The second Tucson Region Indicators Report prepared by Pima Association of Governments provides a snapshot of the region with data on key measures that characterize its current health from an environmental and community perspective.

Five theme areas are: Natural Resources, Air Quality, Water, Transportation and Energy, and Community and Economy, to represent the essence of the community and its influence on the land and our environment. This report, built on 2006 baseline data, provides trends for key indicators, and includes a few new indicators. Buffelgrass is featured for the first time and we are monitoring data to track expanding regional progress to control this invasive plant.

A few positive indicators you’ll want to look at: cost of living – Tucson continues to rise above other urban areas of the state; drinking water – we are increasing our use of renewable resources; alternatively fueled vehicles – more people are driving them; education – our number of high school graduates is on the rise; transit – more people are riding the bus; solar progress – we are making strides to produce more clean energy, and investing in more green buildings.

As our region focuses more on sustainability measures, we expect continued improvements with many of our indicators. It will be important for us to consistently monitor the health of our community and environment in these key areas, as our region grows.

Now at 1 million in population, Pima County could reach a population of 1.5 million by 2030, based on PAG projections. With greater understanding of how we live within our physical and economic environment today, we can make better choices to influence the Tucson region’s future. This report provides critical information to help assess our collective impact on the environment and whether the goals of balanced development are being achieved.

Indicators show progress in five focus areas in 2009 report
<table>
<thead>
<tr>
<th>Natural Resources</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Jurisdictional Map of Eastern Pima County</td>
<td>2</td>
</tr>
<tr>
<td>Protected Natural Areas and State Lands</td>
<td>3</td>
</tr>
<tr>
<td>Protection of the Desert Environment</td>
<td>4</td>
</tr>
<tr>
<td>Pima County Open Space Bond Measures</td>
<td>5</td>
</tr>
<tr>
<td>Invasive Species</td>
<td>6</td>
</tr>
<tr>
<td>Buffelgrass</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Air Quality</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozone</td>
<td>8</td>
</tr>
<tr>
<td>Particulate Matter</td>
<td>9</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>10</td>
</tr>
<tr>
<td>Greenhouse Gas Emissions</td>
<td>11</td>
</tr>
<tr>
<td>Visibility</td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Water</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Municipal Providers – Water Use</td>
<td>13</td>
</tr>
<tr>
<td>Use of Reclaimed Water</td>
<td>14</td>
</tr>
<tr>
<td>Water Conservation Measures</td>
<td>15</td>
</tr>
<tr>
<td>Rainwater Harvesting</td>
<td>16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transportation/Energy</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle Miles Traveled</td>
<td>17</td>
</tr>
<tr>
<td>Vehicles Using Alternative Fuels</td>
<td>18</td>
</tr>
<tr>
<td>Petroleum Displacement</td>
<td>19</td>
</tr>
<tr>
<td>Alternative Fueling Stations</td>
<td>20</td>
</tr>
<tr>
<td>Mass Transit</td>
<td>21</td>
</tr>
<tr>
<td>Sun Rideshare</td>
<td>22</td>
</tr>
<tr>
<td>Use of Alternative Transportation</td>
<td>23</td>
</tr>
<tr>
<td>Bicycling</td>
<td>24</td>
</tr>
<tr>
<td>Transportation Enhancements</td>
<td>25</td>
</tr>
<tr>
<td>Intelligent Transportation Systems</td>
<td>26</td>
</tr>
<tr>
<td>Certified Green Buildings</td>
<td>27</td>
</tr>
<tr>
<td>Solar Energy Progress</td>
<td>28</td>
</tr>
<tr>
<td>Solar Power Generation</td>
<td>29</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Community and Economy</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Recycling</td>
<td>30</td>
</tr>
<tr>
<td>Population Growth</td>
<td>31</td>
</tr>
<tr>
<td>Population and Ethnicity Structure</td>
<td>32</td>
</tr>
<tr>
<td>Cost of Living</td>
<td>33</td>
</tr>
<tr>
<td>Educational Attainment</td>
<td>34</td>
</tr>
<tr>
<td>Employment</td>
<td>35</td>
</tr>
<tr>
<td>Housing Cost and Affordability</td>
<td>36</td>
</tr>
<tr>
<td>Residential Building Permits</td>
<td>37</td>
</tr>
</tbody>
</table>
This map shows eastern Pima County including the entire greater Tucson area. Identified are the developed communities of Tucson, South Tucson, Marana, Oro Valley and Sahuarita and the Native American reservations of the Pascua Yaqui Tribe and Tohono O’odham Nation. Significantly developed areas exist in unincorporated lands of Pima County. Altogether, the map shows an area of 2,547,690 acres.

Also shown on the map are major drainages of the region including, the Santa Cruz River, Cañada del Oro, Cienega Creek, Pantano Wash, Rillito Creek and Brawley Wash, which collectively drain the basin. Major highways also are shown.

Population predictions suggest that by 2015, the Tucson area will experience substantial growth with the area south of Tucson and east of Sahuarita. Throughout the greater Tucson region, Pima Association of Governments is actively engaged in planning major new transportation infrastructure and coordinates wastewater management through its delegated responsibilities under the federal Clean Water Act.

Source: Pima Association of Governments
The Tucson region is situated in a basin within the Sonoran Desert which is noted for its beauty, diverse environment and mineral wealth. The Tucson regional basin is ringed by mountain ranges often referred to as “Sky Islands.” These sky islands represent unique habitats situated above the basin and are largely preserved as natural areas. Saguaro National Park, Tucson Mountain Park, Ironwood Forest National Monument and forest service lands represent large portions of these protected natural areas. Though not specifically shown on this map, large portions of the Tohono O’odham Nation remain undeveloped.

The ultimate conversion of state-owned lands (shown in blue) to public or private use remains the greatest unknown that will eventually determine the extent of additional urban growth in the Tucson region. These state-owned lands constitute an area nearly equal to the area already in private hands.

New and future acquisitions, not included on this map, comprise the 880-acre Clyne Ranch property, located in the Cienega Valley, and the 72-acre Terra Rancho Grande Property, located along Tanque Verde Creek at Speedway Boulevard and Houghton Road. Both of these acquisitions are scheduled to be completed by February 2010.

Source: Pima Association of Governments and Pima County
Protection of the Desert Environment

As the greater Tucson area grows, more land is converted from its natural state to urban use. Through this process, the central urban core becomes relatively more remote from natural areas. Perhaps the greatest future challenge for the Tucson area is to manage its growth, balancing the competing needs of urbanization with the need to maintain a connection to the desert environment.

To that end, Pima County has adopted a major land-use planning document, the Sonoran Desert Conservation Plan which sets a course for long-term development. Its intent is to apply a broad landscape ecosystem perspective to land use decisionmaking, with the objective of avoiding fragmented planning.

A significant determinant of future growth will be the development of state lands located south of Interstate 10. State lands may be in an undisturbed condition today, but are subject to future sale. Of the land within the greater Tucson area, state land holdings represent both a unique resource for potential preservation as well as a reservoir of land to be sold for future development.

The Sonoran desert habitat is home to perhaps the most diverse ecological plant and animal community in the northern hemisphere. PAG’s Regional Council has adopted a resolution encouraging volunteers and developers to work cooperatively to save native plants affected by new development.

Lands Permanently Protected: **834,895 acres***
Lands Conditionally Protected: **126,363 acres**
State Lands Subject to Development and/or Preservation: **749,706 acres**
Privately Held Lands: **585,108 acres**

* Acreage totals are determined from the maps presented in this report.
Source: Pima Association of Governments
Pima County Open Space Bond Measures

Two approved Pima County bond measures provide funds to acquire lands for preservation. In 1997 and 2004, Pima County voters approved bond measures to purchase lands to preserve them in perpetuity. The 1997 bond measure allocated $27.9 million and the 2004 bond measure allocated $174.3 million.

As of October 2009, $25 million was expended from the $27.9 million 1997 open space acquisition bond measure on 25 properties. Remaining funds are committed to current acquisitions scheduled to close in the next few months, which when acquired, will essentially complete the 1997 Open Space Bond Program. For the 2004 open space bond measure, 45 acquisitions have been completed, totaling approximately $148 million.

To date, 45,000 acres of land have been acquired and 126,000 acres of state grazing permits and federal leases were transferred to county ownership.

These bond measures specifically were tied to acquiring lands to promote the goals of preserving Sonoran desert open space and habitat protection. The 2004 measure included acquisition of undeveloped lands in the vicinity of Davis-Monthan Air Force Base to prevent urban encroachment.

Both bond measures are being implemented effectively to achieve the voter’s vision.

Considerable progress has been achieved to implement the 1997 and 2004 bond measures resulting in the acquisition of 45,000 acres of land, much of which borders and extends existing natural areas.

Source: Pima County, October 2009
Invasive Species

**Sonoran Desert**

The Sonoran desert, with its naturally sparse vegetative cover, is being invaded by numerous grasses, especially African lovegrass, fountain grass, and Natal grass. Species such as thistles and knapweeds also form a threat. Once established, these grasses can be very hard to control and nearly impossible to eradicate. They displace native plants and create fuel for wildfires in the desert.

**High Desert**

The unique high desert found in our region's sky islands is threatened by non-native invasives. Red brome, cheatgrass and various Eragrostis species are the greatest threats to our forested lands. The highly flammable cheatgrass significantly compromises the ability of the U.S. Forest Service to control fires, and its fire resistant seeds allow it to repopulate quickly before native plants can be established.

**Washes and Riparian Areas**

Our dry watercourses have become clogged by invasive plants, and our pristine washes, such as Sabino Canyon, have been invaded by a giant reed grass (Arundo donax), tamarix and other non-native species.

**From the Yard to the Desert**

Exotic ornamental and landscaping species, such as shoestring acacia, African sumac, feathery cassia, bird of paradise and fountain grass are extremely invasive and are still widely available at local nurseries. Homeowners and developers near urban washes or natural areas should be especially careful about using these, and other non-native species, in landscaping.

In 2006, the Sonoran Desert Weedwackers was the only such group working in Tucson Mountain Park. Now over 100 people affiliated with seven jurisdictional or neighborhood groups are working each month to uproot invasive grasses.
In 2008, buffelgrass was removed from approximately 1,500 acres of public lands and rights of way. Evidence suggests that it takes several years for buffelgrass to re-establish and, even 10 years after clearing, lands are often still dominated by native species.

Across southern Arizona, the invasive non-native plant buffelgrass has introduced a new fire risk and threatens to irrevocably alter our Sonoran desert by displacing native species. Because buffelgrass burns readily and at over 1,400° F, almost three times hotter than native brush fires, native vegetation is often severely damaged by these fires. Buffelgrass fires threaten lives and properties because stands of the grass occur along roadways, alleyways, and washes that abut private property.

There is near-universal consensus about the need to aggressively control its spread. The annual Beat Back Buffelgrass Day was introduced in 2008 and has made great strides toward raising public awareness regionwide. Volunteer buffelgrass pulls are now happening several times a month in a variety of locations and a coordinated mapping system is being developed.

Local governments, scientists, business leaders, and non-profit organizations have joined efforts to lead control efforts. Formed in 2008, the Southern Arizona Buffelgrass Coordination Center (SABCC) has developed a strategic plan and is working to accelerate efforts to protect the desert’s fragile ecosystem.

Source: Pima Association of Governments, Sonoran Desert Weedwackers
Ozone is formed in ambient air due to the presence of several chemicals that react in sunlight. These chemicals are released to the air in part from vehicles and various industrial processes. Ozone, even at relatively low levels, can reduce lung function and can aggravate existing respiratory conditions such as asthma.

Ozone levels in ambient air are measured to determine compliance with the National Ambient Air Quality Standards, which are established by the U.S. Environmental Protection Agency to protect public health. In March 2008, EPA issued more stringent ozone health standards. The Tucson region is at risk for being out of compliance. In September 2009, EPA announced additional review of the standards, with a potential for further strengthening of the standards.

The Tucson area generally experiences healthy ozone days during the summer, when ozone is at its peak. Tucson has never violated the EPA standards for ozone.

Our knowledge of how ozone forms suggests that the preconditions for ozone to exceed the standard could exist, especially with planned revisions of the standards. Thus, ozone is an air contaminant that should be closely monitored to ensure continued compliance.

Ozone levels have fluctuated near the new health standard for the last decade.

Source: Pima County Department of Environmental Quality
Particulate Matter

These bar graphs present a visual representation of the percentage of days during a year that particulate air quality is categorized by the EPA as Good, Moderate or Unhealthy. Tucson generally has very good particulate air quality.

Source: Pima County Department of Environmental Quality

As a result of a violation of the PM₁₀ standard in 1999 (due to high winds and drought conditions), a Natural Events Action Plan was initiated in 2002 by Pima County Department of Environmental Quality to protect public health from airborne dust.

As Pima County’s development expands to accommodate the growing population, the potential for generating higher particulate levels also will increase due to earthmoving activities, the creation of vacant lots, and travel on unpaved roads. Continued education and vigilance in dust control will assist us in maintaining particulate levels below the health standards.
Carbon monoxide is an odorless and colorless gas that is produced as a result of the incomplete combustion of fuel in motor vehicle engines. Today’s motor vehicle engines are far cleaner than they were in the 1960s and 1970s. Back then, carbon monoxide concentrations in ambient air represented one of the most serious air quality problems in urban areas with levels of carbon monoxide often exceeding the U.S. Environmental Protection Agency’s air quality health standard. The Tucson region was no exception and violations of the EPA standard occurred until 1984. Today, the Tucson region remains subject to the requirements of an EPA-approved air quality improvement plan to control carbon monoxide.

Federal regulations requiring cleaner engines, vehicle fleet turnover, vehicle emissions testing, implementation of a travel reduction program administered by PAG have combined to produce dramatic reductions in carbon monoxide emissions. Current carbon monoxide levels are very low and PAG projections of future emissions through the year 2030 indicate that emissions will continue to decrease as control measures become even more stringent.

Carbon monoxide levels in ambient air are shown from 1973 through 2008 for two monitoring sites near busy intersections.

In the early 1970s, carbon monoxide levels were often reported at levels well above the health standard. Ten years later, the impact of federal regulations and vehicle emissions testing caused levels to fall dramatically, achieving compliance. Since then, carbon monoxide levels have continued to drop and are expected to remain well below the EPA’s health standard.

Source: Pima County Department of Environmental Quality
Greenhouse Gas Emissions

Many chemicals in the atmosphere act as greenhouse gases because they absorb infrared radiation and trap heat in the atmosphere. Naturally occurring greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide and ozone. Some result from human activities such as the burning of fossil fuels, deforestation, farming and livestock practices.

Human-caused greenhouse gases in the Tucson region have increased with population and economic growth. County greenhouse gas emissions have increased by 55 percent from 1990 to 2007 mainly from increased energy use and on-road travel (Figure A). Consumption of electricity is primarily responsible for this rise in energy use and emissions from the residential, commercial and industrial energy sectors (Figure B), comprising over 50 percent of total emissions from 1990 to 2007. Regional on-road vehicle travel has increased 91 percent from 1990 to 2007. These emissions contribute approximately one-third of total emissions, largely from personal and commercial vehicle use.
Pollutants that affect visibility originate from various natural and manmade sources. Natural sources can include windblown dust and soot from wildfires. Manmade sources can include motor vehicle exhaust, electric utility and industrial fuel burning and manufacturing operations. Particulate matter pollution is the major cause of reduced visibility or haze. Unlike other pollutants, visibility is not based on a health standard but is based on human perception. Nevertheless, visibility can be objectively measured and varies depending on the level of air pollution.

The desert Southwest is prized for its expansive vistas. The Tucson region generally enjoys a high degree of visibility and has shown steady improvements over the past 13 years (ADEQ, 2008). Cleaner tailpipe emissions, use of cleaner fuels and industrial controls account for this improvement.

Tucson’s visibility has improved for all three indicators: the average visibility, the 20 percent cleanest and 20 percent dirtiest days. Conditions allowing for excellent visibility are expected to continue for the foreseeable future.
The greater Tucson area has long relied upon groundwater to provide the community’s water needs. However, this “mining” of groundwater consumes more water each year than is naturally replenished through recharge. If groundwater were used exclusively for the foreseeable future, there would be many negative impacts, including long-term water shortages and land subsidence.

In an effort to augment the region’s limited water resources, water from the Colorado River is conveyed to the Tucson region via the Central Arizona Project (CAP). The City of Tucson has the largest CAP allocation in the region. It uses its allocation through the Clearwater program of groundwater recharge, blending and recovery. Using this “blended” water allows the region to reduce the depletion of natural groundwater.

The recharging of the groundwater aquifer using water supplied by the Central Arizona Project began in the 1990s by water providers. As water from the Colorado River continues to mix with natural groundwater, fewer gallons of natural groundwater will be extracted to provide drinking water.
Water in the desert Southwest is a scarce and valuable resource. Treated wastewater can be used instead of potable drinking water to irrigate “turf” areas such as public grass, golf courses and roadside plantings.

In the region, we treat wastewater, or effluent, to reclaimed water standards whenever feasible. “Class A” quality reclaimed water is then distributed through purple-colored water lines and applied to landscaping. The separate distribution system ensures that the drinking water remains separate from the reclaimed system and helps the public to distinguish which water can be used for drinking purposes.

As of 2006, more than 900 sites were being served with reclaimed water. The majority of this water is treated and distributed by Tucson Water. Golf courses, parks and school turf areas receive 93 percent of the reclaimed water.

Approximately 15,000 acre-feet of reclaimed water is currently used in the region, and this consumption is expected to increase to 22,000 acre-feet by 2015. Drought increases reliance on reclaimed water since more irrigation is needed during dry periods.

Sources: Tucson Water and Pima County Wastewater, 2008
Water Conservation Measures

In a desert environment, communities can adapt to limited water supplies by conserving water use.

The Tucson region promotes water conservation and seeks to maintain a balanced portfolio of water conservation measures. In this way we reduce water demand and lessen the need to remove groundwater from the aquifer.

Although total water use has remained more or less stable over the last several years, residential per capita water use has declined. Water awareness and the economic downturn may be factors in increased water conservation.
Rainwater Harvesting

In the Sonoran desert, water conservation is critical to the sustainability equation. The rainwater harvesting (RWH) ethic is growing with leadership and grassroots efforts. A mosaic of local RWH at parking lots, right-of-ways, schools, parks, municipal buildings and businesses to homes, promote a promising future.

Rainwater harvesting is capturing rain-flows and putting it to beneficial use on site. RWH can slow floodwater and prevent runoff. Otherwise, stormwater can pick up pollutants in the streets and take them to fragile desert washes. Rainwater can be actively stored in cisterns or by contouring the landscape into earthworks to help vegetation thrive.

Tucson is a hub for RWH information and business:

- Authors / Guidebooks / Experts
- Installation / Vendors / Co-ops
- Education / Workshops / Certification
- Rebates/Grants / Assistance / Volunteering
- Demonstration Sites / Tours

Find more information at: www.rainwaterharvesting.com

With about 12 inches of rainfall per year in the region, we can harvest 15,000 gallons per year from the rooftop of a 2,000 square-foot house. Rain collected into a landscape can reduce over 1/3 of potable use at a residence because irrigation is no longer needed.

Rainwater Harvesting Grows Through Time

AS OF 2008: Regionally, 60-70 RWH installations occur monthly, e.g. with Southern Arizona Raingutters’ cistern installation, business increased 500% since 2006.

IN 2008: Tucson issues RWH ordinance for new commercial construction and PAG Regional Council approves RWH Resolution. Pima County integrates RWH into Residential Green Building Program.


2007-2011: While some states outlaw RWH, AZ offers a tax rebate incentive.


IN 1998: Harvesting Rainwater for Landscape Use booklet issued by the Cooperative Extension and ADWR. Since ’98, 3,500 people have taken SmartScape RWH workshops.


IN 1998: Harvesting Rainwater for Landscape Use booklet issued by the Cooperative Extension and ADWR. Since ’98, 3,500 people have taken SmartScape RWH workshops.


Rainwater Harvesting Grows Through Time

Sources: Advised by representatives at Water CASA, Water Resources Research Center, Watershed Management Group, Master Watershed Stewards, Tucson Water, Arizona Department of Water Resources, City of Tucson Office of Sustainability, Pima County
No indicator can provide a better measure of the reliance on motor vehicle transportation than vehicle miles traveled (VMT). On any given day in the greater Tucson area, vehicles will collectively travel, on average, about 26 million miles (about 72 percent of the distance from the Earth to Mars).

On an average day, traveling 26 million miles will consume approximately 1.2 million gallons of petroleum and, at $3 per gallon, will cost consumers and businesses about $3.6 million. Over the course of the year, the Tucson area fuel bill is nearly $1.3 billion (not including jet fuel, military, rail and other similar users).

VMT is also a critical factor indirectly measuring economic health. Our economic system is largely dependent on individuals traveling in their vehicles to their places of work and to make purchases.

Vehicle miles traveled has increased significantly over the past decade from about 17 million miles per day in 1998 to 26 million in 2008, reflecting growth of the area. As outlying communities are established, this also results in some commuters having much farther travel distances.

This indicator measures the estimated number of miles driven by all vehicles over the greater Tucson area road system over the course of a single day.

Source: Pima Association of Governments
Many businesses and organizations operate fleets of vehicles to transport people and materials from one location to another. Until recently, the availability of alternative fuels has been limited. As a result, fleet vehicles have been among the first to use alternative fuels since fueling stations can be co-located where the fleet is based. As alternative fueling stations have become more prevalent, the use of alternative fuels by vehicle fleets and individual drivers has accelerated. Hybrid vehicles also are becoming more commonplace. This new technology is expanding rapidly and the availability of hybrid vehicles of all kinds is increasing. Biodiesel, E85, compressed natural gas, and propane have quickly risen in the ranks of preferred alternatives to petroleum as well.

Fleets such as the University of Arizona, the City of Tucson, Pima County, and other smaller companies such as Reynolds Logistics have moved quickly to ensure their fleets are operating on the alternative fuels which can use the petroleum option, such as flexible-fueled engines running on E85 and diesel engines running on biodiesel. They have assisted in paving the way for others to make more of a commitment to the alternatives by writing memoranda of understanding and user agreements when possible to allow access to their fueling facility when appropriate.

![Graph showing the number of alternative-fueled vehicles in the Tucson region over the years 2000 to 2008.](image)

The number of alternative-fueled vehicles (both in fleets and operated by individuals) used in the Tucson region is indicated in the chart above.

Sources: Pima Association of Governments, Clean Cities Program
Petroleum Displacement

When alternative fuels are used in place of gasoline or diesel fuels, there is less demand for petroleum products and the need to import petroleum is reduced.

In 2008, members of the Tucson Regional Clean Cities Coalition reported displacing 12 million gallons of petroleum with alternative fuels, such as biodiesel (B5, and B20), ethanol (E85), compressed natural gas (CNG), propane, and with electric vehicles such as the Zap electric truck, or by using hybrid electric vehicles and idle reduction technologies.

As more vehicles that can use alternative fuels enter the fleet or use advanced technologies, there will be an increased opportunity to displace additional petroleum products.

The annual local displacement of petroleum continues to rise. In 2004, it was estimated that 2 million gallons of petroleum were saved by local Clean Cities Coalition members using various forms of alternative fuels and technologies. In 2008, that number rose to 12 million gallons, which includes the use of alternative fuels, hybrid and fuel-efficient vehicles, and idle reduction technologies.

Sources: Pima Association of Governments, Clean Cities Program
A number of fueling stations in the Tucson area offer alternative fuels, including biodiesel, compressed natural gas (CNG), electric power, ethanol (E85) and propane.

The demand for alternative fuels is related to its ease of use and general availability. Currently, alternative fuels are available in the Tucson region and the number of distribution and retail sites is expanding rapidly. CNG, propane and electric were among the first alternative fuel sources to be used and, to a large degree, these have supported vehicle fleets. New products that allow residential CNG fueling and the anticipated arrival of the new all-electric vehicles and plug-in hybrid vehicles will reshape the market for alternative fueled vehicles. Flex-fuel capable (E85) or diesel vehicles using biodiesel fuel have expanded the marketing for alternative fuel stations.

Higher gas prices in the summer of 2006 fostered additional interest in alternative fuels and technologies. Various private sector initiatives are under-way to increase alternative fuel availability in the Tucson region. Arizona’s biofuels infrastructure assistance program will significantly increase the number of biofuels stations available in Arizona. The successful award by the U.S. Department of Energy through the Transportation Electrification Stimulus package will allow Tucson and Phoenix to be among the first five cities that will begin implementing electric vehicle charging stations and an education program on the benefits of the new Nissan LEAF.

The Tucson region has relatively few alternative fuels stations as indicated in the chart above. The number of stations has increased from 63 in 2006 to 73 in 2009.

Sources: Pima Association of Governments, Clean Cities Program
Mass Transit

On an annual basis, the total number of mass transit riders is on the rise, particularly with Sun Tran, the largest mass transit provider in the greater Tucson region. Sun Tran services have significantly increased since 2002. For FY 2009 (which ended June 30), Sun Tran ridership reached 21,649,000. This represented an 11 percent increase in ridership over 2008.

Passage of the 20-year, Regional Transportation Authority plan by voters in May 2006 has increased Sun Tran service by adding new routes and increasing route frequency. These improvements along with the implementation of Sun Shuttle circulator services will likely result in increased ridership next year.

For some, the use of mass transit is a necessity and for others, a choice. For all riders, mass transit represents an energy-efficient means to move from place to place. With improved service options, more people will use mass transit, resulting in additional energy savings and air quality benefits.

* Annual passenger ridership of Sun Tran system based on daily passenger trips.
Source: Sun Tran/City of Tucson
In January 2008, all of PAG’s commuter services were made available to all commuters in Pima County. The vanpool program expanded to all area commuters, no matter their employer. A variable PAG subsidy was established for all vanpools on an as-needed basis. Since the program expansion, seven new vanpools have been added for an increase of 50 percent.

Guaranteed Ride Home (GRH) is now offered to all alternative mode users, no matter their employer or mode of travel. To qualify, the commuter must use an alternative mode at least twice a week and live and work in Pima County. Commuters can register online and receive four vouchers per year for emergency taxi service when they carpool, vanpool, ride the bus, bike or walk to work. The number of commuters registered for GRH has tripled in the last 18 months.

Since November 2008, over 1,000 new commuters have been added, Web visits have increased by 57% and the 408 people who recorded their commutes from March to May 2009 made 14,556 alternative mode trips, saving 85,700 pounds of greenhouse gases.

PAG’s commuter services became Sun Rideshare in 2009. A new interactive carpool matching system was implemented that provides instant information on possible carpool partners, vanpool availability, transit routes and schedules, convenient park-and-ride lots and potential bike buddies for commuting to work. Commuters can now get alternative mode information 24/7, update their own profile, print GRH vouchers and track their alternative mode usage through the Commuter Calendar.
Greater Tucson Region Indicators Report • 2009

Use of Alternative Transportation

The Travel Reduction Program has experienced steady growth in employee numbers since the inception of the program. The number of employees involved in the TRP increased 57 percent since 1989 and represents approximately 29 percent of the total Pima County workforce.

Any Tucson area company with over 100 full-time equivalent employees must participate in the Travel Reduction Program. As new companies move into the Tucson region, or as smaller companies increase in size, the TRP gains new participants. Since the program began in 1989, the number of participating employers has increased 103 percent.

Alternate forms of transportation result in dramatic savings of energy. About 40 people can ride a bus for the same energy cost as two or three people in a bus. Even in a personal vehicle, the addition of one person to a commute results in a net energy savings of 100 percent (assuming that person would otherwise drive alone to work).

In 1989, Pima Association of Governments initiated the Travel Reduction Program in response to the region’s obligations under the federal Clean Air Act. Local governments also adopted travel reduction ordinances to reduce traffic congestion and improve air quality. Although the greater Tucson area’s air quality has improved since 1989, the Travel Reduction and Sun Rideshare programs are continuing as important travel demand strategies.

User By Mode, 2007

- Bus 2.6%
- Bike 1.7%
- Walk 1.6%
- Carpool 10.4%
- Vanpool 0.3%
- Telework 1.1%
- Field Work 1.0%
- Compressed Work Week 3.0%
- Alternate Fuel Vehicles 0.6%
- Drive Alone Only 77.7%

Sources: Pima Association of Governments, Travel Reduction Program
In May 2008, the Tucson-Pima Eastern Region once again received a Gold Award from the League of American Bicyclists (LAB) in recognition of the region’s ability to provide a bicycle friendly environment. The region is the only region in the country that is recognized with the Gold status as a bicycle friendly community. The region first received Gold status from LAB in May 2006. The award reflects the exceptional level of cooperation between the nine regional jurisdictions, and acknowledges the depth and breadth of programs, policies, facilities and outreach that make the Tucson-Pima Eastern Region the premier bicycle friendly region in the country.

The region’s continuing bicycle improvement program will create positive impacts on the environment, health and physical fitness, while reducing traffic congestion and saving money. We strive to increase the number of riders in the region. In order to measure our progress and identify trends in this area, PAG initiated the region’s first annual bike count in 2008. Results of the first count include:

- 8,316 total bicyclists were counted
- 75% were male
- 46% wore helmets
- 5% wrong-way riding, one of the largest causes of bicycle accidents
- 9% were riding on the sidewalk

Between 1993 and 2008, the region added more than 450 bike facility miles. Bicycle facilities include bicycle lanes, signed bicycle routes and shared-use paths. The Regional Transportation Authority (RTA) plan that passed in 2006 includes $80 million for bicycle and pedestrian improvements. Our region continues to show its commitment to providing better bicycle facilities and being a bicycle friendly community.

Source: Pima Association of Governments
Transportation Enhancements

The federal Transportation Enhancements (TE) program fosters improvements to the cultural, historic, aesthetic and environmental aspects of our transportation infrastructure. PAG has guided approximately 70 TE projects to completion including pedestrian and bicycle facilities, safety and educational activities, historic preservation and Tucson’s transportation museum.

A similar effort aimed at enhancing the community’s transportation infrastructure is the PAG Regional Transportation Art by Youth program. This program has the additional goal of providing summer employment for youth as they develop transportation-oriented art projects. Since its inception in 1995, over 60 projects have been developed, many of which are tile mosaic monument and entry signage, street furniture or sound wall art.

Source: Pima Association of Governments
Jurisdictional boundaries are invisible to the traveling public who desire a “seamless” transportation system. To reduce traffic congestion, traffic signals throughout the region are controlled to maximize traffic flow. This system is particularly effective in locally congested areas. The increase in flow and decrease in delay and idle time can lead to a significant reduction in pollutant emissions as well as improved travel time, fewer vehicle stops and reduced fuel consumption.

By applying the latest technological advancements to our transportation system, ITS improvements can help meet increasing demand by improving the quality, safety and effective capacity of our existing and future infrastructure.

The Greater Tucson region is one of the few metropolitan areas of its size in the country with nearly all of its signals controlled from a single center. Operated by the City of Tucson on behalf of the region, over 500 traffic signals throughout the region (including the Cities of Tucson and South Tucson, ADOT, Pima County, and the Towns of Marana, Sahuarita and Oro Valley) are monitored and controlled from the Tucson Transportation Control Center.

Source: PAG Transportation Planning
Certified Green Buildings

Recently Certified LEED Buildings*:
- Lee H. Brown Conservation Learning Center, City of Tucson: Platinum
- Corona de Tucson Fire Station No. 2, Corona de Tucson Fire District: Gold
- Fire Station 22 & Battalion CH, City of Tucson: Gold
- Jackson Employment Center: Gold
- Rincon Transfer Station, Tucson: Gold
- Symantec Tucson Facility, Palice Investments LLC: Gold
- 1498 Desert Vista Campus Fitness & Sport, Pima County Community College District: Silver
- Oro Valley Marketplace, Oro Valley: Silver
- Tucson Airport Industrial Building No. 2: Silver
- Plaza Building, Desert Vista Campus, Pima Community College: Bronze
- Davidson Elementary School, Tucson Unified School District: Certified

Note that LEED certifications are available for residential properties under the LEED for Homes Program. LEED certifications rank from Certified to Platinum, which is the highest level of energy efficiency.

Registered LEED Buildings*:
- LEED registration of a project indicates that a building will be constructed or remodeled to meet the level of LEED certification designated. (List also includes those that have been certified.)

- 1240 Blacklidge, Tucson
- 1498 Desert Vista Campus Fitness & Sport
- 17th + Fremont, Tucson
- 1939 E. Fort Lowell Road
- AFRIC Marana
- Alvernon Investors II Office
- Arizona History Museum
- Casas K-8 School
- Casitas on Broadway - Building 1A-D
- Casitas on Broadway - Building 2A-B
- Central Animal Hospital
- Chase Bank Branch - Tangerine & Thornydale
- City of Tucson Gadsden Company
- Clements Senior Center
- Corona de Tucson Fire Station No. 2
- Davidson Elementary School, TUSD
- El Pueblo Clinic
- El Rio Health Center, Southeast Clinic
- Elvia LLC, Independent Living Adults
- Enclave Assisted Living Community
- Extreme Makeover 619, Tucson
- Fire Central, City of Tucson
- Fire Station 22 & Battalion CH
- GLHN Architects & Engineers, Inc.
- Green Valley Fire Station 151, 155
- Greyhound Multiuse Facility
- Habitat for Humanity, Tucson
- Jackson Employment Center
- La Cholla Professional Park
- Lee H. Brown Conservation Learning Center
- Limberlost Court Condominiums
- Linda Vista Fire Station
- Los Reales Landfill Entrance Facility
- Marana Gateway Center
- Marana Health Center
- MDA Headquarters, Tucson
- Mercado San Agustin
- MLK Apartments
- Offices at Sierra Bravo
- Oro Valley Marketplace
- Pima County WIN REOC Facility
- Pepper Viner BASF Test House
- Plaza Building, Desert Vista Campus
- Repp Design and Construction Office
- Rincon Transfer Station
- River Crossing Corp Center
- Rocks & Ropes East
- Sahuarita 54
- Sahuarita Christian Academy
- SIC Office Building
- Sheraton Tucson Convention Center Hotel
- Simpson's Residential Remodel
- Sixth Street Residence Halls
- Sixty-three Building LLC
- Southern Arizona indoor Sports Center
- Sun Tran BSMF Phase II-III
- Symantec Tucson Facility
- The Salvation Army Hospitality House
- The Villas at Academy Village
- Town of Sahuarita Public Works building
- Tucson Airport Industrial Bldg No.1-3
- Tucson Hotel and Convention Center
- Tucson Modern Streetcar
- Tucson Origins Park
- Tucson Water Dept. E. Side Satellite Facility
- University of Arizona Student Recreation
- Vail School
- Valley View Early Learning Center

Source: U.S. Green Building Council

* List prepared from USGBC.com which includes LEED projects registered or certified through 2008.

The LEED (Leadership in Energy and Environmental Design) Green Building Rating System* is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings. There are several different levels of LEED certification, based on the extent to which they achieve sustainability goals.

A building that is constructed to meet LEED standards will reduce costs for heating, cooling and water consumption substantially over its useful lifetime. LEED certified buildings are becoming very desirable and are being specified in requests for building proposals with increasing frequency.

In May 2008, Pima County launched a Regional Residential Green Building Rating System. In August 2009, the City of Tucson adopted the Regional Residential Green Building Rating System. Pima County is the only jurisdiction awarded a LEED for Homes Providership and is able to offer this free rating service throughout Arizona. Homes in Pima County and the City of Tucson can be certified either through the LEED for Homes program, or the Regional Residential Green Building Rating System. The NAHB/ANSI 700 National Green Building Standard rating system also is available for residential projects.

Up-to-date information can be accessed online at http://www.usgbc.org
In the greater Tucson region, there is a great abundance of sunshine, and the use of solar photovoltaic (PV) energy systems at residences is building momentum. New technological advances have made solar PV panels more reliable and cost effective.

As of July 31, 2009, 844 solar PV customers were connected to the electrical grid (up from 237 customers three years prior) for a total of 2,493 kW of solar PV distributed generation capacity. Also, 617 solar hot water customers had received Tucson Electric Power (TEP) incentives for a total of 1,785,494 kWh of estimated annual savings.

As these PV systems are connected to the grid, the demand for energy from generating plants using fossil fuels is reduced. In turn, pollutants are reduced. As part of a growing national trend, the Arizona Corporation Commission (ACC) adopted regulations called Renewable Energy Standard and Tariff (REST) for electrical utilities, requiring them to obtain 15 percent of their power from renewable sources, such as the use of residential and commercial solar PV systems, by 2025.

With the addition of federal stimulus money for solar initiatives, the City of Tucson is working to accelerate investments in solar infrastructure and is partnering with Pima County to establish a solar one-stop shop.

To date, seven projects (1 MW) have been completed using $7.6 million of Clean Renewable Energy Bonds (CREBs).

The Southern Arizona Regional Solar Partnership is a cooperative effort to focus attention on southern Arizona’s natural opportunities for putting solar power to work. The Partnership seeks to encourage the expansion of solar-based systems to reduce our reliance on sources of energy that generate greenhouse gases. You can find information on the Southern Arizona Regional Solar Partnership, and the Solar Plan at http://www.pagnet.org/Programs/EnvironmentalPlanning/SolarPartnership/tabid/684/Default.aspx

Visit www.GreenPuebloMap.org to see a map of Pima County neighborhood information including solar PV and hot water heating installations.

Source: City of Tucson, Pima County, Pima Association of Governments and Tucson Electric Power

Solar Energy Progress

Public Safety Training Academy (PSTA)

The PSTA single-axis tracking array is a 472.5 kW DC CREBs’ project designed to more efficiently capture the sun’s incident energy as the day progresses.

Pima County worked with Tucson Electric Power to install rooftop solar photovoltaic systems on the Jackson Employment Center, the County’s first facility to be built to LEED Silver standards. The 4.6kW solar PV system supplies about 8% of the Center’s electrical needs. A public display inside the building allows occupants and visitors to monitor the electrical output of the solar array in real time.

Source: City of Tucson, Pima County, Pima Association of Governments and Tucson Electric Power
Solar Power Generation

In 2008, SunShare photovoltaic systems connected to the TEP grid produced 2,471,287 kilowatt hours.

Federal and state tax credits are available to residents and businesses for installing photovoltaic systems. Go to www.dsireusa.org.

Solar power is coming into its own. Across the country, photovoltaic (PV) systems are being installed on commercial and residential buildings providing increasing amounts of electrical power from a renewable, clean energy resource. TEP offers a program that allows its customers to install PV systems and connect them to the electrical grid.

Solar PV energy generated is used directly for the customer’s load, and any excess energy flows back into the utility grid. This excess energy produced can be recorded using a “net” meter, allowing the customer to bank kilowatt-hour (kWh) credits for surplus energy.

TEP also offers rebates for solar hot water and daylighting projects.

SunShare: customer-owned, customer-sited residential installations up to 20 kW where the system is purchased by the customer through TEP’s Renewable Energy Credit Purchase Program

Commercial: non-residential distributed generation systems generally above 20 kW

Small Utility: TEP-owned and sited systems (not including Springerville)

Source: Tucson Electric Power
Recycling

The greater Tucson region has established strong and effective recycling programs. To a great extent, recycling is affected by the availability of adequate markets for recycled materials. Paper, cardboard and aluminum are among the highest value recyclable materials while glass materials lag with poor markets.

The generation of large quantities of waste materials, however, represents an ongoing challenge for communities faced with limited landfill capacity. Recycling waste materials allows waste to be used again or reprocessed for reuse. Recycling also reduces environmental degradation and saves energy by reducing the need to obtain raw materials.

Many more materials are recycled than are presented in the figure shown. Not the least is waste grease from restaurants which is collected and processed into biodiesel fuel. In addition to grease collection during the year, the Tucson region holds an annual "Grecycle" event to recycle grease the day following Thanksgiving. This event raises awareness about keeping grease out of local sewers and landfills. In 2009, 2,500 pounds of oil was collected and made into biodiesel fuel.

A successful recycling program is clearly an indicator of the commitment of a community to improve resource sustainability.

Recycling Accomplishments FY 2007-08

Pima County
- 13,080 tons of tires
- 2,027 tons of yard waste
- 20,819 tons of paper
- 354 tons of aluminum scrap
- 7,020 tons of ferrous scrap
- 721 tons of plastic bottles
- 29 tons of electronic waste
- 636 tons of lumber

City of Tucson
- 7,631 tons of yard waste
- 466 tons of aluminum cans
- 1,203 tons of steel cans
- 1,351 tons of ferrous scrap
- 2,305 tons of plastic bottles
- 57 tons of electronic waste
- 25,980 tons of paper
- 6440 tons of glass

Source: City of Tucson, and Pima County
The populations of Pima County and the City of Tucson are shown from the year 1900 to the present and projected through to 2040. From a population of less than 15,000 in 1900, Pima County has grown to over 1 million people and is presently ranked as the 40th largest county in the nation with the potential to reach over 1.75 million by 2040.

In recent years, Pima County’s population has grown rapidly due to a large influx of migrants attracted to the region by recreational and economic opportunities, as well as the climate. With the onset of the recent economic downturn, in-migration has slowed significantly, and any population growth at present is largely due to natural increase. The decline in housing prices means that many people are unable to sell their homes in other parts of the country in order to move, and rising unemployment across the nation means people are unable or unwilling to move without the certainty of a job upon arrival. However, as business opportunities begin to expand again over the next few years, it is expected that the region will once again attract young, working-age adults as well as retirees.

The chart shows population growth over time for Pima County and the City of Tucson.

Source: 1900 – 2000 U.S. Census Bureau, 2010 – 2040 PAG
The baby boom generation (those born in the period 1946-1965) account for about one quarter of Pima County’s population, reflecting its reputation as a popular retirement destination. The aging of the baby boomers, combined with increased life expectancy, has led to a rise in the median age from 32.8 years in 1990 to 37.1 years in 2008. Another notably large segment of the population appears with the children of the baby boomers (baby boom echo effect).

Pima County’s sex ratio of 96 males for every 100 females is slightly lower than the national ratio of 97:100. This is likely due to our slightly older population, where females outnumber males in every age group beyond 40. Of those aged 80 and over, more than 60 percent are women, reflecting the higher life expectancy of women.

According to the 2008 American Community Survey, for people in Pima County reporting one race alone, 78 percent are white, 3.5 percent are black or African American, 3.3 percent are American Indian and Alaska native, 2.5 percent are Asian, and approximately 8 percent are of some other race. Three percent reported being of two or more races. It is estimated that 33 percent of Pima County’s population is Hispanic with 57 percent being White, non Hispanic. It is expected that by 2025, no single racial/ethnic group will be in the majority.
Greater Tucson Region Indicators Report • 2009

Cost of Living

The Cost of Living Index is a measure of overall living costs for an area, where 100 is set as the benchmark for the average cost for the locations in the sample: thus areas with scores above 100 have a higher than average cost of living and those with scores below 100 have a lower than average cost of living. With an index value of 99.6 the Tucson metropolitan area has the lowest cost of living of the Arizona metropolitan areas. In comparison, the New York metropolitan area has the highest score in the nation at 219.8. Metro areas with lower costs of living than Tucson include Atlanta (97.2), Austin (95.5), Dallas (92.1), and Philadelphia (88.7). Pima County residents pay significantly less than the rest of the nation for utilities and slightly less for housing; on the other hand, the price of groceries is higher.

Tucson’s median family income, (H.U.D. 2009), is $57,500. What income will it take elsewhere to maintain the same lifestyle? Data from “Sperling’s Best Places” indicate that it would take almost twice that amount in San Francisco ($113,445) and almost $100,000 to live to the same standard in New York. On the other hand, an income of $57,500 in Tucson is equivalent to only $45,566 in San Antonio.
The level of educational attainment in Pima County has improved over time; the proportion of high school graduates has increased from 81 percent in 1990 to 87 percent in 2008, higher than the national level. The county also can boast of a higher-than-average level of graduate and professional degrees, in part reflecting the presence of the University of Arizona and the large number of medical and related facilities in the community.

The chart shows the highest level of education attained by residents of Pima County who are 25 years and older, the age at which most people are likely to have completed their formal education.

Sources: U.S. Census Bureau, American Community Survey, 2008
The leading industries in Pima County are educational services, health care and social assistance, which together employ almost a quarter of the employed population age 16 years and older. Arts, entertainment, recreation, accommodation and food services employ a further 12 percent. Of the employed civilian-workforce, three quarters are private wage and salaried workers, 18 percent are government workers, 6.8 percent are self employed, and .1 percent are unpaid family workers.

Pima County’s unemployment rate generally tracks the State of Arizona and the nation, but at a somewhat lower rate. Even with the recent economic downturn and the county seeing the highest rate in over a decade, the situation remains favorable compared to statewide and national levels.

There are six official measures of unemployment. This unemployment rate is based on the percentage of the working age population who are actively seeking work.

The graph shows the annual unemployment rate for Pima County, the State of Arizona and the United States from 2000 to 2009. The unemployment rate is based on those members of the working age population who are actively seeking work, expressed as a percentage of the total population.

Sources: (Employment by Industry) U.S. Census Bureau, American Community Survey, 2008 and (Unemployment Rate) U.S. Bureau of Economic Analysis
Housing Cost and Affordability

Affordable housing, along with the desert climate, has long made the Tucson region a desirable place to live. In recent years, the majority of new arrivals were relocating from California and other western states where housing values tend to be considerably higher. The liquidity of these individuals, along with a strong housing market and growing population, resulted in rising house prices that reached a record high in 2005. In 2006 we reported that “the Tucson region’s housing market has slowed considerably but has not yet been accompanied by any significant downturn in prices.” The downturn is now evident with the median house price at the end of 2008 falling to $185,900 compared to $242,300 at the end of 2005.

Households spending more than 30 percent of their income on housing costs are considered to be “cost burdened.” In Pima County, 39 percent of owners with mortgages, 10 percent of owners without mortgages, and 50 percent of renters spent 30 percent or more of their household income on housing (ACS, 2008).

The U.S. Census Bureau estimates the 2008 median monthly housing costs for mortgaged homeowners to be $1,363, nonmortgaged owners $361, and renters $720. Although a typical homeowner with a mortgage pays almost twice as much each month as a renter, renters are still likely to pay a greater proportion of their income.

Source: Council for Community & Economic Research, ACCRA Cost of Living Index, and U.S. Census Bureau, American Community Survey, 2008
As in much of the country and particularly in the West, the housing market has been hit by the recent economic crisis. Approximately 3,400 permits for residential units were issued in 2008, a marked contrast to the recent peak of more than 12,000 in 2005. For 2009, the number looks set to be even lower with a little over 1,800 permits being issued in the first nine months. Despite the recent downturn, housing remains an attractive asset for the region as compared to California and other major cities.

Much of the recent growth has occurred outside the urban core in the unincorporated county and the Towns of Marana, Oro Valley and Sahuarita. Older housing is concentrated primarily in the Cities of Tucson and South Tucson, which reflects normal growth patterns from the downtown core and an outward expansion over time. This pattern seems likely to continue with the exception of some infill development.