



CLARK COUNTY REGIONAL EMISSIONS INVENTORY

Greenhouse Gas Emissions for 2014

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Acknowledgements

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City of Las Vegas: <http://www.lasvegasnevada.gov>
City of North Las Vegas: <http://www.cityofnorthlasvegas.com/>
Clark County: <http://www.clarkcountynv.gov/>
Clark County School District: <http://www.ccsd.net/>

Regional Agencies and Utilities

NV Energy: <https://www.nvenergy.com/renewablesenvironment/>
Regional Transportation Commission: <http://www.rtcnv.com/about-the-rtc/>

Southern Nevada Health District: <http://www.southernnevadahealthdistrict.org/>

Southern Nevada Water Authority: <http://www.snwa.com/env/environment.html>

Southwest Gas: <http://www.swgasliving.com/content/energy-efficiency-rebates-nevada>

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Introduction

Background

The Southern Nevada Regional Planning Coalition's (SNRPC) mission is to coordinate regional planning among all public jurisdictions. This is done in a seamless manner while respecting autonomy of all member jurisdictions and agencies. SNRPC plays a key role in developing a consistent protocol for reporting greenhouse gas (GHG) emissions to establish independent reduction strategies and targets by each jurisdiction and agency. SNRPC also provides assistance with the membership dues to ICLEI-Local Governments for Sustainability USA (ICLEI-USA). ICLEI-USA is a leader in greenhouse gas emissions reporting and provides a wide array of tools to assist SNRPC member agencies in developing uniform reporting protocol for greenhouse gas emission inventories.

This report provides a GHG emission inventory for 2014 and the contributions from Residential and Commercial Energy, Transportation, Natural Gas, and Waste. A comparison with the previous studies conducted for 2005-2013 years are also provided where applicable. It is noted that the 2005-2009 was the first inventory report and is treated as a baseline for this and future GHG emissions inventory reports. In order to ensure comparable results, an approach consistent with the 2005-2009 and 2010-2013 reports is followed to prepare the 2014 GHG emissions inventory. This report will include the following jurisdictions: cities of Las Vegas, North Las Vegas, Henderson and Boulder City; and unincorporated Clark County.

ICLEI-USA

ICLEI-Local Government for sustainability is the leading global network devoted to local governments engaged in sustainability, climate protection, and clean energy initiatives. Presently, ICLEI has more than a thousand local governments that are members. Local government with the support of ICLEI accomplish the following: save money, reduce energy, lower greenhouse gas emissions, set achievable goals with regard to sustainability and create more economically prosperous communities. Any local government can join ICLEI with the only requirement being a payment in annual dues based on population size.

ICLEI is well known in two aspects. First, ICLEI creates tools (computer software and instruments) that help calculate GHG emissions. Second, ICLEI establishes national standards that are recognized and established for preparing emissions inventories. In this inventory preparation, Clean Air and Climate Protection (CACP) version 2009 was used. CACP 2009 provides a tool to convert many variables of human activity into equivalent CO₂ (E-CO₂) production. It has conversion factors that translate variables such as energy usage (Kilowatts) or waste produced (tons) into equivalent CO₂ produced.

Recent Climate Change

According to the United Nation's Intergovernmental Panel on Climate Change (IPCC) 2013 Report, human activities have substantially added to the amount of heat-trapping GHG in the atmosphere since the Industrial Revolution. The burning of fossil fuels and biomass has also resulted in emission of aerosols that absorb and emit heat, and reflect light. The addition of GHG and aerosols has changed the composition of the atmosphere. The changes in the atmosphere have likely influenced temperature, precipitation, storms, and sea levels. However, these features

of climate also vary naturally, so determining what fraction of climate changes are due to natural variability versus human activities is challenging (Regional Emissions Inventory 2005-2009).

Greenhouse Gas Protocols

With more local governments conducting emissions inventory reports, ICLEI is leading an effort to set global standards on GHG accounting. GHG protocols is a new field and is ever evolving to be more efficient, accurate, and reliable. This inventory report was done by using the Local Government Operations (LGO) Protocol Version 1.0 from September 2008. The LGO Protocol was developed in collaboration between ICLEI, the California Air Resources Board, the California Climate Action Registry, and The Climate Registry.

When ICLEI-USA started in 1995, there were not many local governments involved in the project. At the time of the 2009 inventory reporting, ICLEI had a network of 600 local governments. Currently, this has grown to 1,000 local governments. ICLEI-USA is the domestic leader on climate protection and adaptation, and sustainable development at the local government level.

Update and Revisions

The Regional Greenhouse Gas Emissions Inventory will be updated on a biennial basis, based on the availability of data from NV Energy, Southwest Gas, Nevada Department of Transportation (NDOT), Regional Transportation Commission (RTC), Southern Nevada Health District (SNHD), and Nevada Division of Environmental Protection (NDEP). Emission reporting is a new field and revisions to both the emission protocol and the greenhouse gas emission inventory are common, and should be expected as measures are revised and new measures are added.

Methodology

ICLEI's Five Milestone Methods

In 2009 SNRPC paid membership fees for agencies that wanted to conduct greenhouse gas emission modeling, with these fees paid agencies had access to ICLEI's tools, protocols, and Five Milestone Methodology. The Five Milestone Methodology is very helpful when committees/groups don't know where to start; many cities, towns, and countries have already used the Five Milestone Methodology and it is a proven method that works.

1. Conduct a baseline emissions inventory and forecast
To conduct a baseline year emission inventory and forecast: first, the local government should conduct research to measure and analyze GHG sources in the region under study for a baseline year (in our case 2005) and for a forecast year (in our case 2015). The research should show from where the GHG emissions are coming from such as by sectors (industrial, residential, etc.). From the research it should be determined which of these operations is causing the most GHG emissions.
2. Adopt an emissions reduction target for the forecast year
Local Government will pass a resolution by establishing a target for your local government. It will increase political will and creates structure for guiding planning and utilization of measures
3. Develop a Local Climate Action Plan

When developing a Local Climate Action Plan it is recommended that local government listen to input from all stakeholders. The Local Climate Action Plan will detail policies and measures that will take to reduce GHG emissions and achieve emissions reduction targets. Most plans have the following: a timeline, a description of financing mechanisms, and an assignment of responsibility to departments and staff. Some plans also have public awareness and education efforts.

4. Implement policies and measures

The Local Government will implement the policies and measures developed in the Local Climate Action Plan. These policies will likely be involved in the area of energy efficiency and energy reduction, along with waste reduction, and better roads to create less transportation GHG.

5. Monitor and verify results

Monitoring and verifying the progress is an ongoing deal that will be done throughout the years from baseline year to forecast year. Software will be given to monitor results and local governments will do verifying. With monitoring results the local government can also listen to feedback from the stakeholders as well as from the research itself.

The base year is a year which to compare current emission with. This will give the reports consistency and significance. The SNRPC has selected the year 2005 to use as a base year; this is due to the fact that 2005 has accurate records for key emission sources in the valley. With accurate records the reports will be given validation.

CACP-2009

ICLEI's Clean Air and Climate Protection (CACP) 2009 software calculates and tracks greenhouse emissions associated with electricity, fuel use, and waste disposal. The software is able to perform Community Analysis, Community Measures, Government Analysis, and Government Measures. In this report the Community Analysis is used. The Community Analysis consists on residential, commercial, industrial, and transportation sectors. In order for the CACP software to calculate GHG emissions, it is necessary to enter the information about emission sources as well as activity data. For example, the electricity is entered in kWh and natural gas use in Therms, other measurement units are available as well. The outputs of CACP include greenhouse emissions, emissions, annual municipal and community energy use, and criteria air pollutants (NO_x, SO_x, CO, VOCs, PM10, etc.). The information used in this report is the equivalent CO₂ (E-CO₂) production from the source.

Equivalent CO₂ (E-CO₂)

Carbon Dioxide Equivalent or E-CO₂ is a metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP). Carbon dioxide equivalents are commonly expressed as "million metric tons of carbon dioxide equivalents (MMT-CO₂Eq)". The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP. The CACP software has all the GWP parameters built-in to automatically calculate the carbon dioxide equivalent.

Data Collection and Processing

Data from four agencies were collected in this inventory to report five emission sources i.e., residential energy use, commercial energy use, industrial energy use, transportation activity, and municipal waste produced. The residential, commercial and industrial energy sectors are based on total energy used in the form of electricity (kilowatt-hours) and natural gas (Therms). Each of these sectors is described below.

Energy Use Sectors (Residential, Commercial, and Industrial)

Energy use in the form of electrical power and natural gas is used. The electrical usage data (kilowatt-hours) was collected from NV Energy and natural gas data (Therms) was collected from Southwest Gas. The data from each agency was separated into three sectors i.e., residential use, commercial use, and industrial use. The Southwest gas data was already separated into the three mentioned sectors. The NV Energy data was divided into the mentioned sectors by using the rate nomenclatures found in the NV Energy website. The kilowatt-hour (kWh) of electrical energy use and Therms of natural gas use were converted to E-CO₂ for each sector using the CACP 2009 software application.

Transportation Sector

Transportation activity data was collected from the Nevada Department of Transportation (NDOT) as annual vehicle miles of travel (AVMT). NDOT AVMT records for the year 2013 and 2014 were used for the report. The records breakdown AVMT by county. Clark County's AVMT values were then retrieved and converted to E-CO₂ using CACP 2009 software application.

Municipal Waste Sector

Waste data was collected from Southern Nevada Recycling Program Coordinator at Nevada Division of Environmental Protection (NDEP). This data included the recycling percentages rates by type of waste (wood, paper, food, etc.). It was assumed that the non-recycled waste had same percentages of various types. These percentages were used in CACP 2009 to convert each waste type into E-CO₂ emissions.

The following pages show a comparison of emission by sector for the year 2014 inventory. Comparison with baseline study for 2005-2009 and the following studies which include years 2010 through 2013 are also discussed.

E-CO₂ Emissions by Sector

This section describes the E-CO₂ emissions for various sectors during the inventory period. These emissions are compared with the base year emissions to monitor changes. Table 1: Emissions by Sector shows the total E-CO₂ results computed using CACP 2009. It can be observed that E-CO₂ emissions have increased since 2005 until 2011 and then slightly decreasing for 2012 with an increase for 2013 and 2014. It is also observed that in 2014 the emissions in the industrial and waste sector have decreased when compared to those in 2005. The commercial and industrial sectors have increased their emissions since 2005. The residential sector increased from 2005 until 2011, but since then it has had a steady decrease.

Table 1. Emissions by Sector (E-CO₂ (tons))

	2005		2010		2011		2012		2013		2014	
Residential	6,938,768	24.75%	6,995,131	23.49%	7,425,547	24.80%	7,190,445	24.09%	7,035,370	23.56%	6,967,395	22.78%
Commercial	6,877,364	24.53%	7,655,530	25.71%	7,757,493	25.91%	7,602,870	25.48%	7,130,904	23.88%	7,767,980	25.40%
Industrial	4,056,220	14.47%	4,624,681	15.53%	4,370,135	14.60%	4,768,052	15.98%	4,588,662	15.36%	3,918,830	12.81%
Transportation	8,870,378	31.64%	9,338,344	31.36%	9,489,662	31.69%	9,572,334	32.07%	10,008,003	33.51%	11,002,925	35.97%
Waste	1,296,808	4.62%	1,160,933	3.90%	898,379	3.00%	709,951	2.38%	1,103,345	3.69%	930,983	3.04%
Total	28,039,538		29,774,619		29,941,216		29,843,652		29,866,284		30,588,113	

Figure 1 shows the pie charts of emissions by sector for 2005 (base year) and 2011 through 2014. The relative contributions of various sectors are similar year by year. For example, transportation continues to be the highest contributor of E-CO₂ and municipal waste continues to be the lowest. Residential and commercial energy sectors have almost equal contribution and collectively make half of the total emissions.

The commercial, residential, and industrial sectors have had similar emission percentages for all the years. Industrial has the lowest of the three sectors and has continued to have the lowest since 2005. The highest in emissions from the three aforementioned sectors has been the commercial sector since 2011 as seen in Table 1.

Transportation contribution shows an increasing trend compared to baseline. It is noted that from 2005 to 2009 (reported in the previous report), transportation contribution had decreasing trends with the lowest values in 2008 (28.30%) and 2009 (29.05%). This decrease was an attribute to a reduced tourist activity caused by the recession. The values for 2011 (32.09%), 2012 (32.17%), and 2013 (33.51%) indicate that the emission contribution of transportation has increased.

Municipal waste in 2013 increased compared to the previous two years, but decreased in 2014. This indicates that recycling rates may have decreased after being on an upward trend for three years. It is important to note that the 2013 waste produced (2.13 tons) is less than the 2005 waste produced (2.71 tons) and the 2014 waste (2.83 tons) is higher than that of 2005. This still indicates that the recycling efforts have contributed to reduce the E-CO₂ emissions.

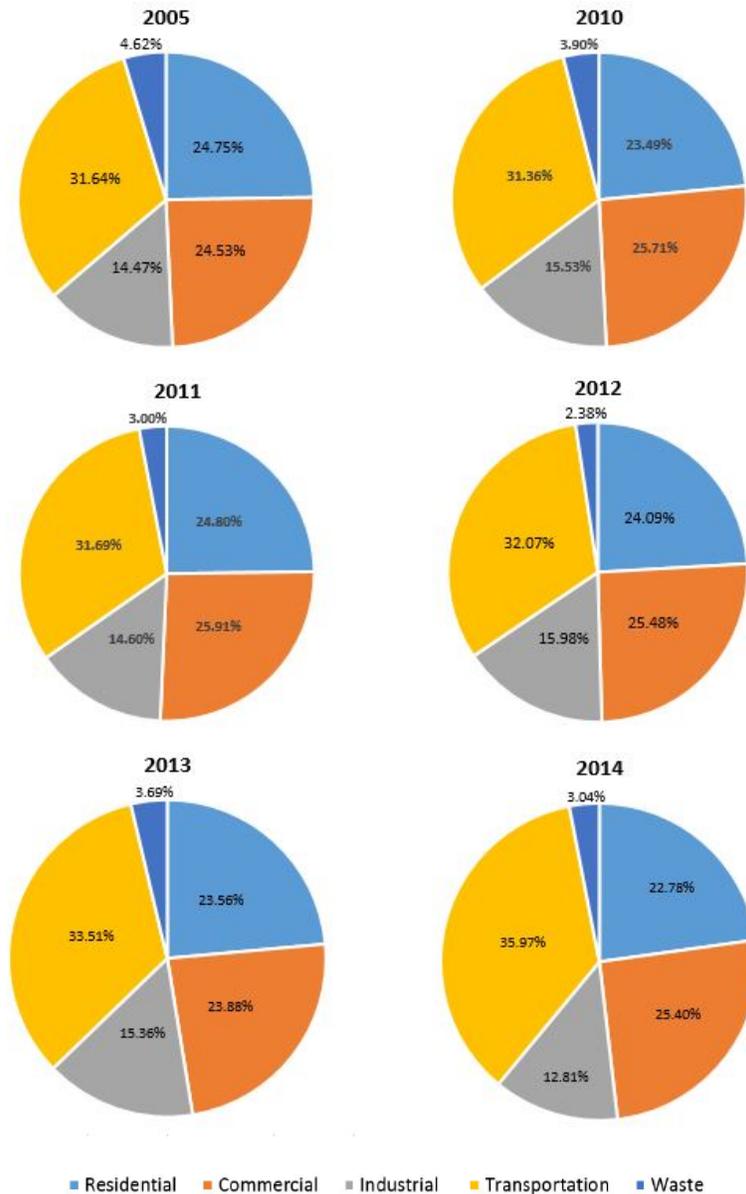


Figure 1. Emissions by Sector per Year

Emission Trends by Sector

In order to understand the trends of emissions since the baseline year, the time series plots are presented. These time series are also compared to population growth and annual visitors. Figures 2, 3, and 4 provide a comparison of total E-CO₂ with population and tourist activity. E-CO₂ has decreased since the year 2008. This decrease could be related to the decrease in the annual visitors in 2012. Clark County had a decreasing E-CO₂ trend until 2011. Since 2008, it appears that the new protocols and regulations have been beneficial to Clark County. In 2014 the total E-CO₂ produced increased from 2013, but it is also seen that in 2014 Las Vegas had an increase in tourism activity which also relates to the increase in AVMT for the 2014 year.

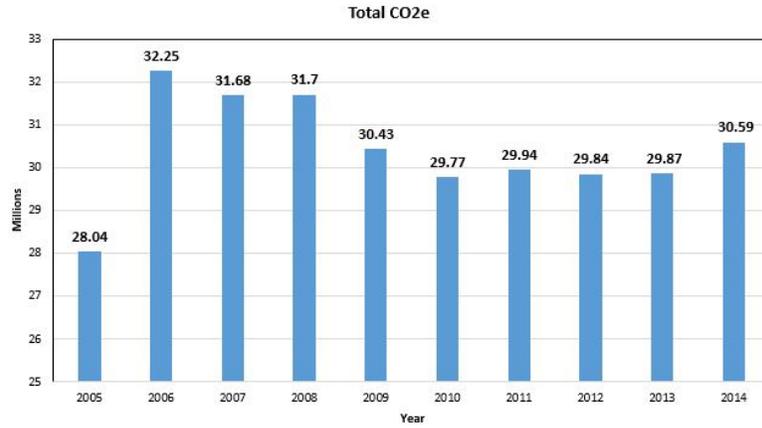


Figure 2. Emissions per Year

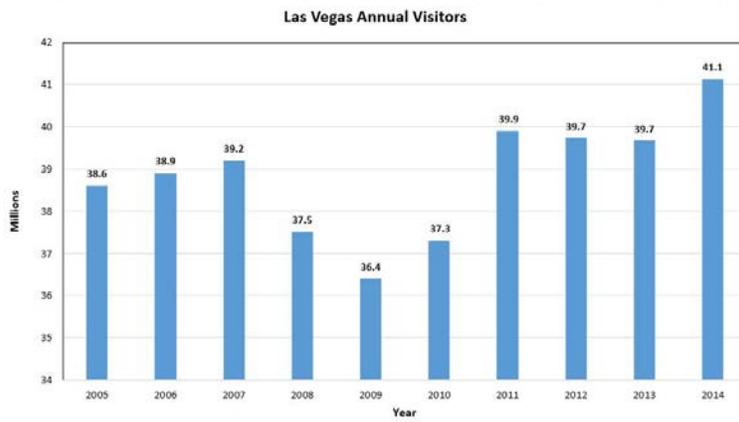


Figure 3. Annual Visitors

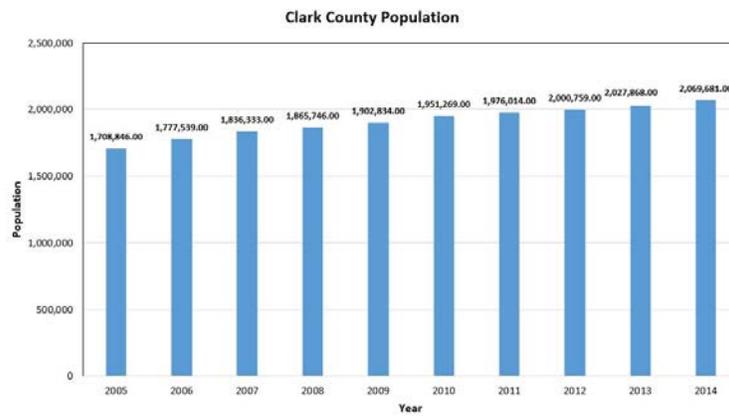


Figure 4. Clark County Population

Energy Sector

The energy sector includes the utility usage in Clark County from two major firms, i.e., NV Energy and Southwest Gas. NV Energy and Southwest Gas data were broken into three sectors, residential, commercial, and industrial. For NV Energy, most of the emissions come from the Residential and Commercial sectors, whereas for Southwest Gas, the Industrial sector dominates emissions. Figure 6 plots the time series of KWh and Figure 7 plots the Therms for residential, commercial, and industrial sectors, respectively. The corresponding E-CO₂ of the energy sector is also plotted in Figure 7. The three sectors are defined as follows:

- Residential Sector – are small-scale homes such as single and multi-family housing.
- Commercial Sector – are all commercial activities and include business buildings and retail stores. The commercial sector also includes municipal government operations and streetlights.
- Industrial Sector – is the sector that has the largest scale of activities and manufacturing. The industrial sector also includes transportation gas. Transportation gas is bulk gas purchased by large users where Southwest pipes are used to transfer this gas. As seen on the Figure 6, industrial Therms have the largest percentage.

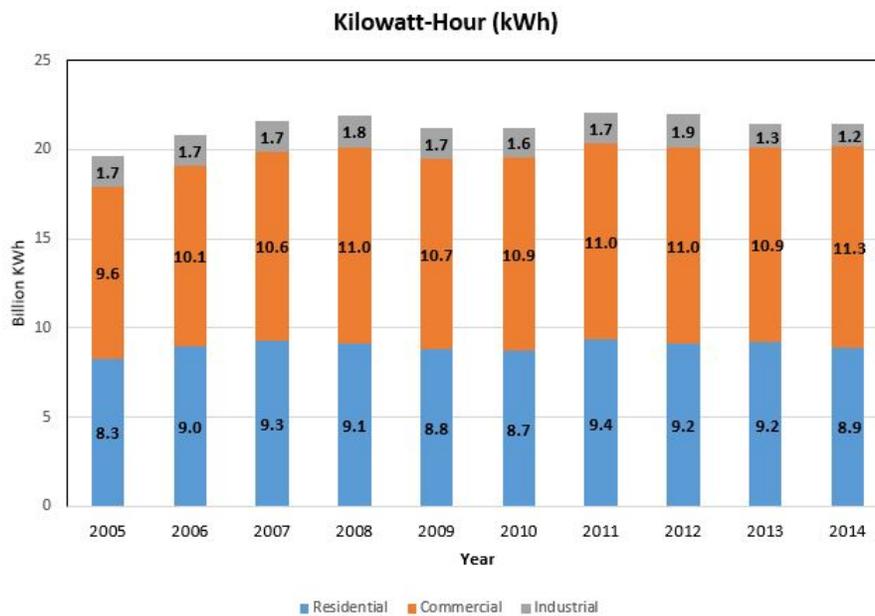


Figure 5. Energy Usage Trend (kWh)

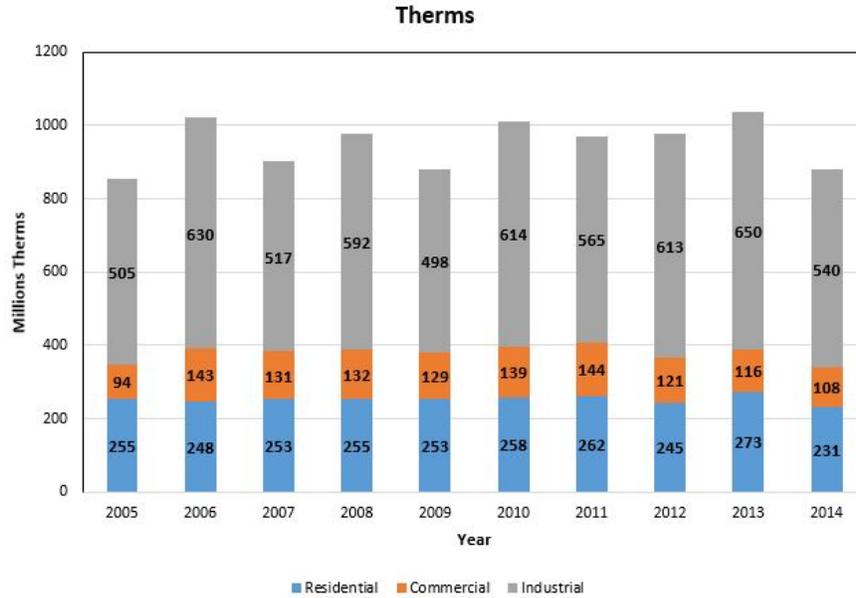


Figure 6. Energy Usage Trend (Therms)

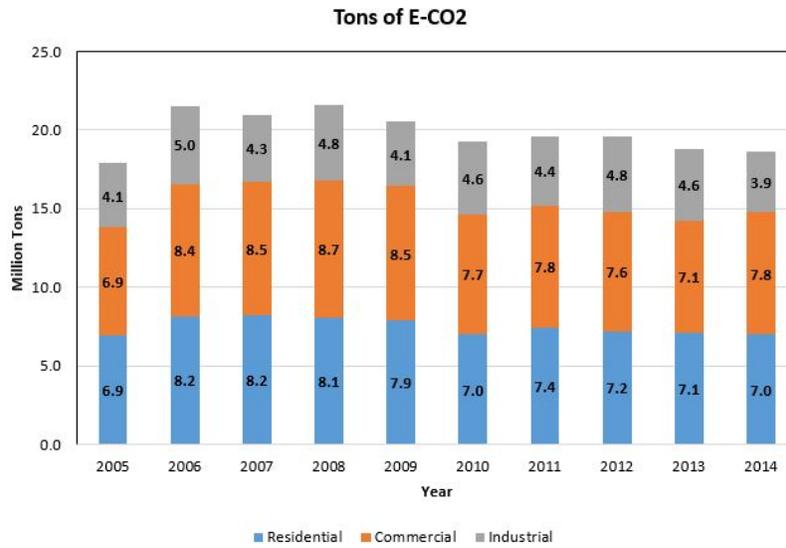


Figure 7. Total Trends of Emissions in Residential, Commercial, and Industrial Sectors

Transportation Sector

The Nevada Department of Transportation (NDOT) was the source of data for the Annual Vehicle Miles of Travel (AVMT) shown in Figure 8. NDOT's AVMT reports can be found on their website and are available as references for research. The data for the previous years has been updated as NDOT released the updated and final versions of the 2012, 2013, and 2014 AVMT data.

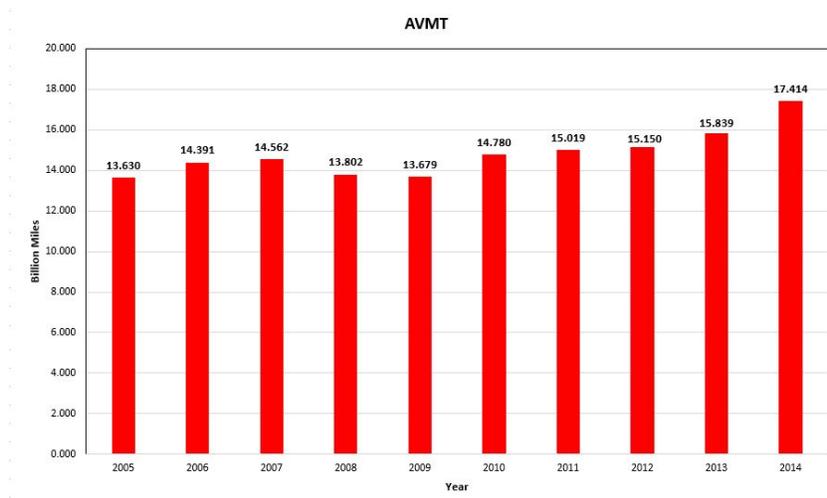


Figure 8. Time Series of AVMT

Waste Sector

After being on a downward trend since 2005, municipal solid waste in Southern Nevada increased in 2013 and 2014. The increase could be due to a larger population in 2013 and 2014, but also related to the increase in the number of tourism in Las Vegas. As seen in Figure 4, the Las Vegas population increased by roughly 27,000 citizens in 2013 and 32,000 citizens in 2014. Adding that much people to the city would create a larger amount of waste. Although municipal solid waste increased in 2013 and 2014, it is still less than the quantity produced in the base year of 2005 which produced 2.71 million tons of municipal waste (See Figure 9). One possible reason for the increase in produced waste is the increase in tourism activity in Las Vegas.

The recycling rates in southern Nevada were on an upward trend from 2010 to 2012 but unfortunately the recycling rates decreased in 2013. The recycling rates went from an all-time high of 27.5% to 22%. Although this recycling rate is the lowest it has been in 3 years, it is still higher than the base year of 2005 which was 14%. In 2014, the recycling rate increased to 23.4% and also the amount of waste produced increased to an all-time high of 2.83 million tons. According to Nevada Division of Environmental Protection (NDEP) recycling rates were being double counted for the previous years. It was not certain for how long this was going on and how much this affected previous recycling rates.

Overall, municipal solid waste is still the smallest contributor to emissions, only contributing 3.04% to the overall emissions produced in southern Nevada in 2014.

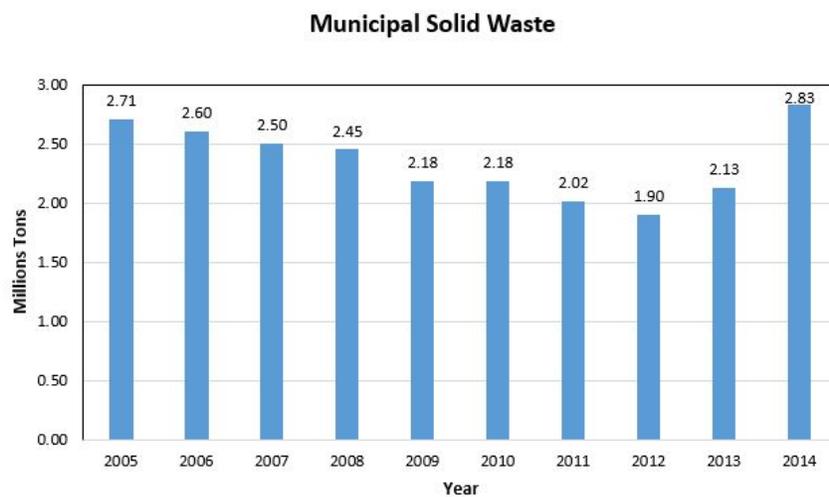
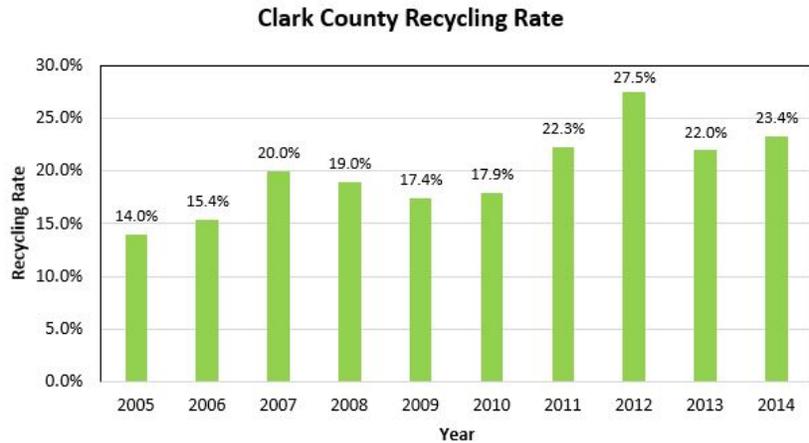


Figure 9. Municipal Recycling and Waste Emission Trends

Mitigating Emissions

Over the past few years, there have been efforts to mitigating excessive emissions throughout the valley. Strategies ranged from building LEED certified buildings to providing more renewable energy sources. A combination of these strategies can decrease CO₂ emissions and result in a more sustainable community.

LEED Certified Buildings

LEED stands for Leadership in Energy and Environmental Design and was developed by the U.S. Green Building Council. LEED rates buildings on sustainability under 5 categories: Building Design and Construction, Interior Design and Construction, Building Operations and Maintenance, Neighborhood Development, and Home Design and Construction. There are four levels of certification: Certified, Silver, Gold, and Platinum. Nevada is home to dozens of LEED-certified buildings.

For example, City Center is one of the newest additions to the Las Vegas strip and is LEED certified gold. City Center is an area made up of multiple large structures which consists of casinos, hotels, and shopping malls. City Center lies on 67 acres of land making it one of the largest LEED certified projects in the world. Made up of 6 buildings, each building has been certified gold including the Aria Hotel which is the largest hotel in the world to reach LEED certified gold and the Crystals building which is the largest retail district to receive LEED certified gold. The sustainable highlights of City Center are: water conservation technology that will save 30% to 43% of water within the buildings and 60% in outdoor landscaping, energy-efficiency initiatives providing a savings equivalent to powering 8,800 households annually, slot machines that serve as air-conditions units, and large scale recycling operations.

Renewable Energy Sources

There are many types of renewable energy such as solar, wind, hydropower, and many others. The most promising renewable energy source in Southern Nevada is solar. Southern Nevada experiences mostly sunny days throughout the year and is capable of producing energy to many homes. Southern Nevada has caught on to the idea of solar power and is now home to Nevada Solar One.

The Nevada Solar One plant is the fifth largest solar plant in the world. The owner of Nevada Solar One is Acciona Energy. The plant is 130 hectare in size and is near Boulder City. The plant produces approximately 136 GWh, which is enough energy for 15,000 homes. Currently, there are 13 solar projects throughout the state that are expected to be finished by 2014 and will produce an additional 2,000 megawatts of renewable energy. They currently sell the energy produced by the solar plant to NV Energy. Wind energy projects are currently in development to produce an additional 800 megawatts.

Public Transit Ridership

Public transit ridership shows a gradual increase in ridership over last five years as shown in Figure 6. RTC's Club Ride program for reducing traffic congestions and improving air quality has grown to 26,000 members. The Club Ride program reduces traffic congestions and improves air quality by members carpooling, using public transportation, or riding bicycles; members log their hours and in 2012, the Club Ride program reduced 1,624 tons of greenhouse gases.

Other Reduction Strategies

There are many reduction strategies being done by these agencies. For example: Southwest is offering Energy Efficiency rebates for certain house hold appliance, business equipment and many other alternatives. Southwest Gas also provides energy saving tips on their website and rebates for people upgrading their appliances and other related equipment that is energy-efficient. NV Energy has invested in using renewable energy. NV Energy Solar Generations program plans on creating 250MW using solar systems installed in households and businesses. The Southern Nevada Water Authority has invested efforts in solar power. Certain water treatment facilities in the valley use solar panels as parking cover. This strategy is able to produce 920,000 kWh per year. The Southern Nevada Water Authority has also installed turbines at certain sites which create anywhere from 500 to 950 kW.

Clark County government has made major efforts in mitigating emissions. For example, approximately 5,000 mercury vapor streetlight fixtures to induction fixtures in residential neighborhoods providing approximately a 30% energy savings. The County's fleet is 2,700 vehicles with 100% alternative fuel and 537 hybrids. The County also revised its standards and building requirements for retrofits and new construction to meet new energy standards. Also, the Clark County solar PV project includes the installation of 30kW Solar Power array on top of new parking canopies

Power Plants around the Valley

As power is a major factor in the calculation of total E-CO₂, we present a brief overview of the power plants supplying energy in this area. Figure 10 displays NV Energy power plants in Southern Nevada. The generating capacity and the type of fuel source used in each power plant is shown in Table 2. The combination of Figure 10 and Table 2 can identify the major sources of stationary emissions. Figure 10 shows that most power plants are near each other, located in the outskirts of North Las Vegas.

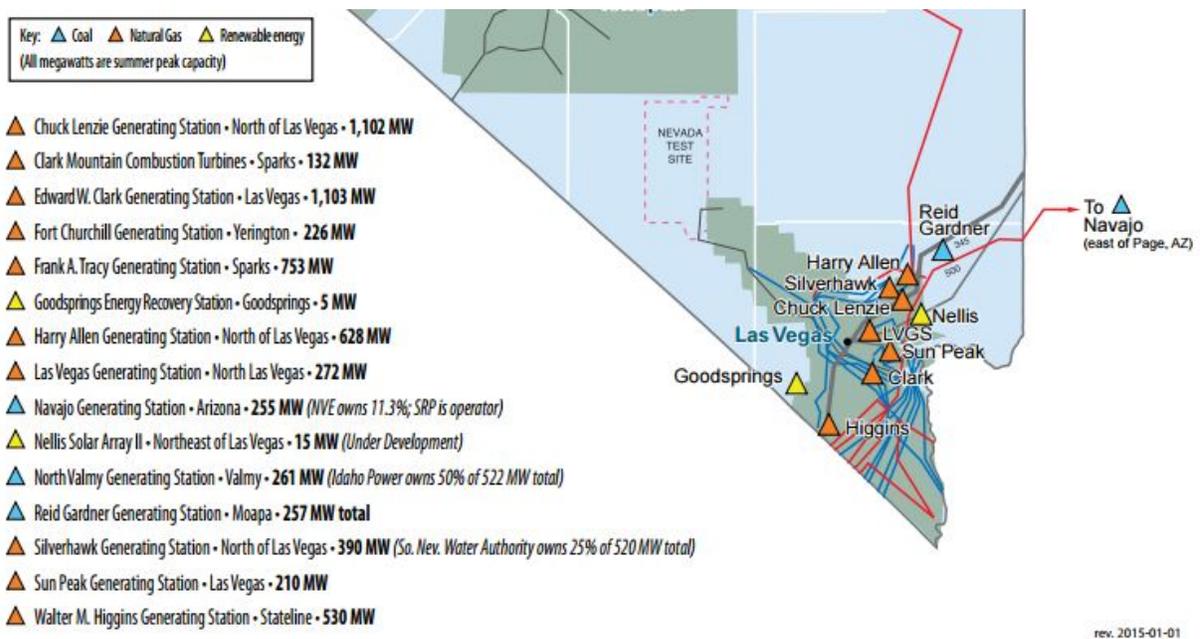


Figure 10. NV Energy Power Plants Map

Table 2. NV Energy Power Plants

<u>NV Energy Power Plants</u>			
<u>Power Plants</u>	<u>Addresses</u>	<u>Generating Capacity</u>	<u>Type of Fuel Source</u>
Chuck Lenzie Generating Station	Great Basin HWY/ I15	1,102 MW	Natural Gas
Edward W. Clark Generating Station	Whitney, NV 89122	1,103 MW	Natural Gas
Goodsprings Energy Recovery Station	Primm	5 MW	Renewable Energy
Harry Allen Generating Station	Great Basin HWY/ I15	628 MW	Natural Gas
Las Vegas Generating Station	North Las Vegas	272 MW	Natural Gas
Reid Gardner Generating Station	Hidden Valley/ I15	257 MW	Coal
Silverhawk Generating Station	Great Basin HWY/ I15	520 MW	Natural Gas
Sun Peak Generating Station	East of las Vegas	210 MW	Natural Gas
Walter M. Higgins Generating Station	Primm	530 MW	Natural Gas

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