moving people, the opportunity now is to transform from a car culture, to one that moves at many speeds simultaneously: an environment filled with pedestrians, bicyclists, drivers of low speed electric vehicles (LEVs), scooters, plug-in hybrid electric vehicles (PHEVs), and busses and trains operating on alternative fuels. An increase in the amount of non-motorized transportation has the added benefit of increasing health in the community both from reduced air pollution and increased exercise.

Improving transportation of people affects, and is affected by, the inter-relationship of land uses. When shopping, schools, jobs and services are close to residences, the number of non-motorized trips can be more easily reduced. (See Section 4, Development and Zoning Code.)

Goods and materials that are imported from long distances have “embedded” in them extensive amounts of transportation-associated energy and greenhouse gas emissions. Typically, the shorter the distance, the less transportation embedded energy the material has. The extent to which goods and materials can be produced locally with comparatively little investment in fossil fuel generated energy, the amount of embedded energy and greenhouse gasses is also reduced. Of particular importance are those goods and materials that must come a long way, are heavy and are consumed in large quantities. Food has high embodied energy because it travels long distances, is heavy, and is consumed in large quantities continuously. (See Section 10, Food Systems.) While food is of major importance, all consumption of goods shipped in is a concern. The more local needs are met with local resources, the

more embodied energy from travel is reduced.

Fuel efficiency and alternative fuel choices affect the movement of both people and goods and materials. When comparing fuels with each other or with other forms of transportation, it is important to look at the energy and environmental impacts from “well to wheel”. This includes the energy and environmental impacts from extracting the fuel, processing and transporting it, any pollution created from using it, and disposal of any residual by-products.



What's Being Done So Far

The Federal government has mandated minimal improvements in vehicular emissions. Further reduction requirements are expected, though not to the level needed to effectively reduce greenhouse gas emissions.

The Santa Fe Metropolitan Planning Organization (MPO) is the organization with the broadest responsibility in Santa Fe transportation matters. Created in 1982, the MPO covers an area that includes the City of Santa Fe and the surrounding area. It coordinates with regional, state and federal transportation authorities and is funded, in part, by the same. The MPO is mandated to meet federal requirements under Title 23 U.S.C. and the 2005 Federal Act referred to as SAFETEA-LU. The issues covered under these mandates include safety, traffic, freight moving efficiency, intermodal connectivity, and environmental protection.

The MPO is assigned to develop a long-range transportation plan every five years or less, as a means to measure progress towards sustainability of the transportation sector.

⁵<http://www.eia.doe.gov/cneaf/alternate/page/environment/chap3.html>

⁶U.S. Environmental Protection Agency. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2005. Washington, DC. April 15, 2007 (<http://www.epa.gov/climatechange/emissions/usinventoryreport.html>)

⁷www.nmenv.state.nm.us/aqb/GHG/documents/CleanCarStandardsFactSheetFINAL.pdf - 2007-09-10



Initiatives already in place, both public and private, which are to be continually supported and developed, include the following:

- Santa Fe Trails bus system with 8 routes covering the entire city. The use compressed natural gas (CNG) as fuel means lower emissions and lower cost of operation. Busses are equipped with racks for bicycles, which strengthens the multi-modal web.
- Park and Ride (State): low cost shuttle service between Santa Fe, Los Alamos, Espanola and Albuquerque. Monthly Park and Ride pass holders ride Santa Fe Trails for free. (Note that the route between Albuquerque and Santa Fe will be discontinued once the Rail Runner commuter train service is implemented).
- North Central New Mexico Regional Transit District (NCRTD): filling the gaps between the state Park and Ride, Santa Fe Trails, and other regional transit systems. Currently, the NCNMRT covers three (3) cities, four (4) counties, and five (5) reservations.
- Santa Fe Ridefinders (City): helps people to find carpoolers and vanpoolers. The City website also connects interested parties to erideshare.com.
- City employee shuttle van from remote parking area.
- New Freedoms (City): curbside transportation program for seniors and the disabled.
- Shuttle services for special events (City) from remote parking.
- Growth of hybrid vehicle market.
- Local availability of alternative fuels including B20 (a biodiesel blend of 20% biodiesel plus 80% fossil fuel diesel); ethanol blends: E10 and E85 and CNG; 100% SVO (straight vegetable oil) fueling station in Albuquerque.
- Southern New Mexico Railway and The Rail Runner operating on B20 fuel.
- Grassroots movement of citizens running their vehicles on B100 and straight vegetable oil.
- Adoption of "Complete Streets" design in city planning; Complete Streets systems safely accommodate car, bicycle and pedestrian traffic along the same roadways.
- The Bicycle and Trail Advisory Committee is charged with evaluating the 1993 Bicycle Master Plan and the

trail portion of the Parks, Open Space, Trails and Recreation Master Plan and advising the City staff on measures needed to expedite the plans' implementation. The Arroyo Chamisa, Railtrail, Acequia Madre and river trails are major trail spines in the City. The Arroyo Hondo Trail is the major trail spine in the County.

- Bike to Work Week events.
- Increased bicycle use among adults; increased signage and road markings for bicyclists; increase in groups promoting riding.
- Availability of electric vehicles, particularly low speed EVs.
- Zero emissions delivery and hauling services.

The following projects under current development are key to City sustainability efforts:

- Rail Runner train service providing commuter service between Santa Fe and locations south including commercial and transportation centers in Rio Rancho, Albuquerque, Los Lunas and Belen. The Santa Fe extension will open late in 2008.
- Multimodal transportation hubs at NMDOT (Alta Vista Street) and downtown at the Railyard.
- Additional Railrunner stations are planned for the 599/25 intersection, St. Francis and Zia Road, and on Richards Ave. near SFCC. These locations are the best choices in light of the sustainability goals of the City. These stops are most accessible to travelers in regions outside of Santa Fe who need not enter the City to access the train to travel south. The population in the south part of the city would benefit by access to the rail going south and also north into the City. All of the Rail Runner stops could be the anchors of an eventual intracity rail system.
- Coordination of city vehicle purchases through the recently appointed energy efficiency staff position.
- City vehicles replaced over time with high efficiency and alternative fuel vehicles (CNG, B20, or electric). The free shuttle for city employees (from remote parking) replaced with an alternative fuel vehicle.
- Santa Fe school district pursuit of biofuels for busses.



- Continued development of the trails network including completion of the trail along the rail tracks from the downtown Railyard to Rabbit Road and eventually to Eldorado.

Proposed Actions

An overall goal of this section is to reduce the GHG emissions from the personal transportation. This will require establishing and supporting City, State and federal initiatives.

6-1. Establish mechanisms and provide support for initiatives that increase the variety and use of mass transit.

Increase Santa Fe Trails trip frequencies from current levels to every 15 minutes on key routes to increase ridership. Santa Fe Trails is currently performing an evaluation of its system that will identify additional actions to increase ridership. Park and Ride can be expanded to serve more areas with increased hours of operation. Groups, including large employers, schools and institutions can be targeted for customized mass transit services similar to how special events are addressed. Investigate options for other types of public transit including trams, trolleys and fixed-rail systems.

6-2. Prioritize zero emission transportation including walking, bicycling, and Electric Vehicles (EVs) both low speed and high speed. EVs include scooters, motorcycles, three-wheeled vehicles, golf carts, ATVs, cars and trucks that operate on electricity.

- a. Establish safe transportation routes for all forms of zero-emission transportation and provide recharging stations for electric vehicles powered by clean, renewable resources.

Low-speed EVs which are currently available are street legal vehicles that can travel on roads designated as 35 mph and they can cross roads with a 40 mph designation. Designated routes could be established that form a network throughout the City.

- b. Offer free or very inexpensive bicycle and/or EV rental systems.

Establish a system where patrons can rent a bike or EV and return them to any other station within the City.

- c. Place bike racks throughout the city.

Bike racks should be available every 1000 feet in dense commercial areas, in all strip malls, professional plazas and larger retail outlets. Ten percent of these racks should have (working) air pumps.

- d. Expand parking availability and provide opportunities for recharging zero-emission vehicles.
- e. Continue the design and construction of a comprehensive pedestrian and bicycle trail system throughout the City.
- f. Improve sidewalk conditions and ensure they meet ADA standards.
- g. Increase the bicycle carrying capacity of Santa Fe Trails buses.

6-3. Encourage carpooling.

Provide incentives to car pool. Utilize self-directed information sources provided via the internet and other sources to identify ride shares.

6-4. Encourage alternative fuels when they're shown to produce less GHG than gasoline or diesel and when their production does not negatively impact food production. Where appropriate, encourage their production locally.

Compressed natural gas has been shown to produce less GHG per mile driven, when analyzed from well to wheel, than gasoline or regular diesel. Some alternative fuels currently consume more energy to manufacture and deliver than they ultimately produce. Ethanol blends haven't proven to be efficient and are now falling out of favor. As new fuels are introduced, they need to be tested under normal conditions in Santa Fe to determine how they stack up against other alternatives.

Current demand for biodiesel grew from just about zero in 1999, to 300 million gallons in 2007. Additional options using coal fired utilities can use algae to sequester CO₂ emissions, and in Farmington they are experimenting with converting this algae into fuel. Another example, methane recovered from landfills and agricultural waste can also be converted into transportation fuel.

Waste cooking oil can be used as a fuel for converted diesel vehicles and it can be processed into biodiesel and biodiesel blends for use



in any diesel vehicle. A small percentage of community members and businesses will be interested in pursuing these cost-effective and sustainable technologies if information, expertise and recycled oil were more readily available.

- 6-5. Support the development of businesses including sales and service businesses that use, sell, and/or promote lower, low and no-emission transportation.

Support transport of people and goods that use low or zero emission vehicles. Offer incentives to both the supplier and the consumer for high MPG vehicles. Prepare for a future transportation sector dominated by electric vehicles. Address the need for transportation with an eye for reducing or eliminating that need.

- 6-6. Seek grants and other financial incentive programs to implement various transportation action items, including bicycle, driver, and pedestrian safety education.

For example, the EPA has designated \$1.5 for New Mexico to promote school district use of biodiesel. Also, the City has recently received a grant from New Mexico Energy Minerals and Natural Resources Division to purchase an electric vehicle for City use.

- 6-7. Implement "Complete Streets" including retrofitting existing streets where the width of the right-of-way allows.

Existing 4 lanes roads can be converted to 2 lanes roads where the number of daily vehicle trips allow so that separate paths for non-motorized transportation can be provided.

- 6-8. Continue and promote the construction, installation and implementation of on-road facilities for use by bicyclists as a safe alternative means of transportation including but not limited to signage, sharrows, "road diets", bike lanes and similar facilities where appropriate on the and existing roads and streets, especially where they integrate with public transportation.

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California Cars Initiative, includes list of EV converters: www.calcars.org

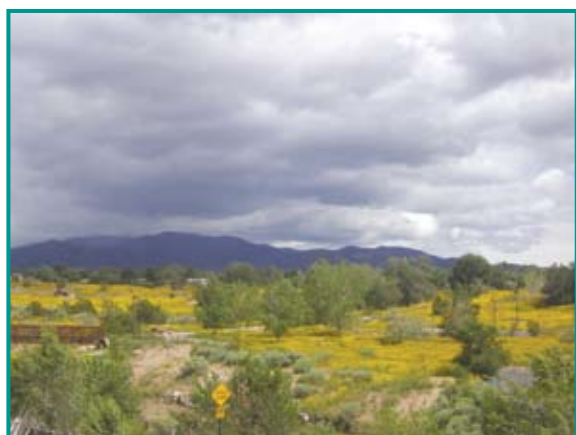


7. ECOLOGICAL ADAPTATION

Introduction

Climate change is already beginning, and the coming decades are anticipated to be dominated by major ecological changes. For New Mexico, the following conditions are anticipated:

“Projected climate changes by mid- to late-21st century include: air temperatures warmer by 6-12°F on average, but more in winter, at night, and at high elevations; more episodes of extreme heat, fewer episodes of extreme cold, and a longer frost-free season; more intense storm events and flash floods; and winter precipitation falling more often as rain, less often as snow. Some climate models project that average precipitation will increase, while others predict a decrease. However, recurrence of a severe multiyear drought like that of the 1950s is likely some time during this century.”⁸



Fundamental changes in climate will result in serious implications for soil, water, plants, and animals. As temperatures rise, the New Mexico report defines some of the impacts, including: local losses of native species, changes in the timing of life events such as migration or initiation of breeding, reduced local biodiversity, stranding of trees in unsuitable habitat by rapid climate change, significant increases in evapo-transpiration, more massive diebacks due to drought stress, more catastrophic forest fires, increased pest risks, reduction of mountain snow packs, and peak spring runoff from snowmelt shifting to earlier in the season.

The following text lists major environmental impacts that are expected, and indeed already beginning, from climate change, and provides a brief selection of possible actions to help mitigate these changes.

ENVIRONMENTAL IMPACTS OF CLIMATE CHANGE⁹ AND SELECTED ACTIONS FOR ADAPTATION

Increased Temperatures/ Less Snow

- Selection of heat-tolerant and warmer zone plants, including food-producing plants, recognizing that plant zones are already shifting;
- Greater plant diversity for prevention of massive die-offs from monocultures;
- Utilization of a balance of annuals for effective plant adaptation to changing conditions; and
- Incorporating biological and architectural shading techniques to reduce increased temperatures and urban heat island effect.

Increased Evaporation

- Consistent organic mulching on bare soils;
- Increased ground vegetation for soil protection and carbon sequestration; and
- Appropriate watering methods. (see Water Conservation)

Increased Risk of Drought/ Earlier Runoff from Mountain Snowpack

- Increased use of water harvesting and recycling of greywater, and possibly grey/black water reprocessing;
- Maximization of methods for absorption of rain water into the ground with such techniques as swales and gabions, etc.; and
- Selection of plants that tolerate drought as well as inundation.

More Massive Dieback of Plants and Species Extinctions

- Increased plant diversity to ensure survival of the majority of plants;
- Protection of species diversity, including for biological pest control; and
- Protection of pollinators.

Increased Risk of Extreme Weather Including Flooding

- Wind protection from increasingly stronger winds using biological and architectural techniques; and
- Utilization of aquifer recharge areas and drainage for floods where appropriate; and

Excessive Carbon in the Atmosphere

- Build up organic carbon materials in soils and plants
- Protect soil carbon from unnecessary loss from soil disturbance, including building sites.

⁸http://www.nmenv.state.nm.us/aqb/cc/Potential_Effects_Climate_Change_NM.pdf

⁹http://www.nmenv.state.nm.us/aqb/cc/Potential_Effects_Climate_Change_NM.pdf



Taking effective actions to adapt to the multiple impacts of climate change offers the opportunity to also curtail carbon dioxide going into our atmosphere. Carbon dioxide (CO₂) is naturally sequestered by living plants and by healthy soils. As plants decay or as soils are disturbed, CO₂ is returned to the atmosphere. By increasing the number of growing plants and minimizing non-restorative soil disturbance, there is a beneficial impact on greenhouse gases. The issue, however, is complicated by the fact that as temperatures rise, soils release more carbon¹⁰, so actions are needed to counter heat-induced carbon releases. Therefore action is required just to remain carbon stable over time.

Other advantages exist, as well. When additional plants produce food, they also reduce the large emissions associated with industrialized food transported thousands of miles into the area (See Section 10, Food Systems). Plants and trees can also help reduce the “urban heat island effect” where the temperatures in a city are higher because dark surfaces like parking lots and rooftops are absorbing the sun’s radiation.

A complete plan for climate change will include both the sequestration of carbon in soils and plants as well as multiple methods for mitigating the unprecedented ecological changes that climate change is bringing us.

What’s Being Done So Far

Santa Fe has an array of ecological programs within its urban fabric. Adapting to climate change requires an overall program to coalesce existing efforts and add additional actions to place ecological preservation and adaptation as the top priority.

The City of Santa Fe’s actions thus far include:

- Encouragement of on-site storm water management.
- Implementation of an initial pilot program installing permeable pavement to reduce urban runoff and increase groundwater recharge.
- Requirements for the protection of significant vegetation (trees).
- Landscape ordinance requirements.
- Utilization of yard wastes for mulch.
- Planning for the restoration of the Santa Fe River.



Proposed Actions

The City of Santa Fe has the opportunity to proactively adapt to coming climate impacts. Effective planning and actions from multiple departments now can be a powerful force for greatly reducing future negative impacts. Environmental degradation is already occurring, yet taking action now can help us adapt. Utilizing biological and social solutions can offer opportunities over energy-intensive technological solutions to climate change. The benefits include:

- Reduction of CO₂ emissions from current methods of soils, water and plants management, and from future increased releases of soil carbon as temperatures increase.
- Reduction of the “urban heat island effect”, making our city more comfortable as temperatures rise and reducing the need for energy-intensive air conditioning.
- Increased coordination with other components of this plan to maximize the synergistic benefits of all.
- Improved utilization of resources with prevention rather than cure by reducing crisis management in the future when these impacts increase in intensity.

7-1. Set an overall city-wide goal of adaptation to climate impacts.

- Define the varied environmental impacts of climate change, beginning with the chart on previous page.
- Select the appropriate actions based on input from multiple sources.
- Write and adopt the adaptation plan that includes measurable goals.
- Widely publicize the goal of adaptation to create resiliency within the Santa Fe community to respond to the effects of climate change. (See Section 11, Education and Outreach.)

¹⁰http://www.ctv.ca/servlet/ArticleNews/story/CTVNews/1126185062975_114/?hub=SciTech



7-2. Create systems that maximize use of rain and storm waters for plant support and groundwater recharge.

- Increase permeability of our urban environment by altering pavement, rooftops and other hard surface, using multiple techniques.
- Restore waterways (Santa Fe River and arroyos) to increase the recharge into our local aquifer, which presently supplies about one third of our city's water.
- Improve water infiltration to planted areas and into the aquifer, including upgrading existing standards of on-site storm water management to aim for 100% on-site runoff water filtration and uptake by the plant roots, not just detention and evaporation via detention ponds.
- Design water systems to both prevent erosion (which releases carbon into the atmosphere as well as destroys plant life) and protect the aquifer by utilizing soils and plants to help purify the water. Include such techniques as street pavement and parking lot retrofits, bioswales, infiltration galleries, etc.

7-3. Reduce "urban heat island effect"¹¹.

- Reduce, alter, and manage parking areas, roof tops and roadways to increase water absorption and water utilization by plantings.
- Alter street design to allow for narrower lanes which can be shaded with trees whenever possible
- Reduce dark surfaces, including providing biological and architectural shading, adding more white roofs and roof gardens, etc.
- Increase planted areas while reducing heat-absorbing graveled areas.
- Plan for increased shade with biological and architectural design, including trees that will shade dark surfaces such as roads.

7-4. Protect soils as the foundation of adaptation to the impacts of climate change.

- Manage soils to increase carbon, support plants, and utilize water effectively. Techniques include adding organic matter, adding beneficial organisms, designing appropriate water utilization, natural soil building



techniques, increased appropriate vegetation, ending the use of herbicides, pesticides and other chemicals, etc.

- Provide soil protection from intense sunlight where appropriate by shading from trees and shrubs, adding mulches, increasing groundcover, etc.
- Create and enforce a strong soil protection ordinance to reduce carbon releases into the atmosphere by significantly reducing the amount of land being disturbed, unless for ecological improvements.

7-5. Improve support for biodiversity with adaptation techniques.

- Protect diversity of existing urban plantings, both cultivated and native by taking care of the existing Urban Forest (plant conglomerates on streets, parks, private yards and around commercial and public buildings). For a successful adaptation to the future changes, the Urban Forest needs to be studied, inventoried, managed, old trees replaced, new plantings vigorously encouraged. In order to realize this, there needs to be a guardian for the whole ecosystem; and an approach that is open to participation by the municipality, neighborhoods, landscape professionals, gardeners and government agencies.
- Develop a list of plants that can tolerate heat and extreme weather events by creating the Plant Adaptation Collaboration (PAL), a group of knowledgeable individuals who will select plants that can better adapt to the changing conditions, including zone changes.
- Revise existing City ordinances to encourage planting and site designs that:

¹¹<http://www.epa.gov/heatisland/>



- Maximize diversity of adaptable plants;
- Use minimal amount of pavement or other hard surfaces to keep site's permeability maximized by other design solutions;
- Eliminate inappropriate plants (high water use, low heat tolerance, etc) that are not able to adapt;
- Provide full-season support for pollinators, beneficial insects, amphibians, and birds, whenever possible;
- Reduce use of cloned or genetically modified plant material which is most frequently sold by many nurseries and seed companies as they are not as adaptable and can be chemically-dependent;
- Provide a certain percentage of food for humans; and
- Maximize shading of hard surfaces, shelter public areas from winds and exposure to the elements, reduce glare and heat absorption by buildings and pavement.



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<http://www.epa.gov/sequestration/faq.html>

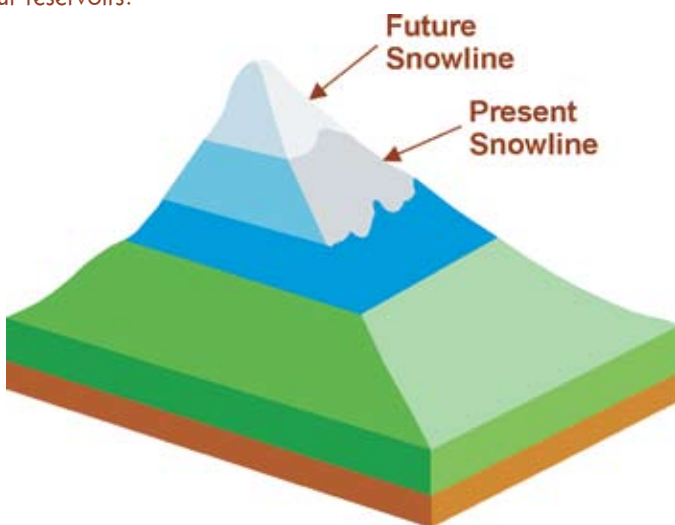


8. WATER CONSERVATION

Introduction

The Energy required to pump water from its source to its destination is significant.¹² The energy source used for water pumping typically results in greenhouse gas emissions, depending upon the source of energy used as discussed in Section 5, Clean Alternative Energy. The City of Santa Fe has made significant efforts to reduce water use through the replacement of water-hogging toilets, appliances, and landscape with lower consumptive models have resulted in a significant reduction of household water consumption. City water conservation programs have resulted in a drop from 160 gallons per person per day to 103 gallons over a ten-year period.¹³ However, more measures can and should be implemented, especially as the number of older toilets available for retrofitting dwindle.

In addition, global warming is expected to result in more frequent and severe droughts in the southwest. It is also expected to result in greater evaporation from lakes, reservoirs, soils and plants; less runoff and more soil drought for a given amount of precipitation; smaller mountain snowpacks; earlier snowmelt; and reduced groundwater recharge.¹⁴ The graphic below shows that the snowline (the level at which snow falls) will go higher into the mountains, reducing the amount of snowpack available to recharge our reservoirs.¹⁵



Warmer temperatures mean less snow, and thus less snow melt, to provide water supplies closer to the time of greatest use in the summer. Our mountain snowpacks are New Mexico's biggest "reservoirs."

¹²DOE, <http://www1.eere.energy.gov/femp/water/>

¹³ Water Update 2007, City of Santa Fe, Sangre de Cristo Water Division

Water conservation, therefore, is not only needed to reduce the GHG emissions of Santa Fe but also to prepare us for a more water-scarce future. Such an effort requires the involvement of the entire community. This section of the Sustainable Santa Fe Plan sets out the Water Conservation Committee's philosophical framework as well as specific action recommendations.

The Water Conservation Committee, after five years of involvement with the issues, believes that it is necessary to move beyond conservation education and rebates. The city needs to define and develop an integrated strategy to accomplish long-range water policies.

Background

Fresh water resources are finite and the world's hydrological system is complex and interconnected. Fundamentally, the underlying city water policy must recognize that we do not live in a vacuum. This section addresses some of the regional and planetary issues that should be considered in any policy.

Use of electrical energy produced by either coal or nuclear, consumes vast quantities of water¹⁶. As described in Section 5, Clean Alternative Energy, these technologies also contribute substantially to greenhouse gas emissions. Each KWh consumes 2 gallons of water and produces 2 pounds of CO₂. Our local use of electricity generated at Four Corner's plants reduces water available for the San Juan/Chama diversion—water Santa Fe counts on as a future water source. Thus, encouraging local energy conservation protects water, here and everywhere.

The new Buckman diversion electrical demand for operation and pumping has been roughly estimated in an annual range from 2 to 7 megawatts. This demand would have the effect of producing between 10 to 35 tons of CO₂ and depleting 20,000 to 140,000 gallons of water if supplied by the energy sources that currently serve the City of Santa Fe. Sustainability would rely on solar or wind power to pump Buckman's water uphill from the Rio Grande.

What's Being Done So Far

The City of Santa Fe has made significant efforts to reduce water use through the replacement of water-hogging toilets, appliances, and landscapes, resulting in a significant reduction of household

¹⁴<http://www.nmdrought.state.nm.us/ClimateChangeImpact/completeREPORTfinal.pdf>

¹⁵www.nmenv.state.nm.us/aqb/cc/Potential_Effects_Climate_Change_NM.pdf - 2006-12-12

¹⁶EPA, http://www.epa.gov/cleanrgy/water_resource.htm



water consumption. City water conservation programs have resulted in a drop from 137 gallons per person per day to 103 gallons over a seven-year period making Santa Fe a national leader. The water conservation achieved by the toilet retrofit program has now peaked as the number of older toilets available for retrofitting dwindles. With the easier conservation actions already taken, and the pending impacts on water created by climate change, more measures must be taken.

This City's Water Conservation Office is responsible for implementing other water conservation measures including citizen outreach and education. This office is guided by the City's Water Conservation Committee who recommends policy and evaluates specific programs related to water conservation. Current water conservation programs include:

- Toilet Retrofit Program
- Rebate Programs for water efficient appliances
- Pre-rinse Spray Nozzle Program
- Moisture Sensors & ET Controllers
- Residential Surveys, Leak Investigation & Landscape Audits
- City of Santa Fe & Homewise "Watersmart Project"
- Public Outreach & Education
- Commercial Landscapers Outreach
- Compliance and Enforcement
- Commercial Air-cooled Ice Machine Rebate
- Commercial High-efficiency Dishwasher Rebate

More information about these programs is available at the City's Website.¹⁷

Proposed Actions

The City of Santa Fe has already made significant inroads into lowering per capita water consumption, particularly by residential customers. This success should not be minimized, but it does reflect a focus on the "low hanging fruit." To move forward, the City will need to take a more thoughtful and strategic approach.

8-1. Develop a Water Conservation Strategic Plan

Such a plan should:

- Recognize the necessity for all water customers (commercial, residential and industrial) to share the burden of conservation equitably.
- Better integrate (for planning purposes) the various functions currently managed by separate entities within citygovernment, including Water Conservation, Long Range Water Supply, Planning and Land Use, Billing Division, etc.
- Address the harder questions regarding water conservation, particularly the interconnections between conservation, land use and growth all within the context of climate change.



8-2. Expand Rebates and Incentive Programs.

Existing programs focus on indoor residential use. New rebate and incentive programs should address outdoor residential use as well as outdoor and indoor conservation in the government, commercial and industrial sectors. Each rebate considered should receive a cost vs. water savings analysis. One recently conducted by staff would seem to indicate that rain barrels are not a cost-effective expenditure.

8-3. Adopt New Technologies to better track water use and then help customers to conserve more easily.

New technologies can help the City to track water use and customers to conserve more easily. These can be coupled with education rebate/incentive programs, and/or ordinances to lower water use. Such new technologies include:

- a. Improve billing system to better track supply-side infrastructure and water use by customers as well as to validate the effectiveness of new conservation measures.

¹⁷<http://www.santafenm.gov/index.asp?NID=168>



Specific, measurable goals should drive the new monitoring program. Possible enhancements:

- Use Water Track software.
- Tie monitoring results to appropriate action by City Staff (e.g., leak repair, education, and enforcement).
- Use monitoring program to determine success of rebate/incentive programs.
- Encourage each individual household and commercial user to develop a water budget.
- Establish rate structures that measure use patterns, instead of arbitrary rates based on meter size.

b. Monitor water use with Fire Flies and Kopy Caps

On the customer side, encourage the widespread adoption of the Fire Fly electronic meter reading system in conjunction with Kopy Caps (devices that interface with the Fire Fly to provide water use information without the need to open the meter can lid). These assist in identifying leaks and overall water use at the water user's location.

c. Broaden the use of, and consider requiring, a variety of water saving appliances:

- High efficiency dishwashers in commercial use.
- Dual flush toilets, which use different amounts of water for liquid and solid waste.
- Pressure regulation valves to automatically reduce the pressure from the water supply main to customer.
- Site-specific rather than whole house water heaters so water is heated only when and where it is needed.

d. Reduce unnecessary public and private landscape watering

This can be accomplished through the use of:

- Moisture sensors.
- Rain sensors.
- Evapotranspiration (ET) controllers to monitor factors such as relative humidity.
- Tighten existing requirements and/or develop new programs for water reuse systems in commercial laundries and car washes.
- Require individual household water budgets which allow families to set personal priorities.

8-4. Proactively Plan and Run Tests to Identify Leaks.

When leaks are found, repair, as necessary.

8-5. Expand existing residential leak investigation/survey program to include other water customer sectors.



8-6. Expand Public Outreach and Education. (see Section 11, Education and Outreach)

The City must lead the water conservation effort by example. As the most readily visible user of water the City Parks Department should be a leader in conservation. This is a fundamental requirement of any public outreach and education program. The Water Conservation Committee suggests the following additional programs and steps in this area:

a. Require Irrigation Certification from the New Mexico Irrigation Association for some irrigation installations

- City parks staff
- Residential landscapers
- Commercial landscapers

b. Improve the City website to include water conservation information for residential and commercial customers that is both useful and interactive.

c. Create and maintain public demonstration gardens throughout the City.

- Establish an annual/periodic xeriscape (low water use landscaping) contest.
- Establish a pilot stormwater reuse site.

8-7. Develop a Strong Compliance and Enforcement Program.

This category is broad, encompassing everything from policies and guidelines to ordinances.

- Once the water-use monitoring program is in place as described above, empower and fund the Water



Conservation office to take action when waste or abuse is evident.

- Develop an overall reuse plan for stormwater. (See Section 7, Ecological Restoration)
- Explore measures to encourage or require water-conserving retrofits upon the sale of a residential or commercial building.
- Adopt rainwater harvesting and permeable paving ordinances.
- Explore technologies which encourage the reuse of gray water and black water in both new construction and existing buildings.
- Adopt ordinances requiring and standards for both passive and active water harvesting

8-8. Expand Support for Water Conservation Activities.

While most of the education programs are presently included in the Water Conservation Office budget, the original rebate and incentive funds came from a one-time water conservation impact fee on water bills. There needs to be a consistent source of funds to accomplish high priority items.

8-9. Initiate a Program to Maximize Water Harvesting.

Rainwater can and should be captured by plants and soil before evaporating.¹⁸ Techniques should be considered such as:

- Requiring the top of planting beds be lower than permeable surfaces like roads, parking lots and walkways.
- Providing weepholes in curbs to allow surface water to flow to planted areas

8-10. Initiate a Program to Process and Utilize Water for Multiple Purposes.

Examples of communities using water for multiple uses can be used as examples for a program for Santa Fe. Cloudcroft, New Mexico will have a water reprocessing plant¹⁹ and John Todd's Eco Machines²⁰ are in use around the world. Local sites that use innovative water conservation methods can be used as teaching laboratories.

8-11. Continue and Increase the Use of Treated Effluent.

Approximately 30% of the City's treated effluent is current being used for meeting irrigation demands that might otherwise be met with potable or groundwater supplies. The City should continue to look for opportunities to supply park, open space, playing field turf, and appropriate commercial uses with treated effluent. Treated effluent also is a potential future source of supply either through return flow to the Rio Grande, storage and filtration into the ground, or direct reuse after adequate treatment.

8-12 Consider the energy requirements of any potential new water sources and seek opportunities to use clean, renewable energy sources for the energy requirements of both existing and new water sources.

¹⁸Rainwater Harvesting for Drylands (Vol. 1): Guiding Principals to Welcome Rain into Your Life and Landscape, Lancaster, Brad, Chelsea Green Publishing Company, 2006.

¹⁹<http://www.itadancedwatertreatment.com/specialfeature.htm>

²⁰<http://www.toddecollogical.com/> and <http://edition.cnn.com/SPECIALS/2007/skewed.view/dodd/>



9. SOLID WASTE REDUCTION

Introduction

Solid waste results in greenhouse gas (GHG) production in two ways. First, on its way to becoming a waste, there is embodied energy from the materials manufacture, transportation, use, and disposal. Then, as it decomposes in a landfill it produces the GHG methane. Reducing GHG from solid waste can be achieved in each step along the way from material manufacture to disposal/decomposition.

In addition to directly creating GHG, not reusing or recycling waste results in the extraction of more natural resources and manufacture and transportation of more new products. Consumption, with its wasting of resources, has been continually growing and now is reaching such extensive and unprecedented levels that the impacts have devastating implications worldwide. From extraction of resources, to manufacture, to shipping, to use that quickly leads to dumping in a “wasted resource” site, ever larger volumes of consumer goods fill our lives for a fleeting moment and then are trashed. As one analyst stated “This is a system in crisis – a linear system on a finite planet can’t continue indefinitely.”²¹ The world is waking up to the need for a complete “cradle to grave”, or, actually, “cradle to cradle” answer.

When tracking wasted resources, embodied energy is also addressed. The adage “Reduce, Reuse, Recycle” is simple in concept, and yet a challenge to implement. Addressing all three levels aims both at embodied energy reduction as well as wasted resource reduction. With global issues, making all three the foundation of a sustainable solution is essential.

EPA has developed estimates of the amount GHG by different waste material types at each point in the material life cycle. The portions of these estimates associated with electricity used in the raw materials acquisition and manufacturing steps are based on the nation’s current mix of energy sources,²² including fossil fuels, hydropower, and nuclear power.

Measuring the GHG emissions reduction of the embodied energy of products is currently emerging here in the US. However, it is more advanced in Europe where products are beginning to carry labels stating their total embodied emissions. Over time, the US may take a similar initiative. Until then this plan encourages reducing the disposal of resource materials to the maximum extent feasible with the ultimate goal of Zero Waste.

This plan recommends the City look at the entire life cycle of waste

and strives to make reductions in GHG emissions at each step to the degree it is within the City’s influence to do so. This means examining how waste materials enter the waste stream and look for opportunities to reduce wastes that ultimately end up in the landfill by diverting them by waste recycling and reuse, focusing on those wastes with the greatest impact.²³ This includes examining the City’s purchasing policies for City operations and how the City uses those materials, as well as addressing ordinances that may affect both residential and commercial consumers.

This Plan proposes that the governing body of the City of Santa Fe adopt a zero waste strategy for managing its waste resources. National efforts such as the Grassroots Recycling Network state the following objective for zero waste, “Zero Waste seeks to redesign the way resources and materials flow through our society. Zero Waste offers a positive alternative to how we currently use our resources. Zero Waste gradually replaces landfills with sustainable enterprises that create local jobs and local economic development.” Zero Waste incorporates traditional ways of thinking about reducing solid waste which prioritizes source reduction, then reuse, then recycling, and finally disposal when there are no other alternatives. Zero Waste then takes this thinking to the next step of looking at waste as a resource.

What’s Being Done So Far

The City and County work in conjunction with the Solid Waste Management Authority (SWMA) to recycle solid waste materials. The City collects recycled materials and pays a small tipping fee to SWMA who in turn sorts and sells the recycled goods. Some materials are more lucrative than others but in general Santa Fe County is able to sell all recycled goods for an average of \$125/ton. The County makes every effort to have the materials recycled as close to the collection facility as possible. As an example cardboard is being recycled at a facility in Fruit, New Mexico.

Caja Del Rio, the active regional land fill which is being utilized by the City of Santa Fe and Santa Fe County, collected approximately 84,400 tons of waste in 2006 from the City of Santa Fe alone. 3,400 tons of that were recycled which represents about 4% of the waste stream. This does not account for source reduction which is waste that never entered the waste stream such as people

²¹<http://www.storyofstuff.com>

²²The emissions are based on the current national grid mix, as opposed to regional grids

²³To make it easier for organizations to use these emission factors, EPA created the Waste Reduction Model (WARM), the Recycled Content (ReCon) Tool, and the Durable Goods Calculator (DGC).



who use reusable grocery bags, or home composting, or people who buy in bulk in re-usable containers, for example.

The City hired a consultant to perform a rate analysis for solid waste, including developing a proposed “Pay as You Throw” system that increases fees for resource disposal as an incentive to increase participation in reduction, recycling, and reuse of these resources. A recommendation to adopt a pay as you throw system was approved and its implementation is expected in fiscal year 2008/2009.

This Plan calls for evaluation of existing GHG emissions associated with solid waste management within the City of Santa Fe, and further calls for development of a comprehensive evaluation of opportunities for reduction of such emissions.

Proposed Actions

9-1. Conduct an Efficiency Analysis of the City and regional waste stream and adopt a Zero Waste ordinance²⁴ that recognizes the viability of gradual replacement of landfills with sustainable enterprises that create local jobs and local economic development.

From a GHG emission standpoint, the first step in moving towards Zero Waste should be ensuring the complete separation of biogenetic materials (such as food waste, paper, cardboard, wood products, yard trimmings, etc.) from the landfill. Moving beyond that to an effective implementation of a Zero Waste program requires commitment from the entire community. Therefore, a cornerstone of such a program would be a comprehensive community outreach and education program. (See Section 11, Education and Outreach).

9-2. Aggressively increase business recycling efforts, including, but not limited to, providing incentives to businesses and other organizations and facilities that reduce the volume of wasted resources from their facility by set percentages that increase over time.

9-3. Establish new City purchasing policies, and other City operations, and propose changes that would reduce waste and embodied energy, reduce GHG emissions, provide preferences for vendors that reduce waste and pollution, and provide preferences for vendors that have “Take Back” programs to reduce waste. (See Section 2, City Operations)

9-4. Work with the construction and demolition industries to develop initiatives for Zero Waste.

This will include education and training for resource diversion, and strive toward total segregation of construction resources by type and destination, and develop a system for non-separated construction waste. City policies will be developed to expedite and support this transition away from disposing of mixed materials into the landfill.

- a. Investigate best uses for separated non-engineered lumber to include shredding by the City tub grinder.
- b. Reject construction waste that is divertible as landfill material at the transfer station. Require that such loads be sorted and recycled.
- c. Encourage the use of natural local construction materials that create few wasted resources.

Compared to today’s manufactured products, local materials also have little embodied energy. (See Section 3, Green Building Code.)

9-5. Divert re-use items at transfer station.

This could include providing composting materials and worms free at the City’s composting facility and encourage more reuse through entities such as Goodwill, Salvation Army, Open Hands, and Habitat for Humanity Restore or through a free flea market at the transfer station.

9-6. Switch fuels for solid waste vehicles and transfer station and landfill equipment such as the tub grinder and chippers from diesel and gasoline to bio-diesel or other fuel with less GHG emissions when the production of those fuels does not negatively impact food production. For transfer station and landfill equipment, such a switch should be completed by 2012 with possible interim goals to mixed fuels by 2009. The specific goals for vehicles are presented in Section 6, Transportation.

Biodiesel and some other fuels produce less GHG in their extraction, manufacture and use. More information on fuels is presented in Section 6, Transportation.

9-7. Prepare and conduct on-going outreach and education as described in section 11, Education and Outreach, of this Plan to strive to Zero Waste including:

²⁴http://www.grrn.org/localgov/lgc_1.pdf, <http://oaklandpw.com/AssetFactory.aspx?did=2123>



- a. Development of a brochure for consumer purchasing decisions by 2008;
- b. Increase composting, and recycling participation with a goal of 85% participation rate of city residents and businesses by 2010 and a reduction in the weight of waste of 75% of the 2003 baseline by 2015;²⁵ and
- c. Encourage people to reuse bags or containers.

The overall goal of the recycling program is to increase the recycling tonnage by 300% by 2010 and 1,000% by 2015 from current levels.

- 9-8. Seek funding to develop a reusable bag, with the option of stores adding their logo, along with a “Sustainable Santa Fe” logo, to encourage bag reuse. This can be combined with an ordinance restricting free bag distribution from stores.

Retail store bags, particularly grocery bags, contribute to solid waste volumes and GHG emissions. The “paper versus plastic” debate is difficult to wade through and depends upon the recycling options available to Santa Fe consumers. There are also biodegradable bags available, however, in a landfill, biodegradation generates methane gas which may contribute to overall GHG emissions. The best overall approach is to reuse bags as much as possible.

- 9-9. Explore opportunities to minimize packaging.

Packaging contributes approximately 32%²⁶ of the overall household waste stream nationally. Regulating packaging materials within the City’s jurisdiction can achieve an overall reduction in waste achieved incrementally.

- 9-10. Explore opportunities to sell carbon offsets (credits) gained by recycling and use the proceeds to further recycling efforts.

Green Tags and the Chicago Climate Exchange are two possible vehicles for selling carbon offsets gained from recycling and other City actions designed to reduce greenhouse gases. (See Section 12, Implementation.)

- 9-11. Seek grant funds to conduct a landfill gas exfiltration analysis of the City’s landfills including an evaluation of any potential reuse or remediation.

- 9-12. Expand the recycling program to add safe compostable food wastes.

These wastes can then be processed into healthy “black gold” compost, including vermiculture projects (using worms to quickly and safely convert wastes), for food production. As an example, “Growing Power” uses restaurant wastes to grow worms that feed edible fish grown year-round in greenhouses.²⁷ Home-based composting and vermiculture should also be encouraged.

- 9-13 Increase Household Hazardous Waste collection to once per quarter.

The use of fluorescent bulbs (including compact fluorescent bulbs) is expected to increase dramatically over the next 10 years. Santa Fe’s landfill need to be protected from the mercury associated with these bulbs while also ensuring that residents have appropriate means to dispose of or recycle these items.

- 9-14. Provide for curbside collection of electronics waste (E-waste).

This can be performed by placing special cages or bins on recycling vehicles. Further, Santa Fe should provide for large item E-waste in the special a large item pickup program and work with retailers to develop collection strategies for recovery of white goods and E-waste.

- 9-15. Santa Fe should follow through with the “Pay as you throw” system to increase recycling participation.

Upon adoption of this system, the City should re-examine its effects after a specified period of time to determine its effectiveness and, if necessary, expand the fee differential between recycling and disposing of materials to drive participation.

- 9-16. Explore the feasibility of implementing a green waste collection program for both residential and commercial customers.

This should include the possible addition of curbside collection and backyard composting bins for residential customers. For commercial customers, a green waste program is needed for restaurants and grocery stores. It is important to build on what is already in place for this sector. As part of this program, attention must be given to increasing the use of compostable disposable plates, cups and eating utensils.

- 9-17. Review operations at the sanitary wastewater treatment plant to ensure optimal aerobic treatment.

Aerobic treatment of sanitary wastewater produces considerably less methane than anaerobic treatment.

²⁵Final Report on the Feasibility of Developing a MRF at the City of Santa Fe’s Transfer Station and Establishing a Regional Recycling Program.

²⁶DOE: www.eia.doe.gov/kids/energyfacts/saving/recycling/solidwaste/sourcereduction.html

²⁷<http://www.epa.gov/reg3wcmd/composting/AlexaKielty.pdf>



10. FOOD SYSTEMS

Introduction

Climate change is creating both extreme weather events as well as gradual shifts in weather. Extreme weather events are happening worldwide- unprecedented droughts, huge storms, massive flooding, scorching heat, threatening crops worldwide. In 2007 flood waters covered an estimated 80% of the entire Mexican state of Tabasco, with all the crops being lost.²⁸ The year before, even Hatch, New Mexico had a flood that drowned chili crops.²⁹ More gradual changes such as temperature rises and shifting seasons are beginning to impact food growing, as well. Most of these threats are only in their infancy, and the impacts are beginning to be apparent in our grocery stores, and the trend is clear.³⁰

What role does food have in creating climate change? The estimated 7% of total emissions from agriculture for the state of New Mexico³¹ is misleading because this figure is merely growing food. Our modern food system includes many energy-intensive stages after the food is grown- processing, transportation, and packaging. Transportation alone is estimated to account for about 20% of all commodity shipping based on ton-miles.³² Adding all these steps together creates our food system with huge GHG emissions. A precise figure is not available for New Mexico, but elsewhere 22% of all emissions were estimated to be from food systems.³³ California has determined that out of all the types of industries, food processing and food packaging are among the largest GHG emissions producers. Even drinks in disposable glass bottles cause substantial emissions.³⁴

Food miles are surprisingly high and mostly hidden from our awareness. The following graphic shows an example of how many stages it takes to get a packaged product like a cake mix into a Santa Fe grocery store. This is only for one ingredient- wheat flour. Complete GHG emissions would also include the miles for other ingredients, as well as the emissions from all the processing and all the packaging.



Wheat Travels Over 5,000 miles from the field to the grocery store.³⁵

Another example, getting a hamburger into our grocery store is shown in the graphic below. There's over 3,500 miles for the actual shipment of product (first the animal, then the meat) through the various stages of processes,³⁶ then add the estimated miles the trucks return empty (called "backhauling"), a total of over 5,000 miles again were driven on our highways. This astonishing mileage for domestic beef. Beef from other countries, would have even more miles.



Trucks travel over 5,000 miles from ranch to grocery store.

²⁸http://www.latimes.com/news/printition/asection/la-fg-mexflood3nov03,1,5413461.story?coll=la-news-a_section

²⁹<http://www.foxnews.com/story/0,2933,209050,00.html>

³⁰<http://www.sciencedaily.com/releases/2007/12/071203173031.htm>

³¹<http://www.nmclimatechange.us/ewebeditpro/items/O117F9698.pdf>

pdf

³²US Department of Commerce, Bureau of Transportation Statistics, 1997 Economic Census-Transportation-1997 Commodity Flow Survey. <http://www.census.gov/prod/www/abs/97cf-pdf.html>

³³<http://www.organicconsumers.org/btc/london022706.cfm>

³⁴<http://www.ihf.com/articles/ap/2007/12/07/america/Global-Warming-Regulations.php>

³⁵http://www.organicconsumers.org/2006/article_711.cfm

³⁶http://www.organicconsumers.org/fair_trade/beef.htm



Our food system's complete dependency upon fossil fuels raises the issues of food security and social justice. The price for a barrel of oil keeps increasing, even having reached well over \$100 a barrel. Beyond this, more people are concerned that Peak Oil will create inevitable major food shortages, with the decline of petroleum-based agricultural chemicals and the exorbitant expense of food miles.³⁷ Looking at the two typical food examples above, it is easy to see that fuel price hikes can mean dramatic increases in food prices. Food prices have risen so much recently for multiple reasons, including biofuels made from crops, that low-income people have been rioting in countries around the world.

Curbing GHG emissions and adapting to future changes must begin to make the shift to local food. Local sustainable food reduces emissions considerably while also providing food security for the future. Food systems take years to develop. We need to lay the foundations now.

What's Being Done So Far

The State of New Mexico has already recognized the importance of decreasing food miles by establishing local food as a priority in meeting the state's climate GHG emissions reduction goals.³⁸

The City of Santa Fe already has some preliminary food-related initiatives including:

- Strong support for the Santa Fe Farmers Market, with a permanent building under construction;
- Legal Gray Water reuse, allowing more water for plants and productive gardens without taxing the municipal water system; and
- Preliminary discussions on the creation of community gardens.

Beyond the City's actions, Santa Fe is alive with numerous non-profits, businesses, and others promoting a wide variety of local food initiatives. This is the perfect time for the City to take a leadership role in goal-setting and coordinating Santa Fe's burgeoning local food movement.

³⁷The Lady Eve Balfour Memorial Lecture, Nov. 2007, "What Will We Eat When the Oil Runs Out? Richard Heinberg [http://www.soilassociation.org/web/SA/saweb.nsf/2503d470a9e6ebe280256a8e00554d9e/00f6d238ebdba743802571e10037fa9f/\\$FILE/LEL07_transcript.pdf](http://www.soilassociation.org/web/SA/saweb.nsf/2503d470a9e6ebe280256a8e00554d9e/00f6d238ebdba743802571e10037fa9f/$FILE/LEL07_transcript.pdf) and http://www.youtube.com/watch?v=_S0RvVrdvF0&feature=user and <http://www.soilassociation.org/peakoil> and <http://www.richardheinberg.com/museletter/159>

³⁸The New Mexico Climate Change Advisory Group Final Report, December, 2006. <http://www.nmclimatechange.us/ewebeditpro/items/O117F10150.pdf> (A-10) This state report also recommends organic agriculture (A 9) and the reduction of farm and range land being converted to development uses (A-8).



Proposed Actions

The City of Santa Fe must lead in the vision of a local food system. This will require involvement of many city departments, many community organizations, and multiple organizations outside the city limits. Santa Fe's local food systems require a double focus—developing a City Harvest program that includes infrastructure for local, sustainable food production, processing, storage, and distribution, and developing the Foodshed project that connects the city with surrounding sustainable producers and distributors throughout the bioregion.

10-1. Set a target for local food.

A target such as "30% of the food consumed in Santa Fe by residents will be from a 300 mile foodshed by 2018" could be set. Percentages can increase over time. The current estimate of the amount of local food consumed in the state is 3%.

10-2. Design and implement a City Harvest (food within the city) program to create multiple food growing, processing, storing, and selling opportunities.

- a. Create collaborations among groups that work within the city.
- b. Review the variety of urban harvest programs that are happening in the U.S. and elsewhere to expand awareness of multiple techniques,^{39,40} and to develop multiple pilot research projects to determine the most productive and sustainable methods for Santa Fe.
- c. Identify and reduce barriers- legal, economic, educational, etc. to urban agriculture including the retailing of food.
- d. Work with City departments on solutions, including increasing the availability of: Land and

³⁹<http://www.spinifarming.com/> and <http://www.marketgardening.com/wallismarketgarden/>

⁴⁰http://www.growingpower.org/urban_agriculture.htm



other resources for food purposes; Water resources, including water reuse- (see Section 8, Water Conservation); and Waste conversion to provide safe inputs (see section 9, Solid Waste reduction).

- e. Develop a plan with targets to promote “Yard to Table”.
- f. Map and Inventory Productive Land and other locations for food.
- g. Create a matching program between those who have productive space and those who would like to garden/grow food in such space, including temporary occupancy programs (TOPs) and SPIN (Small Plot INTensive growing) that allow people to earn tens of thousands of dollars using other people’s land including backyards.⁴¹
- h. Incorporate local food into Economic Development and Planning.
- i. Include food growing opportunities into all affordable housing as a critical component of economic and food security.
- j. Develop programs for urban gardening for the homeless and low-income people, as well as therapy for those with mental and physical disabilities and for urban “at-risk” youth, ex-cons, etc.
- k. Dedicate municipal water resources to food production.
- l. Develop neighborhood centers for home economics, sustainability, and food-related processes, including shared community facilities such as greenhouses, facilities for food storage, and community kitchens.
- m. Provide educational resources for techniques such as water re-use from roof-tops, gray water for institutional re-use, roof-top gardens, and organic food production.
- n. Develop guidelines for appropriate growing in Santa Fe based on traditional and appropriate dryland gardening techniques (Waffle gardens,

perennial polyculture and mulching systems using locally available materials and living mulches, careful varietal selection tailored to urban food production, etc.).

- o. Explore the feasibility of adding acres of ecological intensive greenhouses such as the urban model “Growing Power” after a pilot project has been adapted to local conditions.

10-3. Develop a Foodshed (within the 300 miles range) Program in Collaboration with Regional partners.

- Hire the City Harvester to coordinate both programs, within the city and relationships outside the city.
- Build on existing programs by creating collaborations and partnerships with regional initiatives for both private and governmental programs.
- Preserve Productive Land.
- Explore foodshed-wide policies such as lobbying to keep water rights tied to agricultural lands.
- Reduce transportation by cooperative programs for back-hauling (using empty trucks returning from deliveries), sharing shipments, etc.

References:

Growing Better Cities: Urban Agriculture for Sustainable Development (www.idrc.ca/en)

World Health Organization <http://www.euro.who.int/nutrition/security/sectop>

American Planning Association’s official Policy Guide on incorporating food in planning <http://www.planning.org/policyguides/food.htm>

CPULs – Continuous Productive Urban Landscapes. Designing Urban Agriculture for Sustainable Cities. Andre Viljoen (ed) 2005. Architectural Press. <http://www.energybulletin.net/17603.html>

<http://www.sustainabilitynz.org/docs/AConvenientUntruthJune07.pdf>

<http://www.cookingwithkids.net/>

<http://www.nmclimatechange.us/ewebeditpro/items/o117F10150.pdf>

⁴¹<http://www.spinfarming.com/> and <http://www.marketgardening.com/wallysmarketgarden/>



11. EDUCATION AND OUTREACH

Introduction

The United States leads the world in releasing the highest levels of greenhouse gases (GHG) emissions per person. Roughly, 25% of the world's GHG emissions are spewed into the environment by our nation, yet we have merely 5% of the world's population. For our city to meet its commitment to GHG emissions reductions, the hearts and minds of our community must change. No government can impose the varied changes that are needed if it fails to garner the backing of its citizens. Community education at all levels is essential to increase the understanding of why change is needed, as well as to create the multiple transitions required to reach meaningful GHG reduction goals. The vision of sustainability must become integral to our community as a whole.



Background

The City of Santa Fe has diverse resources for sustainability education, which are both formal and informal, as well as private and public. Our city also has a strong underpinning of proud multi-cultural heritage with traditional lifestyles that respected and relied on local resources. Sustainable lifestyles are still within our cultural memory, and evidence of a more sustainable past is everywhere. All cultural groups have participants in the movement to regenerate learning about green building, local food, social justice, land stewardship, and other traditional systems.

Sustainability education must be placed within the context of climate change. There needs to be a basic understanding of the issue of carbon and other GHGs, their rapid buildup, why we need to move towards GHG reductions, and what is currently being done, including giving visibility to city goals. Goals are more likely reached when the community is fully backing them.

Each section of this Plan represents a component needed to meet the goals of a carbon neutral community. Education and training on each plan component will be facilitated by members of the

Sustainable Santa Fe Commission, with expertise and participation from local and regional resources.

What's Been Done So Far

With sustainability being such an inclusive topic, and with most age groups needing to be included, no one existing educational program covers everything. The good news is that the basic building blocks are increasing, often with great enthusiasm. Some schools, for example, have school gardens as a learning tool for food security and sustainability. Adult classes are being conducted for trade education where students learn practical solutions such as how to install solar panels or how to use adobes for local green building. Examples are everywhere, and now the task is to coordinate and network components into a common vision, and fill in any missing gaps.

Educational Resources for K-12

Changes to our existing school systems must be done thoughtfully, since the demands on today's teachers can be overwhelming. Teachers in both private and public sectors need support, not additional content requirements. Sustainability runs through a broad scope of disciplines, and this transition must provide the resources to incorporate sustainability themes while meeting the objectives required by both state and national educational leadership.

Examples of how this might be done are evolving. Within the Santa Fe Public Schools System (SFPS), Charter School 37 is a public charter school founded on the pillar of sustainability. Monte del Sol is a public charter school that now has all of its pillars under the umbrella of sustainability. They have an organic garden, water harvesting, solar panels, etc. Also, teacher training was piloted during the summer of 2008 by Earth Care International, with support of the SFPS and other non-profits.

Colleges and Post-Secondary Educational Resources

Our college campuses have a variety of classes, extra-curricular activities, media events, and other programs to teach components of sustainability. For example, the College of Santa Fe has had impressive media events on the issue of local food and other relevant topics.

In addition to degree accreditation, continuing education opportunities at Santa Fe Community College are a valuable resource. The Center for Community Sustainability at Santa Fe Community College offers trades skills education that serves both workforce as well as individual needs for sustainable housing, water conservation, and design. In spite of the existing programs, there is considerable room for additional programs and activities.



Community Education Campaign

Most adults are not attending classes, and the media are limited in their ability to increase awareness. This necessitates a strong adult community-based program for climate change education beyond any formal, school-based education program. Tapping into a wide variety of existing community groups would facilitate this program.

Practical information and education needs to be available. Numerous kinds of partnerships with the City of Santa Fe can support initiatives that provide practical knowledge such as how to reduce energy usage at home and in the workplace, how to conserve water, and how to reduce waste.

Additional Informal Educational Resources and Non-Degree Programs

Additional opportunities for workshops and continuing education exist.

Regional Chapters of national organizations, such as Roots and Shoots and Bioneers, work with people of all ages on issues related to sustainability.

Other initiatives, such as Santa Fe's Youth Media Project, is a partnership between the Santa Fe Public School System, Santa Fe Community College, and KSFR, a local radio station. This partnership offers dual credit for high school students to allow them to receive college credit. Sustainability could be incorporated into this kind of program.

Proposed Actions

- 11-1. Identify training and education needs within each section of this Plan, eliminating overlap while recognizing synergistic opportunities.
- 11-2. Identify and develop a curriculum integration task group made up of local public and private K-12 school teachers as well as climate and sustainability education groups.
 - a. Identify local public and private K-12 schoolteachers.
 - b. Identify qualified technical resources for teacher continuing education in concepts and subject areas related to climate change and sustainability e.g. alternative energy, ecology, water resources, diversity, etc.
 - c. Provide task group members with training on climate change and sustainability topics.
 - d. Facilitate the development of an integration plan for sustainability in the school system, and respective schools.

- e. Establish incentives for integration of sustainability concepts into local schools.

- 11-3. Work with the State Department of Education and SFPS to have them accept sustainability as one of their primary learning goals and toward the integration of Sustainability as part of the K – 12 Standards and Benchmarks.
- 11-4. Identify informal educational resources for climate and sustainability education.
 - a. Conduct a community-wide asset mapping of organizations and resources for climate and sustainability education at all levels e.g. informal and formal, K-12 and post secondary etc. and identify goals, objectives, funding sources and timeline for existence of such programs or assets within year one of this Plan.
 - b. Develop a resource guide or work with existing projects to provide a resource list to consumers of such information.
- 11-5. Develop both formal and informal (non-degree seeking) education programs.
 - a. Develop materials for community based action that addresses climate change by working with a variety of resource organizations and others.
 - b. Develop a cadre of informed community members from many community sectors that can effectively utilize the City of Santa Fe Community Climate Education session(s) to implement actions and programs within their respective groups.
- 11-6. Support local and regional educational initiatives that strengthen more local markets for sustainable products and services.
- 11-7. Work with existing initiatives such as Bioneers and others to establish an annual sustainability education conference for teachers, parents, and youth that focuses on the integration of sustainability and related topics into the schools system, while providing resources to its participants.
- 11-8. Direct City support and funding towards educational materials development and training, and when appropriate, towards organizations that offer needed solutions.



12. IMPLEMENTATION AND EVALUATION

Purpose and Scope of Implementation Plan

The purpose of the Implementation section of the Sustainable Santa Fe Plan is to establish proposed objectives, which will only have authority when action is taken in the form of law, resolution, or recommended practice, and are ultimately adopted.



Successful implementation of the Sustainable Santa Fe Plan requires community involvement and potentially additional research in order to successfully reach each target objective. All sectors of the community including individuals, agencies, businesses, institutions, private and public schools, the Community College, and City government need to become engaged in the process of carrying out the effort to reduce Santa Fe's GHG emissions. For us to reach our target reduction goals, all sectors of the community will need to make a commitment to the established goals and adopt actions to attain them.

Using the City's overarching climate change reduction goal, this plan delineates multiple topics, each with interrelated action plans to achieve the climate goal. The City will identify funding and partnerships in the interest of achieving its goal. These critical topics will be woven together to eventually combine to yield major GHG emissions reductions.

In an ongoing effort to continuously improve and integrate emerging best practices, this plan and its objectives will be evaluated. Using all practical and available resources, the City will conduct annual, five year and ten year assessments to determine the effectiveness of this plan and its objectives and will modify the plan accordingly. Subsequent assessment data and modifications will be reflected in the plan through managed documentation as revisions to this plan.

Serving as a Model

The opportunity for City Government is to be a model to both its residents, and other cities, especially within the region. Every department must educate staff members, review current practices and functions, and begin the transition towards sustainability and emissions reduction. This, however, is only one part of the City's multiple roles.

Implementing the Strategic Community Outreach

Climate targets are different than most other kinds of City programs. Today's society is based on utilizing carbon in its various forms to meet our daily needs and desires. To effectively transition to a low-carbon city, a comprehensive program that continues over time is required. The City is the keystone to realizing such a broad array of actions and goals. Without firm backing from City Government, we will not effectively reduce our emissions in any meaningful timeframe. Santa Fe is alive with potential, however, for the majority of key goals defined in this plan's chapters already have individuals and organizations working on these relevant components. These ongoing projects and initiatives must have built in strategies for continuous improvement as there will always be opportunities. Transition to a low-carbon economy is an ongoing process. Major and pervasive changes necessitate involvement and coordination of the key players, and for the issue of GHG emissions, the



necessary changes are relevant to all citizens, not merely a limited sector within our city, making this topic of sustainability and GHG emissions reductions a deeper and more profound challenge.

As part of a comprehensive effort to implement the Sustainable Santa Fe Plan objectives, Santa Fe's Governing Body, the Sustainable Santa Fe Commission, the Youth Advisory Board, the City's Green Team, all City staff, and citizen commissions and boards - must reach out to the key varied sectors throughout the



community to build the climate goal as a common vision. The City can accomplish this task as the leader in establishing a recognized and accepted city-wide climate vision. Such a city-lead vision lays the foundation of the entire program as stated in the U. S. Conference of Mayors Agreement on Climate Change adopted by Santa Fe through Resolution 2006-54.

The city-wide climate vision necessitates a strong outreach campaign, with selected people going to various community groups, presenting the vision and the plan, reviewing the climate change imperative as needed, and requesting both acceptance of the relevant goals and willingness to work towards the plan's implementation. Development of a Strategic Outreach Plan will utilize the appropriate people for the respective organizations. The Green Team, the Sustainable Santa Fe Commission, and the Youth Advisory Board, working with strategic partners, will develop the outreach strategy, the talking points, visuals including a simple booklet outlining the program, and participatory group materials. Once the outreach participants are prepared and scheduling has begun, the Green Team and the Sustainable Santa Fe Commission and the Youth Advisory Board will meet regularly with outreach participants to review progress, to provide support, to ensure a smooth operational flow, and to assist in building networks among relevant groups. Also, such a review process allows systematic feedback on how well the outreach is working which then facilitates alterations in the plan as needed and alerts the City to what support could facilitate the varied processes.

Building all the topic areas concurrently is challenging, but a coordinated outreach program can perform well without neglecting or postponing important objectives. As all target areas need to be addressed now, there is opportunity to start communication for all objectives concurrently. This across-the-board strategy can take advantage of synergistic impacts. Through public service announcements on local radio stations and newspaper articles, the City will assure that all areas are addressed. Comprehensive activities in the schools can be another mechanism for broad reaching GHG education. The recognition of the City's vision, and the empowerment and coordination of both existing and new groups can create the building blocks to lead to powerful actions within a more aggressive timeline. The existing and new champions, coordinating with the City and each other, will be able to effectively identify barriers and to actively promote the objectives within the larger context.



Implementation work groups will be formed for each topic of this plan with representation from the Sustainable Santa Fe Commission, the Youth Advisory Board and other community members and stake holders. The work groups will meet regularly and report progress to the Sustainable Santa Fe Commission. In this way, the vast amount of information, ideas, and interested parties can be organized effectively, with responsibility and accountability to the City and its goals.

The following chart is the summary of all major actions, by topic. Each objective for each section is listed with a target time period for initiation. Within the proposed start timeframe, specific target dates will be defined by key leadership to include City Staff and Elected Officials, the Sustainable Santa Fe Commission, and community partners. These specific target dates will be developed and communicated as ongoing addendums to this Sustainable Santa Fe Plan in the interest of continuous improvement.



SUMMARY SANTA FE CLIMATE ACTION PLAN

ACTION ITEMS	IMPLEMENTATION STATUS	TARGET COMPLETION DATE
<p>GREENHOUSE GAS EMISSIONS INVENTORY</p> <p>1-1. Acquire the data needed to complete the Baseline Emissions Inventory.</p> <p>1-2. Use the software and other measures to assess the efficacy of measures recommended in this Plan.</p> <p>1.3 Set priorities for implementation of plan actions based on their calculated efficacy, cost, requirements and additional benefits.</p>		
<p>CITY OPERATIONS</p> <p>2-1. Develop a workplace training program to help city staff reduce the impacts of their daily operations.</p> <p>2-2. Follow the recommendations of the energy audits once completed.</p> <p>2-3. Review the City's purchasing manual and propose revisions that would reduce the impact of city purchases including: reduced packaging, reduced toxicity, increased local and organic food, increased recycled material content, leveraged purchasing power of sustainable products through partnerships with the County and/ or the State, increased local and low-mileage purchases, increased waste reduction (reduced disposables), increased recycling, increased water harvesting, and increased energy efficiency.</p> <p>2-4. Move towards plug-in electric hybrid technology for all appropriate fleet vehicles paired with solar photovoltaic recharge stations.</p> <p>2-5. Maximize hydro-electric energy generation capability of the City's water system.</p>		
<p>GREEN BUILDING CODE</p> <p>3-1. Implement performance based Santa Fe Green Building Codes that recognize the need for phased-in mandatory minimums and offer incentives to builders for performance significantly above the mandatory thresholds.</p> <p>3-2. Codify long-range commitments and date benchmarks included in the "2030 Challenge".</p> <p>3-3. Develop green building codes and incentive programs for:</p> <ul style="list-style-type: none"> Existing building remodels and retrofits, Commercial buildings, and Structures in historical districts, both new and existing. 		
<p>DEVELOPMENT AND ZONING CODE</p> <p>4-1. Amend the Development Code to make access to solar exposure a property right thereby encouraging investments in solar equipment and design.</p> <p>4-2. Amend the Development Code to encourage use of gray water for landscape watering and other uses such as toilet flushing.</p>		



ACTION ITEMS	IMPLEMENTATION STATUS	TARGET COMPLETION DATE
<p>4-3. Amend the Development Code to encourage use of cisterns and other water harvesting techniques that use rainwater to reduce use of tap water for landscape watering.</p> <p>4-4. Amend the Development Code to encourage natural vegetation shading of buildings and hardscape surfaces as vegetation both absorbs CO2 and provides shading from unwanted solar gain in the summer, reducing the need for mechanical cooling.</p> <p>4-5. Amend the Development Code to require subdivisions be laid out to enable maximum feasible use of solar design, solar equipment, and the ability to use stormwater to reduce water demand.</p> <p>4-6. Amend the Development Code to encourage locally grown food to both reduce GHG emissions and prepare for future rises in fuel costs to transport food into the area.</p> <p>4-7. Encourage Passive Solar Building Design.</p> <p>4-8. Amend the zoning code to incorporate of some aspects of performance zoning to allow for a greater variety of compatible uses which reduces the number and length of vehicle trips.</p> <p>4-9. Encourage Development of Affordable Energy Efficient Housing.</p> <p>4-10. Amend the Development Code to require large development projects and subdivisions to provide safe bicycle and pedestrian infrastructure.</p>		
<p>CLEAN ALTERNATIVE ENERGY</p> <p>5-1. Reduce Santa Fe's demand for energy through efficiency.</p> <p>5-2. Reduce energy demand during peak hours.</p> <ol style="list-style-type: none"> Conduct an energy audit which tracks uses of energy by time of day and time of year. Identify those demands that coincide with PNM's peak hours (June to September, 2 p.m. to 8 p.m.) and explore options for reducing those peaks. <p>5-3. Conduct community outreach, such as informational campaigns and "give-aways" of things like compact fluorescent light bulbs and other energy or water saving devices (water pumping requires a lot of energy so water savings also reduces energy demand). This could be done through a new efficiency utility.</p> <p>5-4. Encourage more renewable energy and distributed generation, including concentrated solar, photovoltaic systems (PV), wind power, microturbines and cogeneration, and possibly larger distributed generation and energy storage projects that could be used to "firm" renewables and lower the need for new power plants and power lines.</p> <ol style="list-style-type: none"> Provide assistance to individuals and local businesses to understand any existing incentives to installing distributed generation within the City and guide them through the process including any forms or contacts with state offices that are needed. 		



ACTION ITEMS	IMPLEMENTATION STATUS	TARGET COMPLETION DATE
<ul style="list-style-type: none"> <ul style="list-style-type: none"> b. Add a solar rights ordinance to the City's Development Code (Chapter 14) to ensure that investments in solar technology, both passive and active, are protected and are easily defended. (Current state law requires people to register their solar right with the county and they then must sue a neighbor that violates that right through the civil court system). 5-5. Develop programs to help people install renewable energy systems. <ul style="list-style-type: none"> a. Implement a loan program that would provide residents with low interest loans to facilitate the purchase of renewable energy sources and energy equipment and energy efficiency upgrades for buildings. 5-6. Examine how the City gets its energy and consider alternatives that would reduce dependence on fossil or nuclear fuels to a much greater amount than is currently required by the NM PRC. <ul style="list-style-type: none"> a. Encourage private or public/private partnerships to develop small-scale renewable energy and distributed generation projects within the City. b. The City could consider entering into power purchase agreements (PPA) in order to purchase renewable energy. c. Consider the development of a regional municipal power utility that could offer efficiency programs and distributed generation, and possibly larger renewable systems, including utilizing more efficient and more ecological High-Voltage DC (HVDC) transmission lines, while still using PNM for base and backup energy supplies, with the goal of avoiding need for new generation and transmission. d. Lobby the state government to pass laws that would allow communities to aggregate their loads and choose their own power suppliers who are providing clean, renewable energy as is being done in California with the Community Choice Aggregation program. 5-7. Ensure that as energy rates rise, the low-income families in the community are not left without the means to pay for basic energy needs. <ul style="list-style-type: none"> a. Require any utility serving Santa Fe, prior to disconnecting a City resident, to notify the city's affordable housing office and provide the opportunity to determine if the household meets the criteria that would prevent their utilities from being disconnected. b. If the resident earned too much to qualify but still not enough to pay the bills, the City could identify non-profits or develop a funding source to assist such residents. 5-8. Enhance the State of New Mexico's program for assisting low-income families with weatherization with complementary programs, including energy-efficiency. 		



ACTION ITEMS	IMPLEMENTATION STATUS	TARGET COMPLETION DATE
<ul style="list-style-type: none"> a. Establish a minimum weatherization standard that existing structures would be required to meet either at sale and/or by a specific time in the future. Low-income owners and owners that commit to renting to low-income tenants could be provided assistance either from the State or some other mechanism. b. Lobby the State Legislature for increased funding of low-income weatherization programs. c. Investigate alternative low-cost methods of weatherization and efficiency, and promote the preferable methods. 		
<p>TRANSPORTATION</p> <ul style="list-style-type: none"> 6-1. Establish mechanisms and provide support for initiatives that increase the variety and use of mass transit. 6-2. Prioritize zero emission transportation including walking, bicycling, and Electric Vehicles (EVs) both low speed and high speed. EVs include scooters, motorcycles, three-wheeled vehicles, golf carts, ATVs, cars and trucks that operate on electricity. <ul style="list-style-type: none"> a. Establish safe transportation routes for all forms of zero emission vehicles powered by clean, renewable sources. b. Offer free or very inexpensive bicycle and/or EV rental systems. c. Place bike racks throughout the city. d. Expand parking availability and provide opportunities for recharging zero-emission vehicles. e. Continue the design and construction of a comprehensive pedestrian and bicycle trail system throughout the City. f. Improve sidewalk conditions and ensure they meet ADA standards. g. Increase the bicycle carrying capacity of Santa Fe Trails buses. 6-3. Encourage carpooling. 6-4. Encourage alternative fuels when they're shown to produce less GHG than gasoline or diesel and when their production does not negatively impact food production. Where, appropriate, encourage their production locally. 6-5. Support the development of businesses including sales and service businesses that use, sell, and/or promote lower, low and no-emission transportation. 6-6. Seek grants and other financial incentive programs to implement various transportation action items, including bicycle, driver, and pedestrian education. 6-7. Implement "Complete Streets" including retrofitting existing streets where the width of the right-of-way allows. 6-8. Continue and promote the construction, installation and implementation of on-road facilities for use by bicyclists as a safe alternative means of transportation including but not limited to 		



ACTION ITEMS	IMPLEMENTATION STATUS	TARGET COMPLETION DATE
<p>signage, sharrows, "road diets", bike lanes and similar facilities where appropriate on the and existing roads and streets, especially where they integrate with public transportation.</p>		
<p>ECOLOGICAL ADAPTATION</p> <p>7-1. Set an overall city-wide goal of adaptation to climate impacts.</p> <p>7-2. Create systems that maximize use of rain and storm water for plant support and groundwater recharge.</p> <p>7-3. Reduce "urban heat island effect".</p> <p>7-4. Protect soils as the foundation of adaptation to the impacts of climate change.</p> <p>7-5. Improve support for biodiversity with adaptation techniques.</p>		
<p>WATER CONSERVATION</p> <p>8-1. Develop a Water Conservation Strategic Plan.</p> <p>8-2. Expand Rebates and Incentive Programs.</p> <p>8-3. Adopt New Technologies to better track water use and then help customers to conserve more easily.</p> <ul style="list-style-type: none"> a. Improve billing system to better track supply-side infrastructure and water use by customers as well as to validate the effectiveness of new conservation measures. b. Monitor water use with Fire Flies and Kopy Caps. c. Broaden the use of, and consider requiring, a variety of water saving appliances. d. Reduce unnecessary public and private landscape watering. <p>8-4. Proactively Plan and Run Tests to Identify Leaks.</p> <p>8-5. Expand existing residential leak investigation/survey program to include other water customer sectors.</p> <p>8-6. Expand Public Outreach and Education (see Section 11, Education and Outreach).</p> <ul style="list-style-type: none"> a. Require Irrigation Certification from the New Mexico Irrigation Association for some irrigation installations. b. Improve the City website to include water conservation information for residential and commercial customers that is both useful and interactive. c. Create and maintain public demonstration gardens throughout the City. <p>8-7. Develop a Strong Compliance and Enforcement Program.</p> <p>8-8. Expand Support for Water Conservation Activities.</p> <p>8-9. Initiate a Program to Maximize Water Harvesting.</p> <p>8-10. Initiate a Program to Process and Utilize Water for Multiple Purposes.</p> <p>8-11. Continue and increase the use of treated effluent.</p>		



ACTION ITEMS	IMPLEMENTATION STATUS	TARGET COMPLETION DATE
<p>8-12 Consider the energy requirements of any potential new water sources and seek opportunities to use clean, renewable energy sources for the energy requirements of both existing and new water sources.</p>		
<p>SOLID WASTE REDUCTION</p> <p>9-1. Conduct an Efficiency Analysis of the City and regional waste stream and adopt a Zero Waste ordinance that recognizes the viability of gradual replacement of landfills with sustainable enterprises that create local jobs and local economic development.</p> <p>9-2. Aggressively increase business recycling efforts, including, but not limited to, providing incentives to businesses and other organizations and facilities that reduce the volume of wasted resources from their facility by set percentages that increase over time.</p> <p>9-3. Establish new City purchasing policies, and other City operations, and propose changes that would reduce waste and embodied energy, reduce GHG emissions, provide preferences for vendors that reduce waste and pollution, and provide preferences for vendors that have "Take Back" programs to reduce waste.</p> <p>9-4. Work with the construction and demolition industries to develop initiatives for Zero Waste.</p> <ul style="list-style-type: none"> a. Investigate best uses for separated non-engineered lumber to include shredding by the City tub grinder. b. Reject construction waste that is divertible as landfill material at the transfer station. Require that such loads be sorted and recycled. c. Encourage the use of natural local construction materials that create few wasted resources. <p>9-5. Divert re-use items at transfer station.</p> <p>9-6. Switch fuels for solid waste vehicles and transfer station and landfill equipment such as the tub grinder and chippers from diesel and gasoline to bio-diesel or other fuel with less GHG emissions when the production of those fuels does not negatively impact food production. For transfer station and landfill equipment, such a switch should be completed by 2012 with possible interim goals to mixed fuels by 2009. The specific goals for vehicles are presented in Section 6, Transportation.</p> <p>9-7. Prepare and conduct on-going outreach and education as described in section 11, Education and Outreach, of this Plan to strive to Zero Waste including:</p> <ul style="list-style-type: none"> a. Development of a brochure for consumer purchasing decisions by 2008; b. Increase composting, and recycling participation with a goal of 85% participation rate of city residents and businesses by 2010 and a reduction in the weight of waste of 75% of the 2003 baseline by 2015; and c. Encourage people to reuse bags or containers. 		



ACTION ITEMS	IMPLEMENTATION STATUS	TARGET COMPLETION DATE
<p>9-8. Seek funding to develop a reusable bag, with the option of stores adding their logo, along with a "Sustainable Santa Fe" logo, to encourage bag reuse. This can be combined with an ordinance restricting free bag distribution from stores.</p> <p>9-9. Explore opportunities to minimize packaging.</p> <p>9-10. Explore opportunities to sell carbon offsets (credits) gained by recycling and use the proceeds to further recycling efforts.</p> <p>9-11. Seek grant funds to conduct a landfill gas exfiltration analysis of the City's landfills including an evaluation of any potential reuse or remediation.</p> <p>9-12. Expand the recycling program to add safe compostable food wastes.</p> <p>9-13. Increase Household Hazardous Waste collection to once per quarter.</p> <p>9-14. Provide for curbside collection of electronics waste (E-waste).</p> <p>9-15. Santa Fe should follow through with the "Pay as you throw" system to increase recycling participation.</p> <p>9-16. Explore the feasibility of implementing a green waste collection program for both residential and commercial customers.</p> <p>9-17. Review operations at the sanitary wastewater treatment plant to ensure optimal aerobic treatment.</p>		
<p>FOOD SYSTEMS</p> <p>10-1. Set a target for local food.</p> <p>10-2. Design and implement a City Harvest (food within the city) program to create multiple food growing, processing, storing, and selling opportunities.</p> <ol style="list-style-type: none"> Create collaborations among groups that work within the city. Review the variety of urban harvest programs that are happening in the U.S. and elsewhere to expand awareness of multiple techniques and to develop multiple pilot research projects to determine the most productive and sustainable methods for Santa Fe. Identify and reduce barriers- legal, economic, educational, etc. to urban agriculture including the retailing of food. Work with City departments on solutions, including increasing the availability of: Land and other resources for food purposes; Water resources, including water reuse; and Waste conversion to provide safe inputs. Develop a plan with targets to promote "Yard to Table". Map & Inventory Productive Land and other locations for food. Create a matching program between those who have productive space and those who would like to garden/ grow food in such space, including temporary occupancy 		



ACTION ITEMS	IMPLEMENTATION STATUS	TARGET COMPLETION DATE
<p>programs (TOPs) and SPIN (Small Plot INTensive growing) that allow people to earn tens of thousands of dollars using other people's land including backyards.</p> <ul style="list-style-type: none"> h. Incorporate local food into Economic Development and Planning. i. Include food growing opportunities into all affordable housing as a critical component of economic and food security. j. Develop programs for urban gardening for the homeless and low-income people, as well as therapy for those with mental and physical disabilities and for urban "at-risk" youth, ex-cons, etc. k. Dedicate municipal water resources to food production l. Develop neighborhood centers for home economics, sustainability, and food-related processes, including shared community facilities such as greenhouses, facilities for food storage, community kitchens. m. Provide educational resources for techniques such as water re-use from roof-tops, gray water for institutional re-use, roof-top gardens, and organic food production. n. Develop guidelines for appropriate growing in Santa Fe based on traditional and appropriate dryland gardening techniques (Waffle gardens, perennial polyculture and mulching systems using locally available materials and living mulches, careful varietal selection tailored to urban food production, etc.). o. Explore the feasibility of adding acres of ecological intensive greenhouses such as the urban model "Growing Power" after a pilot project has been adapted to local conditions. <p>10-3. Develop a Foodshed (within the 300 miles range) Program in Collaboration with Regional partners.</p>		
<p>EDUCATION AND OUTREACH</p> <p>11-1. Identify training and education needs within each section of this Plan, eliminating overlap while recognizing synergistic opportunities.</p> <p>11-2. Identify and develop a curriculum integration task group made up of local public and private K-12 school teachers as well as climate and sustainability education groups.</p> <ul style="list-style-type: none"> a. Identify local public and private K-12 schoolteachers. b. Identify qualified technical resources for teacher continuing education in concepts and subject areas related to climate change and sustainability e.g. alternative energy, ecology, water resources, diversity, etc. c. Provide task group members with training on climate change and sustainability topics. d. Facilitate the development of an integration plan for sustainability in the school system, and respective schools. 		



ACTION ITEMS	IMPLEMENTATION STATUS	TARGET COMPLETION DATE
<p>e. Establish incentives for integration of sustainability concepts into local schools.</p> <p>11.3. Work with the State Department of Education and SFPS to have them accept sustainability as one of their primary learning goals and toward the integration of Sustainability as part of the K - 12 Standards and Benchmarks.</p> <p>11-4. Identify informal educational resources for climate and sustainability education.</p> <p>a. Conduct a community-wide asset mapping of organizations and resources for climate and sustainability education at all levels e.g. informal and formal, K-12 and post secondary etc. and identify goals, objectives, funding sources and timeline for existence of such programs or assets within year one of this Plan.</p> <p>b. Develop a resource guide or work with existing projects to provide a resource list to consumers of such information.</p> <p>11-5. Develop both formal and informal (non-degree seeking) education programs.</p> <p>a. Develop materials for community based action that addresses climate change by working with a variety of resource organizations and others.</p> <p>b. Develop a cadre of informed community members from many community sectors that can effectively utilize the City of Santa Fe Community Climate Education session(s) to implement actions and programs within their respective groups.</p> <p>11-6. Support local and regional educational initiatives that strengthen more local markets for sustainable products and services.</p> <p>11-7. Work with existing initiatives such as Bioneers and others to establish an annual sustainability education conference for teachers, parents, and youth that focuses on the integration of sustainability and related topics into the schools system, while providing resources to its participants.</p> <p>11-8. Direct City support and funding towards educational materials development and training, and when appropriate, towards organizations that offer needed solutions.</p>		



REFINING SCHEDULED IMPLEMENTATION

Proposed Implementation Measures with broad time frames are to be established within 6 months of the Plan adoption by City Council. Specific date deliverables will be identified for each objective within the Targets of Opportunity by the specific implementation team, not limited to City Staff and the Sustainable Santa Fe Commission. Specific delivery dates for each objective will be communicated to City leadership within the proposed time frame and modified to meet leadership objectives as necessary.

EVALUATION

The Sustainable Santa Fe Plan is an ambitious effort to affect Climate Change and increase sustainability through City led initiatives and partnerships. As all objectives identified in this Plan are measurable and modifiable based on their overall ability to affect the City goal to reduce GHG emissions. Using both qualitative and quantitative evaluation methods, City Staff, with assistance from the Sustainable Santa Fe Commission will conduct an annual evaluation of the progress toward each initiative and its overall impact on the objectives and overall goal. This report may not be limited to written delivery, but may also integrate creative communication capabilities. Feedback to the community will be provided through the City website and maintained in each annual