

INDICATOR INSIGHT

SUSTAINABILITY ◀•▶ AN EXPERT'S INSIGHT ON THE ISSUE IN ARIZONA

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Sustainability does not seek environmental protections at the expense of economic development, but seeks economic development in a way that considers the environment and that uses natural resources without using up these resources. According to the Global Institute of Sustainability at Arizona State University, “a sustainable society considers the interconnectedness of environmental, economic, and social systems; reconciles the planet’s environmental needs with development needs over the long term; and avoids irreversible commitments that constrain future generations.”

Arizona Indicators presently tracks environmental measures of sustainability in several areas: the quality of our air and water, the magnitude of the urban heat island, energy generation and consumption, and solar power development. Some of these indicators are applicable to the entire state and may be measured at the state or county level. Others, such as the urban heat island, apply specifically to the Phoenix metropolitan area. Urban areas may face different challenges than rural areas in sustainability due to the sheer number of people living there. About 66% of Arizonans live in the Phoenix metropolitan area with another 16% living in the Tucson area. The other metropolitan areas of the state (Flagstaff, Lake Havasu-Kingman, Prescott, and Yuma) each contain 2%-3% of the state population with the remaining 7% of Arizonans spread throughout the rest of the state.

Air Quality

The Environmental Protection Agency (EPA) is the federal agency that sets standards for air quality by setting limits for specific air pollutants. Not only are there legal mandates for air quality, but by keeping air and water clean today, we benefit the present population and also help set a precedent for future air quality. Measures of three air quality indicators are reported by Arizona Indicators: carbon monoxide, particulate matter (PM₁₀), and ground level ozone. The EPA exceedance count (the number of times air pollutant concentrations exceeded the level of EPA air quality standards) is reported for each pollutant. Measurements for air quality indicators are reported at the county level. Counties that persistently exceed the standards may be classified as “nonattainment” areas by the EPA, and be required to take measures to improve their air quality.

Carbon Monoxide

Carbon monoxide exceedances were once common in Maricopa County, but in 2005 the EPA designated the Phoenix metropolitan area in attainment for the National Ambient Air Quality Standard. Today the biggest threats to air quality in Arizona come from ground level ozone and PM₁₀ (particulate matter between 2.5 and 10 microns in size).

Particulate Matter

High levels of PM₁₀ are caused by blowing dust from unpaved roads, construction sites, vacant lots, and agricultural areas. PM₁₀ levels can also be elevated from mining activity. A PM₁₀ exceedance occurs when the 24-hour average is above the level of the standard (150 µg/m³). The measurement indicates the amount of particulate matter (in micrograms) contained in a cubic meter of air. In December 2008, the EPA classified Maricopa and Pinal Counties as serious nonattainment areas and Cochise, Gila, Pima, Santa Cruz, and Yuma Counties as moderate nonattainment areas.



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Arizona Indicators is an online information resource and analysis tool that centralizes data about the state and its communities. Arizona Indicators presents data in 11 major topic areas, interactive visualizations, clear data descriptions, and public opinion data.

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To help Maricopa County reach the National Ambient Air Quality Standards for ground level ozone and PM₁₀, certain restrictions have been set on wood-burning fireplaces and the use of leaf blowers on governmental properties during high pollution advisories. An ordinance to further reduce PM₁₀ levels at all times in Maricopa County prohibits the blowing of landscape debris into public roadways and the operation of leaf blowers on any surface that is not stabilized.

Ground Level Ozone

Ground level ozone is an ongoing problem especially in the Valley of the Sun, but also throughout the state. Hot, dry cities are especially prone to high levels of ozone, which is created when heat causes a chemical reaction between substances from vehicle exhaust and industrial emissions. In March 2008, the EPA strengthened the ozone 8-hour standard to 0.075 parts per million from 0.084 parts per million, increasing health protections but making it harder for Arizona counties to reach compliance. In 2008, Gila, La Paz, Maricopa, Pinal, and Yuma Counties all recorded one or more ozone exceedance for the year; furthermore, most of Maricopa County and a small portion of Pinal County were classified as nonattainment areas by the EPA.

Water Quality

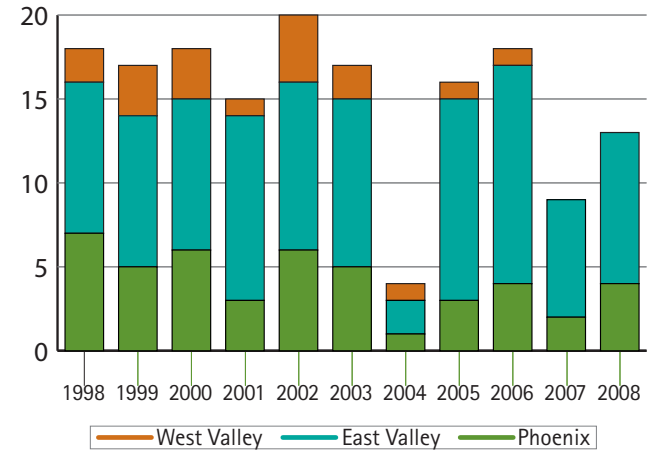
The Environmental Protection Agency is also responsible for setting national drinking water standards. The Safe Drinking Water Act (SDWA) was passed by Congress in 1974 to protect public health by regulating drinking water and its sources. Under the SDWA, the EPA sets standards for drinking water quality and works with states and water providers to meet these standards. The Safe Water Drinking Information System on the EPA website is updated quarterly and allows consumers to query their water provider's records to see if there have been any violations and, if so, the types of violations and the follow-up action. In addition, every community water provider is required to provide its customers with a water quality report once a year.

Violations can occur regarding 1) the levels of contaminants that exceed maximum permissible allowances, also called maximum contaminant levels (MCL); 2) techniques applied to treat water to make it safe; and 3) how and when systems are monitored and reported in compliance with the law. Data reported for Arizona Indicators are health based violations, which include both MCL violations, meaning the amount of a contaminant exceeded the safety standard, and treatment violations, meaning the water was not treated properly. Residents depend on consistent, safe drinking water to ensure a basic quality of life. When water systems are in violation of standards, or if there are errors in treatment or measurement, human health is put at risk, supplies may be suspended, and people lose confidence in the safety of the water supply.

Urban Heat Island

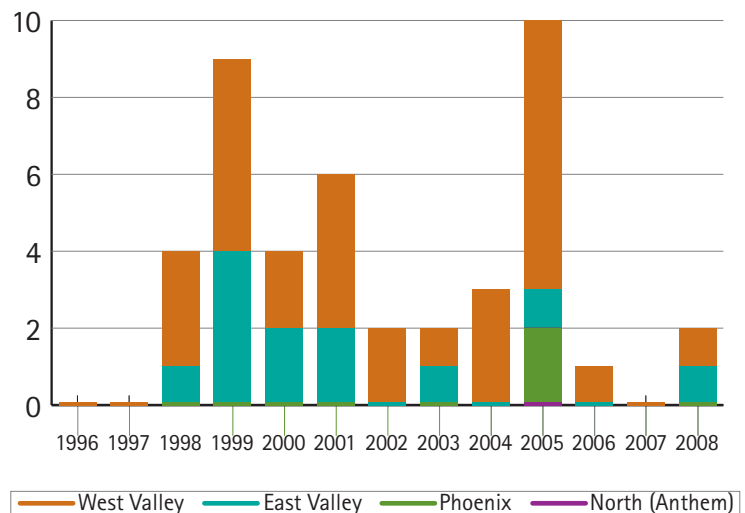
The Urban Heat Island (UHI) is a phenomenon of higher nighttime temperatures in the urban core compared to the surrounding rural countryside. The UHI results from urbanization and replacing natural land surfaces with materials that retain heat and, in Arizona, is restricted to the Phoenix metropolitan area. UHI conditions influence the environmental, social, and economic characteristics of the region as increased temperatures in the urban core decrease the comfort level for those living there. The UHI also results in higher energy costs and disproportionately affects the most vulnerable portions of the community, such as lower income residents who may not be able to afford the high electric bills resulting from greater use of air conditioning. As we plan for future growth and work towards a sustainable urban form, we must consider whether new

Total Ozone Exceedances in Maricopa County



Source: Environmental Protection Agency.

Number of Health-based Violations per year in Maricopa County (Water Systems Serving More than 10,000 People)

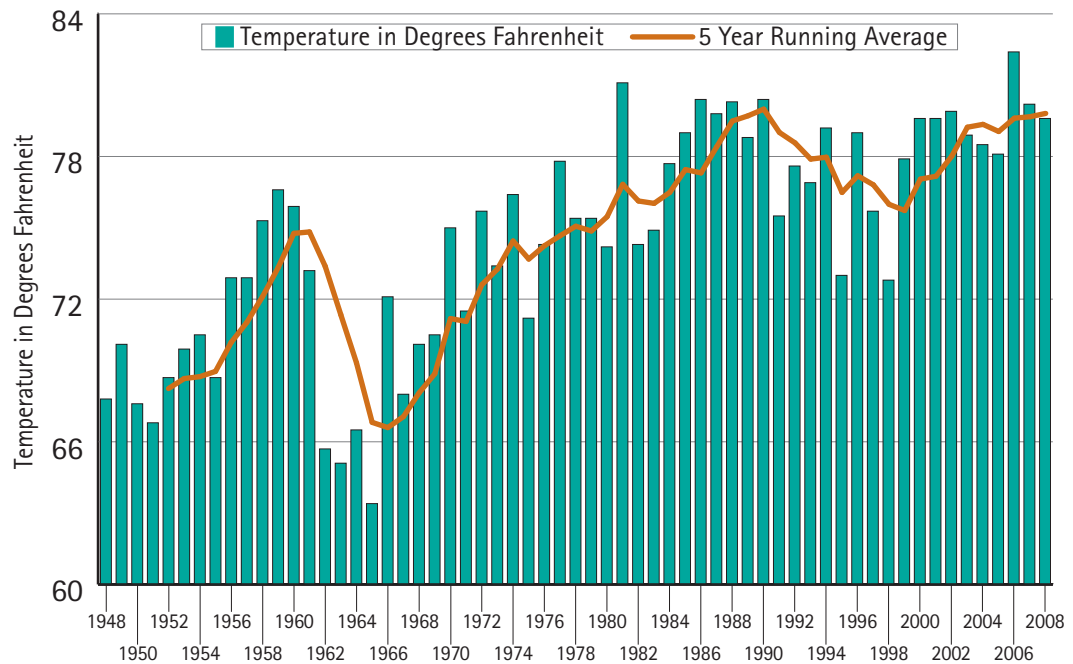


Source: Environmental Protection Agency.

development will promote or mitigate the urban heat island. Research has shown that vegetation helps maintain cooler temperatures at night, but at the expense of greater water use. However, most types of energy require large amounts of water to produce and researchers are seeking to determine the tradeoffs in the water/energy nexus and how best to build for our future in a way that conserves both water and energy resources.

The Phoenix metropolitan area has grown from near one million people in 1970 to over four million people today. This population growth has been characterized by rapid development and urban sprawl. As the desert is replaced with built-up urban area, nighttime temperatures have increased. The number of June days with minimum temperature above ninety degrees at Sky Harbor Airport has increased dramatically in the past six years. Where it used to be a rare occurrence to experience a nighttime low above ninety degrees, in 2003 there were twelve such nights and in 2007, there were ten. As a result of these higher extremes, the average low temperature for June has increased markedly in the past sixty years. As the Phoenix metropolitan area continues to grow, the urban heat island will expand from the urban core further into suburban regions. In order to continue living in this desert city, we must ensure that development is done in such a way that considers the comfort of the city's residents.

Average June Low Temperatures at Sky Harbor International Airport



Source: NOAA's National Climatic Data Center, Satellite and Information Service.

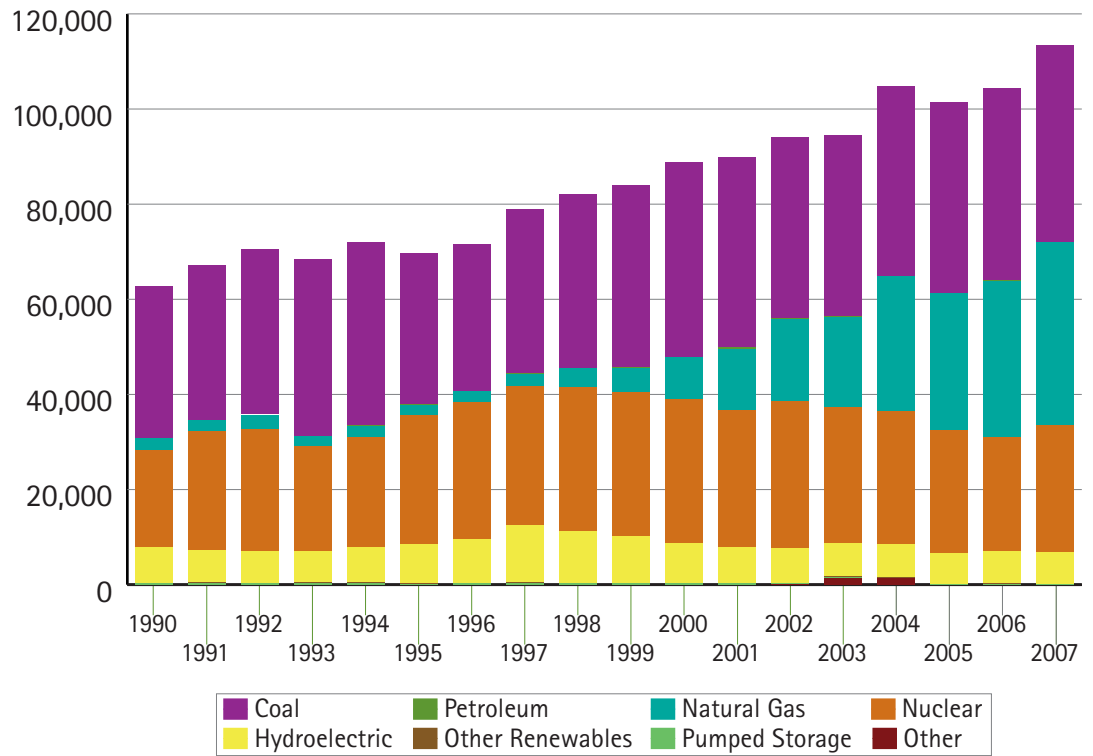
Energy

From 1990 to 2007, there has been over a 70% increase in the population of Arizona. The increase in retail sales of electricity (kilowatt hours) has outpaced even population growth, experiencing an eighty-five percent increase during the same time period. Electricity sales in Arizona include residential, commercial, industrial, and other sales. The percentage of residential sales has increased from 37% of total sales in 1990 to 45% in 2007. During the same time period, commercial sales have increased from 33% to 40% of the total, while industrial sales have decreased from 24% to 16%. At the residential level, energy use per household continues to increase. According to the Arizona Department of Commerce's Energy Office, "phantom energy" may take tiny bits of energy from electric outlets in their homes, and may include electrical cords for appliances, device chargers, electronics and other items left plugged in that continuously sap energy, even if they are turned off or not in use. The most likely culprits are appliances that power clocks or timers and/or can be turned on or off with a remote control. "Phantom" loads are estimated to account for 10% of household power consumption.

As the energy needs of Arizona rise, so does its energy production. Most electric power in Arizona is produced from non-renewable sources, such as coal. Energy produced from non-renewable sources is not sustainable as eventually the fuel sources for these power plants will be exhausted. Non-renewable energy sources include coal, petroleum products, natural gas, and fuel for nuclear reactors. Furthermore, power plants fueled by coal, petroleum products and natural gas produce large amounts of greenhouse gases and coal burning plants emit sulfur dioxide, nitrogen oxides,

and particulates which result in visibility-reducing haze. Coal-fired and nuclear power plants combined to produce over eighty percent of the electricity produced in Arizona in the 1990s. In the past several years, production of electricity by natural gas-fueled power plants has increased from less than ten percent in 2000 to almost thirty-four percent in 2007, accompanied by decreases in the percentage of electricity produced by coal-fired and nuclear plants. Not all electricity that is generated in Arizona is used by Arizonans; much of it is exported to other states, particularly to markets in Southern California. In 2007, we produced 113.3 billion kilowatt hours in Arizona and consumed 77.2 billion kilowatt hours.

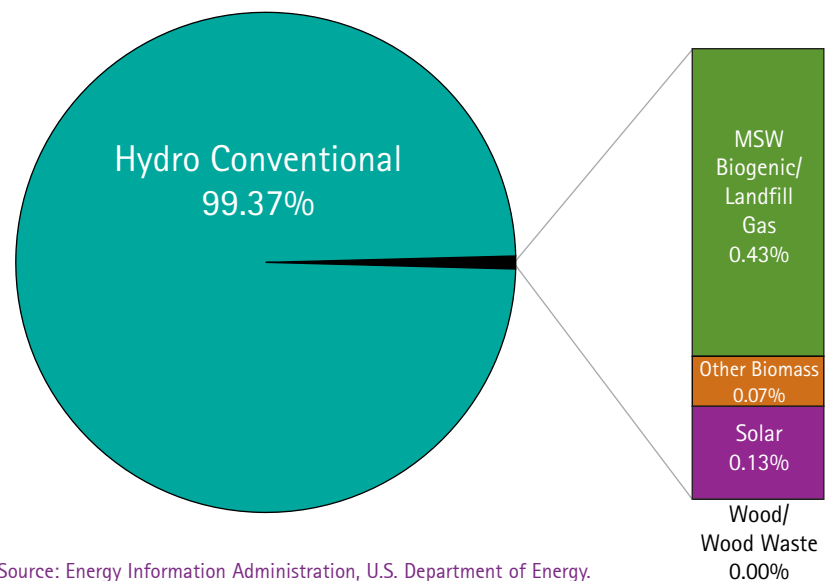
Net Generation of Electric Power in Arizona by Source (Thousand MW-h)



Source: Energy Information Administration, U.S. Department of Energy.

Renewable energy sources provide a sustainable solution; however, at present they supply only a small portion of Arizona's energy needs. Total electricity generation by renewable sources, such as hydroelectric dams and solar energy, has actually decreased in recent years. In 1997, over fifteen percent of energy generated in Arizona came from renewable sources; however, by 2007 this had dropped to less than six percent, due primarily to decreases in hydroelectric production. Currently, over 99 percent of renewable energy generated in Arizona comes from hydroelectric dams, but hydroelectric production may continue to decrease due to the ongoing drought and climate change. The Arizona Corporation Commission, the state agency responsible for public utilities regulation, has mandated that regulated electric utilities must generate 15 percent of their energy from renewable sources by 2025. Currently, less than one percent of the energy produced in Arizona is from solar power. However, solar power is poised to take a prominent place in energy production in the future, beginning with construction of the Solana Generating Station near Gila Bend. In addition, the Dry Lake Wind Power Project, located near Heber, is the state's first commercial-scale wind farm. These projects are a start to increasing sustainable energy production in Arizona.

Net Generation of Renewable Electric Power in Arizona by Source, 2007.



Source: Energy Information Administration, U.S. Department of Energy.

Arizona Indicators gives residents of Arizona an idea as to how we are doing on sustainability measures. As our population continues to grow, we need to be conscientious about how we care for our air and water, develop our urban form, and plan for our energy future in order to leave a legacy for future Arizonans. We should work to meet "the needs of the present without compromising the ability of future generations to meet their own needs."