CLIMATE PROTECTION TASK FORCE

REPORT TO LAWRENCE CITY COMMISSION

WORKING DRAFT 1/16/09

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EXECUTIVE SUMMARY

The United Nations Intergovernmental Panel on Climate Change (IPCC), a global consortium of scientists, has determined that the warming of our climate system is “unequivocal" and is most

likely due to the increase in greenhouse gas concentrations generated by human activity.[1] Assuming greenhouse gas emissions increase on a moderate trajectory, risks to the state of Kansas by 2100 may include: increased temperatures, fewer frost days, and more heat waves; lower heating costs and higher air-conditioning costs; more intense and less predictable storm cycles (precipitation intensity increases, while frequency decreases); a higher probability of flooding; higher rates of evaporation and transpiration, and decreases in soil moisture and annual moisture surplus; and an overall need for more water in the state, with less total moisture available.[2] In addition to impacts on agriculture, water resources, and our local ecosystem, these climate fluctuations may stunt economic growth, jeopardize tourism and manufacturing, and have adverse consequences for human health.

Recognizing a need for action, former Mayor Dennis "Boog" Highberger signed on to the U.S. Conference of Mayors Climate Protection Agreement on behalf of the City of Lawrence, Kansas in March 2006.[3] Under the Agreement, participating cities commit to:

> 1) Strive to meet or beat the Kyoto Protocol targets in their own communities, through actions ranging from anti-sprawl land-use policies to bike path development to public information campaigns;
>
> 2) Urge their state governments and the federal government to enact policies and programs to meet or beat the greenhouse gas emission reduction target suggested for the United States in the Kyoto Protocol—7% reduction from 1990 levels by 2012; and
>
> 3) Encourage the U.S. Congress to pass the bipartisan greenhouse gas reduction legislation, which would establish a national emissions trading system.

In order to advance these goals, the Mayor's Task Force on Climate Protection (also known as the Climate Protection Task Force, or CPTF) was appointed in February 2008 to create a Climate Protection Plan for the City of Lawrence.

In conjunction with Mayor Michael Dever, CPTF has developed the following climate mitigation goal for the City of Lawrence: **An 80% reduction in greenhouse gas emissions measured in carbon dioxide equivalence (CDE) by 2050, using baseline data from 2005.**

CPTF suggests the following timeline for achieving incremental reductions goals:

1) 30% reductions by 2020
2) 50% reductions by 2030
3) 70% reductions by 2040
4) 80% reductions by 2050

Recognizing many actions are needed to achieve these emissions reduction goals, CPTF has, over the last 11 months, worked diligently with significant community stakeholders to develop the following seven strategies:

1) **Provide dedicated staffing and adequate funding to support climate protection and sustainability initiatives.**

2) **Enhance energy conservation policies and building standards.**

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[1] IPCC Fourth Assessment Report: Climate Change 2007, http://www.ipcc.ch/ipccreports/assessments-reports.htm
[2] http://www.globalcarbonproject.org/misc/carbontrends.htm
[3] http://www.usmayors.org/climateprotection/list.asp)

3) **Incorporate the goal of reducing greenhouse gas emissions into land use planning.**

4) **Develop transportation policies and programs to consume less energy and reduce emissions.**

5) **Provide for outreach and education on emission reduction issues.**

6) **Develop source reduction and waste reduction programs and initiatives.**

7) **Prioritize efforts to reduce greenhouse gas emissions in municipal and institutional facilities, including city facilities, local schools, and institutions of higher learning as a reflection of leading by example.**

These recommended strategies have been prioritized based on their potential impact to the goal of greenhouse gas reduction. Each strategy will have an immediate impact and can help the City of Lawrence effectively reduce GHG emissions from both government operations and the community as a whole. They are not linear, and can be undertaken concurrently. However, the amount of time required to implement these strategies effectively will depend on the implementation of Strategy #1 (the application of appropriate human and financial resources) and the priority City government gives to achieving these goals. CPTF recognizes the importance of leadership in implementing the seven strategies. Based on the success factors of like programs in similar communities, CPTF strongly recommends providing dedicated staffing and adequate funding as the highest priority.

Through the reduction of local GHG emissions, the City of Lawrence can recognize cost savings, attract environmentally friendly businesses to the area, and help Lawrence establish a leadership role in climate risk mitigation in Kansas.

INTRODUCTION

BACKGROUND

In March 2006, former Mayor Dennis "Boog" Highberger signed on to the U.S. Conference of Mayors Climate Protection Agreement on behalf of the City of Lawrence, Kansas. [4]

Under the Agreement, participating cities commit to take the following three actions:

> 1) Strive to meet or beat the Kyoto Protocol targets in their own communities, through actions ranging from anti-sprawl land-use policies to bike path development to public information campaigns;
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> 2) Urge their state governments and the federal government to enact policies and programs to meet or beat the greenhouse gas emission reduction target suggested for the United States in the Kyoto Protocol—7% reduction from 1990 levels by 2012; and
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> 3) Encourage the U.S. Congress to pass the bipartisan greenhouse gas reduction legislation, which would establish a national emissions trading system.

In order to advance these goals, the Mayor's Task Force on Climate Protection (also known as the Climate Protection Task Force, or CPTF) was appointed in February 2008 to create a Climate Protection Plan for the City of Lawrence.

The task force is chaired by Mayor Michael Dever and includes community members representing significant stakeholder groups within the City of Lawrence. CPTF group members are: PLEASE ADD IN YOUR TITLE

Michael Dever, Chair	Mayor, City of Lawrence
Carey Maynard-Moody, Vice-Chair	Sierra Club
Dr. Bridget Chapin	Campus Coordinator & Associate Professor of Biology, Haskell Indian Nations University
John Geist	Energy Manager, USD 497
Charles Gruber	Real Estate
Steve Hughes	Hughes Consulting Engineering
Chad Luce	Westar
Jeff Novorr	Lawrence Memorial Hospital
Susan Rodgers	Hallmark
Simran Sethi	Sustainability Advisory Board member, Journalist, and University of Kansas School of Journalism Visiting Professional Chair

[4] http://www.usmayors.org/climateprotection/list.asp)

Jeff Severin	Director, University of Kansas Center for Sustainability

The effort is supported by Assistant City Manager Cynthia Boecker, Assistant Public Works Director Tammy Bennett, and City Communications Manager Lisa Patterson. This report is further supported by Bowersock Mills Owner/ Operator and Co-Chair of the Lawrence Chamber of Commerce's Growing Green Task Force Sarah Hill-Nelson and KU Graduate Candidate and Sustainability Advisory Board member Brian Sifton.

The explicit goals of this group are as follows:

1) Report greenhouse gas emissions baseline data for city operations and the community;

2) Recommend greenhouse gas emission reduction goals and target timeframes; and

3) Develop suggested strategies to meet the goals while preserving economic development, transportation options, and the ability of responsible producers of energy to provide a stable and cost effective energy supply.

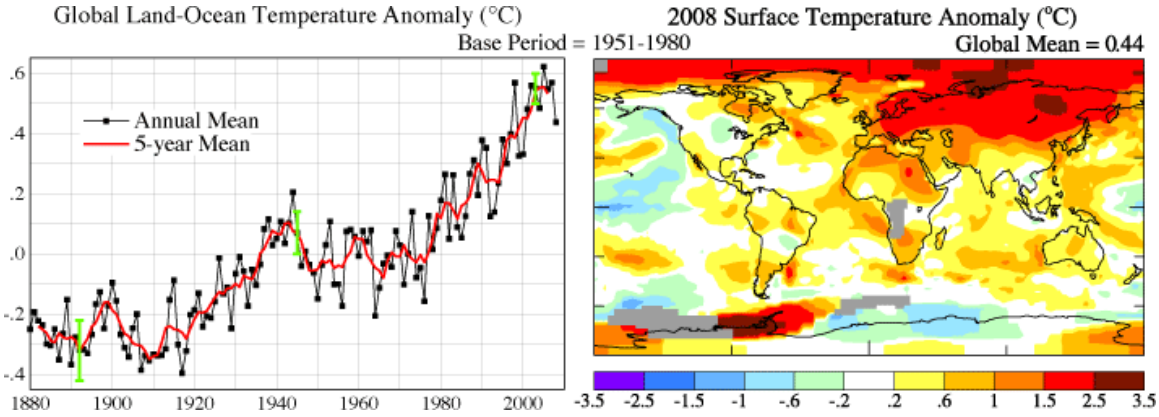
The following report is a proposed plan of action to be presented to the Lawrence City Commission on TBD, 2009.

CLIMATE CHANGE

Two leading federal climate science agencies—the National Aeronautics and Space Administration[5] and the National Oceanic and Atmospheric Administration[6]—recently confirmed 2008 is one of the ten warmest years on record. Overall, the 10 warmest years (since records began in 1850) have all occurred since 1997. Climate scientist Melanie Fitzpatrick with the Union of Concerned Scientists states: "This year's data show that global warming continues to increase our climate's baseline temperature. Even some moderate cooling effects from cyclical weather patterns in the Pacific Ocean failed to dampen the impact global warming had this year. Heat-trapping emissions from human activity have caused most of the increase in global average temperature since the middle of the twentieth century. . . The scientific evidence shows that the window of opportunity to act is still open, but that further delay will only lead to excessive warming."[7] (See Figure A.)

Figure A – Left: Annual-means of global-mean temperature anomaly Right: Global map of surface temperature anomalies, in degrees Celsius, for 2008.[8]

[5] http://data.giss.nasa.gov/gistemp/2008/
[6] http://www.noaanews.noaa.gov/stories2009/20090113_ncdcstats.html
[7] http://www.ucsusa.org/news/press_release/federal-science-agencies-1077.html
[8] http://data.giss.nasa.gov/gistemp/2008/



CLIMATE CHANGE IN KANSAS

The November 2008 Climate and Energy Project report "Climate Change Hits Home: The Risks of Climate Change for Kansas" indicates global warming will impact the eastern and western portions of our state in varying and significant ways.[9] The report asserts that, assuming greenhouse gas (GHG) emissions increase on a moderate trajectory, risks to Kansas by 2100 include:

- Increased temperatures, fewer frost days, and more heat waves;
- Lower heating costs, higher air-conditioning costs;
- More intense and less predictable storm cycles (precipitation intensity increases, while frequency decreases);
- Higher probability of flooding;
- Higher rates of evaporation and transpiration, and decreases in soil moisture and annual moisture surplus; and
- An overall need for more water in the state, with less total moisture available.[10]

In addition to impacts on agriculture, water resources, and our local ecosystem, these climate fluctuations may stunt economic growth, jeopardize tourism and manufacturing, and have adverse consequences for human health.

This information is corroborated by the Environmental Protection Agency (EPA) report "Climate Change and Kansas,"[11] and the report "State Economic and Environmental Costs of Climate Change," compiled by the Center for Integrative Environmental Research (CIER) and National Conference of State Legislators (NCSL). The July 2008 NCSL report attributes potential economic losses of $1 billion to the state of Kansas due to climate change. It also projects an increase in legal battles as a result of water decline and an exacerbation of health issues including asthma due to temperature rise.[12]

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[9] http://www.climateandenergy.org/LearnMore/InTheNews/ClimateStudy.htm
[10] http://www.globalcarbonproject.org/misc/carbontrends.htm
[11] http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/SHSU5BUQME/$File/ks_impct.pdf
[12] http://www.ncsl.org/programs/environ/ClimateChange.htm

CLIMATE PROTECTION TASK FORCE GOALS AND STRATEGIES

On March 21, 2008, Governor Kathleen Sebelius issued Executive Order No. 08-03 establishing the Kansas Energy and Environmental Planning Advisory Group (KEEP) to identify opportunities for Kansans to respond to the challenge of global climate change while becoming more energy efficient and energy independent, and spurring economic growth.[13] Like Governor Sebelius and the leaders of many other states and cities, representatives of the City of Lawrence feel compelled to respond to the issue of climate change, as well. The creation of CPTF acknowledges the urgent need for action at the local level and will enable the City of Lawrence to take a leadership role in climate risk mitigation in Kansas.

The Climate Protection Task Force's overarching goal is to achieve an 80% reduction in greenhouse gas (GHG) emissions measured in carbon dioxide equivalence (CDE) by 2050, using baseline data from 2005.

CPTF suggests the following timeline for achieving incremental GHG reductions:

- **30% reductions by 2020**
- **50% reductions by 2030**
- **70% reductions by 2040**
- **80% reductions by 2050**

Many actions are needed to achieve this emissions reduction goal. CPTF believes the following seven strategies can have an immediate impact and will help the City of Lawrence effectively reduce GHG emissions from both government operations and the community as a whole:

#1 Provide dedicated staffing and adequate funding to support climate protection and sustainability initiatives.

#2 Enhance energy conservation policies and building standards.

#3 Incorporate the goal of reducing greenhouse gas emissions into land use planning.

#4 Develop transportation policies and programs to consume less energy and reduce emissions.

#5 Provide for outreach and education on emissions reduction issues.

#6 Develop source reduction and waste reduction programs and initiatives.

#7 Prioritize efforts to reduce greenhouse gas emissions in municipal and institutional facilities, including city facilities, local schools, and institutions of higher learning.

These strategies are not linear, and can be undertaken concurrently. The amount of time required to successfully implement these strategies will depend on the adaptation of Strategy #1 (providing appropriate human and financial resources) and the priority City government gives to achieving these goals. CPTF recognizes the importance of leadership in implementing the seven strategies. Based on the success factors of like programs in similar communities, CPTF strongly recommends dedicated staffing and adequate funding as the highest priority.

CONTEXT

[13] http://www.ksclimatechange.us/

The strategies of the CPTF were forged through careful consideration and counsel. This report represents the efforts of the core CPTF as well as the following working groups comprised of significant community stakeholders listed below and detailed in Appendix A.

- Energy Efficiency, & Conservation: Steve Hughes (Chair), Steve Bennett, David Dunfield, James Dunn, Ron Durflinger, John Geist, Joe King, Larissa Long, Chad Luce, Barry Walthall.
- Policy, Education, & Outreach: Simran Sethi (Chair), Marty Birrell, Cynthia Boecker, Phil Cauthon, Robert Glicksman, Derek Helms, Sarah Hill-Nelson, Nancy Jackson, Gwendolyn Klingenberg, Lisa Patterson, Jeff Severin, Brian Sifton, Daniel Wildcat.
- Transportation: Carey-Maynard Moody (Chair), Karen Clawson, Marc Epard, Todd Girdler, Charles Gruber, Marian Hukle, Lisa Pool, Bart Rudolph, Kyle Schneweis, Steve Stewart.
- Waste Management: Susan Rodgers (Chair), Tammy Bennett, Dwayne Fuhlhage, Kathy Richardson, Chris Scafe, Charlie Sedlock, Bob Yoos.

Working group discussions and subsequent strategy recommendations were informed by our understanding of GHG emissions sources by source and type, as determined by the City of Lawrence Greenhouse Gas Inventory of March 17, 2008. (See Appendix B.)

The following data and graphs summarize the GHG inventory for 1990, 1995, 2000, and 2005. The year 2005 is the baseline year to which we refer. (See Figure B.)

Figure B – Equivalent Tons of CO2 & Tons Per Capita for Lawrence, KS.

Year	1990	1995	2000	2005
Equivalent CO_2 Tonnes	2,241,690	2,400,703	2,431,863	1,661,047
Equivalent CO2 Tonnes per capita	34.17	32.70	30.36	18.76

In 2005, the City of Lawrence's GHG emissions reflected patterns of energy consumption reflective of similar cities across the nation. Electricity use in Lawrence accounts for the majority (64%) of the community's GHG emissions, with transportation and natural gas accounting for the bulk of the remaining emissions. By sector, commercial and residential use account for approximately 2/3 of emissions (34% and 32% respectively). (See Figures C and D.)

Figure C - 2005 Greenhouse Gas Emissions by Source for Lawrence, KS.

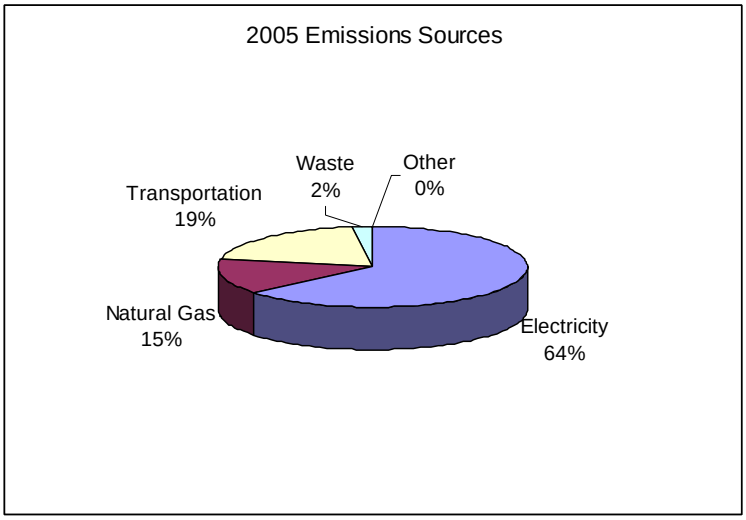
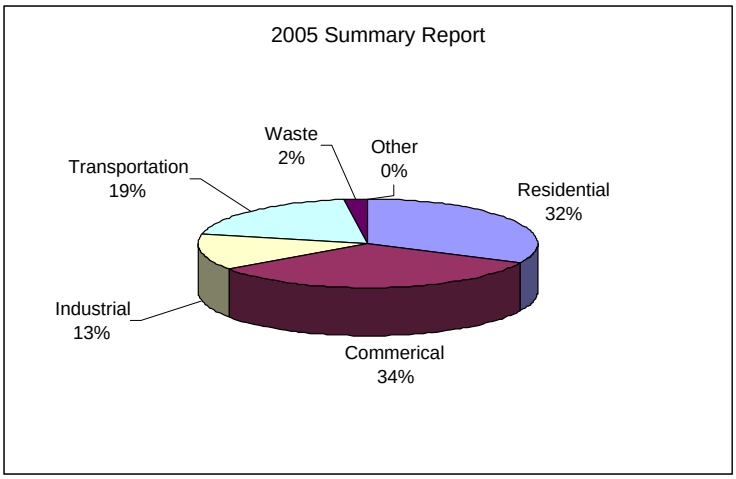


Figure D – 2005 Greenhouse Gas Emissions by Sector for Lawrence, KS. (FIX LETTER BLEED IN PIE CHART)



The remainder of this document addresses and describes the Recommended Strategies outlined above. CPTF has distilled this information into short synopses. Each synopsis includes background information about the subject, the benefits and need for adaptation, strategy applicability to Lawrence, and specific recommendations.

Working groups chaired by CPTF members spent 11 months researching and gathering information with the intention that this document may serve as a viable tool for directing future efforts. Due to their engagement in this effort and their familiarity with the subject, the Task Force proposes that select members of CPTF remain active in the strategic implementation of these efforts and participate in future climate change strategies.

STRATEGY #1: PROVIDE DEDICATED STAFFING AND ADEQUATE FUNDING TO SUPPORT CLIMATE PROTECTION AND SUSTAINABILITY INITIATIVES.

INTRODUCTION

Over the last several years, City departments, community businesses, educational institutions, and volunteer organizations have worked to address the challenges of climate change through various methods, including investing in energy efficient technologies and raising awareness about this critical issue. While there are many key components in place to begin working towards the recommendations in this plan, the effort will require centralized coordination and oversight as well as financial backing. Currently, Lawrence lacks an overarching structure to coordinate and effectively implement a climate plan.

BENEFITS AND NEEDS

Natural resource stewardship is vital to the sustenance of individuals, communities, and businesses. At various times and for a variety of reasons, government, city departments, advisory boards, advocacy groups, and citizens have addressed environmental concerns. City departments including Waste Reduction and Recycling, Solid Waste and Water, and Sewer Divisions have addressed their respective areas of concern and impact, but there has been little coordination and no overarching goals or oversight for efforts.

Successful and meaningful responses to concerns about climate change at the municipal level will necessarily include all of these stakeholders, and more. Volunteer efforts will remain an essential component of this program, but successful execution of a plan will require the City to provide continuity and oversight, and to exercise the authority required to coordinate and sanction a community-wide GHG reduction program. In order to follow through with the commitment the City of Lawrence has made to reduce GHG emissions, a dedicated full-time staff position must be created to ensure the recommendations in this report are executed within City operations and throughout the community.

APPLICABILITY TO LAWRENCE

Citizen and government groups in Lawrence have made numerous efforts over the past ten years to encourage environmentally friendly or “green” development and community action. Yet the community has never come to a consensus and executed policies that promoted sustainable development (an integrated commitment to economic growth, social development, and environmental protection).

Politically and economically, this moment may prove appropriate for gathering the support necessary to develop a city that can grow sustainably into the next century. Sustainable development “meets the needs of the present without compromising the ability of future generations to meet their own needs.”[14] It implies economic growth together with the protection of environmental quality and does not diminish the prospects for future generations to enjoy a quality of life at least as good as our own.

The threat of climate change and the attendant negative economic impacts related to GHG generation, as well as the urgent need for economic growth, may allow community members to achieve consensus on this issue.

RECOMMENDATIONS

[14] http://www.un.org/documents/ga/res/42/ares42-187.htm

CPTF strongly recommends the creation of a full-time staff position as its highest priority. The task force recognizes leadership is the cornerstone of successful implementation of the remaining suggested strategies, as reflected in the success factors of like programs in similar communities. The amount of time required to successfully implement this climate plan will depend on the adequate staffing and funding City government gives to achieving these goals.

CPTF suggests that this climate advisor report directly to the City Manager, and serve as a resource to City staff, the Chamber of Commerce, and community members to facilitate actions that will result in GHG emissions reductions. This staff person will meet regularly with all City departments and City advisory boards to identify existing practices and develop strategies for implementing additional sustainability initiatives into municipal operations, as well as advise the City Manager, City Commission, and Planning Commission on issues of sustainability. This individual will also coordinate with stakeholder groups and community members to develop, approve, and promote education and outreach materials and community-wide efforts. Stakeholder and community groups shall include staff and volunteers from educational institutions, the business community, neighborhood associations, hospital/medical groups, civic, social, and religious organizations, and other volunteer networks assisting with this effort.

In establishing a Sustainability Director, Lawrence would join many other cities across the nation that have made this commitment, including Fayetteville, Arkansas; Flagstaff, Arizona; Kansas City, Missouri; Durham, North Carolina; Corvallis, Oregon; and LaCrosse, Wisconsin.[15]

Most critically, adequate funding must be provided to successfully implement this plan. This includes budgeting for a staff salary that is commensurate with similar City of Lawrence administrative positions and municipal sustainability or climate coordinator positions in peer communities, along with operational costs for producing and maintaining an education and outreach program. While the position may pay for itself in energy-saving practices implemented in city operations, the possibility of adding a sustainability fee to municipal utility service bills should be explored to ensure a sustainable and predictable source of funding for this effort.

[15] Fayetteville, Arkansas. http://www.accessfayetteville.org/government/sustainability/index.cfm ; http://www.accessfayetteville.org/government/sustainability/documents/Sustainability_Coordinator_job_descrip..pdf; LaCrosse, Wisconsin. http://www.co.la-crosse.wi.us/solidwaste/docs/Newsletters/June08.pdf; Durham, North Carolina. http://www.greenpolicy.us/index.php?title=Durham%2C_NC_Creating_a_Sustainability_Coordinator_Position; Corvallis, Oregon. http://www.ci.corvallis.or.us/index.php?option=com_content&task=view&id=1825&Itemid=2099; Flagstaff, Arizona. http://www.flagstaff.az.gov/Archive.asp?ADID=596
Kansas City, Missouri. http://www.kcmo.org/manager.nsf/web/emsmanual?opendocument

STRATEGY #2: ENHANCE ENERGY CONSERVATION POLICIES AND BUILDING STANDARDS

INTRODUCTION

The Alliance to Save Energy has determined current energy use in buildings represents 39% of all energy use in the United States, superseding both industrial or transportation usage.[16] Annually, buildings are responsible for 38% of CO_2 emissions, 40% of energy use, and 70% of electricity use annually.[17] A recent study by the McKinsey Global Institute found that increased efficiency in buildings, industry, transportation, and energy production could meet almost all increased energy demand in the United States while preventing more than 1.5 billion tons of GHG emissions.[18]

BENEFIT AND NEED

In an interview with Forbes magazine, energy expert Amory Lovins called energy-efficiency "the largest, cheapest, safest, cleanest, fastest way to provide energy services."[19] Efficiency is the least expensive, most effective means of reducing the long-term cost of decreasing GHG emissions. In addition to emissions reductions, energy conservation reduces operating costs for homes, businesses, and municipal services. Historically, energy prices have trended upward. Certain fuels, natural gas, for example, have exhibited significant price volatility. Both volatility and increasing prices have clear negative effects for businesses, individuals, and organizations alike. Energy efficiency is the best way to reduce emissions, extend energy supplies, and insulate consumers from price fluctuations. Standards and incentives will encourage stakeholders to invest in projects that will conserve energy over the long term.

APPLICABILITY TO LAWRENCE

Within Lawrence, electricity accounts for 64% of GHG emissions, the result of the energy used to heat, cool, ventilate, light, and operate buildings throughout the City. The City of Lawrence 2009 Budget in Brief report attributes a large part of the projected 3.9% increase in expenditures over 2008 to "rising commodities costs, mainly fuel, electricity, and natural gas."[20] A reduction in the amount of energy required to perform these tasks is not only the least expensive and most efficient way to begin to reduce GHG emissions, but may reduce some of the projected municipal costs for 2009.

Recent utility data provided by city staff for the major city buildings (City Hall, Lawrence Arts Center, Community Health Building, and the Fire Medical #1 Building) reflects a 3.8% decrease in the overall cost for energy (electric and natural gas) from 2006 to 2007. This data indicates that natural gas consumption for the major city buildings increased by 10% from 2006 to 2007. (This was mainly due to a colder winter which had 23% more heating degree days in 2007 (4969 HDD) than 2006 (4021 HDD)).[21] The utility data when compared with the actual weather tends to indicate that implemented energy conservation measures are reducing consumption and GHG emissions. Electrical consumption was down 5.7% from 2006 to 2007. This accounted for all the dollar savings the City has seen from

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[16] http://www.ase.org/content/article/detail/4096
[17] http://www.ase.org/section/_audience/policy
[18] http://www.mckinsey.com/mgi/publications/Curbing_Global_Energy/index.asp
[19] http://www.forbes.com/2008/07/03/energy-efficiency-biz-energy_cx_al_0707efficiency_lovins.html
[20] http://www.lawrenceks.org/budget
[21] NOAA Climate Data East Central Kansas, http://www7.ncdc.noaa.gov/CDO/CDODivisionalSelect.jsp

2006 to 2007. Establishing policies and incentives to encourage conservation will, over the long-term, extend savings to every sector of the community.

RECOMMENDATIONS

CPTF recommends that the City undertake the following:

1) Collaborate with local utilities to make citizens aware of existing efficiency programs, incentives, and assistance.

2) Develop new incentive-based programs specifically for Lawrence residents and businesses as part of the comprehensive education and outreach program (see Strategy #5). Such programs should include incentives for energy efficient buildings and the practice of effective energy conservation.

3) Enhance current building codes to increase energy efficiency in new construction and remodeling work. Codes should require the use of high-efficiency systems and longer lasting construction materials (to reduce lifecycle energy costs).

4) Implement tax abatements and other incentives, as well as strengthened enforcement, to drive these changes.

Detailed suggested actions are listed in Appendix D.

STRATEGY #3: INCORPORATE THE GOAL OF REDUCING GREENHOUSE GAS EMISSIONS INTO LAND USE PLANNING.

INTRODUCTION

BENEFITS AND NEEDS

APPLICABILITY TO LAWRENCE

RECOMMENDATIONS

GENERAL NOTES TO BE CULLED:

- Understanding the reduction of vehicle miles traveled is, in part, dependent on the location of goods and services, the CPTF encourages land use and planning policies that reduce the need for transportation. New developments can be planned to reduce the need to burn fuel in the process of transporting residents from place to place for their daily needs. Strategies such as maximizing urban infill and investment in the vitality of the urban core may reduce fuel burned by making walking, biking and public transit more appealing than the private automobile. Work, school, play, and shopping should all be within easy & close proximity in any development planning.

3. Develop land use and planning policies that reduce the need for transportation:

a) Direct the Planning Commission to consider the effects of climate change on long-range planning, and vice versa, when drafting Chapter 16 for the Horizon 2020 Comprehensive Land Use Plan.

b) Zone land as transit-oriented development (TOD) near highly used transit stops and incentivizes this type of development.

c) With the next update of the Long-Range Transportation Plan, include language, which states the importance of considering the following when planning for new roadways: high quality natural areas (including wildlife habitat and native prairie) and agricultural land, and air and water quality.

d) Transportation projects/planning should be reviewed to assess their contributions to GHG emissions in the city to ensure that we are working towards the target reduction. And set a target for transportation-related emissions.

e) Improve urban design of development projects and roadways to accommodate a multi-modal transportation system.

f) Focus on redevelopment and infill where infrastructure currently exists and, when development occurs outside these areas, it should be: 1) contiguous with existing development to avoid leapfrog development, 2) compact, dense, and mixed-use, 3) include a balance of housing and jobs, 4) include a minimum percentage of affordable housing, and 5) avoid high quality natural areas and prime agricultural land.

g) Adopt bicycle/pedestrian level of service standards and guidelines for new developments, repair crumbling sidewalks and invest in new sidewalk segments to ensure continuity.[22]

h) Complete Streets is a common planning term to describe a way of designing streets that incorporates users of all modes of travel (drivers, cyclists, pedestrians, transit users), of all ages and abilities. This website does a nice job of demonstrating: http://www.completestreets.org/

[22] http://www.lawrenceplanning.org/t2030/T2030_Chap8.pdf , http://www.enhancements.org/download/trb/1538-001.PDF)

i) Develop street design standards that include Bike/Pedestrian friendly accommodations and repair or retrofit areas of the city where bicycle facilities are now needed.[23]
j) Complete the implementation of a comprehensive network of bicycle facilities identified in the bikeway system map.[24]
k) Continue to mandate and enforce bicycle parking for new development and retrofit other areas, including transit stops, to provide adequate bicycle parking.[25]

[23] http://www.lawrenceplanning.org/t2030/T2030_Chap8.pdf , http://www.planning.org/research/streets/index.htm ,)
[24] (http://www.lawrenceplanning.org/documents/Bike%20Facility%20Map(2006).pdf , http://www.lawrenceplanning.org/t2030/T2030_Chap8.pdf)
[25] http://www.lawrenceplanning.org/t2030/T2030_Chap8.pdf , http://www.bicyclinginfo.org/engineering/parking.cfm

STRATEGY #4: DEVELOP TRANSPORTATION POLICIES AND PROGRAMS TO CONSUME LESS ENERGY AND REDUCE EMISSIONS

INTRODUCTION

According to the United States Environmental Protection Agency (EPA), transportation is the fastest-growing source of U.S. GHGs, accounting for 47 percent of the net increase in total U.S. emissions since 1990.[26] Transportation is also the largest end-use source of carbon dioxide (CO_2), the most prevalent greenhouse gas. The combustion of traditional gasoline is the primary cause of vehicular emissions, however, tailpipe emissions are an increasing cause for concern that can be remedied through vehicle technologies and low-carbon fuels.

BENEFIT AND NEED

Lawrence can benefit significantly from developing transportation policies and programs that encourage community members to consume less energy and reduce emissions. The use of public transportation generates only half as much CO_2 and nitrogen oxide, per passenger mile, as does the use of private vehicles.[27] Increasing the availability, convenience, and use of public transportation not only reduces GHG emissions and produces a cleaner environment, but it also affords our country greater energy independence.[28] Additionally, Lawrence households that use public transit, rather than a private vehicle, can save over $6,000 per year.[29]

APPLICABILITY TO LAWRENCE

In a recent vote, Lawrence citizens demonstrated overwhelming support for their public transit system, with 74% of voters favoring a 0.2% sales tax to fund continuation and enhancement of the Lawrence Transit System (the "T"). However, the T only addresses transportation concerns within city limits. According to the 2000 Census, roughly 25% of Lawrence's work force commutes out-of-town.[30] This creates significant opportunities for carpooling and inter-community mass transit exist.

RECOMMENDATIONS

The climate protection plans of many cities focus on reducing the number of miles that the community's vehicles travel. Yet, greenhouse gases are emitted when vehicles idle as well as travel. With that in mind, CPTF transportation recommendations are designed to *reduce the amount of fuel the vehicles burn* in Lawrence both in City operations and community use. CPTF recommends the following:

1) Continue to support, enhance and promote public transit and work with local and regional partners to develop and enhance services that integrate public transportation into a regional transportation plan.

2) Create education and outreach programs (see Strategy #5) that encourage and facilitate behaviors that reduce fuel use, such as car-pooling, biking, and walking, and where possible

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[26] http://www.epa.gov/OMS/climate/index.htm
[27] http://www.publictransportation.org/reports/asp/energy.asp
[28] Public Transportation's Contribution to U.S. Greenhouse Gas Reduction Science Applications International Corporation for the American Public Transportation
http://www.apta.com/research/info/online/documents/climate_change.pdf
[29] http://www.publictransportation.org/news/features/070109_energy_report.asp
[30] U.S. Census Bureau, Census 2000, Summary File 3, Table P27.

implement policies and ordinances that reinforce these behaviors. Specific strategies are included in Appendix E.

STRATEGY #5: PROVIDE FOR OUTREACH AND EDUCATION ON EMISSIONS REDUCTION ISSUES

INTRODUCTION

Individuals, businesses, and governments are increasingly aware of the economic and environmental impacts of climate change and, increasingly, wish to reduce their greenhouse gas emissions. The biggest barrier to implementation is a lack of awareness on how to do so in an impactful and cost-effective manner. Providing education and outreach regarding climate change is critical not only to making this GHG reductions efforts successful, but perhaps equally important to making them simpler, easier, and more accessible. For example, energy conservation is an easy and cost-effective first step to GHG emissions reductions. Educating the community about new technologies, new policies and how they can help save money and save the planet can enable inspiring and substantive climate change and sustainability action. Providing a consistent and ubiquitous message to the community through education and outreach is a critical step towards changing long-held habits and fostering transformation.

BENEFITS AND NEEDS

Education and outreach ensure that the community as a whole shares an understanding of climate protection and sustainability. Perhaps more importantly, education and outreach provide citizens with tools for change, including information about personal actions and the cumulative impact of those actions. Through education and outreach, citizens may access useful websites, tools, contractors, vendors, and programs. When combined with the appropriate resources, education creates a culture of awareness that can support and encourage community-wide efforts.

Education and outreach complement the other recommendations in this report by making the general public aware of strategies for reducing GHG emissions, connecting individuals and businesses with resources to help them implement change, and providing motivation for the community to work together to achieve a common emissions reduction goal.

APPLICABILITY TO LAWRENCE

Education and outreach campaigns have been successfully implemented in our community to address environmental and cultural issues. For example, the City of Lawrence Waste Reduction and Recycling (WRR) division provides information to community members through media, public events, and online resources.[31] The Lawrence community has also joined together to promote specific efforts, such as the City of the Arts campaign in 1999-2000. When paired with expert resources available through Haskell University, The University of Kansas, Unified School District #497, and local and state environmental and conservation organizations, the City of Lawrence has the potential to develop a high quality education and outreach program that addresses the specific needs and concerns of our community.

RECOMMENDATIONS

CPTF recommends the development of a comprehensive education and outreach program that not only raises awareness about the local impacts of climate change and possible solutions, but also connects the community with the resources necessary to implement changes within their homes, businesses, and institutions. The general tone of the program should be to reward those that make significant progress and set the example for the community.

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[31] www.lawrencerecycles.org

The program should include a centralized marketing campaign with a coordinated look and feel to ensure a consistent message. The campaign should feature materials and initiatives developed by and for target audiences within the community. Potential target audiences include residents (through direct contact and contact with religious, civic, and social organizations), businesses, non-profit organizations, and educational institutions.

Education and outreach materials may inspire voluntary behavior change and increase buy-in for City-wide GHG reductions efforts. For example, numerous studies and practices show that energy efficiency and conservation strategies are implemented fastest and most fully when peers influence one another, so the program should engage stakeholders to motivate and activate their peers throughout Lawrence. CPTF suggests educational efforts extend to K-12 curricula. Additional information can be found in Appendix C.

An effective public outreach program should incorporate a range of social marking tools (see *Fostering Sustainable Behavior*, McKenzie-Mohr & Smith, 1999) including but not limited to:

- A public commitment from individuals to participate in a reduction program
- Social networking in the form of a "block leader" or other peer-to-peer network for distributing information and encouraging participation in reduction programs
- Incentives for participation in the program (financial or otherwise)
- Regular feedback on progress towards the community goal

As part of this effort, CPTF recommends the establishment of a community-wide logo to be used throughout websites, brochures, advertisements, press releases, and other communications disseminated by related stakeholder groups thereby reinforcing consistent branding of the City of Lawrence climate change effort. While many stakeholder groups may wish to retain their own branding, a shared, consistent logo on any community climate change publications would signify cross-community collaboration on this issue and could be vetted by the City of Lawrence Communications Director or designated sustainability staff.

STRATEGY #6: DEVELOP SOURCE REDUCTION AND WASTE REDUCTION PROGRAMS AND INITIATIVES

INTRODUCTION

The manufacture, distribution and use of products – as well as management of the resulting waste – all result in greenhouse gas emissions. Waste prevention and recycling reduce greenhouse gases associated with these activities by reducing methane emissions and saving energy.[32] The disposal of solid waste produces greenhouse gas emissions through the anaerobic decomposition of waste in landfills (which produces methane) and the transportation of waste to disposal sites. The disposal of material also typically indicates replacement by new products, which require additional fossil fuel and raw materials. [33] By preventing the initial generation of waste (source reduction) and strategically managing the waste that occurs, we can minimize the creation of greenhouse gasses.

BENEFITS AND NEEDS

Waste reduction and recycling are potent strategies for reducing greenhouse gases. According to the U.S. E.P.A., waste mitigation strategies can:

- Reduce emissions from energy consumption. Recycled materials typically require less energy than making goods from virgin materials. Waste prevention is even more effective because less energy is needed to extract, transport, and process raw materials and to manufacture products when people reuse things or when products are made with less material. (When energy demand decreases, fewer fossil fuels are burned and less CO_2 is emitted to the atmosphere.)
- Curtail emissions from incinerators. Incinerator emissions typically include carbon monoxide, sulfur dioxide and the greenhouse gas nitrous oxide, plus small amounts of mercury, lead, and dioxin. Diverting certain materials from incinerators through waste prevention and recycling limits the emission of greenhouse gasses and air other air pollutants into the atmosphere.
- Reduce methane emissions from landfills. Waste prevention and recycling (including composting) divert organic wastes from landfills, reducing the methane released when these materials decompose.
- Increase storage of carbon in trees. Forests take large amounts of CO_2 out of the atmosphere and store it in wood, in a process called carbon sequestration. Waste prevention and recycling of paper products can leave more trees standing, continuing to assimilate CO_2 from the atmosphere.[34]

APPLICABILITY TO LAWRENCE

Two percent of local GHG emissions are attributable to waste, both by type of emissions (electricity, natural gas, transportation, and waste) and by sector (commercial, residential, industrial, transportation, waste). The City of Lawrence operates solid waste collection for residential, commercial, and industrial customers. A variety of private companies provide recycling collection and services (collection for residential and commercial/industrial customers as well as drop off). The City of Lawrence also collects grass and leaves from residential

[32] http://www.epa.gov/climatechange/wycd/waste/index.html
[33] http://www.epa.gov/climatechange/wycd/waste/generalinfo.html
[34] http://www.epa.gov/osw/conserve/tools/payt/tools/factfin.htm

customers, and provides drop-off sites for newspapers, cardboard, and mixed paper, and commercial collection services for cardboard and sorted office waste paper.

Landfill services are contracted with Hamm's Landfill located in Jefferson County, a Subtitle D sanitary landfill serving many communities and counties within the state of Kansas. While the collection and treatment of landfill gases would contribute positively toward climate protection, the landfill is not owned by the City or located within the community. Therefore, the most effective and immediate method for emissions reduction is to address the total volume and composition of waste deposited.

RECOMMENDATIONS

In order to achieve meaningful reduction of GHG emissions generated from and by waste, the community must practice source reduction and diversion. Source reduction refers to any change in the design, manufacture, purchase, or use of materials or products (including packaging) to reduce their amount or toxicity before they become municipal solid waste. Source reduction also refers to the reuse of products or materials.

To support GHG reductions and benchmark progress, the CPTF recommends the following target waste reduction goals:

- 2013 (5 year goal): 3.0 lbs per person per day
- 2018 (10 year goal): 2.75 lbs per person per day
- 2023 (15 year goal): 2.25 lbs per person per day (or 50% of EPA national average, generated municipal solid waste)

Waste diversion refers to how waste is managed once it is produced, other than disposal in a landfill. Diversion is not carbon neutral. Suggested streams to target for diversion from landfill or alternative management include:

- Bottles and containers
- Electronic waste
- Food waste management
- Plastic bags
- Move-in / move-out materials
- Co-location of industries and/or by-product synergy

Appendix C contains additional resources on educational strategies for source reduction.

STRATEGY #7: PRIORITIZE EFFORTS TO REDUCE GREENHOUSE GAS EMISSIONS IN MUNICIPAL AND MAJOR INSTITUTIONAL FACILITIES

INTRODUCTION

Local governments control and oversee many of the day-to-day activities that determine the amount of energy used and waste generated by their communities. For example, local governments make land use and development decisions that determine the density and physical layout of communities, which influence vehicle miles traveled. They create building codes that determine the energy efficiency of residential and commercial buildings; and determine the existence and adequacy of public transportation and alternative transportation routes (foot and bike paths) that, in turn, inform the degree to which citizens must rely on personal automobiles. The most impactful way to encourage citizen action is for municipal governments and primary institutional contributors to GHG emissions to lead by example and prioritize these emissions reductions.

BENEFITS AND NEED

The consistent success factor in institutional implementation of sustainability initiatives is acceptance and engagement from those in leadership positions. Therefore, the most important place for the City of Lawrence to start its climate protection efforts is in municipal operations. Municipal operations account for 34% of commercial GHG emissions generated by the City. This provides an opportunity for Lawrence leadership to inspire widespread change, reduce operation costs, and gain leverage in reaching out to the community for support for the City's other climate protection policies.

APPLICABILITY TO LAWRENCE

According to the 2008 Budget Report, the University of Kansas, Lawrence Public Schools and the City of Lawrence are the 1st, 3rd and 4th largest employers in the city, respectively. This creates an opportunity for the City to initiate institutional energy conservation strategies that touch a great number of employees involved in education and municipal operations. While capital improvements will play a large role in reducing the City's contribution of greenhouse gases, encouraging a culture of awareness will be just as vital, as outlined in the prior section on outreach and education (Strategy #5).

RECOMMENDATIONS

As leaders in the community, CPTF recommends that municipal operations and major institution take steps to both mitigate and adapt to the impacts of climate change. Mitigation of climate change is the effort to reduce the emission of GHG in to the atmosphere; adaptation to climate change is the effort to prepare municipal decision-making and infrastructure for the likelihood that some change will occur, regardless of how effective mitigation strategies are. The International Council for Local Environmental Initiatives (ICLEI) has provided a basic outline for reducing GHG emissions from government operations, including recommendations for lighting, buildings, procurement, water, waste, fleet, and power supply.[35]

Detailed suggestions from the CPTF are listed in Appendix D. Recognizing there are significant lags in replacing existing infrastructure owned and operated by the City, this prioritized list of policies emphasizes upgrades and increased efficiency first, and replacement only after sufficient capital depreciation has occurred.

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[35] http://www.colorado.gov/energy/in/uploaded_pdf/Best_PracticesLocalGov.pdf.

CONCLUSION

SUMMARY

In summary, the CPTF believes that the City of Lawrence can recognize cost savings through the reduction of local GHG emissions, attract environmentally friendly businesses to the area, and help Lawrence establish a leadership role in climate risk mitigation in Kansas.

Possible funding through tax on energy a la Boulder, CO?

FUTURE STEPS

Smaller oversight group that will work with appointed staff?

1 member from each working group + Cynthia + Mayor Dever? Work in conjunction with Planning group, Peak Oil group & SAB?

ADDITIONAL RESOURCES

This CPTF Climate Protection Report was modeled on the Climate Action Plan for Norman, OK, a city of similar size and demographics to Lawrence, KS. That report, along with additional climate mitigation resources, can be found on the City of Lawrence Climate Protection Task Force web page (http://www.lawrenceks.org/climate_protection/).

These additional resources helped guide the thinking of the CPTF and informed this report:

Climate Protection Manual for Cities, Natural Capitalism Solutions

Energy and Environment: A Best Practices Guide, U.S. Conference of Mayors

Kansas: Assessing the Costs of Climate Change, National Conference of State Legislators

Best Practices for Climate Protection: A Local Government Guide, ICLEI

Progress Report on Climate Protection and Phase 1 Recommendations, City of Kansas City, MO Office of Environmental Quality

City of Boulder, Office of Environmental Affairs Climate and Energy Programs Progress Report 2007.

APPENDIX A: WORKING GROUP MEMBERSHIP

Energy Efficiency, & Conservation: Steve Hughes (Chair), Steve Bennett, David Dunfield, James Dunn, Ron Durflinger, John Geist, Joe King, Larissa Long, Chad Luce, Barry Walthall – INSERT CHART

Policy, Education, & Outreach:

Simran Sethi, Chair	Sustainability Advisory Board member, Journalist, and University of Kansas School of Journalism Visiting Professional Chair
Marty Birrell	Director, Prairie Park Nature Center
Cynthia Boecker	Assistant City Manager, City of Lawrence
Phil Cauthon	Editor, Lawrence.com
Robert Glicksman	Robert W. Wagstaff Distinguished KU Professor of Law & Participating Faculty, Center for Research on Global Change/Member, Board of Directors of the Center for Progressive Reform
Derek Helms	Editor, The Lawrencian
Sarah Hill-Nelson	Owner/ Operator Bowersock Mills & Power Company & Co-Chair, Grow Green Task Force, Lawrence Chamber of Commerce
Nancy Jackson	Executive Director, Climate and Energy Project, The Land Institute
Gwendolyn Klingenberg	President, Lawrence Association of Neighborhoods
Lisa Patterson	Communications Manager, City of Lawrence
Jeff Severin	Director, University of Kansas Center for Sustainability
Brian Sifton	Former President of KU Environs, Student in School of Architecture and Urban Planning
Dr. Daniel Wildcat	Director, Haskell Environmental Research Studies Center & Convenor of American Indian/ Alaska Native Climate Change Working Group

Transportation: Carey-Maynard Moody (Chair), Karen Clawson, Marc Epard, Todd Girdler, Charles Gruber, Marian Hukle, Lisa Pool, Bart Rudolph, Kyle Schneweis, Steve Stewart. INSERT CHART

Waste Management: Susan Rodgers (Chair), Tammy Bennett, Dwayne Fuhlhage, Kathy Richardson, Chris Scafe, Charlie Sedlock, Bob Yoos. INSERT CHART

APPENDIX B: GREENHOUSE GAS INVENTORY

GREEN HOUSE GAS INVENTORY

City of Lawrence

KANSAS

PREPARED BY THE CITY OF LAWRENCE

17 MARCH 2008

EXECUTIVE SUMMARY

This summarizes the City of Lawrence's involvement with the International Council for Local Environmental Initiatives (ICLEI) and their City's for Climate Protection (CCP) campaign. By subscribing to ICLEI in 2007, the city joined forces with over 715 cities, towns, counties, and their associations worldwide. In addition, ICLEI provides many resources and support for its members to reduce green house gases within their communities. The CCP program's goals are to achieve significant reductions in domestic greenhouse gas emissions by assisting local governments in taking action to reduce emissions and realize multiple benefits for their communities – thinking globally, while acting locally.

Local governments play a vital role in climate change efforts because they directly influence and control decision making that can reduce emissions. Local policies and regulations regarding land use and development, energy efficient building codes, recycling programs, and public transit options all affect local air quality as well as the global climate.

ICLEI developed 5 milestones to help facilitate local governments efforts in reducing green house gas emissions. Through these five milestones, local agencies are able to quantify, implement, and track measures to reduce green house gas emissions within their communities. The outlined program includes:

1. Green House Gas Emissions Inventory
2. Adoption of an Emissions Reduction Target for the Forecast Year
3. Development of a Local Action Plan
4. Implementation of Policies & Measures
5. Monitoring & Verifying Results

Included in the report is the green house gas inventory for the City of Lawrence. ICLEI provides access to software designed to simplify the emissions analysis. The Clean Air and Climate Protection Software (CACPS) also allows users to forecast future annual emissions based on predicted growth rates for various sectors. Furthermore, CACPS is capable of tracking various measures implemented to reduce green house gas emissions over time.

The following table summarizes the annual green house gas emissions in the City of Lawrence for the given years:

Year	1990	1995	2000	2005
Equivalent CO_2 Tonnes	2,241,690	2,400,703	2,431,863	1,661,047

Table 1.1 – Community Summary

The internationally accepted unit of measure for CO_2 is equivalent metric tons or tonnes of CO_2. Table 1.1 – Community Summary indicates a 30% decrease in green house gas emissions from the year 1995 to 2005.

METHODOLOGY

The green house gas inventory breaks down into two different sections, community and government. The CACPS software allows local governments to track emissions for the community as a whole and the city's operations separately. Each module is then broken down into specific segments:

- Community
  - Residential
  - Commercial
  - Industrial
  - Transportation
  - Waste
  - Other
- Government
  - Buildings
  - Vehicle Fleet
  - Employee Commute
  - Streetlights
  - Water/Sewage
  - Waste
  - Other

For the community green house gas inventory, citywide data was collected for local electricity and natural gas consumption, annual vehicle miles traveled (VMT) within the city limits of Lawrence, annual landfill contributions, and other green house gases otherwise not accounted for in the preceding fields.

The government module allows governing bodies to quantify the green house gas contributions associated with operating city owned buildings, city fleets, water and sewage facilities, streetlights, landfill contributions, and any other green house gases not otherwise accounted for. The government section makes up a portion of the overall community's green house gases; by tracking government operations specifically, officials are better able to implement and track green house gas reduction measures. Officials are also able to determine cost savings and payback periods using the software features.

Each category converts inputs into equivalent annual tonnes of CO_2. The CACPS software includes emissions and conversion factors to convert different utility measures into green house gas equivalents. For example, annual kilowatt-hours are converted into tonnes of CO_2 based on the average electricity generation methods in the area and their subsequent emissions. It should also be noted that the software analyzes point of use emissions, not life cycle emissions – that is, the software accounts for emissions created or as a result of actions taking place within the city limits. Even though a cubic foot of natural gas consumed a significant amount of energy to reach Lawrence, the only emissions accounted for in this survey are those associated with converting the cubic foot of natural gas into energy while in the city limits of Lawrence.

RESULTS

COMMUNITY:

The following data and graphs summarize the green house gas inventory for the City of Lawrence for selected years.

Year	1990	1995	2000	2005
Equivalent CO_2 Tonnes	2,241,690	2,400,703	2,431,863	1,661,047
Equivalent CO2 Tonnes per capita	34.17	32.70	30.36	18.76

Table 1.2 – Equivalent Tonnes of CO_2 & Tonnes per capita

1995:

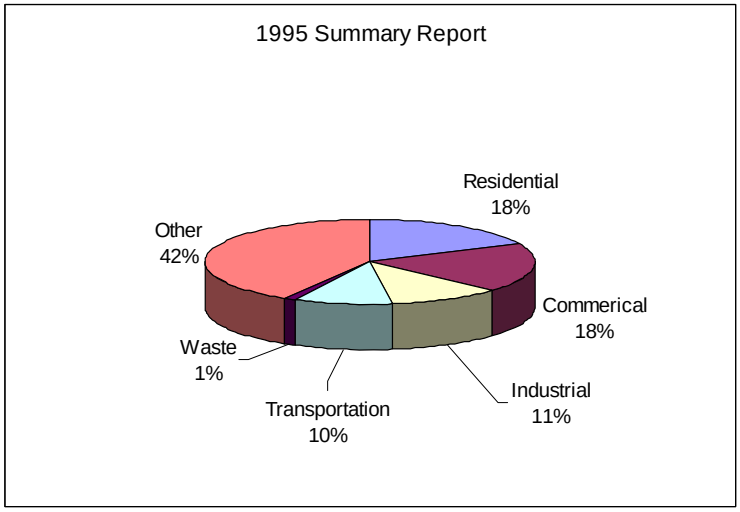

Figure 1.1 – 1995 Summary Report

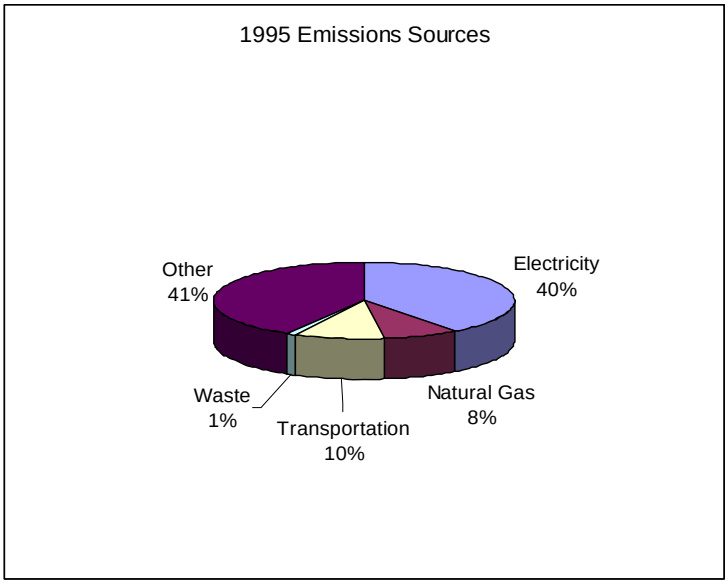

Figure 1.2 – 1995 Emissions Sources

2000:

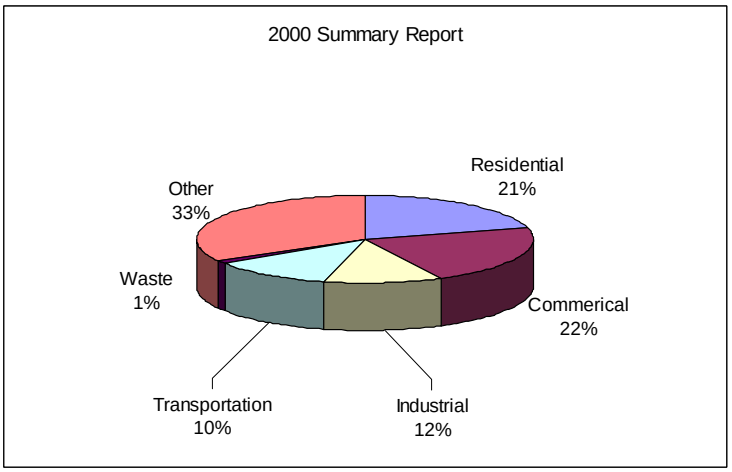

Figure 1.3 – 2000 Summary Report

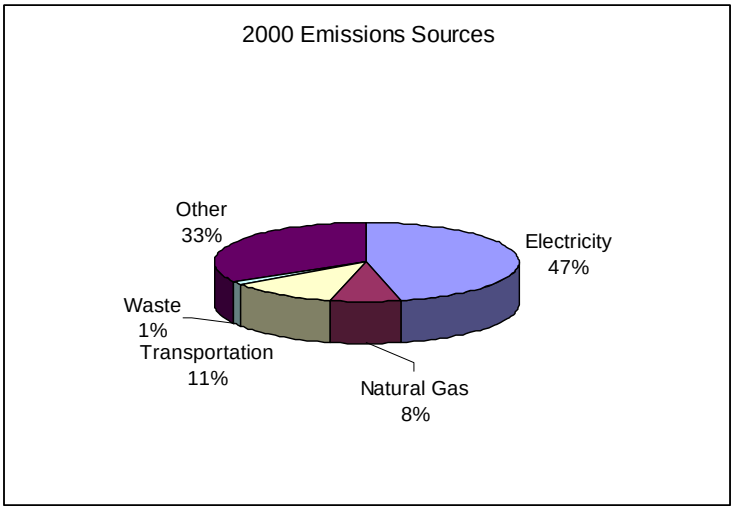

Figure 1.4 – 2000 Emissions Sources

2005:

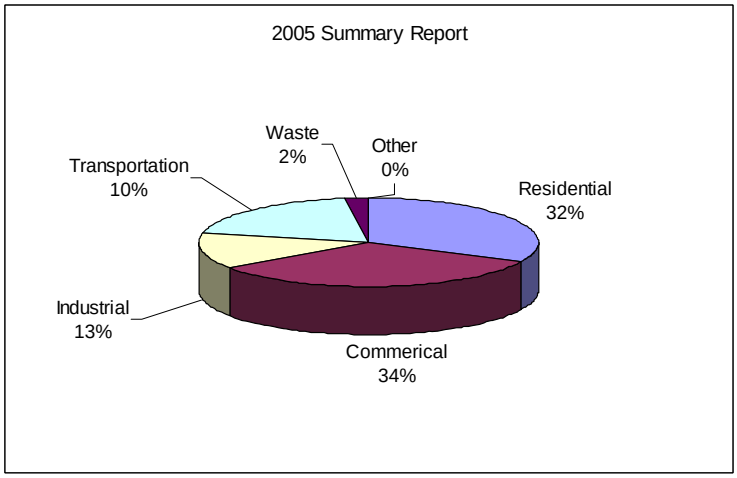

Figure 1.5 – 2005 Summary Report

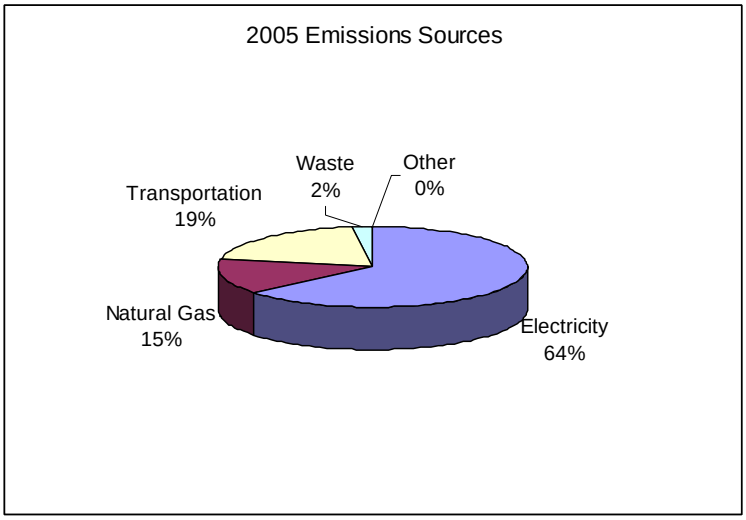

Figure 1.6 – 2005 Emissions Sources

Figure 1.1 – 1995 Summary Report through Figure 1.6 – 2005 Emissions Source summarizes the emissions inventories for each five year milestone from 1995 to 2005. A significant shift can be seen in the 'other' sector between the year 2000 and 2005; this data is provided by the Kansas Department of Health and Environment. It primarily encompasses emissions created by industrial processes that would not be included through gas consumption (i.e. methane or nitrous oxide production). The reduction can be attributed to the closing of the Farmland plant in east Lawrence. This and other measures already implemented by the City of Lawrence and its residents have contributed to a reduction in overall green house gas emissions in the city of Lawrence.

With a base year selected, ICLEI's "business as usual" growth model can be analyzed. The "business as usual" model reflects how emissions would be expected to increase as a community grows, without addressing any green house gas emission reductions. However, by adopting a 7% decrease from this trend, a community can decrease its emissions significantly. See Figure 1.7 – Emissions Trends, for a representation of this model.

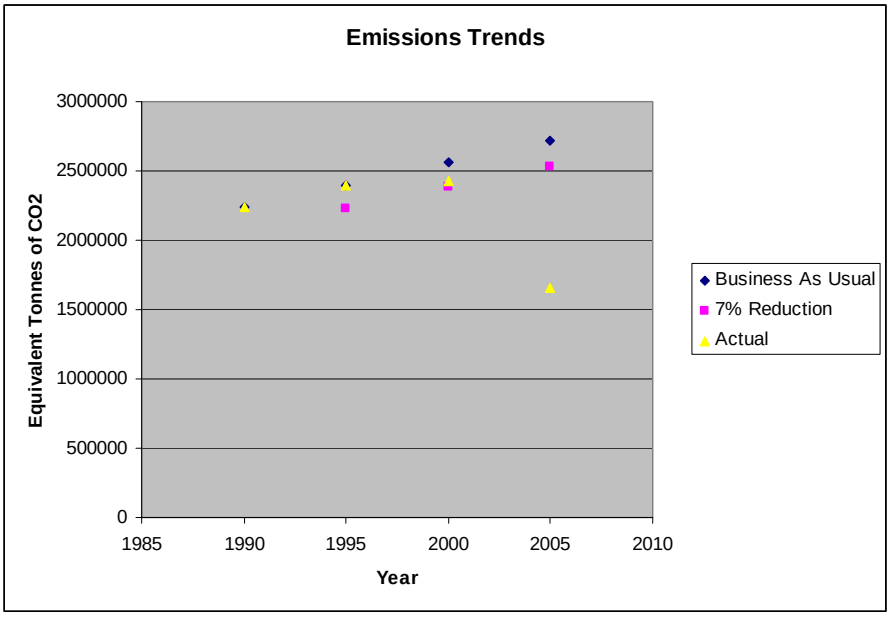

Figure 1.7 – Emissions Trends

Please see Appendix A for a more complete summary of yearly data.

GOVERNMENT:

An emissions inventory was also conducted for the City of Lawrence's government operations. However, all of the data necessary to benchmark emissions was not available prior to 2001. Insufficiencies exist in the reporting of electricity consumption. The CACPS software requires utility breakdowns into three different categories: buildings, water and sewage, and streetlights. While total electricity consumption exists, future records should be broken down to reflect consumption amongst the three categories. This will also help officials to develop initiatives that will benefit the community the most by targeting less efficient facilities. Table 1.3 – Government Tonnes of CO_2 by Source and Figure 1.8 – Government Summary reflect a rough comparison of government created tonnes of CO_2 between 2001 and 2005. The data reflects a 20% increase in emissions from 2001 to 2005.

Year	2001	2005
Electricity	27,914	35,921
Diesel	1,782	2,156
Gasoline	1,908	2,131
Natural Gas	20,219	24,719
Total	**51,823**	**64,927**

Table 1.3 – Government Tonnes of CO_2 by Source

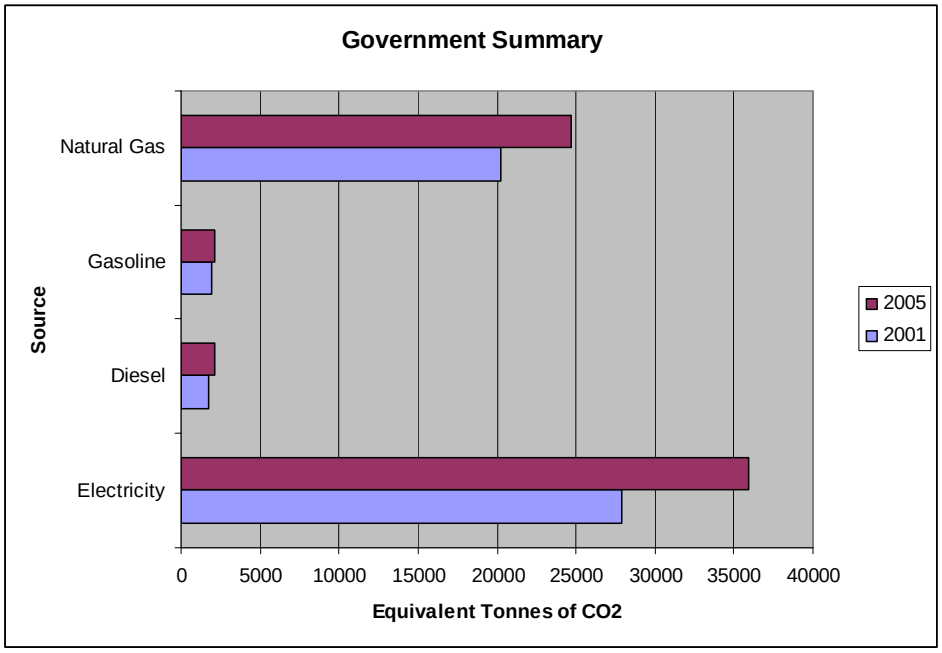

Figure 1.8 – Government Summary

While the government data makes up a portion of the community's total emissions, it is important to benchmark and track government emissions. Through adopting specific measures to make all government facilities more efficient, the city can reduce its utility costs while improving the local environment. The City of Lawrence also has the ability to set an example for the community's residents and surrounding cities.

Many initiatives have already begun at the government level, including but not limited to, (electric) hybrid and flex-fuel cars, replacing incandescent light bulbs with compact fluorescents, more efficient T8 fluorescent lighting strips, and light emitting diode (LED) traffic signals. Due to insufficient data, the exact realization of these benefits cannot be quantified.

Please see Appendix B for a more complete summary of yearly government data.

APPENDIX A

Community module

Government module

Emissions by benchmark year

COMMUNITY MODULE

Year	Residential Electricity (kWh)	Commercial Electricity (kWh)	Industrial Electricity (kWh)	Residential Gas (DTH)[a]	Commercial Gas (DTH)[a]	Industrial Gas (DTH)[a]	Annual VMT	Waste (Tons)	MSW Recycled (Tons)	Other (Tons CO_2)[b]	Population
1990	220960786	325438558	264908716	2282201[c]	591900[c]	70675[c]	289692470	21470	--	1110656	65608
1991	--	--	--	--	--	--	313294100	34018	--	--	66738
1992	214688249	336724558	245872155	2282201	591900	70675	334124285	37213	--	--	68141
1993	247644348	352533993	239964231	2760113	715849	85474	337301245	48430	--	--	69642
1994	258520249	367152742	245219418	2509087	650744	77701	339105440	49894	--	--	71328
1995	272069349	384453033	252312895	2688220	697203	83248	349651020	51333	18852	1094754	73419
1996	281432020	399826063	260816460	3000814	778276	92928	382055355	55444	--	--	74780
1997	299687617	417945167	273906280	2559644	663856	79266	389605015	58440	--	--	78128
1998	328118268	444278547	271356485	2220696	575948	68770	400300245	59764	20000	--	79186
1999	320940916	453310247	244576646	2207970	572648	68376	408272210	62532	21000	--	80839
2000	355309871	476497849	267484198	2522363	654187	78112	447380500	64286	21500	887528	80098
2001	355261185	482759613	216066406	2284020	592372	70731	447380500	68664	23278	--	81457
2002	372199531	483971279	182418951	2466338	639657	76377	418609375	67784	25566	--	83495
2003	372008477	485815013	161444472	2668945	692204	82651	433780235	68731	28342	--	85282
2004	363789152	487134755	164388374	2497339	647697	77337	520690750	71589	29640	--	87184
2005	395799160	505050987	168063260	2523738	654544	78154	537687705	71221	27473	--	88541
2006	397580268	506138279	167689907	2237072	580196	69277	551959570	75361		--	89176
2007											
2008											
2009											
2010											
2011											
2012											
2013											
2014											
2015											
2016											
2017											
2018											
2019											
2020											

[a] Total annual consumption breakdown into classes based on historical percentages - see notes for details

[b] Other category consists of Farmland Industries Pollutants - Information provided by KDHE

[c] 1990 numbers are not available -- conservatively used 1992 data for 1990

GOVERNMENT MODULE

Year	Total Electricity (kWh)	Building Electricity (kWh)	Green Energy (kWh)	Building Gas (DTH)	Vehicle Fleet- Unleaded (gallons)	Vehicle Fleet- Diesel (gallons)	Streetlights (kWh)	Water /Sewage (kWh)	Waste (Tons)	Other (Tons CO_2)
1990	--	--	--	--			3817527			--
1991	--	--	--	--			--			--
1992	--	--	--	--	182118	121570	3848832			--
1993	--	--	--	--	180372	129142	3934975			--
1994	--	--	--	--	165768	129563	3960010			--
1995	--	--	--	--	168929	135090	3958185			--
1996	--	--	--	--	181753	144472	4331536			--
1997	--	--	--	--	186577	166035	4667326			--
1998	--	--	--	--	193792	175532	4798992			--
1999	--	--	--	--	196572	186778	4786970			--
2000	--	--	--	--	209474	210964	4744667			--
2001	22468032		674041	360745	216920	207397	4740653			--
2002	24476411		734292	371683	226476	215394	4746834			--
2003	26331029		789931	415893	222728	218989	4858580			--
2004	31356918		940708	429920	226418	229251	4811355			--
2005	31489640		944689	441038	227486	233382	4700109			--
2006	31124793		933744	426476	212685	235043	4667284			--
2007				441223						--
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015										
2016										
2017										
2018										
2019										
2020										

INCLUDED IN COMMUNITY TOTAL

Year 1990

Emissions by Sector

	Equiv CO_2 tonnes	Equiv CO_2 %	Energy (MMBtu)
Residential	361,966	16.1%	3,082,224
Commerical	374,775	16.7%	1,714,514
Industrial	281,562	12.6%	976,221
Transportation	204,501	9.1%	2,614,269
Waste	11,316	0.5%	-
Other	1,007,570	44.9%	-
Total	2,241,690	100%	8,387,228

Emissions by Source

	Equiv CO_2 tonnes	Equiv CO_2 %	Energy (MMBtu)
Carbon Dioxide	1,007,570	44.9%	-
Diesel	32,216	1.4%	409,329
Gasoline	172,285	7.7%	2,204,939
Electricity	849,936	37.9%	2,768,969
Natural Gas	168,367	7.5%	3,003,990
Waste	11,316	0.5%	-
Total	2,241,690	100%	8,387,227

Year 1995

Emissions by Sector

	Equiv CO_2 tonnes	Equiv CO_2 %	Energy (MMBtu)
Residential	435,692	18.1%	3,616,784
Commerical	441,834	18.4%	2,009,329
Industrial	268,992	11.2%	944,384
Transportation	233,986	9.7%	2,991,999
Waste	27,055	1.1%	-
Other	993,144	41.4%	-
Total	2,400,703	100%	9,562,496

Emissions by Source

	Equiv CO_2 tonnes	Equiv CO_2 %	Energy (MMBtu)
Carbon Dioxide	993,144	41.4%	-
Diesel	37,127	1.5%	471,568
Gasoline	196,859	8.2%	2,520,431
Electricity	952,107	39.7%	3,101,827
Natural Gas	194,412	8.1%	3,468,671
Waste	27,054	1.1%	-
Total	2,400,703	100%	9,562,497

Year 2000

Emissions by Sector

	Equiv CO_2 tonnes	Equiv CO_2 %	Energy (MMBtu)
Residential	507,075	20.9%	3,735,025
Commerical	527,100	21.7%	2,280,460
Industrial	279,685	11.5%	991,027
Transportation	278,970	11.5%	3,569,203
Waste	33,881	1.4%	-
Other	805,152	33.1%	-
Total	2,431,863	100%	10,575,715

Emissions by Source

	Equiv CO_2 tonnes	Equiv CO_2 %	Energy (MMBtu)
Carbon Dioxide	805,152	33.1%	-
Diesel	46,307	1.9%	588,085
Gasoline	232,664	9.6%	2,981,118
Electricity	1,131,442	46.5%	3,751,850
Natural Gas	182,417	7.5%	3,254,662
Waste	33,881	1.4%	-
Total	2,431,863	100%	10,575,715

Year 2005

Emissions by Sector

	Equiv CO_2 tonnes	Equiv CO_2 %	Energy (MMBtu)
Residential	534,315	32.2%	3,874,588
Commerical	547,816	33.0%	2,553,547
Industrial	220,702	13.3%	1,535,008
Transportation	320,678	19.3%	4,120,382
Waste	37,536	2.3%	-
Other	-	0.0%	-
Total	1,661,047	100%	12,083,525

Emissions by Source

	Equiv CO_2 tonnes	Equiv CO_2 %	Energy (MMBtu)
Carbon Dioxide	-	0.0%	-
Diesel	55,474	3.3%	704,521
Gasoline	265,204	16.0%	3,415,861
Electricity	1,060,988	63.9%	3,648,169
Natural Gas	241,845	14.6%	4,314,974
Waste	37,535	2.3%	-
Total	1,661,046	100%	12,083,525

APPENDIX B

Appendix B lists contact information for various data collection to aid the green house gas emission survey.

Company	**Contact**	**Number**	**Email**
Westar Energy	Chad Luce	785-575-8134	
Aquila Gas - External Affairs Director	Larissa Long	785-832-3918	larissa.long@aquila.com
(Green Energy Tags)-Zephyr Energy	Sarah Hill-Nelson	785-766-0884	shillnelson@zephyrenergy.org
Kansas Department of Health - Other	Pat Simpson	785-842-4600	
Kansas Department of Health - Other	Will Stone	785-296-6427	wstone@kdhe.state.ks.us
Hamm Landfill - Solid Waste	Charlie Sedlock	785-597-5111 ext. 238	
City of Lawrence - Solid Waste	Bob Yoos	785-832-3032	byoos@ci.lawrence.ks.us
City of Lawrence – Transportation Planner	Anson Gock	785-832-3155	agock@ci.lawrence.ks.us
City of Lawrence - Fleet Manager	Steve Stewart	785-832-3020	sstewart@ci.lawrence.ks.us
KDOT - Traffic & Field Operations (VMT)	Leif Holiday	785-296-2906	leifh@ksdot.org

APPENDIX C: EXAMPLES OF EDUCATION & OUTREACH (REORGANIZE?)

Energy Efficiency and Conservation Education and Outreach (FIX NUMBER FORMATTING)

1) Promote programs, incentives, and assistance available through state and federal government, and local utilities.

3) Collaborate with local utilities to establish an incentives-based program in Lawrence. As an example, Westar Energy could refer to the conservation program developed by Midwest Energy for Salina, Kansas.
4) Develop community incentives for building energy efficient buildings and practicing effective energy conservation through rebates. Examples include building to LEED standards, weatherization of existing buildings, the purchase of energy efficient appliances and other energy-saving measures
5) Develop porch light program that replaces porch lights with CFLs or other energy efficient light fixtures.
6) Develop a partnership with University of Kansas and Haskell University student organizations and local utilities to provide energy conservation resources to off-campus students, modeled after the Colorado University-Boulder Green Teams Neighborhood Sweep.[36]
7) Perform infrared scans (detecting poorly insulated homes and inefficient windows) of homes in older neighborhoods to provide education and incentives to homeowners to improve the energy efficiency of their homes.
8) Provide community education on parasitic power usage from computers, monitors, media players, and televisions.
9) Develop an online interface for information and resources to include conservation tips; information on incentive-based programs, local contractors and vendors; examples of conservation efforts in the community; and feedback on progress. The Boulder, CO Climate Smart website is a good model (http://www.beclimatesmart.com/).
10) Foster neighborhood groups that can assist each other with basic weatherization projects, modeled after Green Living Emporia. IS THERE A MORE ESTABLISHED EXAMPLE?? (http://www.emporiagazette.com/news/2008/nov/17/about_town/).

Source Reduction Education and Outreach (FIX NUMBER FORMATTING)

Suggested focus areas for the next five years should be:

1) Paper
2) Packaging and containers
3) Organics (food waste and yard waste).

K-12 Curriculum

A K-12 curriculum should be developed to be incorporated into the Lawrence School District and be made available online for use by the Lawrence Virtual School and area home schools. Such a curriculum should provide unbiased environmental education on climate and energy that addresses the areas targeted in this report. A partnership between the City of Lawrence, USD #497, the Kansas Association for Conservation and Environmental Education (KACEE) and their Green Schools program, and other stakeholders would ensure that materials developed for the curricula would also help schools meet state science (and other applicable subject) standards and standards for excellence in environmental education.

[36] http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=1120&It

APPENDIX D: MITIGATION AND ADAPTATION STRATEGIES FOR MUNICIPAL AND INSTITUTIONAL OPERATIONS

Facilities and Infrastructure

1) Set a goal for reducing energy use in City buildings. Contract with a consulting firm to perform energy audits on City buildings, starting with the highest energy users first. Upgrades of all lighting, heating/ventilation/air conditioning systems, and building envelopes/insulation should be considered to maximize investment in efficiency. If it is beneficial, consider contracting with an Energy Service Company to provide energy savings guarantees, rather than subcontracting work on a per-job basis.
2) As articulated in the City Commission Goals section of the 2009 Operating and Capital Improvements Budget, identify new building standards that require a significant increase in energy efficiency, relative to a comparable building. The United States Green Building Council's Leadership in Energy and Environmental Design (LEED), the American Society of Heating, Refrigerating and Air-Conditioning Engineer's Advanced Energy Design Guides, the Department of Energy's High Performance Buildings, and the City of Tucson's Sustainability Energy Standard all provide representative, high-efficiency standards. New building standards should include, but are not limited to: site orientation that maximizes passive solar heat gain; use of high R-value insulation, high efficiency windows; inclusion of alternative energy sources such as geothermal, photovoltaic and wind; use of reflective roofing materials or rooftop plantings; and high efficiency lighting and HVAC systems.
3) In choosing the location for city services, include building energy efficiency and density into the evaluation procedure.
4) Remedy the concern expressed in the Greenhouse Gas Inventory that government reporting of electricity consumption is insufficient. Consider providing real time monitoring of energy use at City facilities.
5) Increase efforts to change over to light emitting diode (LED) traffic lights, high efficiency streetlights, and as articulated in the City Commission Goals section of the 2009 Operating and Capital Improvement Budget, implementation of traffic light coordination.
6) Develop policies related to turning off electrical devices when not in use, thereby reducing parasitic power usage.
7) As articulated in the City Commission Goals section of the 2009 Operating and Capital Improvement Budget and in the interest of long-term infrastructure planning, take into consideration changes in the intensity of design storms when confronting future storm sewer and roadway infrastructure decisions.
8) Enhance the City's current energy conservation codes to reduce energy consumption in new construction and remodeling work.[37]
9) Modify current International Energy Conservation Code to require that all new residential single family and multi-family domestic hot water heating and comfort heating is done with high efficiency natural gas fired equipment. Natural gas produces 121-150 pounds of CO_2 per million BTUs and electrical power produces 424-433 pounds of CO_2 per million BTUs. This code enhancement should be monitored as more electrical power is produced by renewable systems that have little if any green house gas emissions.

Procurement

1) Establish a comprehensive environmental procurement policy.
2) Revise Chapter 10.2.4 of the Purchasing Procedures of the City, further defining "environmentally preferable products"; articulate and codify expectations for all items

[37] http://www.neep.org/newsletter/1Q2008/codes.html

previously identified and add guidelines for procuring energy efficient appliances (such as those labeled "Energy Star"), vehicles (hybrid, electric, or alternative fuel), and heavy equipment (electric or alternative fuel). Include a cost/benefit analysis using the expected useful life of the item, the energy efficiency it provides, and the expected price of energy.

3) Improve performance of materials used by the city so that they are not replaced as often. For example, improve the performance of concrete mix for curbing and asphalt for paving to improve durability.

Water

1) When the new wastewater treatment plant issue is revisited, articulate to Black and Veatch the city's desire to include expected energy costs over the useful life of the plant in the decision-making matrix. If applicable and feasible, invest in a highly efficient wastewater treatment plant.
2) In the interest of long-term water resource planning, take into consideration the expected sedimentation and decreased capacity of Clinton Lake in the next 3 to 4 decades. Concomitantly, higher atmospheric temperatures will lead to increased evaporation from the lake surface and, therefore, some decrease in retention.
3) In the interest of long-term water resource planning, consider the effect that increased variability of surface water and river systems will have on the functioning of wastewater treatment plants, storm water sewers, levees, and flood plain development.

Waste

1) Develop waste reduction strategies specific to municipal operations (management practices and the possible development of a localized green team).

Fleet

1) Adopt and implement operational policies that minimize fuel consumption in the vehicle fleet by route optimization, idling reduction, maintenance practices and/or other means and document emissions reductions from those policy changes. [38]
2) Reduce the overall impact of the Lawrence Police Department by investing in technology that will minimize the need for idling.
    a) Consider the use of auxiliary power sources and/or power units to operate vehicle accessories and climate controls while the engine is turned off.
    b) Examine the establishment of police precincts to reduce use of idling patrol cars used as "offices" with computers.
    c) Equip patrol vehicles with bike racks and increase bike patrols.
    d) Developing a patrol car take home policy which reduces fuel use
3) Reduce the overall impact associated with the collection of waste and recyclables:
    a) Develop waste management strategies to reduce carbon footprint of collection.
    b) Increase bio-content of diesel fuel used.
    c) Upsize containers for decreased frequency of collection (evaluation required per site) (on-going, but important to note).
    d) Optimize collection routes (on-going, but important to note).
4) Move the public transit and other vehicles away from diesel fuel and toward the cleanest burning fuel, which may include, but not be limited to biodiesel, compressed natural gas (CNG) and electricity. Install necessary infrastructure for converted fleet.[39]

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[38] http://oee.nrcan.gc.ca/communities-government/transportation/municipal-communities/reports/index.cfm?attr=28
[39] http://www.netl.doe.gov/publications/proceedings/08/clean-cities-ca/pdfs/6.25Wed/Lindholm%20-%20Clean%20Energy.pdf
http://www.informinc.org/FS_ST_NYC_Refuse.pdf

5) Purchase hydraulic hybrid front load sanitation trucks to replace retired trucks. This vehicle generates pressure during breaking, which is converted into energy (hydraulic), which is used to resume lost momentum (start up). Costly brake repairs are reduced.[40]
6) Utilize EPA grants for diesel oxidation catalysts.[41]
7) Right size the fleet and eliminate unnecessary take home vehicles.

Other

1) Follow closely the evolution of federal and state energy policy; due to the lack of agreement on climate change policy at the federal and state levels, municipalities are at the leading edge of climate protection policy. It would therefore behoove the federal and state governments to take advantage of the efforts made at the municipal level and energy- and environment-related block grants will likely be policy options.
2) Continue providing support for the farmers market and local agricultural markets, as articulated in the City Commission Goals section of the 2009 Operating and Capital Improvement Budget. Seek out new ways to promote the expansion of local agricultural markets.
3) Nurture a "culture of conservation" among City employees by disseminating goals, information, and policy changes, and actively encourage changes in personal behavior as they relate to energy use.
4) Take the opportunity to expand meetings with the Douglas County, USD #497, Haskell Indian Nations University and the University of Kansas, as articulated in the City Commission Goals section of the 2009 Operating and Capital Improvement Budget. Partner with these stakeholders to develop institutional goals and share information. Coordinate on public statements expressing commitment to climate protection policies.
5) In the interest of maintaining local food supplies, consider prohibiting the conversion of prime agricultural soils to alternate uses.
6) In the interest of human health services planning, consider the effects that higher temperatures will have on the population—especially the very young and very old—when developing public policy.

[40] http://www.wastemanagement.com/wm/environews/20081114_WM_Begins_Field_Testing_of_Hydraulic-Diesel_Hybrids.pdf
http://www.calstart.org/programs/htuf/hybriddialog/Htuf_info_04_01.pdf
[41] http://www.kdheks.gov/news/web_archives/2008/09242008b.htm

APPENDIX E: EXAMPLES OF TRANSPORTATION POLICIES AND PROGRAMS

Support, enhance and promote public transit:

1) Continue efforts to consolidate the T and KU on Wheels and increase efforts to optimize routes and connectivity with other transportation systems such as Amtrak and the K-10 Connector.[42]
2) Provide *transit prioritization traffic flow*, a system providing signal prioritization for buses.
3) Coordinate with USD 497 to develop a program for families with school age children to use public transit or coordinate walking school buses.[43]
4) In cooperation with Topeka, Mid-America Regional Council (MARC), and Kansas City, develop a regional transit system (a commuter bus or light rail system along the Kaw River corridor).[44]
5) Promote public transit with an employer/commuter financial incentive program. Commuter choice programs offer federal tax incentives or employee-paid pretax benefits for public transportation.

Promote ride sharing, vanpooling, and other fuel reduction programs throughout the community, along with biking and walking as alternatives to carbon-based transportation:

1) Implement fuel reductions policies and programs for the municipal fleet.
2) Avail of the following programs:
    a. Green Commute Challenge. [45]
    b. MARC's Carpool Connection.[46]
    c. Parking Management.[47]
    d. State van-pools.[48]
3) Develop park-and-ride lots
4) Create City-wide, enforceable anti-idling program and policy[49]
5) Incorporate Intelligent Transportation Systems (ITS) in the Metropolitan Transportation Plan, The T operations plus development of ITS projects.(NEED CITATION)
6) Promote workplace policies that encourage employees to bicycle and walk.[50]
7) Establish a goal to become a Bicycle Friendly Community designated at the platinum level from the League of American Bicyclists.[51]
8) Provide monitored bike parking at special events.[52]
9) Review and modify laws and policies affecting bicyclists and ensure effective procedures are in place for handling violators and for training law enforcement officers.[53]
10) Implement a Smart Bike or bicycle-sharing program.[54]

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[42] Kansas Long Range Transportation Plan
http://www.kansaslrtp.org/pdf/Final_LRTP/KS%20LRTPFinal.Chapter%204.pdf
K-10 Connector http://www.thejo.com/main.aspx?page=schedule-k10
[43] http://www.hastebc.org/public-transit-for-kids
[44] www.kansastlink.com
[45] http://www.marc.org/rideshare/challenge/index.htm
[46] http://marc.greenride.com/en-US/employer.aspx
[47] Climate Protection Manual for Cities, Developed by Natural Capitalism Solutions. Chapter 5: Develop A Local Action Plan pages 205-207. Best Bets: Residential Transportation "Implement Parking Management Programs"
[48] http://www.da.ks.gov/fm/cmp/information/VanPoolCoordinators.htm
[49] http://www.idlefreebc.ca/index.php
[50] http://www.resourceconservation.mb.ca/gci/TDM/ , http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_webdoc_22-a.pdf
[51] http://www.bicyclefriendlycommunity.org/about.htm
[52] http://www.sfmta.com/cms/vclos/13487.html , http://www.sfbike.org/?valet
[53] http://www.bicyclinginfo.org/enforcement/
[54] http://en.wikipedia.org/wiki/Community_bicycle_program , http://www.nytimes.com/2008/04/27/us/27bikes.html

11) Review parking requirements in line with some best practices, which includes shared parking for some uses and maximum (not minimum) parking requirements in some instances. (Fewer parking spaces result in less driving.)
12) Charge a higher fee for parking.