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PHOENIX-TUCSON AMBITIONS REPORT

SUNCORRIDOR, FUTURECORRIDOR

A GLOBAL MEGAREGION IN THE 21ST CENTURY.

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LEARNING FROM...

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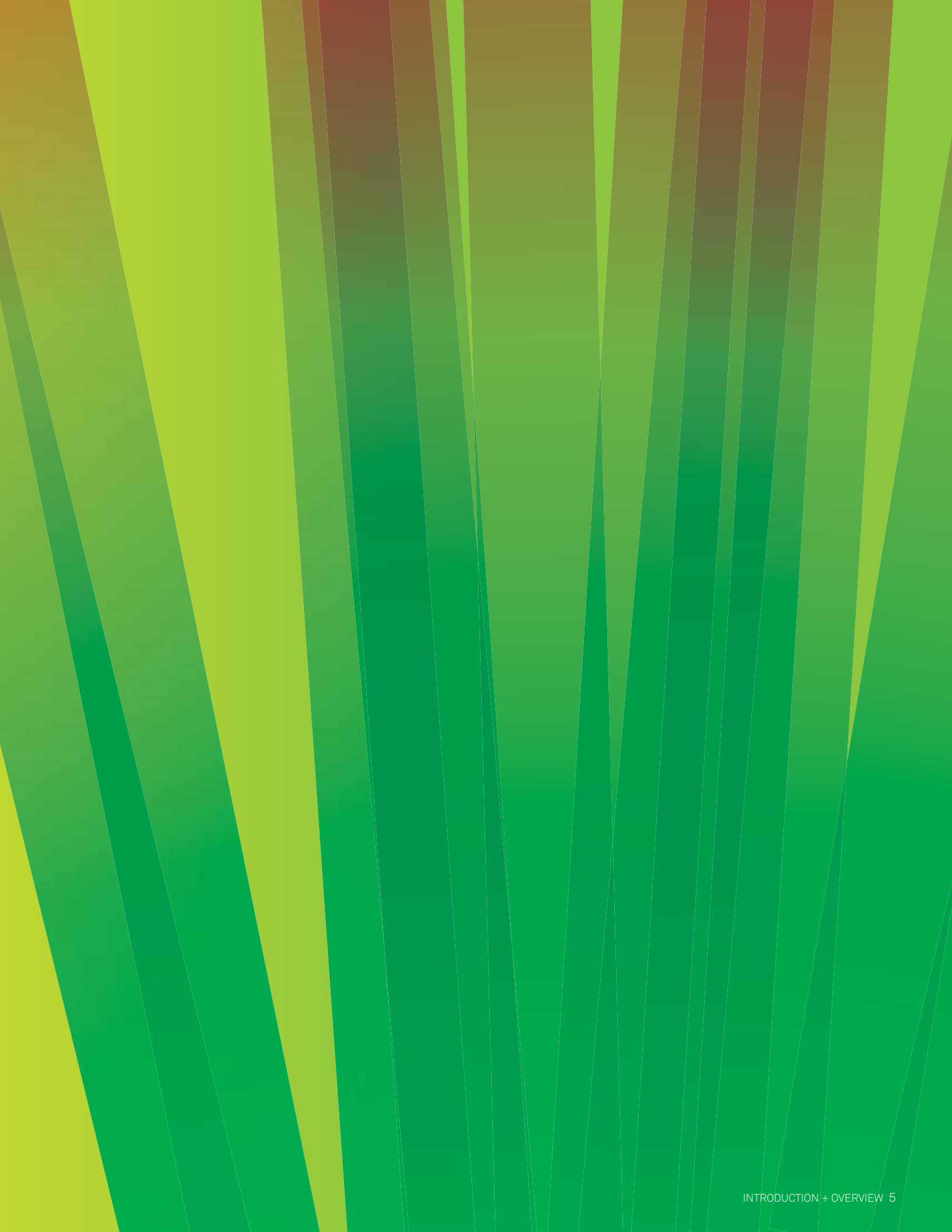


THE HUMAN CONDITION IS NOW URBAN.

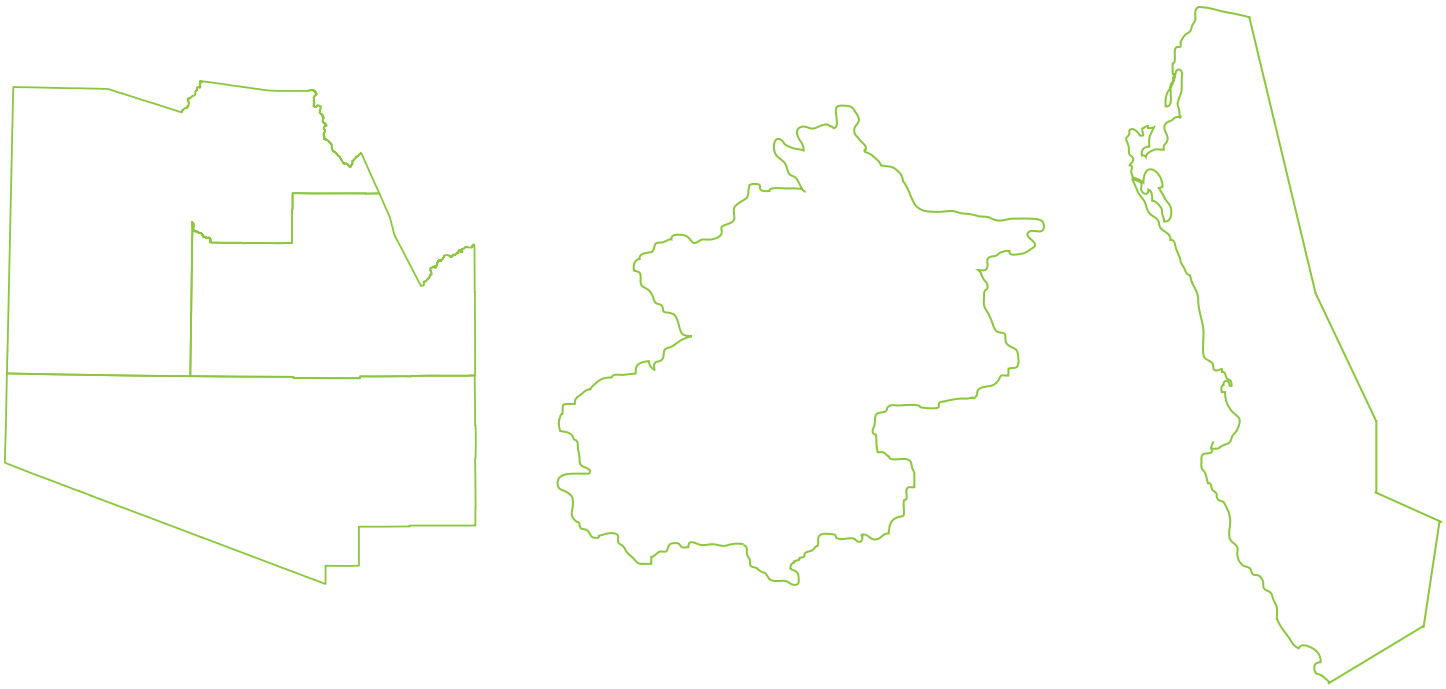


Figure 1a
From left to right: Outlines of the study areas for the Sun Corridor, Beijing and Jeddah, all subjects of the AECOM Global Cities Institute's research. Below right:

Increasingly we will find the solutions to our shared global challenges – from climate change to outmoded infrastructure – in how our cities and regions work, which is why the AECOM Global Cities Institute was created. The Institute draws on the company's fully integrated planning, design, and management capabilities to help make cities and regions better.

The AECOM Global Cities Institute will partner with cities and regions to understand their most pressing issues, bringing together the best expertise in a multidisciplinary laboratory that goes beyond traditional practice. Each year, the AECOM Global Cities Institute will work with selected cities and regions throughout the world to develop solutions that will enhance urban quality of life. The Institute will look at both the bigger picture and the finer grain: from open space to green, grey, and social infrastructure, from environmental quality to public safety. All the components of what makes a city, or region, work – and work better – will come into focus.

In 2010, three cities/regions have been chosen to initiate the Institute's work, (1) Arizona Sun Corridor; (2) Beijing, China and (3) Jeddah, Saudi Arabia. (Figure 1a)

City/Region Engagement Process

The main objective of the Global Cities Institute work in each city or region is to help advance strategic thinking in a variety of critical areas. Each team will bring together a wide range of disciplines: from architects and environmental planners, to transportation engineers and development economists, to advance

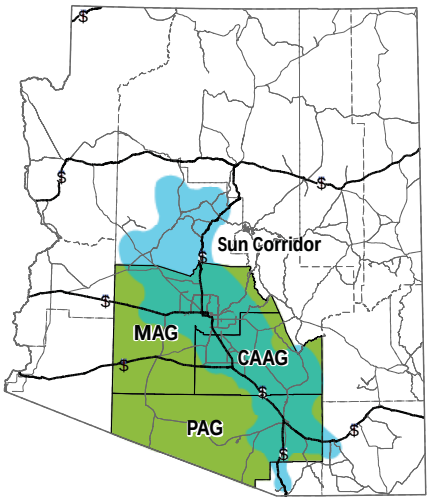


Figure 1b
The Sun Corridor within the State of Arizona; and the jurisdictional boundaries of the Maricopa Association of Governments (MAG), the Central Arizona Association of Governments (CAAG) and the Pima Association of Governments (PAG).

urban progress. In each city or region, this work will be realized in four steps:

1. *Understanding Aspirations:*
   The Institute will conduct an in-depth analysis of contemporary urban issues, reaching out to the local community and potential partners including other businesses, academic institutions, and non-governmental organizations. This fact-finding exercise will help to define what areas of urban life would benefit from further discussion.

2. *Framing Success:*
   The Institute will bring together practitioners from a wide range of disciplines. In the process, preconceptions that may otherwise be barriers to urban and regional progress will be challenged. Together, the team and stakeholders will explore social, economic, environmental, urban form, transportation, infrastructure, and governance opportunities.

3. *City/Regions Ambitions Report:*
   The Institute will document the outcome in a comprehensive report provided to each region/city with a detailed summary of our findings. This document will highlight key issues and challenges, strategic opportunities, and future implementation pursuits – all in support of improving the region/city's quality of life and its competitive advantage.

4. *Leaders Forum:*
   Following the sharing of our findings, each city/regional team will convene a forum to explore results and next steps. Attended by recognized experts, city and regional leaders, academics, business leaders, and political leaders, the forum will be an opportunity for key people within the city and the region to openly discuss the possibilities before them.

Objectives of the Sun Corridor Megaregion Engagement

The intent of the AECOM Global Cities Institute selection of the Sun Corridor Megaregion as one of its pilot efforts is to:

1. Help advance strategic thinking in a variety of the critical areas not being addressed by others that will create a diversified economy, enable critical infrastructure investment decisions, and suggest the basis for a new urban development paradigm in a desert environment.

2. Facilitate informed decision-making on the part of public officials, key community stakeholders, and interest groups relative to advancing responsible community development of the Sun Corridor Megaregion.

3. Enable the leadership of the Sun Corridor Megaregion to take advantage of national resources soon to be available, such as the Partnership for Sustainable Communities Program initiatives from HUD/DOT/EPA, and federal transportation bill reauthorization.

A NEW URBAN DEVELOPMENT PARADIGM IN A DESERT ENVIRONMENT.


AYS CENTER

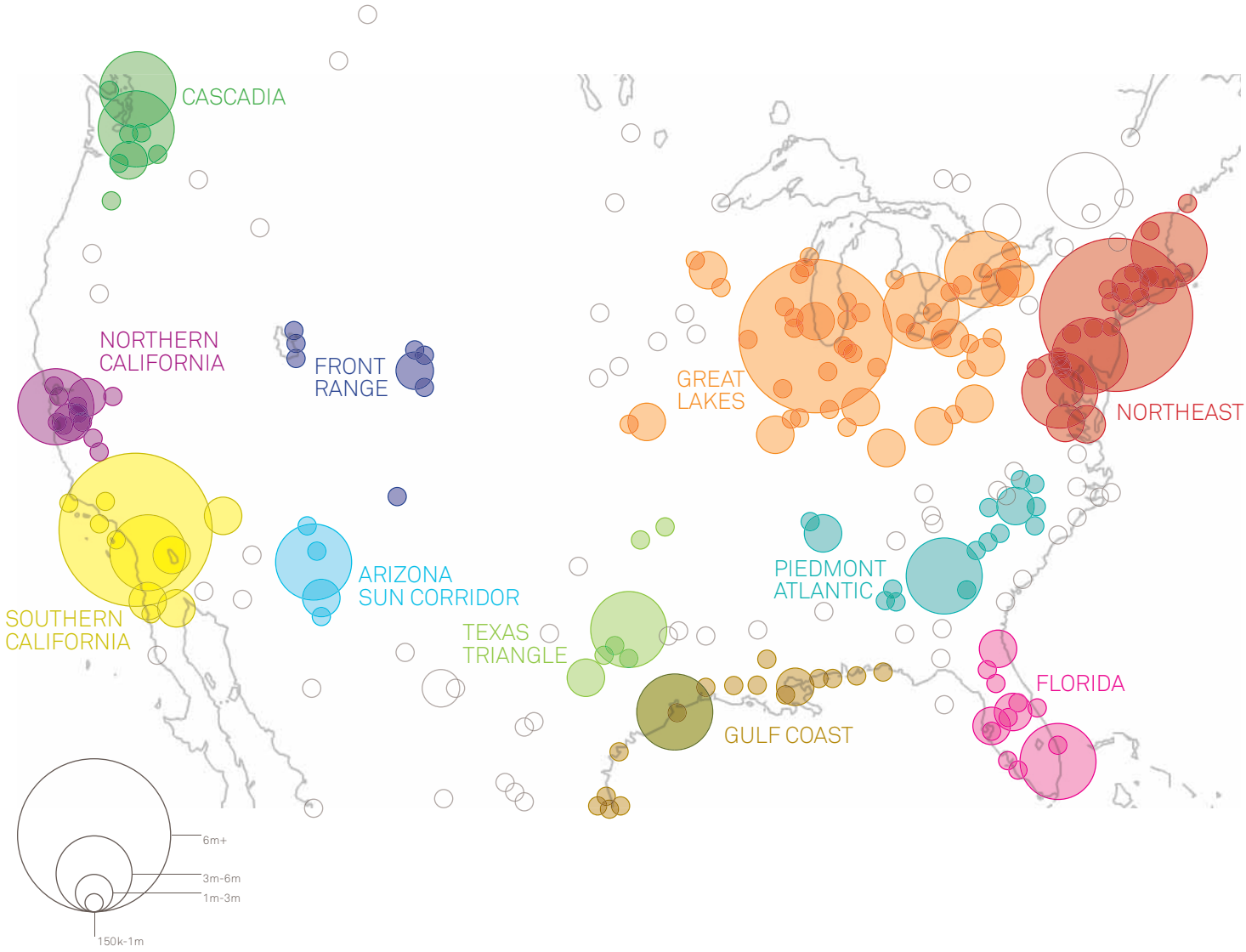


Figure 2a
Megaregion areas in the continental United States and southern Canada.
Source: Regional Plan Association, 2009.

The concept of "megapolitan areas" has been developed to describe the expansion and merging of metropolitan regions through the second half of the 20th century as their boundaries blur, creating a new scale of geography. A megapolitan can be described as a conglomeration of two or more intertwined metropolitan areas with a combined population of five million or more. Megaregions are characterized by interlocking economic systems, shared natural resources and ecosystems, and common transportation systems. A megaregion may be comprised of one or more megapolitan areas, such as the Northeast megaregion, which is comprised of the megapolitan areas of Washington, DC, New York City and Boston.

The Arizona Sun Corridor, which is one of eleven nationally-defined megaregion areas (Figure 2a), is both a megaregion and a megapolitan.

Greater Phoenix and greater Tucson are its principal metropolitan areas, although the megaregion is defined as stretching further northward and southward. The core of the megaregion, and what is referred to as the "Sun Corridor Megaregion" moving forward, is comprised of three counties: Maricopa, Pinal, and Pima. The Phoenix and Tucson metropolitan areas anchor the megaregion at its north and south ends, respectively. While there are many environmentally sensitive lands within the megaregion, it also has the highest degree of developable lands in the state of Arizona.

THE SUN CORRIDOR IS CLEARLY MOVING FROM 'METRO' TO 'MEGA.'

Table 1

Population and employment projections for the Sun Corridor.

Source: Statewide Travel Demand Model, HDR, 2008; Morrison Institute report *Megapolitan: Arizona's Sun Corridor*, 2008; MAG, 2009.

COUNTY	2005 POPULATION	2050 POPULATION	2005-2050 % INCREASE	2005 EMPLOYMENT	2050 EMPLOYMENT	2005-2050 % INCREASE
MARICOPA	3,681,000	7,133,000	94%	1,748,000	3,594,000	106%
PIMA	925,000	1,964,000	112%	399,000	752,000	88%
PINAL	274,000	2,200,000	703%	45,000	1,044,000	2,220%
SUN CORRIDOR TOTAL	4,880,000	11,297,000	132%	2,192,000	5,390,000	146%
STATE OF ARIZONA	6,086,000	14,552,000	139%	2,591,000	6,699,000	159%

The population of both Phoenix and Tucson is expected to grow more than 50 percent over the next 20 years; in 2005, the entire area had a population of five million people; the projected 2050 population is more than ten million (Table 1). Even though projections are in flux, considering the recession and the slowdown in migration and immigration, the Sun Corridor is clearly moving from "metro" to "mega."

As continued population growth places increasing pressure on this region, there is greater need to coordinate planning and policy decisions throughout the Sun Corridor. Connecting its cities with each other, the rest of Arizona, and other states (including Sonora, Mexico) will require comprehensive and interconnected economic, social, environmental, land use, and multimodal transportation systems to foster continuing economic growth and a high quality of life.

Governance and Identity

In December 2009, the Maricopa Association of Governments (MAG), Pima Association of Governments (PAG), and Central Arizona Association of Governments (CAAG), signed a joint planning agreement to coordinate their planning activities and cooperatively work together to advance the Sun Corridor in the global economy, realizing that their economies are linked and

THE SUN CORRIDOR: SOLIDIFYING AS A GEOGRAPHIC ENTITY.

that regional planning issues transcend jurisdictional boundaries. The Joint Planning Advisory Council (JPAC) was established to identify mutually agreed upon goals and interests, provide guidance on possible technical assistance and joint planning activities, and enhance the communication and cooperation among the policymakers in the three regions.

This is a huge milestone in the region, solidifying the Sun Corridor Megaregion as a geographic entity. In the past, MAG, CAAG, and Pinal County have participated in several joint planning studies. MAG and CAAG share three member agencies in common (Apache Junction, Gila River Indian Community, and Queen Creek), and PAG and CAAG share one member agency in common (Marana). Because of the natural interdependencies that exist in the region, this agreement allows all jurisdictions to work together toward one common goal.

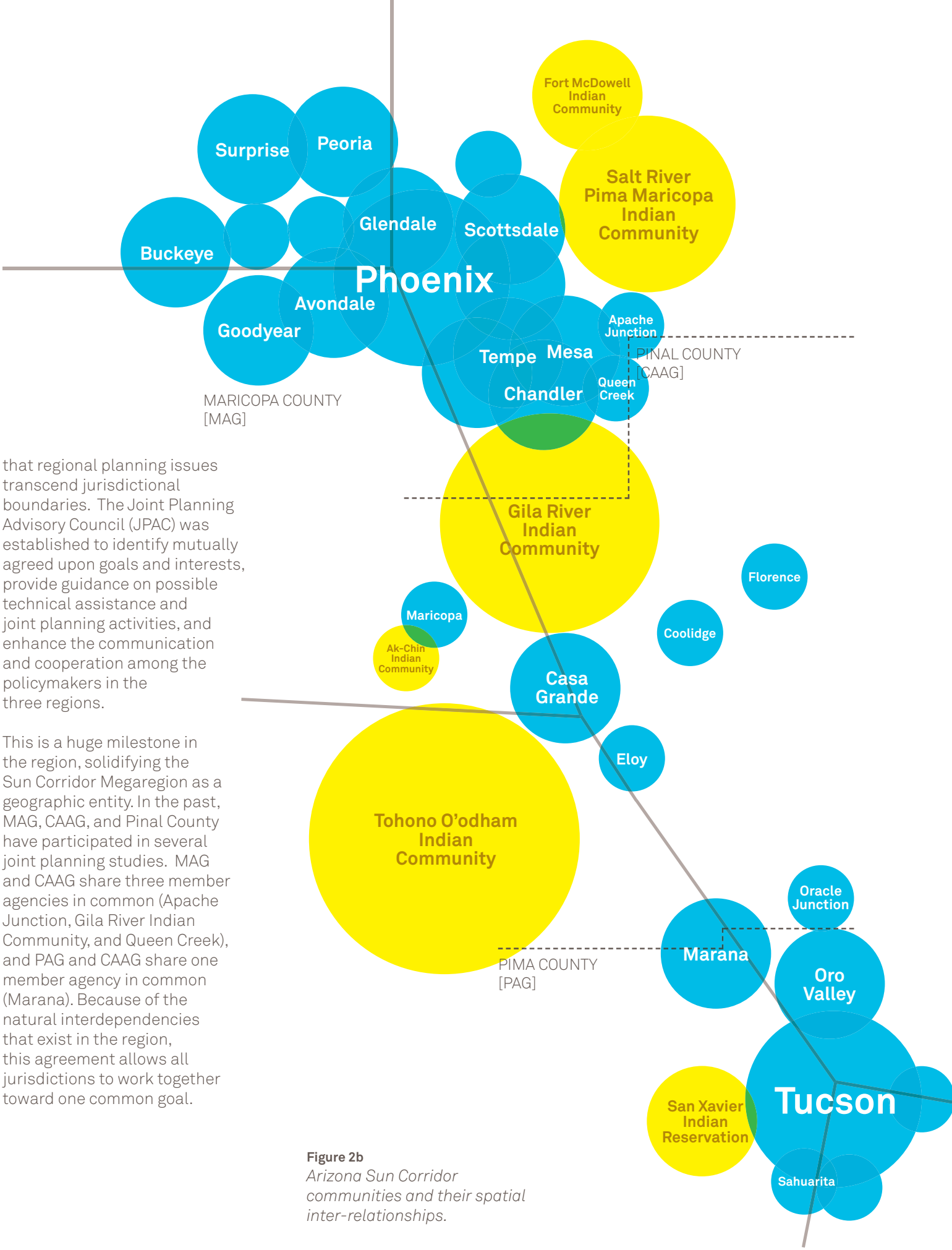
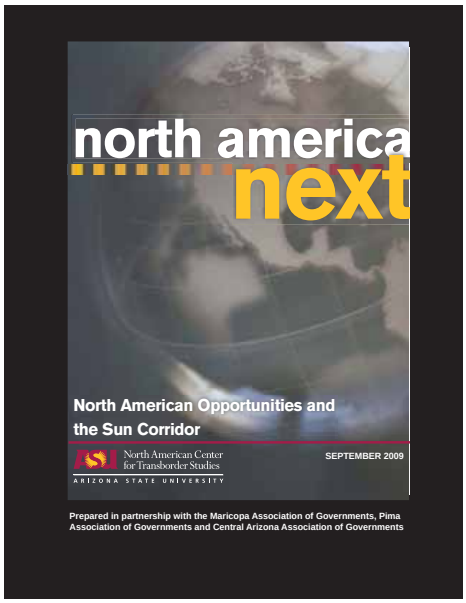


Figure 2b
Arizona Sun Corridor communities and their spatial inter-relationships.



The Bigger Picture

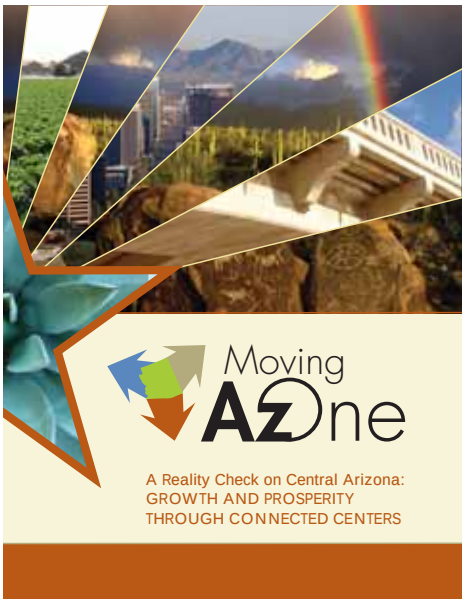
Concurrent with the establishment of the JPAC, various organizations have identified issues and opportunities that need to be comprehensively addressed and integrated for successful evolution of the megaregion. These organizations are working on strategic concepts and preliminary planning strategies to lay out a variety of options to achieve successful implementation. The AECOM Global Cities Institute's Sun Corridor engagement is just one piece of the larger puzzle, setting a solid foundation for future efforts moving forward. In conjunction with this effort, the following listing identifies a series of other completed and ongoing planning processes that fit within the same vein of thought to move toward realization of the Sun Corridor as a dynamic economic activity center, showcase for sustainability, and a desert urbanist pattern of development with state-of-the-art infrastructure and maximum use of renewable energy over the next fifty years.

Morrison Institute for Public Policy, ASU: Megapolitan, Arizona's Sun Corridor; 2008

The Morrison Institute, a public policy organization affiliated with Arizona State University (ASU), published a document entitled *Megapolitan: Arizona's Sun Corridor*. The purpose of this document was to introduce readers to the megapolitan concept and characteristics of the Sun Corridor region. A series of circumstances were presented that describe what could likely shape future growth in the Sun Corridor, including the incorporation of sustainability into future community development, the extent of and potential utilization of State Trust land near urban areas; competition for a diverse, high-wage economy, advances in transportation; energy generation and other technologies; the availability of water, changing population trends, growing tribal influences, infrastructure needs, and the size and scope of government.

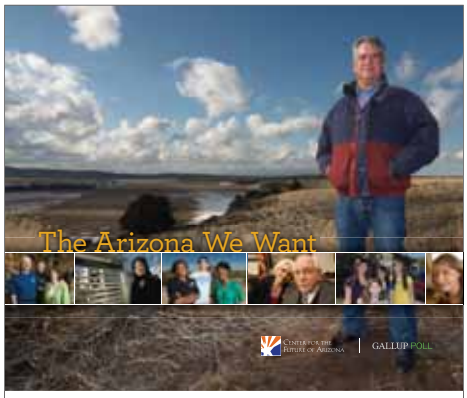
North American Center for Transborder Studies, ASU: North America Next, North American Opportunities and the Sun Corridor; 2009

This document was produced by ASU, in collaboration with MAG, CAAG, and PAG to understand the role of the Sun Corridor in the larger North American economy. The purpose of this document was to present challenges, opportunities, and options for the Sun Corridor to become a major player in continental and international trade. Key opportunities to exploit the location of the Sun Corridor to foster economic opportunities include: (1) location along the NAFTA highway and Asia-Pacific land-bridge, (2) ability to develop inland ports and distribution centers, (3) development of growth industry clusters, and (4) ability to become a renewable energy hub. Key challenges in the Sun Corridor include: (1) multifunctional planning, (2) sustaining quality of life, and (3) the future of Smart Growth.



Moving AzOne: A Reality Check on Central Arizona; 2010

The Urban Land Institute (ULI) is working in the Sun Corridor on the idea of "connected centers." A center is defined as an enduring, walkable, and integrated open-air, multiuse place that is organized around a clearly identifiable and energized public realm where citizens can gather and strengthen community bonds. Over time, a center should evolve into one of the most compact, and most diverse part of a community, with strong connections to its surroundings. Most cities across the region recognize the value of economic activity centers and are actively working to create them. However, municipalities can, in many cases, work separately from each other on centers and, sometimes, at cross-purposes. Without better coordination, Arizona may end up with under-built centers that do not provide the desired regional benefits for a long time, if ever. This study shows how cooperation and unity across jurisdictional boundaries can help advance the megaregion as a major economic player.

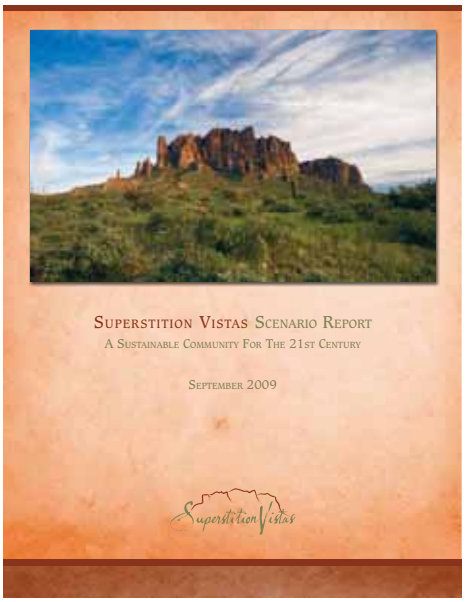


The Arizona We Want; 2009

The Center for the Future of Arizona completed *The Arizona We Want* in 2009 as an initiative designed to implement Arizona citizens' agenda based upon the findings of a completed Gallup Arizona Poll. The purpose of the report was to offer a clear picture of what citizens think about life in Arizona communities, what they want for the future, and how we can work together to achieve a common set of goals. Key issues that have emerged as items requiring resolution include: (1) Arizona needs fully prepared leadership and governance structures appropriate to the 21st century, (2) Arizona needs an infrastructure investment strategy, (3) Arizona needs a clear and sustained commitment to global competitiveness, (4) a constructive solution to illegal immigration must be found and implemented, and (5) Arizona needs a balanced and stable tax system.

Pinal County Comprehensive Plan; 2009

The *Pinal County Comprehensive Plan* is a document meant to steer the County on future decisions to manage growth, preserve the desired quality of life, and promote sustainability. It is a long-term vision that promotes effective economic vitality while ensuring environmental stewardship. The purpose of the Plan is to articulate the County's vision and outline the strategic direction required to position it as a vibrant, healthy, and economically sustainable region within Arizona. Its ultimate goal is to present "one plan" that reflects a county-wide consensus and a coordinated effort between incorporated cities and towns. The vision for the comprehensive plan effort focused on seven key issues: (1) sense of community, (2) mobility and connectivity, (3) economic sustainability, (4) open spaces and places, (5) environmental stewardship, (6) healthy, happy residents, and (7) quality educational opportunities.



Superstition Vistas Scenario Report, a Sustainable Community for the 21st Century; 2009

The Superstitions Vistas report documents a visioning process for a 275-square mile tract of State Trust Land in Pinal County to ensure that development of this land sets an example for sustainability and economic prosperity for the region – and for development of future State Trust Land tracts. The *Superstition Vistas Scenario Report* outlines three feasible alternative futures for the area, with the end goal of establishing a master plan for future development. A comparison of the scenarios and recognition of the key issues has provided for a series of lessons learned:

- Creating mixed-use centers around major transportation areas is the primary driver of improved transportation performance.
- All components of sustainability must be balanced.
- The lifeblood of any sustainable community is a vibrant economy.
- The Arizona State Trust Land system must be reformed to build a smart and sustainable future.
- Providing a full spectrum of housing that matches community needs and market demand is necessary to be truly sustainable.
- Building green and promoting auto efficiency has a greater potential impact on carbon emissions than urban form.
- Superstition Vistas will need connectivity to the region and super-region to exist as a central piece in the Sun Corridor.

Statewide Transportation Planning Framework Program; 2010

As a response to the growing demand for transportation infrastructure, and in light of significant forecasts for population and employment growth over the next several decades, the Arizona State Transportation Board allocated resources for a statewide collaborative process called "Building a Quality Arizona," or "bqAZ." The purpose of this effort was to quantify transportation needs statewide and identify the full range of options to address those needs, along with a comprehensive 2050 transportation vision. It is the first statewide transportation planning effort in Arizona to address truly long-range needs (2030 and 2050); the first to consider all surface modes on an equal footing; the first to include city, county and state systems; and the first to fully integrate principles of Smart Growth, environmental stewardship, responsible economic growth and tribal participation. Accepted by the State Transportation Board in January 2010, the *Statewide Transportation Planning Framework Program* has gone above and beyond a traditional transportation study in taking a more holistic planning approach. Transportation is only one element of the built environment and communities in which we all reside. This Program has made the linkages and connections between multimodal transportation and land use, urban form, economic development, and the natural environment—embracing a vision of a sustainable future. Policy implications suggest that the state of Arizona must: 1) plan a more diversified transportation network,

OUR ENGAGEMENT IS JUST ONE PIECE OF THE LARGER PUZZLE, SETTING A SOLID FOUNDATION FOR FUTURE EFFORTS MOVING FORWARD.

2) work with local governments and regional agencies to improve location efficiency, 3) adopt policies to reduce greenhouse gas emissions, 4) plan for its emerging megaregion structure, and 5) address its transportation funding needs.

Others

The planning efforts described above are, by no means, inclusive of all the work that has gone into envisioning the future of the Sun Corridor. Many other studies conducted by other state and regional agencies (e.g., Arizona Department of Transportation, Arizona Department of Commerce, Arizona Game and Fish Department, Arizona Department of Environmental Quality, MAG, CAAG, PAG, Pinal County, Greater Yuma Port Authority), non-profit organizations (e.g., Center for the Future of Arizona, Lincoln Land Institute, Sonoran Institute, The Nature Conservancy), academic institutions (e.g., ASU, University of Arizona) and the business community (e.g., East Valley Partnership) have contributed to advancing the school of thought thus far.

A series of future studies are under discussion to advance the dialogue in the Sun Corridor to build upon the conclusions presented in this document. Such future efforts include:

- ADOT's Alternative Analysis (AA) and Environmental Impact Statement (EIS) to establish a preferred Phoenix to Tucson intercity rail corridor and implementation program.
- ADOT's *Border Master Plan* to formulate a comprehensive transportation infrastructure development program 100-km on both sides of the binational border to facilitate mobility and international trade, as well as support economic development.
- MAG's *Freight Transportation Framework Study* to take advantage of the Sun Corridor's strategic location as the crossroads for international trade and determine what economic development opportunities this portends and what infrastructure might advance such initiatives.
- MAG's *Sustainable Transportation and Land Use Integration Study* to understand and shape future growth in a coordinated manner with mobility options.
- ASU Morrison Institute for Public Policy's *Watering the Megapolitan*, to understand the current water supply and demand, and to assess future water supplies available to the Sun Corridor.

SUN CORRIDOR MEGAREGION POINT OF VIEW

Issues and Opportunities Assessment

The chief question this exercise raised was "What critical decisions and strategic investments do key stakeholders in Arizona need to make in the next 5+ years to successfully advance public policy and investments to achieve a sustainable Sun Corridor Megaregion?"
In interviewing key stakeholders (e.g., state agencies, COGs/MPOs and counties, community groups, business associations, utility companies, development community, and special interest groups), three important issues rose to the top very quickly: 1) economic vitality and diversification, 2) sustainable development pattern, and 3) Sun Corridor marketing identity and governance.

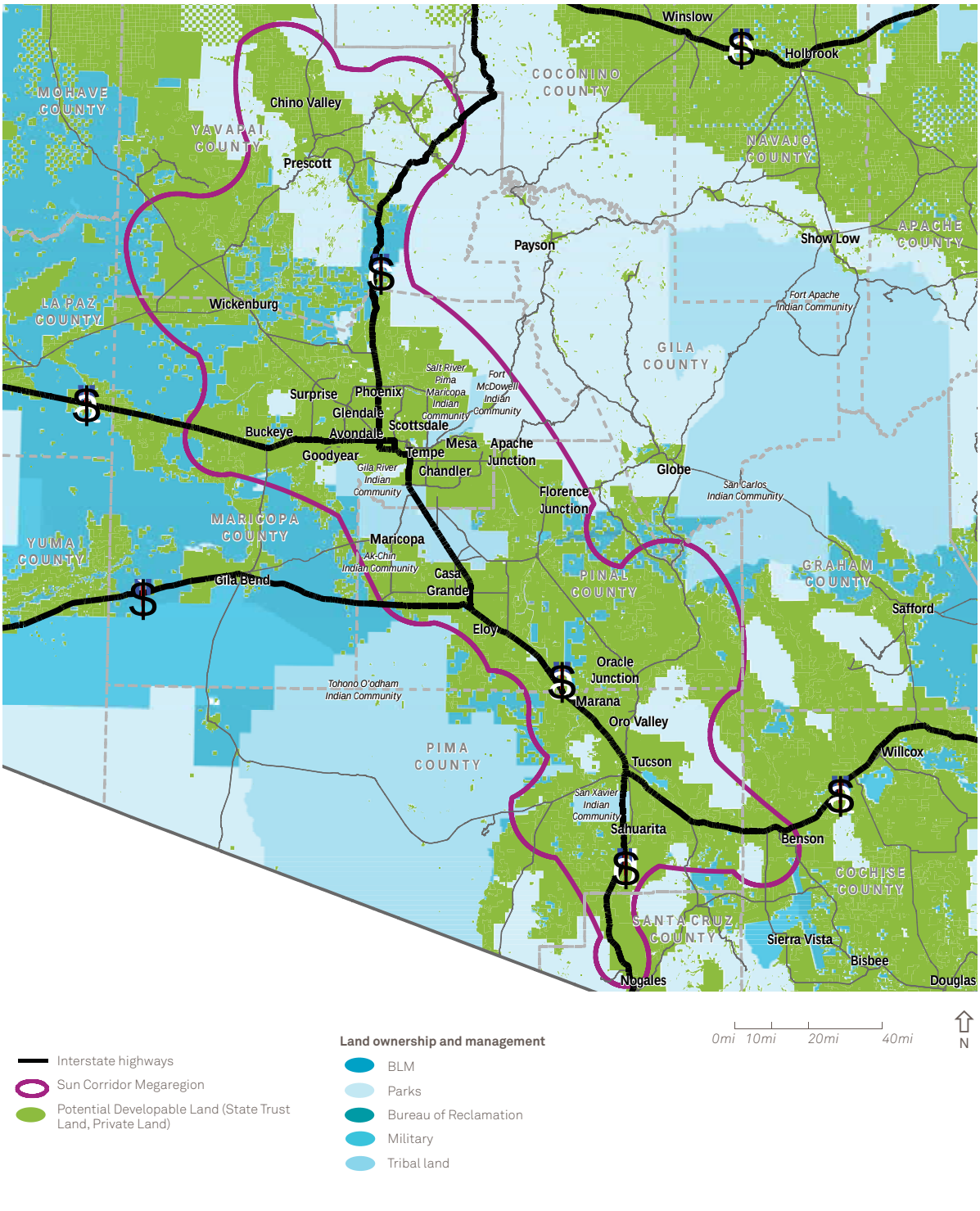
Because a number of Arizona's traditional economic engines (e.g., construction, tourism, mining) are cyclical industries, the state has been overly susceptible to exaggerated economic booms and busts. Without a successfully functioning economy, the Sun Corridor will not have future development, nor will it need an identity to thrive in the global economic system.

A series of strong economic engines is essential to the long-term vigor of the Sun Corridor. However, a strong economy is only one determinant of overall quality of life. The Sun Corridor needs to be a place where people want to live. Ask Arizonans what tops their list of "quality of life" measures, and you will undeniably hear about the environment, ranking the number one reason why people choose to live and make a life in Arizona – according to a 2009 Gallup Poll and documented in Dr. Lattie Coor's *The Arizona We Want*.

Arizona is a state with a variety of landscapes and terrain and any approach to development must consider environmental sustainability. Private developable land constitutes only 17 percent of all land area in the state. State Trust land, with the potential for future development, adds another 13 percent. That is only 30 percent of 114,000 square miles of Arizona, however it is almost entirely concentrated in the Sun Corridor Megapolitan (within the purple border in Figure 3). Future community development must realize that some areas will see no new development, whereas other areas will respond with mixed use development and higher densities than traditionally experienced. Rail and other multimodal transport options will be required to support these development patterns. Increased open space will allow urban ecosystems to thrive. Efficient water usage is necessary for life in the desert and waste cannot continue to consume the landscape. Integrated solutions are necessary to foster a sustainable development pattern where people want to live. The AECOM Global Cities Institute has tackled both of these issues—economic diversification and sustainable development.

So how do these both come together to promote the Sun Corridor as a "dynamic economic activity center and showcase for sustainability of a desert urbanist development pattern"? The answer is regional governance and identity. In a very timely fashion, organization of the JPAC has provided an initial platform for regional decision-making which can eventually address the question of regional governance. With this new entity in place, political cooperation and coordination is underway to solidify a process that identifies future planning efforts with mutual

Figure 3
Developable land in Arizona.



IN A MEGAREGION WORLD, THERE ARE FEWER BUT MORE POWERFUL COMPETITORS FOR ECONOMIC DEVELOPMENT.

benefits. The AECOM Global Cities Institute will help tackle the question of identity, understanding the organization and success of other megaregion entities throughout the U.S. and internationally.

Defining Solutions

The *Sun Corridor, Future Corridor: A Global Megaregion in the 21st Century* report evaluates options and makes recommendations on three interrelated themes: 1) economic engines to diversify and enable the Sun Corridor to achieve its full economic potential, 2) the importance of regional sustainability to the Sun Corridor's future, and 3) the rise of megaregion organization and the Sun Corridor's identity in particular. Although discussed in separate chapters, economic engines, sustainability, and megaregions are not separate elements of the Sun Corridor's future development strategy; the region's performance in each of these areas is inextricably linked with its performance in the other two. This argues not only for a broad and comprehensive approach to planning, but it also suggests that policymakers may leverage investments in one area to obtain spillover effects in other realms. For example, a healthy and solid economy not only supports traditional development objectives but is also a keystone for a sustainable quality of life.

The overarching question across all three pairings is this: As the national economic landscape evolves into one dominated by megaregion economies, how will Sun Corridor policymakers evaluate economic development policies and outcomes? Do the same evaluation metrics apply to megaregions as to metropolitan and city development? Is all economic growth equally valuable when an urban area becomes a megaregion?

Megaregions and the Economy

In a megaregion world, there are fewer but more powerful domestic competitors for economic development. Based on current projections, many of the anticipated megaregions will have greater economic breadth and depth than many current state economies. In the national economic landscape, there are 50 state economic development agencies each advocating for the cities and counties in its own jurisdiction and offering incentives to attract business. Metropolitan areas, cities, counties, and even towns add their own campaigns to the mix, leading to a diverse and sometimes chaotic competition for businesses relocating or expanding. Excluding businesses seeking a place with particular industry specialization (such as Washington, D.C. or Las Vegas), a business seeking a large- to mid-size urban area has many possible options that meet its particular site requirements.

In an economic landscape dominated by megaregions, there is by necessity a greater sorting of potential locations. If a business seeks a large urban economy, there will be fewer options. Moreover, there is much less of a continuum between large and mid-size domestic economies, making the choice of urban economies more distinct. Moreover, megaregions will increasingly be competing against other large urban economies elsewhere in the global economy. In this new competitive environment, the need to have a distinct identity increases. This identity can come from the presence of a dominant industry, high-tech San Jose and financial New York are examples. It can also come from non-industry factors. Portland,

MEGAREGIONS WILL HAVE GREATER ECONOMIC DEPTH AND SIZE THAN MANY CURRENT STATE ECONOMIES.

for example, is identified as a center for commitment to sustainability and preservation of quality of life. Austin is known as a progressive modern city. One of the challenges for the Sun Corridor's economic development strategy will be developing and marketing its identity and aligning it with the Sun Corridor's environmental and economic strategies. Because of the Sun Corridor's unique location and proximity to other developing megaregions, opportunities may arise to collaborate with the Southern California and Front Range megaregions to compete with more powerful global competitors.

A section of our report, *In the Global Economy*, will provide an overview and evaluation of existing and potential future economic engines to help ascertain the Sun Corridor's position within the broader economy. A series of economic indicators reveal how the Sun Corridor ranks against other U.S. megaregions in economic performance, innovation, and quality of place. Ideas presented in this section can help establish a foundation for future performance measurement of initiatives underway to advance responsible development of the Sun Corridor.

Megaregions and Sustainability

Urban residents at the turn of the last century paid a 10-year penalty in life expectancy compared to rural residents. While advances in water, sewer, and sanitation infrastructure eliminated the penalty over the century, there are downsides associated with megaregion development. Megaregions will not thrive if the air is polluted, water is scare or unsanitary, parks and public facilities are not sufficient to balance the pressure of population density, or if governments cannot deliver services such as trash collections and law enforcement efficiently.

Innovation in public service delivery is one of the keys to adapting and managing the density inherent in a megaregion economy and maintaining quality of life. Government policy, too, is key. As governments are more fragmented, the cost of delivering public services across the entire megaregion increases as the fixed costs of service delivery are borne by each jurisdiction. By contrast, there are economies of scale in delivering these services in large densely populated areas. The intuition behind this idea is illustrated in reverse in the older cities of the Northeast and Midwest where city populations are

THE ABILITY TO OFFSET THE COSTS OF POPULATION AND EMPLOYMENT GROWTH IS CENTRAL.

shrinking. In sharp contrast to the Sun Corridor where the question is how to thoughtfully accommodate anticipated growth, Detroit, MI and Rochester, NY are embracing the idea of "thoughtfully shrinking." The population loss in these areas is not uniform, with some areas maintaining a healthy density and others with just one or two households in some blocks. Delivering services to such sparsely populated areas of the city is costly and these cities have proposed relocating residents of sparsely populated neighborhoods to more densely populated locations in the city in order to consolidate the area served by public services to save costs. The vacated space could be allocated to new uses that enhance the quality of life for the balance of the community. What this suggests is that while individual political jurisdictions may elect to remain separate, there will be increasing incentives for political jurisdictions within the Sun Corridor to consider cooperative agreements to provide public services and enjoy the benefits of a lower fiscal burden as the region grows and density rises.

The section of our report, *Integrating Sustainability*, will explore the major elements of a sustainable development pattern and what actions and policies the Sun Corridor must achieve to realize successful implementation of livable communities.

Megaregion Positioning: Tying Together Economic Engines and Sustainability

Economic growth entails costs as well as benefits. Large complex urban areas such as the emerging Sun Corridor Megaregion exist because they are focal points for commercial and other transactions. Urban areas provide access to large pools of labor, frequent and relatively inexpensive air transport, specialized technical and professional services, and a large client base. These factors and others provide so-called agglomeration economies that diminish the cost of transactions and make the urban area's firms more productive. Balanced against the advantages of urban size are the diseconomies of large urban areas; these negatives include higher living and business costs such as rents, crime, and traffic congestion. As long as firms and households perceive that the advantages outweigh the negatives of a Sun Corridor Megaregion location, firms and households will locate in the urban area, incur the costs, and the metropolitan economy will grow and thrive. When the negatives outweigh the benefits, existing businesses choose to expand elsewhere and population growth slows.

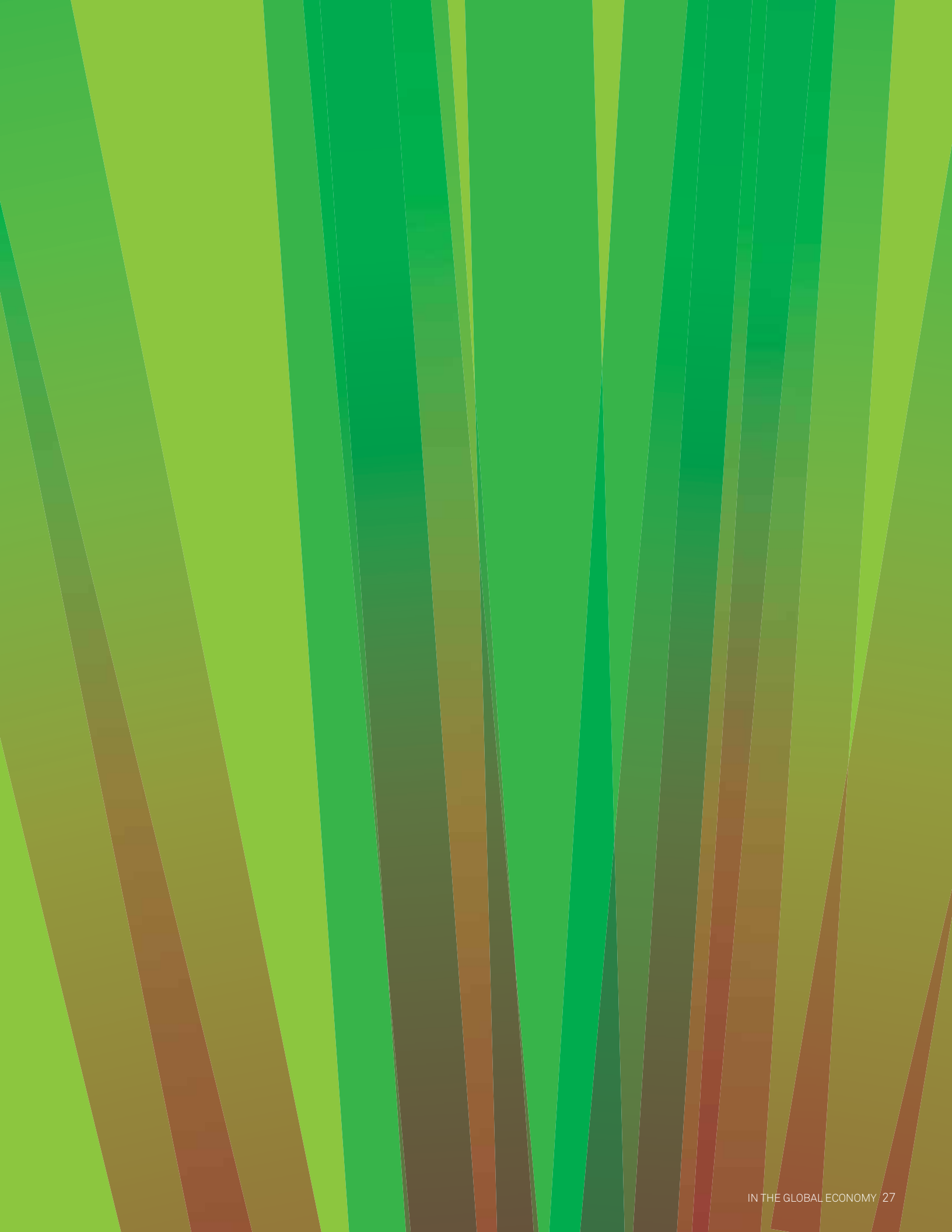
For example, investments to expand travel capacity or improve the travel time of public transit service reduce the negatives associated with congestion and thus encourage the urban area's size and the density of people and firms—effective transport intrastructure is a critical factor influencing sensitivity to land and labor costs. Absent the ability to move large numbers of specialized skilled labor in, out and within the urban economy on a daily basis, the Sun Corridor's economic potential is constrained, the agglomeration economies will be less as a consequence, and the region will be less competitive than other urban areas. The same idea holds true for other types of infrastructure as well. Each infrastructure investment in the overall Sun Corridor regional travel network, energy or water system creates an incremental change in the region's broader economic potential. These benefits are capitalized into the

property values at the locations where the benefits are realized, supporting the economic vitality of the region. The ability to offer a sustainable quality of life is thus central to the Sun Corridor megaregion's ability to offset the costs of population and employment growth. Investments in infrastructure accommodate a larger, more densely populated, and potentially more productive megaregion economy.

This balance between the costs and benefits determines the optimal size of urban areas. Recognizing this, megaregion economic development strategies may become more selective, emphasizing not just job creation, but jobs that maximize income relative to the costs they impose on the economy. While this relationship among the benefits, costs and optimal urban size exists currently—think of how corporate headquarters left New York City and population growth stalled in the 1980s—the balancing act intensifies when an urban area becomes a megaregion and increases the penalty associated with unmanaged growth.

The section entitled *Which Way Sun Corridor?* brings together the solutions suggested as part of the economic and sustainability discussions to respond to the challenge of how the Sun Corridor can grow into a successful megaregion while maintaining the quality of life and economic competitiveness that have encouraged people to settle there in the past. It speaks to the identity and governance models of other successful megaregion entities, both in the U.S. and abroad.

2. IN THE GLOBAL ECONOMY



FINDING VALUE, ADVANCING WELL-BEING.

This chapter provides an understanding of the recent economic performance of the Sun Corridor in order to better inform the region's strategic policy and planning decisions and thereby help it achieve its full economic potential over the medium-to-longer-term.

The first section of this chapter reviews the Sun Corridor's recent economic performance relative to the United States as a whole and where feasible, relative to other megaregions considered peers or competitors such as the Front Range, the Texas Triangle, and Southern California. The second section provides a framework for understanding the Sun Corridor's economic potential. The third section applies the framework developed in the preceding section and reviews the development needs and key issues faced by several sectors that are likely to be the most promising for the Sun Corridor's future economic development. The concluding section draws on the common challenges and opportunities from the sector-specific reviews.

Recent Economic Performance in Comparison to Other Megaregions

The first step in achieving the Sun Corridor's full economic potential is to understand the megaregion's recent economic performance and to develop an appreciation for the key sources of value in advancing economic well-being.

Figure 4 shows that the Sun Corridor has exhibited very strong growth performance over the last decade. The Sun Corridor's gross domestic product (GDP) in real terms (i.e., after removing inflation) has grown at an annual rate of 3.6 percent between 2001 and 2008, which was well above the national growth rate of 2.3 percent and higher than the growth rate of any of the other four comparable regions. It is worth exploring what has fueled this very strong growth performance.

Figure 5 suggests that population and employment increases have been the key forces behind this growth performance over the last decade. The Sun Corridor has been a top-ranking performer historically in terms of both population growth and employment. Sun Corridor population has grown at 3.3 percent per year over the last decade—more than three times that of the United States overall.

Clearly, this is very high population growth by the standards of any advanced economy. Job growth tends to follow population growth in the medium-to-longer term, although not necessarily in the short term.[1] This is why the Sun Corridor has also had higher jobs growth—at 1.9 percent—compared to the other selected megaregions.

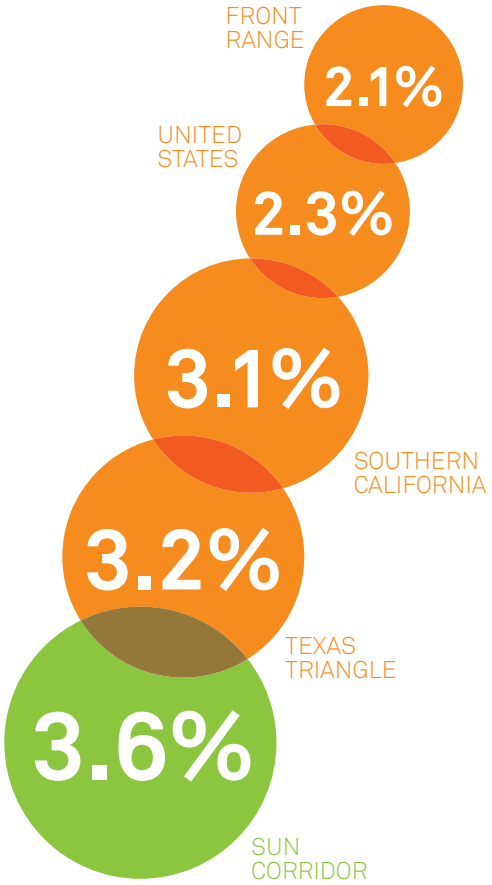


Figure 4
Real GDP growth, compound annual growth rates (percent), 2001-2008.
Source: Bureau of Economic Analysis (U.S. Department of Commerce), AECOM analysis. Note: Index derived from chained 2001 dollars.

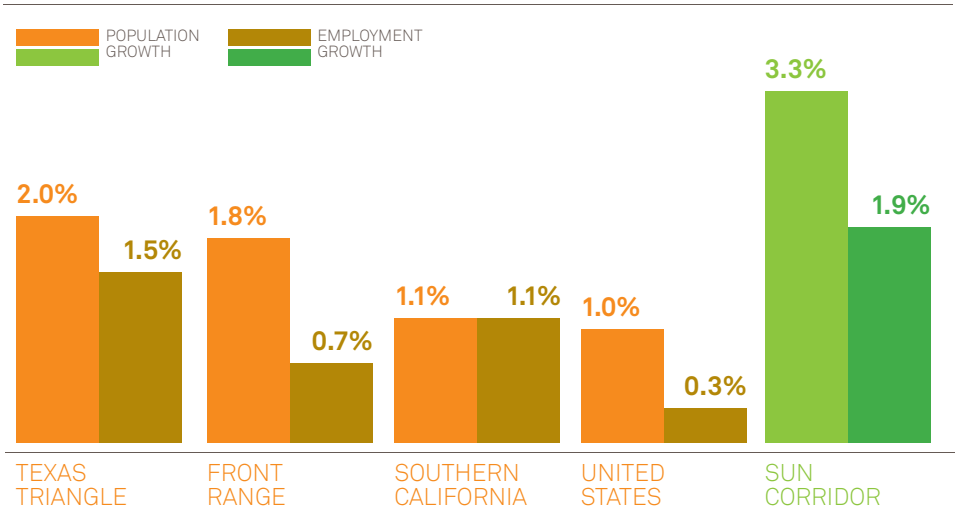


Figure 5
Population and employment growth, compound annual growth rates (percent), population (2000-2009), employment (2001-2008).
Sources: Bureau of Economic Analysis (U.S. Department of Commerce), AECOM analysis.

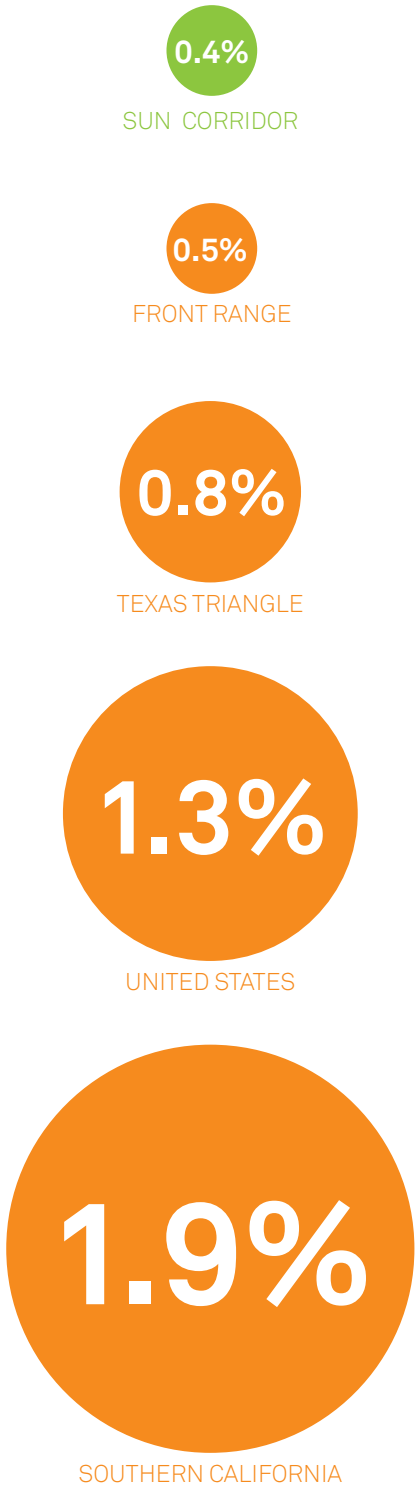


Figure 6
Real GDP per capita growth, compound annual growth rates (percent), 2001-2008.
Sources: Bureau of Economic Analysis (U.S. Department of Commerce), AECOM analysis.

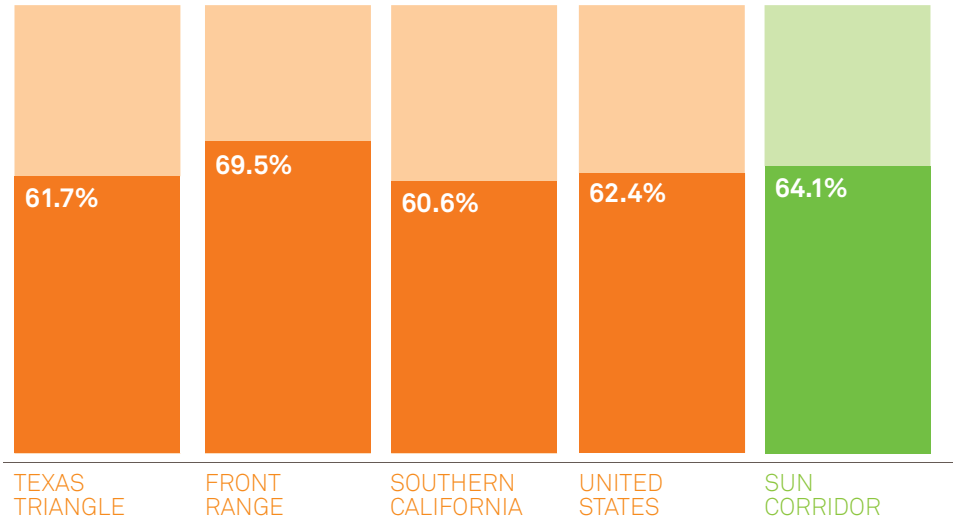


Figure 7
Labor force quality, proportion of the labor force with associate degree or higher (percent), 2008.
Source: U.S. Census Bureau, 2006-2008 American Community Survey and Census 2000.

However, when we look at the evolution of real GDP per capita (Figure 6), a widely accepted quality of life standard, we see that the Sun Corridor trails the pack at just 0.4 percent average annual growth. This quality of life standard has grown three times more rapidly at the national level (1.3 percent). While this is far from a perfect measure of the evolution of living standards—it does not capture qualitative factors such as air quality and greenhouse gas emissions—it does suggest that the strong relative growth performance experienced by the Sun Corridor was due more to an increase in the size of the labor force rather than to any increase in the quality of the workforce or other sources of productivity growth.

One of the key potential drivers of productivity growth—the kind of growth performance that translates into higher average per capita incomes—is the quality of the labor force. Figure 7 shows that 64 percent of the Sun Corridor labor force has an Associate degree or higher in terms of educational attainment, which is higher than the corresponding proportion for the United States as a whole (62.4 per cent), but lower than that for the Front Range (69.5 per cent). While this is not the only measure of labor force quality (e.g., the quantity and quality of on-the-job training is also important), it does suggest that the Sun Corridor has some room to improve to reach the top of the performance league in the area of labor force quality, which is currently occupied by the Front Range among the selected megaregions examined here.

Understanding the Sun Corridor's Economic Potential

The Sun Corridor's economic potential is determined on the one hand by the resources available to produce goods and services in the megaregion, and on the other hand by the local, regional, and global demand for them. The region's resources include the quantity and quality of its labor force, its capital stock, resource base, and other endowments, such as

$249bn

Generated output, state of Arizona, 2008.

Source: Bureau of Economic Analysis for Arizona gross domestic product; in current dollars.

$20bn

Total overseas exports, state of Arizona, 2008.

Source: WISERTrade; in current dollars.

9%+

Unemployment rate, state of Arizona, 2010.

the attractive weather and alluring landscape of the Sonoran Desert. The demand patterns that drive the opportunities for Sun Corridor businesses and entrepreneurs are shaped by consumer tastes in North America and globally, as well as by the "intermediate demands" of regional and global firms for Sun Corridor goods and services that fit into their respective supply chains.

As a result of matching the available resources and overall demand for goods and services, Arizona generated output of $249 billion in 2008, including exports of $20 billion.[2] The region's economic potential is usually greater than the output achieved in any one year, as is particularly the case in the current recession where unemployment in Arizona has jumped to over 9 percent of the labor force. However, in the medium term, output tends to follow economic potential quite closely. This underlines the importance of focusing the megaregion's efforts on improving economic potential.

Improving the Sun Corridor's economic potential can be achieved by increasing the resources available (e.g., through immigration or even by working longer hours) or by making smarter use of existing resources through innovation. The latter approach is preferable and the results are typically measured through productivity growth, which refers to the growth in output achieved through the available capital, labor, and material inputs. Increasing productivity growth is the key to achieving higher quality of life in the Sun Corridor, although it is also important to take into account the sustainability dimensions of growth, such as land use, air quality, and public safety, which are not factored directly into GDP-based measures of productivity growth.

At the micro level, productivity growth is all about making the region's products and services more competitive and attractive in the marketplace, thereby increasing the region's share of the markets in which it participates. This is often achieved through firms' investment in plant and machinery, or in other more intangible aspects of their businesses. Undertaking investments is not just a way of adding to the megaregion's capital stock, but it is also a way of achieving smart growth, because it often incorporates new technology and process innovations, all of which can lead to more efficient ways of producing goods and services.

The framework for the Sun Corridor's economic potential, as shown in Figure 8, incorporates three other dimensions:

Structural Forces and Trends

These are the contextual forces which shape demand patterns and market opportunities and also affect the value of the Sun Corridor's resources. These forces create significant pressures in certain markets, but they also represent opportunities for the region's entrepreneurs. For example, demographic trends, such as population growth, immigration, as well as aging, will create work force renewal challenges across many industries in the Sun Corridor, but they also present opportunities to cater to certain needs in the tourism, accommodation, services industries and even healthcare sectors.

One major structural change in the global economy in the last decade is the emergence of low cost producers such as China, India, and Brazil, which has led to significant productivity gains, lower consumer prices, and some workforce dislocation effects as manufacturers have relocated some

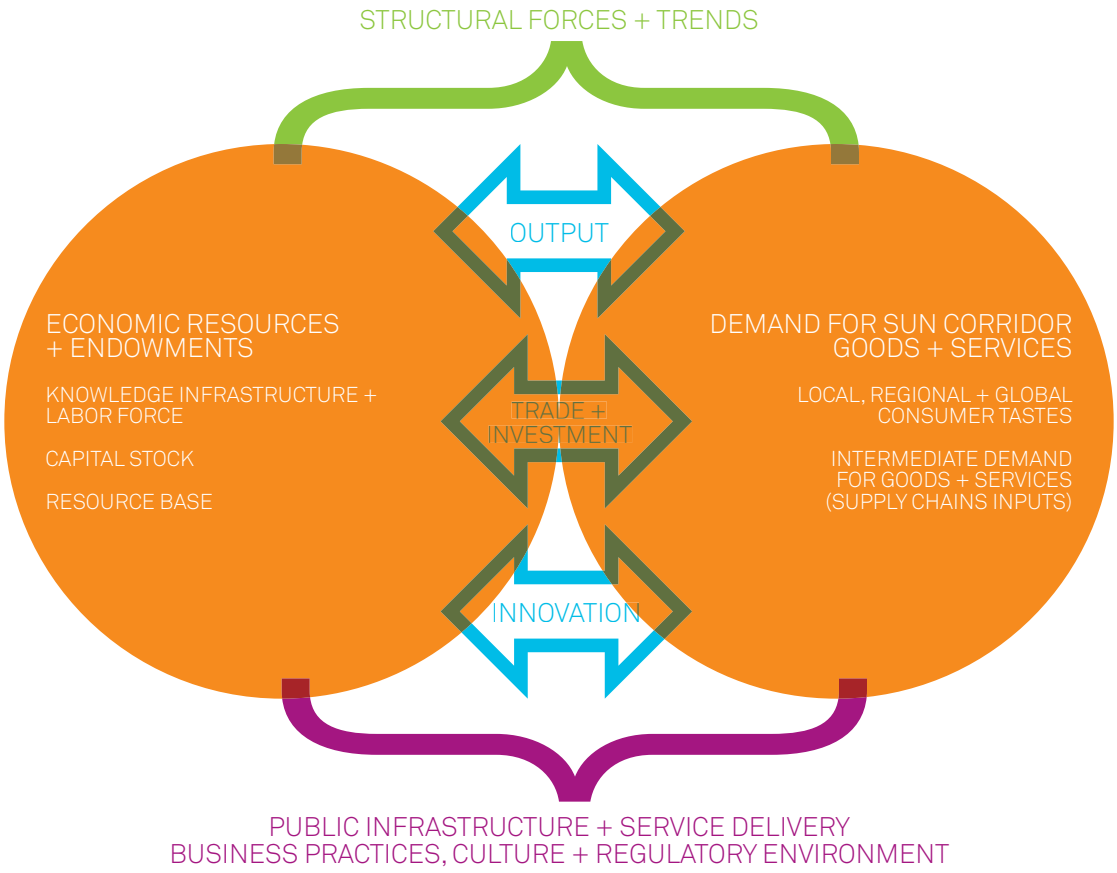


Figure 8
A framework for the Sun Corridor's economic potential.

of their facilities to these countries. This process has been at the heart of the integration of supply chains at the regional and global levels. To the extent that firms in the Sun Corridor can participate in these supply chains —as a source of cost-effective inputs and value-added components, or as a market for final goods and services— this tends to be associated with significant improvements in firms' competitiveness and productivity growth in the economy overall.

Emerging market economies are growing at two-to-three times the rates of growth experienced in advanced economies. China and India are exhibiting growth rates in real terms (i.e., after inflation) in the order of eight-to-ten percent per year. Other emerging Asian economies (e.g., Indonesia, Malaysia, Philippines, etc.) are growing at rates between five and six percent per year. By contrast, advanced economies are expected to grow between one percent, as in the case of Europe, and three percent per year, as in the case of the United States.[3] Since the Sun Corridor has its own emerging market to the south—Mexico, and the rest of Latin America—this presents remarkable opportunities to be harnessed through trade and investment flows as well as multiple challenges in the areas of immigration and public safety. Moreover, the manufacturing sector in Mexico could also experience renewed vigor in the medium term if global supply chains are regionalized. This would not be implausible if the long term declining trend in transportation and logistics costs comes to a halt or even reverses over the next few years, due to rising energy prices among other factors.

Public sector fiscal constraints represent another structural trend which should be factored into the analysis. It would appear that the depth of the recent recession and the relatively slow recovery for many advanced economies will leave federal, state, and local governments facing large and persistent deficits and rising debt burdens well into the medium term. This is unlikely to be a cyclical phenomenon.

THE EMERGING SECTORS OF YESTERDAY ARE NOT NECESSARILY THE EMERGING SECTORS OF TOMORROW.

Public Infrastructure and Service Delivery

Investment in public infrastructure supports economic activity and lowers business costs by providing users with services such as transportation, energy, and water and wastewater treatment. Research in this area has found that public infrastructure investments have significant positive impacts on output and productivity growth. For example, a one percent increase in public infrastructure capital stock leads to an increase in output between 0.15 and 0.35 percent.[4] Other studies found relatively high rates of return on highway investments (18 percent in the 1970s), but these dropped in the 1980s and 1990s.[5]

While there remains some debate about the precise magnitude of the impact of public infrastructure investments, there is no reason to believe that the impact of each infrastructure investment should be the same. In fact, microeconomics would suggest that the contribution of each infrastructure project to output and productivity should depend on the balance of benefits and costs of the project for users and the economy overall. Projects with a benefit-cost ratio greater than one can be expected to make a positive contribution to output and productivity growth, especially when output is interpreted in the widest sense of the term to include environmental, safety, and other considerations that affect quality of life.

Business Practices, Culture and Regulatory Environment

These factors also exert important influences on the economic potential of the Sun Corridor. Arizona is well-known for its entrepreneurial prowess. Nurturing this culture and the associated business practices in the next generation of entrepreneurs will better position the Sun Corridor to take full advantage of its economic potential. However, supporting the economic potential of the Sun Corridor also requires the right institutional and regulatory frameworks which set the "rules of the game" that underpin all markets that operate effectively. This covers a wide range of legislation and regulation, from intellectual property protection, especially for emerging markets in digital media, to safety and economic regulation, where this may apply, as in the case of utilities.

Understanding the Sun Corridor's Full Economic Potential

Achieving the Sun Corridor's full economic potential requires an appreciation of where the opportunities lie in the future and what enabling conditions are needed to fully realize these opportunities across all industry sectors.

THE FUTURE IS INFRASTRUCTURE, EDUCATION, TRADE AND INNOVATION.

Identifying the opportunities for future economic potential requires identifying the emerging sectors and clusters (as opposed to mature sectors). These exhibit high growth rates relative to other sectors as well as high productivity growth (i.e., smart growth). However, identifying these opportunities on a forward-looking basis is fraught with difficulties. The emerging sectors of yesterday are not necessarily the emerging sectors of tomorrow. But we also know that the growth prospects of emerging sectors do not typically turn on a dime. There tends to be considerable inertia in the growth prospects of emerging sectors, even though there may be higher volatility in the short-term. As a result, we propose identifying the high-growth sectors historically, and then commenting on the likelihood that their relative growth prospects will persist in the medium to longer-term. As a caveat, we should also note that the discussion of emerging sectors is not intended as an identification of target sectors in any exclusive sense. Governments and policy-makers in North America have not had strong record of choosing of choosing winners and losers—either at the firm or sector level.

The second dimension to achieving the Sun Corridor's full economic potential is the discussion of enabling conditions required to fully realize the available opportunities across industry sectors, regardless of whether or not these opportunities arise in the sectors analyzed below. This discussion of enabling conditions is organized into four categories:

- Infrastructure, including transportation, energy and water and wastewater infrastructure
- Education and training
- Trade and investment
- Innovation

The development of each of these areas contributes directly to productivity growth across the Sun Corridor economy, thereby enabling the megaregion to capture a larger share of the opportunities that arise at the regional and global levels. By ensuring that government policies support the development of these four enabling conditions, we can improve the capacity and flexibility of the megaregion's firms and

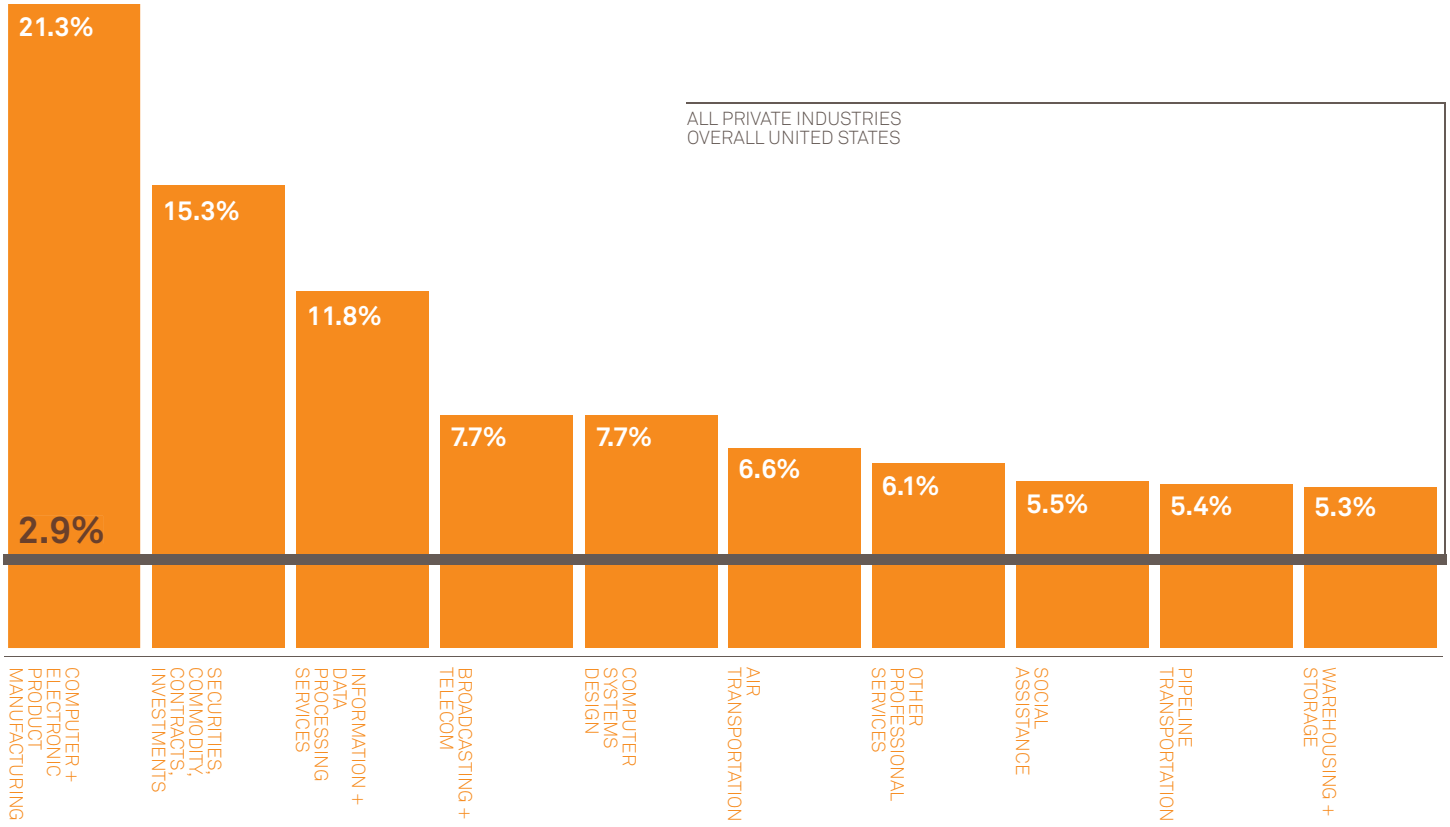


Figure 9
Real GDP by industry, United States; compound annual growth rates (percent), 1997-2007.
Source: Bureau of Economic Analysis (U.S. Department of Commerce), AECOM analysis.

entrepreneurs to take advantage of business opportunities as they arise.

Identification of Emerging Sectors

The methodology used to analyze emerging sector opportunities is a four-step process identifying:

- The top-ten high-growth sectors nationally over the last decade.
- The subset of emerging sectors where the Sun Corridor already has a reasonable presence (i.e., where the Sun Corridor has the capacity to capture a significant share of the opportunity).
- Sectors which exhibit high-productivity growth as well as output growth.
- Sectors with high potential, as already noted by other studies in the Sun Corridor.

Figure 9 shows the top ten growth sectors in the United States over the decade to 2007. During this period, all private industries in the United States enjoyed real GDP growth of 2.9 percent per year on average. By contrast, the top ten sectors enjoyed average annual real GDP growth ranging from 21 percent (computer and electronic product manufacturing) through five percent (warehousing and storage). These high and persistent growth rates are indicative of newly emerging industries. While growth rates tend to decline as these sectors mature, they remain important engines of growth and smart growth in particular. All of this suggests that these ten sectors are a reasonable starting point for identifying a group of emerging markets at the national and even global level.

Figure 10 is a rough representation of Arizona's ability to compete in the top-ten high growth sectors nationally, showing that Arizona is underrepresented in most of the top ten high-growth sectors nationally. The chart shows the industry shares of GDP in the United States and Arizona, based on 2007 data (the last

year of data available). The column on the right shows the ratio of the Arizona to the United States shares, with the industries ranked beginning with the one where Arizona has the highest relative share (computer and electronic product manufacturing, where Arizona's share is almost twice the national average) to the one where Arizona has the lowest share (pipeline transportation, where Arizona's share is one-fifth the national avarage). However, Arizona has been over-represented only in computer and electronic product manufacturing, and in air transportation on a GDP share basis, historically.

The emerging sectors selected for further analysis consist,in the first instance, of the subset of the top-ten high growth sectors nationally where Arizona has a solid presence and hence, is likely to be able to compete effectively. The sectors listed on the next page are those whose share of GDP in Arizona is at least 75 percent of the national average share. In sectors where Arizona has only a marginal presence (i.e., a share well below 75 percent of the national average), the Sun Corridor may be poorly positioned to capture a significant share of future growth prospects. Moreover, social assistance is excluded from the analysis, because it consists primarily of non-profit institutions. Information and data processing is included even though Arizona's share of GDP in this sector is just below the 75 percent cutoff. Emerging sectors that show promise are:

1) Computer and electronic product manufacturing

2) Air transportation

3) Other professional services (excluding legal and computer systems design)

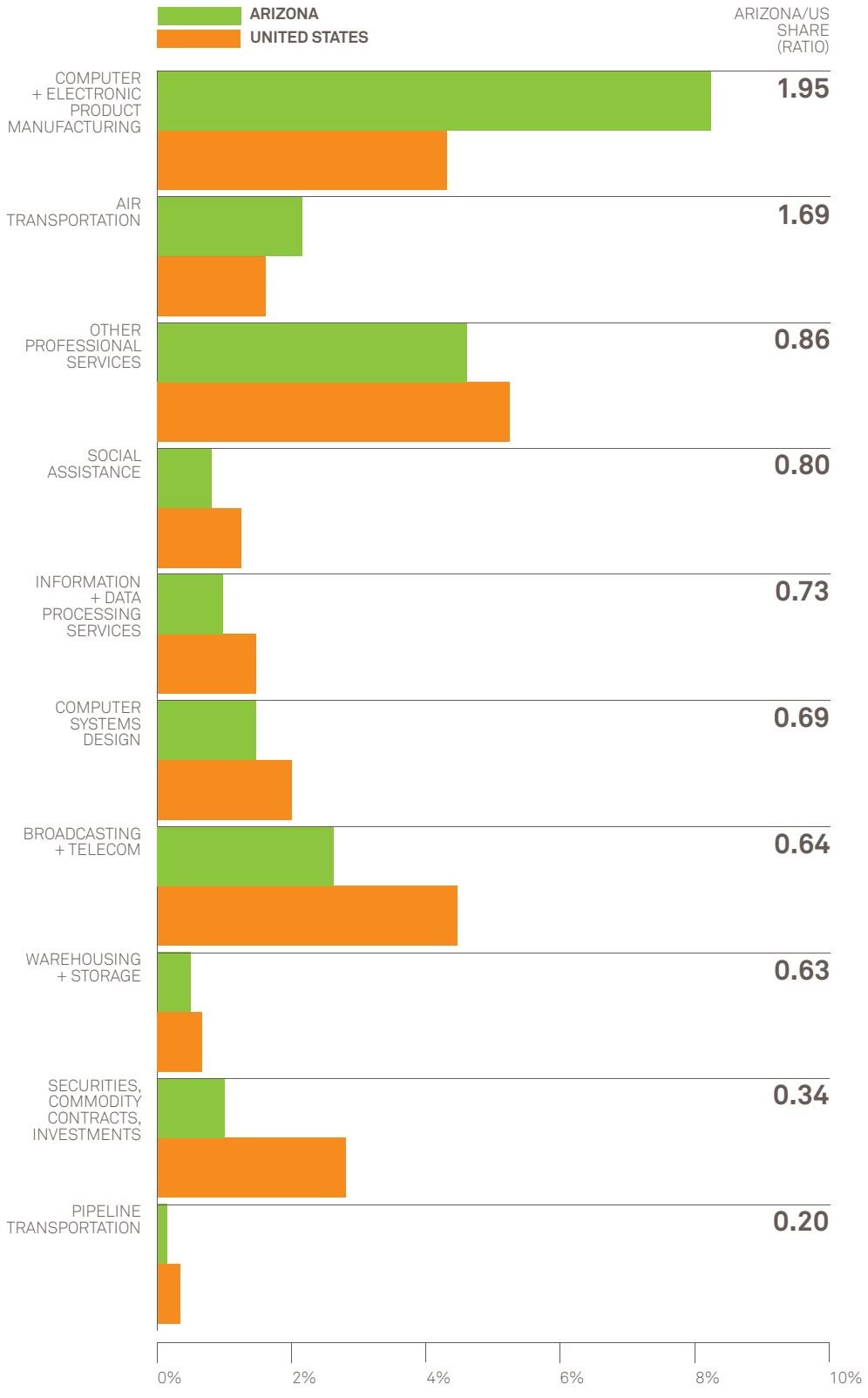


Figure 10

Industry shares of GDP, United States and Arizona; 2007 (percent).

Source: Bureau of Economic Analysis (U.S. Department of Commerce), AECOM analysis.

4) Information and data processing services

Since history alone is not a good basis for perfect foresight, sectors and clusters identified in other reports on the Sun Corridor or recommended by other commentators on the megaregion are also explored. These consist of:

5) Transportation, logistics, and warehousing (including the concept of inland ports)

6) Aerospace and defense

7) Biotechnology and pharmaceuticals

8) Renewable energy

9) Tourism and hospitality (or selected niches within agriculture)

Analysis of Emerging Sectors

In the analysis of each of the ten potential sectors with emerging-market opportunities for the Sun Corridor, some additional diagnostic analysis regarding emerging or mature sector status is provided, as well as commentary about the growth prospects of the sector on a forward-looking basis; and a review of the challenges faced by the sector. In terms of additional diagnostics, those sectors that exhibit both high output growth and high productivity growth over an extended period of time are examined. High productivity growth *per se* (i.e., smart growth) is not enough to signal emerging-sector status, since even mature sectors can experience high productivity growth in periods of contraction or restructuring. This is why it is important for an emerging sector to exhibit productivity growth alongside output growth over more than one business cycle. In addition, a preferred measure of productivity growth is multifactor productivity (MFP), which refers to output per combined units of labor and capital inputs, thereby avoiding the pitfalls associated with partial productivity measures, such as labor productivity (defined as output per unit of labor input).

1) Computer and Electronic Component Manufacturing:

Figure 11 shows that additional diagnostic analysis supports the emerging-market status of this sector, because it exhibits exceptionally high MFP growth at the national level (7.4 percent per year) while experiencing real output growth (1.5 percent per

year) over the same period (2000 to 2007). In Arizona, this sector appears to have grown at a much higher rate in real terms (at 14.8 percent per year between 1997 and 2007) than at the national level, at least until the current recession. The three largest subsectors by employment consist of semiconductors, electronic instruments, and computer and peripherals, which together accounted for over 80 percent of industry employment in the United States in 2006. Of the three, only electronic instruments exhibited relatively low productivity growth at 1.6 percent per year from 2000 to 2006.[6]

Looking forward, the growth potential of this emerging sector is likely to be limited particularly in terms of employment. This is due partly to the recent recession, during which high-tech manufacturing employment in Arizona dropped from the 2000 peak of 100,000 jobs to 75,000 in 2009 and partly to the continued threat posed by offshore production.[7] Moreover, this emerging sector has historically achieved exceptional productivity growth in considerable part through reduced employment, with nationwide hours worked in this sector dropping by 5.3 percent per year between 2000 and 2006 despite the increase in output.[8]

Despite these limitations, it is important to recognize that this sector will continue to provide high-wage jobs, and that the long-term shift of the high-tech sector from manufacturing to services output will support high-quality jobs in services clusters.

2) Air Transportation:

Air transportation is a mature sector nationally, as suggested by Figure 12, which shows MFP growth of 1.2 percent per year and real output growth of 3.4 percent per year for the 1987 to 2006 period. However, there remains significant growth potential for air transportation in the Sun Corridor and other parts of the Southwest.[9] This is supported by the fact that real output for this sector in Arizona grew by 10.3 percent per year between 1997 and 2007 as compared to 3.2 percent nationally during the same period.[10] The tourism sector has been both a driver and a beneficiary of the development of the Sun Corridor's air sector. Better air connectivity would improve the attractiveness of the megaregion as a vacation and a seasonal retirement destination.

Further development of the regional air network would improve intercity and global connectivity for the business community and make the Sun Corridor a more attractive destination for regionally and globally mobile business. In addition, air cargo is likely to be a high growth niche within the sector, which would improve the locational advantages for the Sun Corridor's high-tech sector and other sectors that rely heavily on air cargo shipments.

The main challenge for the Sun Corridor is to continue to support the hub status of the Phoenix Sky Harbor International Airport, which leads to more direct services and improved frequency to major destinations in the United States and internationally. This calls for the development of a regional airport strategy for the Sun Corridor, which addresses capacity constraints at the airport at Sky Harbor and avoids cannibalizing valuable connecting traffic at the airport while continuing to develop a region-wide airport network for both passenger and cargo traffic.

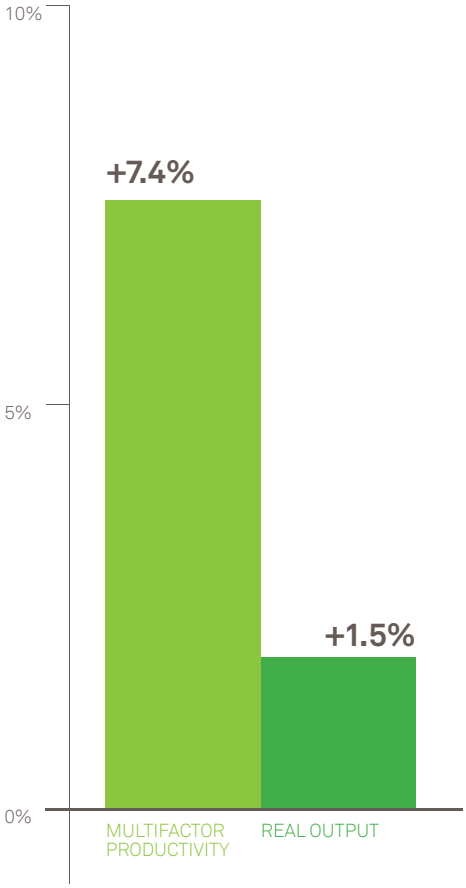


Figure 11
Computer and electronic component manufacturing and diagnostics; 2000-2007, United States, Compound annual growth rates (percent).
Bureau of Labor Statistics, Multifactor Productivity Trends for Detailed Industries, 2006 (August 29, 2008).

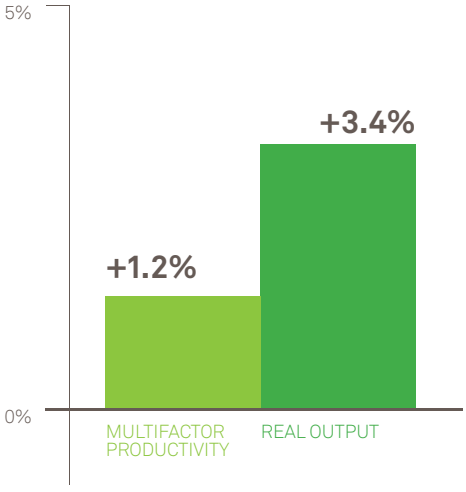


Figure 12
Air transportation diagnostics; 1987-2006, United States, Compound annual growth rates (percent).
Bureau of Labor Statistics, Multifactor Productivity Trends for Detailed Industries, 2006 (August 29, 2008).

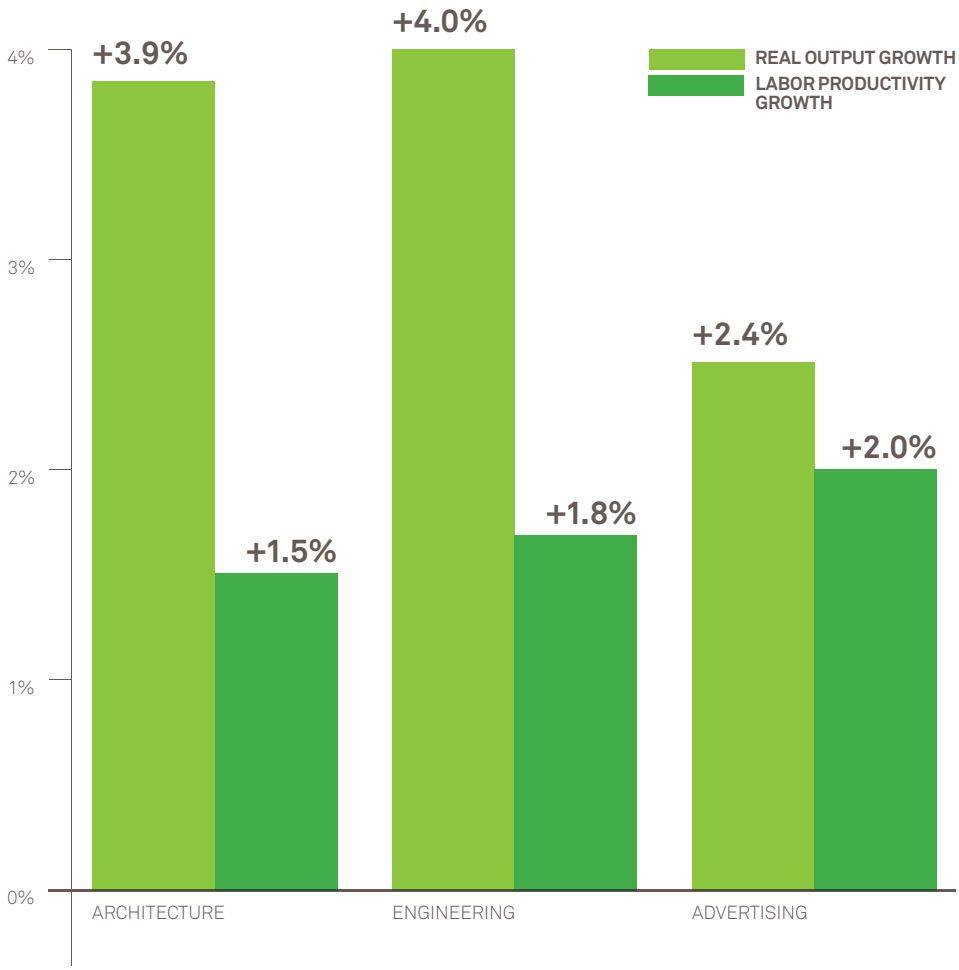


Figure 13
Other professional services diagnostics; 1987-2008, United States, CAGRs (percent).
Source: Bureau of Labor Statistics (U.S. Department of Labor), Productivity and Costs by Industry: Manufacturing, Mining and Selected Service-producing Industries, 2008 (June 10, 2010).

3) Other Professional Services:

This sector consists primarily of architectural, engineering, financial, consulting, and advertising services (excluding legal and computer design services). These services are relatively mature at the national level, with average annual output growth and labor productivity growth in each of these sub-sectors closely approximating their respective national averages for the non-farm business sector over the 1987 to 2008 period (Figure 13). However, this is a relatively high-wage sector and as such should continue to be nurtured to ensure that the Sun Corridor serves as a regional center for these professional services.

4) Information and Data Processing Services:

This sector provides information, storage, access, and processing services and consists of news syndicates, libraries, archives, online information service providers, and data processors. The sector represents less than one percent of the United States and the Arizona economies, but it has exhibited very rapid growth in the last decade in both Arizona (19.5 percent per year) and in the United States overall (11.8 percent per year) for the period from 1997 to 2007. This suggests that it may be a significant source of growth activity in the medium term. Moreover, the Sun Corridor may be well-positioned to participate in this growth, particularly if the industry growth rate in Arizona continues to outpace the national sector growth rate, as it did from 1997 to 2007.

5) Transportation, Logistics, and Warehousing—the Inland Port Vision:

The vision for a transportation and logistics hub in the Sun Corridor has been put forward by several commentators, and most notably in the *North America Next* report completed by the North American Center for Transborder Studies at ASU in September 2009. The key to this vision is that the Sun Corridor lies at the crossroads of two major trade corridors—the east-west corridor that links the Midwest and the Southern United States to the Asia-Pacific economies through the ports of Los Angeles and Long Beach (I-10/UPRR Sunset Route and I-40 BNSF Transcon Corridors), and the North-South CANAMEX trade corridor that links western mainland Mexico to the western United States and western Canadian markets (proposed I-11 Corridor).

Inland ports involve the co-location of intermodal terminals and logistics warehouses operated by retailers, manufacturers and industrial suppliers. They are located on one site with hundreds of acres, usually inland, and often on the edges of large metropolitan areas. The rationale for private investments in inland ports is partly based on the expectation of continued rapid growth of intermodal freight traffic driven by overall freight traffic growth in line with economic growth regionally and globally and by the continued containerization of merchandise, produce and raw materials. The rationale for attracting large warehouses to these facilities is that the co-location of intermodal terminals and warehousing facilities reduces drayage costs (i.e., trucking costs between the two types of facilities) and provides for more efficient supply chain management, given that transportation is now the largest component of logistics costs.[11]

There is also a wider public policy rationale for promoting inland port investments. The idea is that these inland logistics hubs attract ancillary economic activity, consisting of a wide array of other firms that either support or trade with transportation, logistics, and warehouse service providers; or that provide some value added to the goods in transit. As a result, many communities across the country are considering how to best attract these logistics hubs and many are prepared to invest public funds to attract these facilities.

As a result of both the market rationale and the public benefits, inland ports are now appearing at many locations across the United States, including multiple facilities in Chicago, Kansas City, Dallas/Fort Worth, and Memphis, as well as others in Salt Lake City, San Antonio, Houston and Birmingham (Alabama).

One of the largest inland ports to date is the CenterPoint Intermodal Center in Joliet, Illinois, a 3,900-acre logistics center developed by CenterPoint Properties, and which includes the 785-acre Union Pacific Intermodal Terminal.[12]

There are multiple requirements for developing an inland port. In addition to demonstrable interest by retail or industrial warehouse users and by Class I rail carriers, these logistics hubs require:

- Minimum of 500 acres of relatively flat land.
- Easy access to major highway corridors, Class I railroad mainlines, and air cargo.
- Designated Foreign Trade Zone (FTZ) status for tax relief on goods stored on site, including those manufactured on site from foreign component parts.
- Major public sector investment in supporting infrastructure.

Why then would the Sun Corridor provide an attractive location for such a facility? There are several reasons in addition to the geographic location of the Sun Corridor at a transportation crossroads of the two trade corridors noted above:

- Two Class I railways (BNSF and UPRR) traverse the Sun Corridor.
- Congestion, high labor costs, and political/environmental pressures limit expansion at the Ports of Los Angeles/Long Beach.
- Potential opening of the port of Punta Colonet in Mexico (earliest 2016), with a rail line connecting into the United States possibly through Yuma, Arizona.

THE SUN CORRIDOR LIES AT THE CROSSROADS OF TWO MAJOR TRADE CORRIDORS.

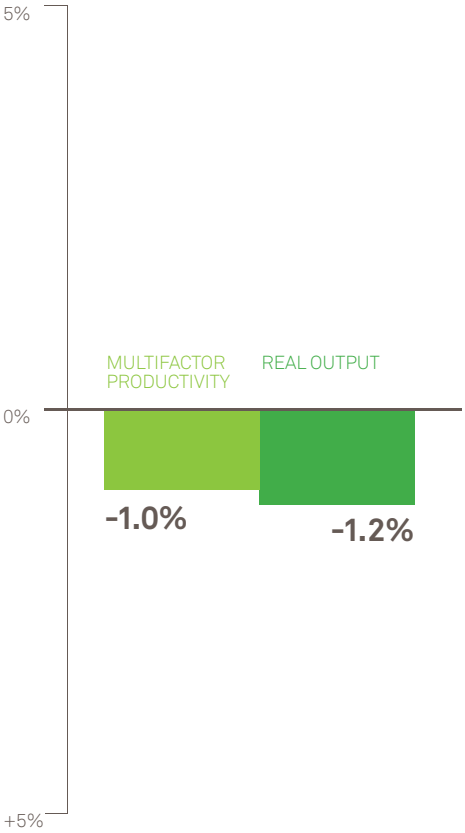


Figure 14
Aerospace and defense diagnostics; 1987-2006, United States, CAGRs (percent)
Source: Bureau of Labor Statistics, Multifactor Productivity Trends for Detailed Industries, 2006 (August 29, 2008).

- Port expansion underway at Guaymas and other existing Mexican ports on the Sea of Cortez, with a rail line connecting to the UPRR Sunset Route through Tucson.

The Sun Corridor may not have the population catchment areas as Chicago, the Texas Triangle, or the Atlanta megaregion, but a logistics park in this megaregion could serve as a major transhipment center at first, with manufacturing and end user warehouses gradually locating to the site as population growth continues to improve the economics of the inland port. However, potential challenges associated with developing an inland port also need to be considered. These include:

- The current underutilization of the Texas inland ports.
- The Panama Canal expansion, which could divert some traffic away from the West Coast ports to Gulf of Mexico or East Coast ports.
- Appropriate siting for a large parcel of land.
- Limited Sun Corridor capabilities in this sector, given that warehousing and storage in Arizona has a share of output that is only 63 percent of the national average, based on the sector analysis carried out earlier.

6) Aerospace and Defense:

This sector consists of aerospace, defense, and space-related manufacturing, research and development (R&D), industrial high-tech fields, assembly, and distribution and warehousing. The sector clearly exhibits mature characteristics, as confirmed by the declining real output and declining MFP rates between 1987 and 2006. However, there may well be some niches with high-growth potential in areas such as avionics software development. The Sun Corridor already has a strong presence in the sector, with over 35,000 employed in Arizona at wages well above the average, including at such locations as Luke Air Force Base in metropolitan Phoenix, Davis Monthan Air Force Base in metropolitan Tucson, Yuma Marina Corps Air Station, the Barry M. Goldwater Air Force Range near Yuma, and the Fort Huachuca Intelligence training site near Sierra Vista. In addition, the sector may also have synergies with other high-tech sectors, such as precision instruments and software development.[13]

Efforts to focus resources on the high-growth niches may come up against several challenges, including:

- Extensive competition from other aerospace and defense (A&D) clusters throughout North America, including those in Texas, Washington, and Mexico.
- Dependence on government procurement (e.g., Homeland Security) and tax incentives to attract manufacturing facilities in an environment of public sector fiscal constraints.
- Challenge of attracting, retaining, and educating a highly-skilled workforce while confronting an aging workforce and a high number of retirements.

The third challenge can be mitigated and even overcome if the Sun Corridor succeeded in attracting more highly-skilled professionals from A&D sectors elsewhere in the country, including professionals approaching


First Solar

retirement but seeking to continue to work in the sector as consultants or on a part-time basis.

7) Renewable Energy:

This sector consists of a wide range of businesses and technologies related to renewable energy production (solar, wind, waste to energy), R&D, and environmental remediation, including:

- Water and wastewater treatment
- Resource recovery
- Pollution control
- Distributed power generation
- Watershed management
- Carbon management

There is high market growth potential for this sector in the medium to longer term, but the sector's presence in the Sun Corridor remains limited to date outside of the traditional niches such as water and wastewater treatment. The long-term growth potential of the renewable energy sector depends on (1) how effectively the sector competes with conventional energy sources (i.e., how quickly production and distribution costs for alternative energy, especially solar power, decline to levels prevailing for other energy sources) and (2) the implementation of policies which raise prices and/or limit reliance on conventional energy sources (e.g., cap-and-trade schemes or carbon taxes).

This emerging sector will face an array of challenges over the medium-term, most of which are not specific to the Sun Corridor, other than the ability to develop, attract and retain a highly skilled workforce. Other challenges include:

- Access to venture capital.
- Uncertainty about regulatory framework regarding carbon mitigation.
- Uncertainty of public policies for promoting R&D.
- Limited commercial-scale opportunities in solar energy if production and distribution costs remain high relative to those for conventional energy sources.

8) Bioscience and Related Pharmaceutical Activities:

This sector consists of pharmaceutical R&D, including drug discovery and drug delivery, medical devices, medical imaging technologies, industrial products, and biomaterials. There is no doubt that this is an emerging sector with high growth potential both nationally and in the Sun Corridor. The sector is anchored by higher-education and research institutions in medicine, pharmaceuticals and agriculture, including the Translational Genomics Research Institute (TGen) located in Maricopa County and Flagstaff, and biosciences R&D at Innovation Park in Oro Valley. Of particular importance is the link between healthcare service organizations and the university teaching hospitals.

As in the case of other emerging high-tech sectors, biosciences faces a number of challenges as it strives to grow in the medium term:

- Ability to develop, attract, and retain a highly-educated workforce.
- Access to venture capital funding.
- Commercialization of innovations in basic research.
- Uncertainty of public and private sector research funding.

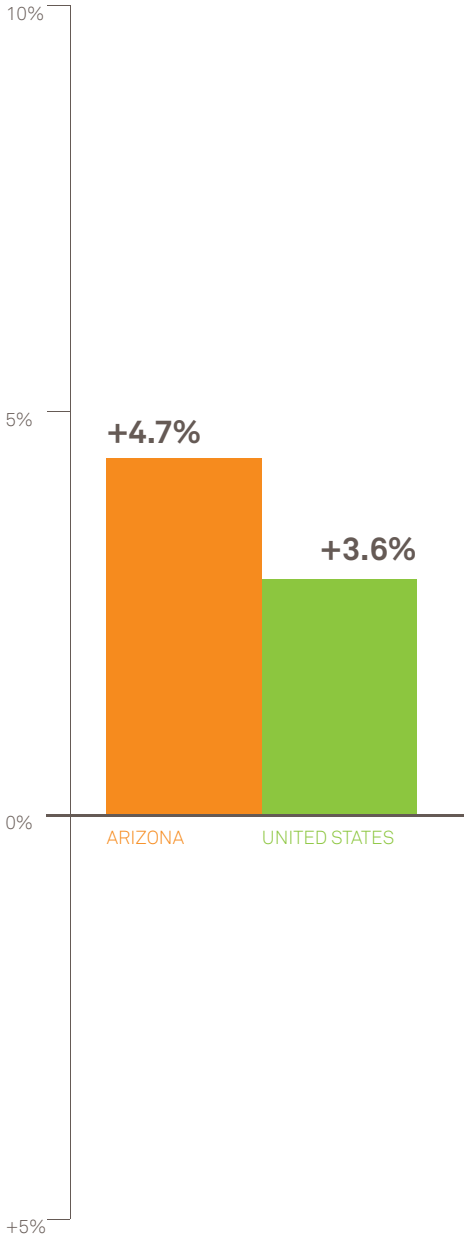


Figure 15
Agriculture diagnostics; 1997-2007, real output growth, CAGRs (percent).
Source: Bureau of Economic Analysis, http://www.bea.gov/regional/gsp/action-cfm

9) Agriculture:

Agriculture overall is a mature sector. Over the last decade, crop and animal production has grown more rapidly in Arizona than it has in the United States economy overall, but it remains only a small part of the Arizona economy (less than one percent of the private sector in 2007).

Nevertheless, farm production may play a new role in meeting niche sector demands and contributing to sustainable development (e.g., mitigation of urban heat islands). High-growth niches include:

- Gourmet/niche agriculture for the tourism and hospitality sector
- Local crop production for the "locavore" movement

Both the above niches are currently only fledgling parts of the farm production sector. Moreover, the agricultural industry faces the particular challenge of being a water-intensive activity, which can exacerbate water scarcity in an already arid region. This is not a new challenge for the sector, but it is one that can be mitigated through the use of effluent for irrigation and by charging for water (and effluent) based on market prices which capture the full cost of water (to avoid subsidizing water-intensive activities).

Four Enabling Conditions for Sun Corridor Development

The previous sub-section reviewed a wide range of emerging sector opportunities. Firms and entrepreneurs in the Sun Corridor are well positioned to make commercial assessments as to which of these opportunities are worth pursuing in the short- and medium-term. However, private enterprise needs certain enabling conditions in place in order to make effective investment decisions and take full advantage of opportunities as they arise. The enabling conditions discussed below are either areas where the private sector alone is not in a position to address the needs—such as public infrastructure, and trade and investment—or where it may not have the right incentives to do so entirely on its own—as in the case of education and training, and even innovation. Four enabling conditions are discussed for Sun Corridor development which represent cross-cutting areas that need to be addressed and nurtured by policy makers at all levels of government.

Public Infrastructure

Continued investments in public infrastructure are essential to support four areas of connectivity for the Sun Corridor's economy:

- *Labor markets:* Infrastructure that supports timely access to work locations also ensures that employers can draw from a broad geographic and skilled labor pool.
- *Goods markets:* Timely freight movements are essential not only for Sun Corridor firms that supply markets outside the megaregion, but also to enable the local firms to participate in regional and global supply chains.
- *Regional and global mobility:* This is essential for the business community, particularly for certain services sectors such as professional services firms.
- *Cost-effective access to energy, water, and other resources:* These are important for all firms in

ATTRACTING HIGHLY-SKILLED AND HIGHLY-EDUCATED PEOPLE WILL BE A KEY DRIVER.

INNOVATION IS AT THE HEART OF FUTURE PRODUCTIVITY GROWTH AND IMPROVED LIVING STANDARDS.

the Sun Corridor and are key determinants of the megaregion's attractiveness as an investment location.

Based on these needs, public investments should be aimed at supporting transportation infrastructure (roads and highways, public transit, border infrastructure, airports and some parts of rail freight infrastructure[14]), water, wastewater and other energy infrastructure, including production and distribution networks for renewable energy.

However, not all public investments in infrastructure are equally supportive of economic growth and sustainability. Public investment decisions should be guided by a planning process that sets out a full range of options and by comprehensive cost-benefit analyses of major capital projects, taking into account environmental and safety impacts as well as the typical user benefits derived from public infrastructure.

Education and Training

Attracting highly-skilled and highly-educated people is a key driver of productivity for most of the emerging sectors of the Sun Corridor economy. Yet firms seldom have the incentive to make significant investments in transferable skills (e.g., basic language skills) that workers take with them when they change firms, although they have some incentive to invest in firm-specific human capital, (e.g., through on-the-job training and other learning and development investments).[15] This is why it is essential for governments to ensure that public education institutions fulfill their mandate effectively, both for primary and secondary school education and for post-secondary education and vocational training.

Specific challenges which need to be addressed within the Sun Corridor include:

- Relatively low levels of educational attainment among the fast-growing foreign-born population, which is likely to be a drag on future productivity growth, if not addressed.

- Specific education and skills development needs within the immigrant workforce in the Sun Corridor (e.g. ESL, technical training).

Trade and Investment

Trade and investment are essential tools for enabling Sun Corridor firms to access markets outside its megaregion. However, they are also tools for accessing specialized know-how and other resources that may be available outside the megaregion and even outside the country, which occurs when local firms achieve higher levels of participation and integration into regional and global supply chains. This broader view of the role of trade and investment requires a better appreciation of the role of imports and outbound foreign direct investment, both of which are important vehicles for participating in global supply chains. It is also a view that is particularly supportive of innovation and productivity growth for the Sun Corridor.

One implication of this broad view of trade and investment is the recognition that the Sun Corridor is located next to a major emerging economy that in the medium- to long-term is likely to grow at significantly higher rates than Arizona's other more mature trading partners, such as California. Moreover, Mexico is not only an emerging economy, but it is also a gateway to other parts of

Central and South America which have considerable long-term growth potential, such as Brazil.

This strategic geographic location presents exceptional trade and investment opportunities for Sun Corridor firms – not only to supply goods and services into large and rapidly growing markets, but also to build supply chains that may draw on certain skills or resources that are in plentiful supply or at advantageous prices in Mexico and elsewhere in Latin America. Building these supply chains is key to ensuring that certain high value-added business functions are located in the Sun Corridor, but it requires outward foreign direct investment and intimate knowledge of the relevant end markets. In fact, today's younger immigrant cohorts may provide the commercial linkages back to the relevant end markets in Latin America, particularly if they are able to improve their levels of educational attainment relative to the older cohorts.

In order to advance this trade and investment agenda, all levels of government should seek to promote increased trade and economic cooperation with Mexico and particularly with neighboring Sonora, which in practice also means contributing to the reduction of the remaining trade barriers within the context of the North American Free Trade Agreement (NAFTA).

Innovation

The innovation process is at the heart of future productivity growth and improved living standards. It entails not only innovations in basic research, but also commercializing new goods, services, processes and business models, which is valuable across all sectors, and can be a key economic engine for generating high-wage jobs. This means that public policy should nurture both basic and commercial research and development, which means removing any unnecessary regulatory and other barriers to innovation, providing targeted incentives for private sector R&D spending and supporting public sector R&D spending in areas of basic research which would not otherwise be taken up by the private sector.

THE SUN CORRIDOR IS AT THE HEART OF GLOBALLY SIGNIFICANT MATURE AND EMERGING ECONOMIES.

The Brookings Institute report on *Mountain Megas* noted that government spending on R&D in the Intermountain West has not kept up with national increases.[16] However, commercialization success also depends on private sector R&D spending, which should be monitored and promoted. By encouraging R&D spending and dismantling barriers to innovation, governments can help drive productivity growth in the Sun Corridor and thereby ensure that industry clusters across the megaregion also contribute effectively to the creation of high-wage jobs.

This summary ties together four themes from this chapter which have particular significance for public policy and economic development strategy for the Sun Corridor.

SUMMARY + IMPLICATIONS

First, we believe that an inland port for the Sun Corridor is an ambitious vision which could serve as a rallying point for several initiatives and interests. It maximizes the locational advantages of the Sun Corridor at the crossroads of two major transportation corridors. It is also much more than a logistics hub, and could include manufacturing, final assembly, and supporting services, which is why public sector efforts at the development stage are essential. Perhaps most importantly, we believe that an inland port project for the Sun Corridor can help channel policy efforts towards the broader vision of improving trade and economic cooperation with emerging markets in Mexico and elsewhere in Latin America. Improved trade links with Mexico are essential to realizing the inland port, but at a practical level it is also important to recognize that alleviating trade and investment barriers with Mexico will have substantial and immediate impacts on the Sun Corridor economy, even if inland port concept is delayed or not realized as originally expected.

The promotion of trade and economic cooperation with neighboring Mexican states is a second theme that looms large for the Sun Corridor. The proximity of such a large and rapidly growing market is a major opportunity. While this initiative can be pursued through existing organizations, such as the Arizona-Mexico Commission, the scale of effort required suggests that this will require renewed commitment across local and state governments. This initiative also requires joint planning of bi-national border region infrastructure and strategic investments in key infrastructure to support greater international trade. Since federal involvement is essential to realizing border infrastructure, if the Sun Corridor can speak with one voice on this issue, it will help to create a constructive Federal agenda.

Public infrastructure challenges are another theme that is integral to realizing the Sun Corridor's full economic potential. Improving transportation connectivity and providing cost-effective access to water and energy resources are essential for the Sun Corridor. In practice, this means choosing the right infrastructure projects and using the available public resources strategically. It also means revisiting projects already in the planning pipeline in light of the impact of the most significant recession in the last sixty years. This should prioritize projects and thereby maximize benefit-cost impact per dollar of

TOWARDS A SUSTAINABLE URBAN FUTURE: AN INLAND PORT, CONNECTED TO THE WIDER WORLD.

FUTURE GROWTH PRESENTS AN OPPORTUNITY FOR THE SUN CORRIDOR TO FORMULATE A NEW SUSTAINABLE URBAN DEVELOPMENT PARADIGM.

public investment. Key projects for establishing the infrastructure spine of the Sun Corridor and worthy of serious consideration include:

- Phoenix to Tucson intercity rail,
- I-11 transportation corridor.
- Pinal County north-south multimodal transportation corridor.

Finally, the public funding crunch affects most public policy and economic development strategies for the Sun Corridor. This macroeconomic imperative will set constraints for what the public sector can achieve in the medium-term, but it is also an invaluable opportunity to revisit certain public sector practices in order to ensure more efficient delivery of public infrastructure and public services. Specifically, there may be opportunities to do so in the following ways:

- Reinvigorating user-pay principles in the provision of public infrastructure services (e.g., transportation, water, and wastewater).
- Exploring a greater role for public/private partnerships (PPPs) to ensure a quicker and more efficient delivery of public infrastructure.
- Taking advantage of new/upcoming federal funding initiatives (e.g., Transportation Act Reauthorization, Sustainable Communities Partnership, and the federal emphasis on rail and border transportation improvements).

3. INTEGRATING SUSTAINABILI

TY

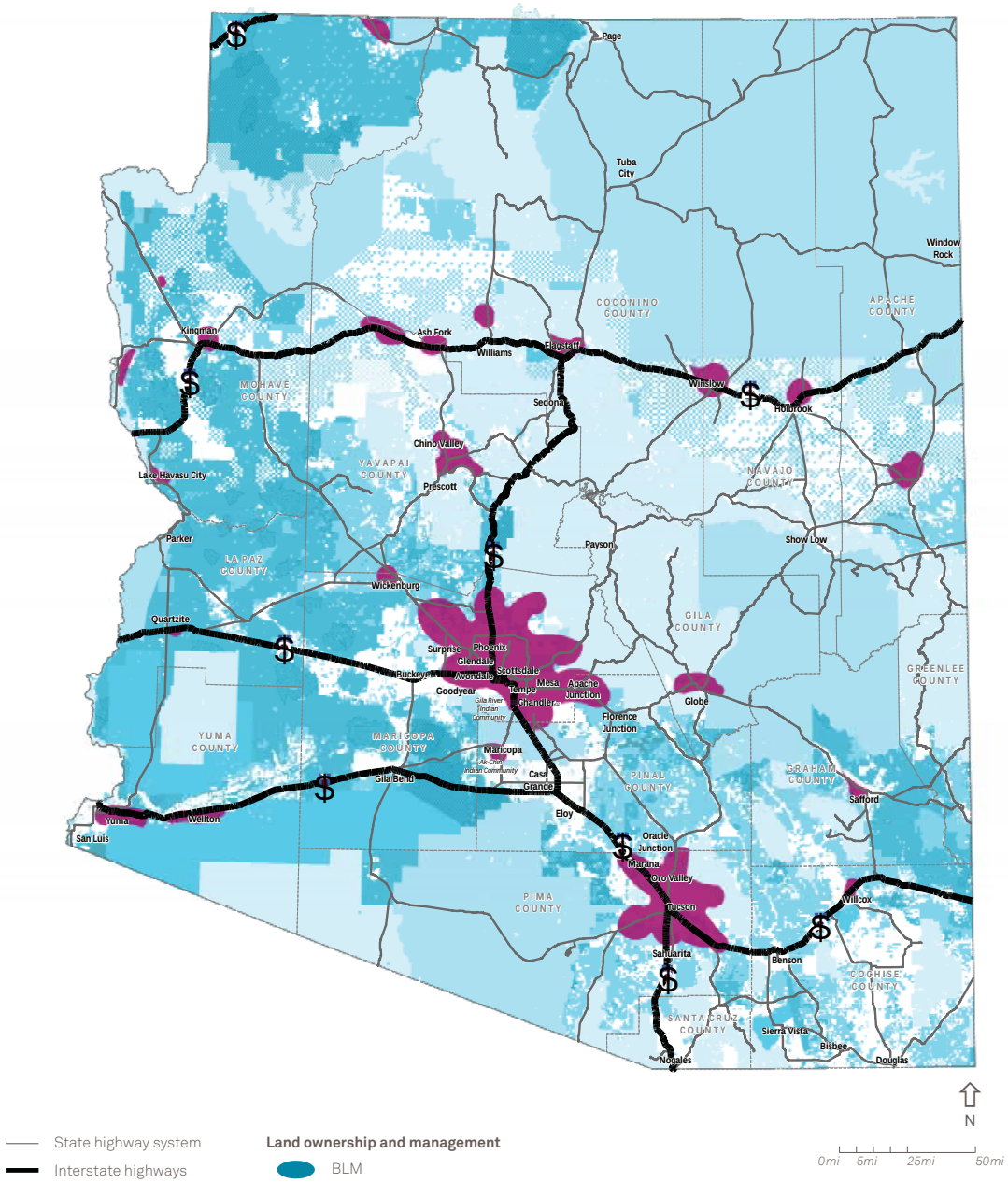
Over the course of the last 60 years, the Sun Corridor has tried to keep up with growth by building the modern infrastructure necessary to support its 20th century population and economic development. By 2050, population and employment levels in Arizona are projected to more than double from their 2005 levels (Figure 16). At least half of the transportation infrastructure needed in 2050 has yet to be built. Two-thirds of housing units in 2050 will be built after 2007. Future growth presents an opportunity for the Sun Corridor to formulate a new sustainable urban development paradigm.

Previously, the success of each regional entity in the Sun Corridor was due to steadfast leadership and vision. MAG has paved the way for future growth in Maricopa County by looking ahead and determining major infrastructure needs through a series of framework studies. Pinal County has changed the face of planning with its new Comprehensive Plan that looks at development in a much more holistic manner. Pima County is ready to embark on a major visioning exercise, entitled "Imagine Greater Tucson" to develop a common action plan for the region to embrace growth, while still maintaining and enhancing quality of life for future generations.

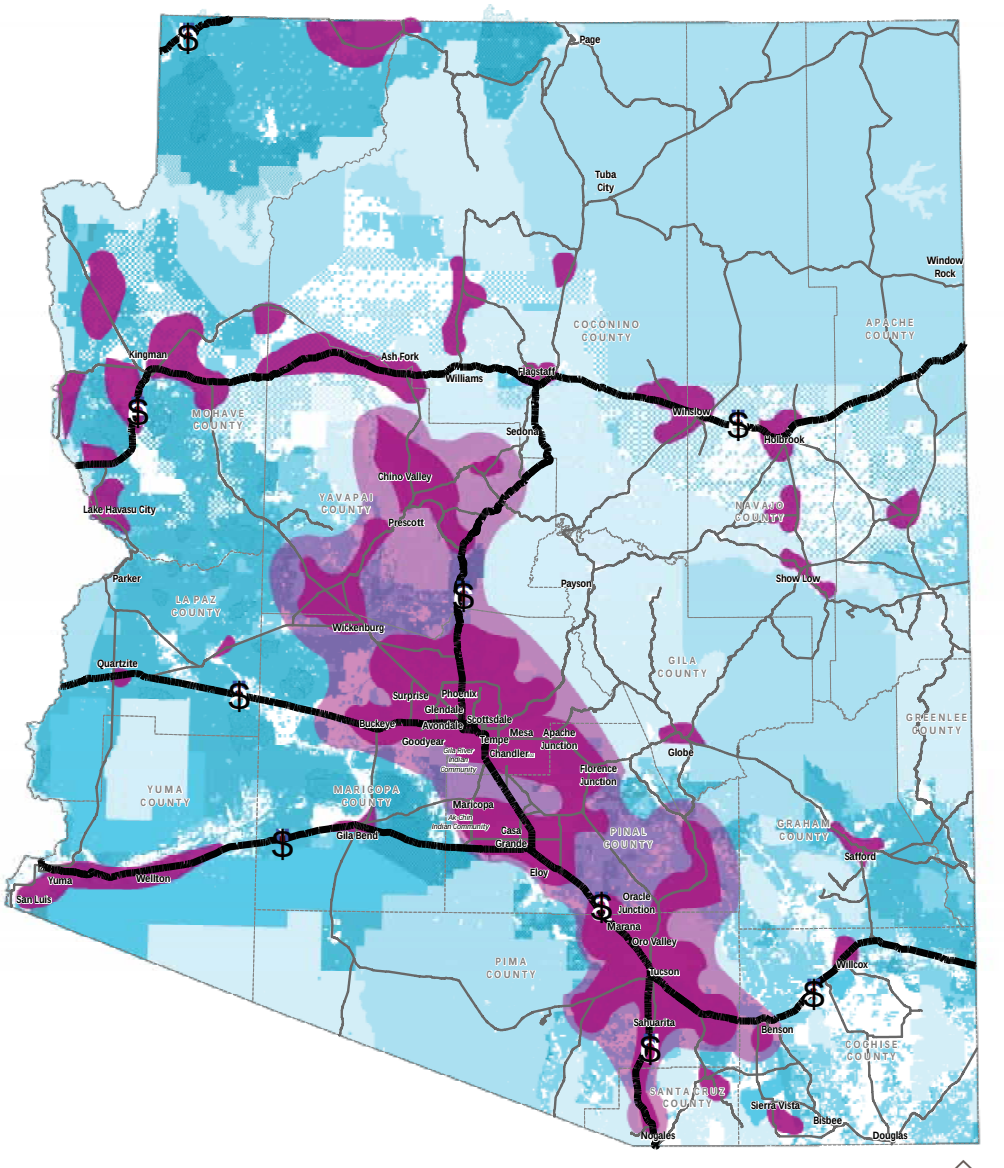
However, the success of the megaregion as one entity will depend upon successful cooperation of all these individual regional entities. For the Sun Corridor to achieve a sustainable development pattern, it must work towards a balanced future by meeting new social, demographic, economic, and environmental challenges. In efforts to do so, recent plans, reports, and visioning exercises have been developed by local jurisdictions, counties, and civic organizations to address growth and future quality of life by promoting sustainable development, environmental stewardship, economic prosperity, and sustainability. These key studies will be cited throughout the section, identifying opportunities for smart development and regional cooperation to lead the Sun Corridor to a sustainable future.

Figure 16
Population growth, Arizona.
Source: Maricopa Association of Governments

2005



2050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Tuba City
Window Rock
COCONINO COUNTY
APACHE COUNTY
Kingman
Ash Fork
Williams
Flagstaff
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YAVAPAI COUNTY
Lake Havasu City
Prescott
NAVAJO COUNTY
Parker
Payson
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LA PAZ COUNTY
Wickenburg
GILA COUNTY
Quartzite
Surprise
Phoenix
Glendale
Scottsdale
Buckeye
Avondale
Mesa
Apache Junction
Goodyear
Tempe
Chandler
Gila River Indian Community
Globe
GREENLEE COUNTY
Florence Junction
YUMA COUNTY
MARICOPA COUNTY
Maricopa
Ak-Chin Indian Community
Casa Grande
Gila Bend
PINAL COUNTY
GRAHAM COUNTY
Safford
Eloy
Yuma
Wellton
San Luis
Oracle Junction
Marana
Oro Valley
PIMA COUNTY
Tucson
Willcox
Sahuarita
Benson
COCHISE COUNTY
SANTA CRUZ COUNTY
Sierra Vista
Bisbee
Douglas
Nogales
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State highway system
Interstate highways
County boundary
National Monument
Wilderness Area
2050 population and employment centers
Sun Corridor Megaregion
Land ownership and management
BLM
State land
Parks
Military
Tribal land
Private

Sustainable Development Principles

Fundamental to all the plans, reports, and visioning exercises already conducted are five common sustainable development principles. These principles provide the framework for an approach to sustainable growth in the Sun Corridor:

01 PRESERVE OPEN SPACE AND THE NATURAL ENVIRONMENT.

02 ENABLE DEVELOPMENT OF MULTI-USE ACTIVITY CENTERS COMPOSED OF LOCATION-EFFICIENT LAND USES.

03 CREATE QUALITY JOB CENTERS PROXIMATE TO A RANGE OF HOUSING OPTIONS.

04 DEVELOP A MULTIMODAL TRANSPORTATION NETWORK FOR EFFICIENT COMMUNITY AND REGIONAL MOBILITY AND TO CREATE ECONOMIC OPPORTUNITY.

05 SHAPE COMMUNITY ENVIRONMENTS THROUGH INFORMATION AND COMMUNICATIONS TECHNOLOGY.

LEARNING FROM...
'THE ARIZONA WE WANT'

The Arizona We Want, published by the Center for the Future of Arizona in 2009, builds an agenda for Arizona's future based on the Gallup Arizona Poll, a survey of Arizona residents regarding their desires for the future of their community. The report highlights what citizens think about life in Arizona, what they envision for their future, and what needs to be done in order to achieve their common goals.

The following key findings from the online survey represent the policies or investments citizens are mostly likely to support as planning for Arizona's future begins:

- School programs that ensure students are career /college ready; academic preparation to be competitive with the rest of the world.
- Insurance programs for all Arizonans with payment assistance for those who need it.
- Job training programs, as well as an increased number of high-quality jobs.
- Statewide water management plans and preservation of the natural environment.
- Investments in technology and facilities for solar, wind, and other renewable energy resources to help Arizona become more energy independent.

These findings can serve as the beginning of a process to define an agenda for Arizona's future that includes a combination of public policy and community building efforts. It was determined that in order for Arizona to succeed, governance is a huge issue that must be tackled. Instead of working alone, state agencies and organizations must collaborate to provide infrastructure and services to Arizona citizens in the most efficient manner possible.

Arizona Opportunity Map
Source: *The Arizona We Want*, Center for the Future of Arizona, Gallup Arizona Poll, 2009

PRINCIPLE 01

PRESERVE OPEN SPACE

Sustainability, adaptation, and stewardship of the land have a long history in Arizona. The Native American communities of the central basin of Arizona built an agricultural society, depending on the land for their sustenance. The evidence of this history dates back to the Hohokam Indians, with the construction of vast canal systems based on the Gila and Salt Rivers, which enabled a civilization to thrive and flourish for hundreds of years. It is debated what caused this culture's demise —prolonged drought, disease, war, or a combination that eventually led to the Hohokam abandonment of their fields. One thing is certain, however: The ability to control water enabled life within this desert environment. The settlers of the mid-1800s recognized the value of the past infrastructure and rebuilt the very canals that once served this prehistoric culture. By introducing large water reservoirs, these new settlers formed a more sustainable water source to bridge years of drought that are common in our desert environment.

The influence of Native American communities continues today. Seven out of Arizona's 22 federally recognized tribes are located in the Sun Corridor. The decisions that are made for the future of Arizona by these tribal communities and related institutions have a great impact on patterns of growth, agriculture, water uses, and intergovernmental collaboration.[17]

As farmland outside the tribal communities face development, Native American lands are becoming more important. Today, the Gila River Indian Community's (GRIC) 16,000-acre farm grows a variety of crops and provides year-round employment for many tribal members. In 2008, the farms had more than $10 million in gross sales. Native American communities have 23 percent of all water allocation of the Central Arizona Project (CAP), a 336-mile long system of canals, tunnels, pumping plants, and pipelines that bring 1.5 million acre-feet of Colorado River water to central Arizona per year.[18] With the recent reallocation of water determined in the Arizona Water Settlements Act, agricultural production is expected to grow dramatically on the GRIC – it essentially becoming the "breadbasket" of Arizona, supplying food for the state's citizens and developing an export economy. Beyond tribal operations, there are also 22,000 acres of additional tribal land farmed by independent operations.[19]

THE ABILITY TO CONTROL WATER ENABLED LIFE WITHIN THIS DESERT ENVIRONMENT.

Given the locations and scale of the Native American communities in the Sun Corridor, they have the potential to: (1) provide wide swaths of permanent open space within the megaregion, providing natural boundaries and buffers to urban expansion, (2) protect environmentally-sensitive lands, and (3) serve as a local food production source for the Sun Corridor, furthering the emerging economic engine related to niche agriculture.

From an urban perspective, conservation of sensitive lands combined with tribal community open space preservation can play a huge role in shaping the future development pattern in the core of the Sun Corridor, clustering growth in polycentric nodes and facilitating a "connected centers" approach, which will be expounded upon in the next principle.

Preservation of the natural environment in the Sun Corridor requires extensive cooperation and a strong foundation has already been set. The Nature Conservancy estimates that there are approximately three million acres of developable land located in the Sun Corridor between Phoenix and Tucson. More than one million acres of developable land will be needed to support projected growth through 2050. Their recently completed analysis, *Growing by Design: Choices for a Sustainable Arizona*, states that if Arizona does not create a development plan that accommodates resources required for fresh water, clean air, and a livable climate, much of the corridor's natural resources could be lost.

Both Pinal and Pima counties have been at the forefront of open space planning. The *Pinal County Open Space and Trails Master Plan* and Pima County's *Sonoran Desert Conservation Plan*, have identified and protected areas of active and passive open space and cultural resource locations. By coordinating these plans with comprehensive planning efforts and regional transportation plans, both counties have integrated natural resource protection with land use and transportation development guidance. For example, Pinal County is encouraging the reuse and recharge of effluent or "gray water" for lakes, fountains, and golf courses. Additionally, and on a more local scale, master planned communities in the Sun Corridor are developing site plans and standards to respect the natural environment, such as leaving wash corridors preserved for natural drainage, orienting buildings to create natural shading (as well as to take advantage of sun exposure), constructing renewable energy systems, using local construction materials, and directing land uses in a manner that promotes non-vehicular travel and altogether reducing energy consumption.

An additional opportunity exists to steer growth away from environmentally-sensitive areas in the form of the Arizona State Land Department (ASLD). The ASLD owns 36 percent of all land in Pinal County—the heart of projected growth of the Sun Corridor—and more than half of all developable lands in the county itself. These State Trust Lands are potentially suitable for development without negative impact on the natural infrastructure and are generally contiguous to already populated locations, allowing balanced growth in urban, suburban, and edge areas on developable lands. A series of legislative reforms are necessary, however, to truly utilize State Trust Lands for this purpose of regional sustainability.

LEARNING FROM...
GREEN INFRASTRUCTURE

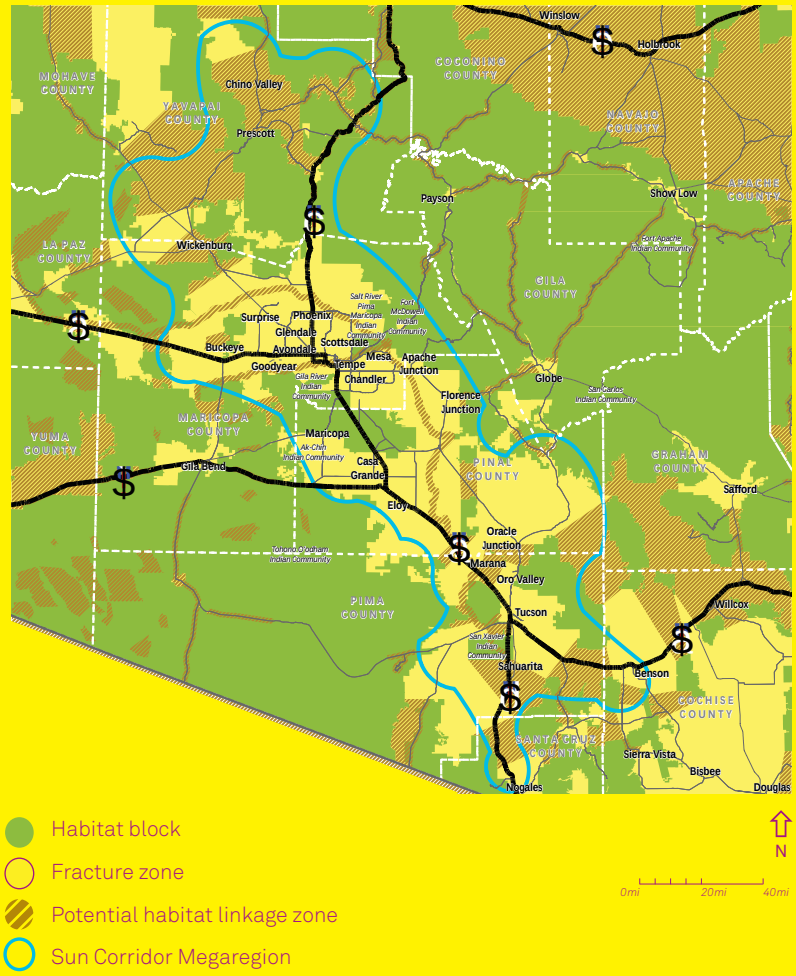
Moving toward regional sustainability, The Nature Conservancy has begun to work with the Arizona State Land Department (ASLD) on using a green infrastructure strategy to identify appropriate areas for development and open space preservation within the ASLD's nine million acres of developable land statewide. This work is especially relevant to the Sun Corridor, as it includes the large portions of developable State Trust Land. This work is supported by the previously completed work of the Arizona Wildlife Linkages Workgroup, a partnership of public and non-governmental agencies, which completed a study known as *Arizona's Wildlife Linkages Assessment*. The assessment documented and mapped initial efforts to identify habitat blocks and potential linkage zones to promote habitat connectivity for Arizona's wildlife, providing a framework for land managers and planners to assess opportunities for mitigation, such as wildlife crossings, land protection measures, and community planning.

Using the myriad of information currently available from several sources, including The Nature Conservancy, the Arizona Game and Fish Department, Sun Corridor counties, and other governmental and non-profit organizations, a comprehensive overlay describing the environmental framework for the corridor could be developed, resulting in a plan illustrating areas for future development, areas for environmental preservation, potential recreational areas, cultural heritage preservation sites, etc.—creating a unique environmental identity for the Sun Corridor. Variations of such a development plan have been created among the organizations cited above. The Nature Conservancy compares the current growth pattern to an alternative growth scenario which allocates approximately one million acres of State Trust Lands and 1.7 million acres of private land for development that will not disturb the natural environment. However, to truly realize a future development pattern that respects open space and natural environment preservation throughout the Sun Corridor, a plan must share regional consensus and be bound in local codes.

Green infrastructure

Arizona Wildlife Linkages Assessment

Source: Arizona Wildlife Linkages Assessment, 2006.



PRINCIPLE 02

MORE MULTIUSE ACTIVITY CENTERS

A new regional vision rooted in the broad idea of prosperity, as opposed to one measured strictly by population growth, is necessary to sustain the region in the future. Many communities throughout the United States are acknowledging that population growth cannot be accommodated in the boom-bust pattern, as it previously has been. New development is eating up pristine agricultural lands and natural resources. The Sun Corridor has been expanding outwards at a rapid rate, beginning with post-WWII suburbanization, with no end in sight.

Current development patterns are depleting resources, straining mobility connections, and decreasing quality of life. The alternative to the current development trend of sprawl urban population (e.g., disconnected neighborhoods, traffic congestion, and urban decline) is smarter growth Smarter growth focuses on expanding the range of transportation, employment and housing choices; enhancing the unique sense of community and place; equally distributing the costs and benefits of development; preserving and enhancing the natural and cultural resources; and promoting public health.

Many communities are embracing smart growth because they recognize that new development patterns can result in healthier communities, a vibrant economy, and a higher quality of life—not to mention, reduced energy costs and less pollution.


FLASH BACK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POPULATION GROWTH CANNOT CONTINUE TO FOLLOW THE BOOM-BUST PATTERN.

MAG first explored the benefits of concentrating population and employment growth in either a polycentric- or corridors-based urban development pattern in its award-winning *Urban Form Study* of 1994. The State of Arizona adopted "Growing Smarter" and "Growing Smarter Plus" legislation in 1998 and 2000, respectively, requiring countless and local jurisdictions to incorporate the principles of smart growth in the updates of their comprehensive and general plans.

The San Diego Association of Governments (SANDAG) recently adopted its *Regional Comprehensive Plan* (RCP) that provides a strategic framework for where and how the region should grow. The RCP core values and the foundation for their land use, transportation, environmental, and social policies are shaped by the tenets of smart growth and the strategy of concentrated centers, referring to multi-use development clusters that provide residents with various housing options, employment opportunities, and day-to-day amenities—all linked with multiple transportation modes.

The idea of concentrated and connected centers is not unique to San Diego, but is being developed by organizations and communities throughout the United States. The Urban Land Institute (ULI), a national organization that seeks to provide leadership in the responsible use of land and in creating and sustaining thriving communities worldwide, will publish an analysis on this subject relative to Arizona in fall 2010. Entitled *A Reality Check on Central Arizona: Growth and Prosperity Through a Connected Centers Strategy*, this report describes the nature of connected centers as locations where associations exist between the workforce and population, as well as connections between centers.

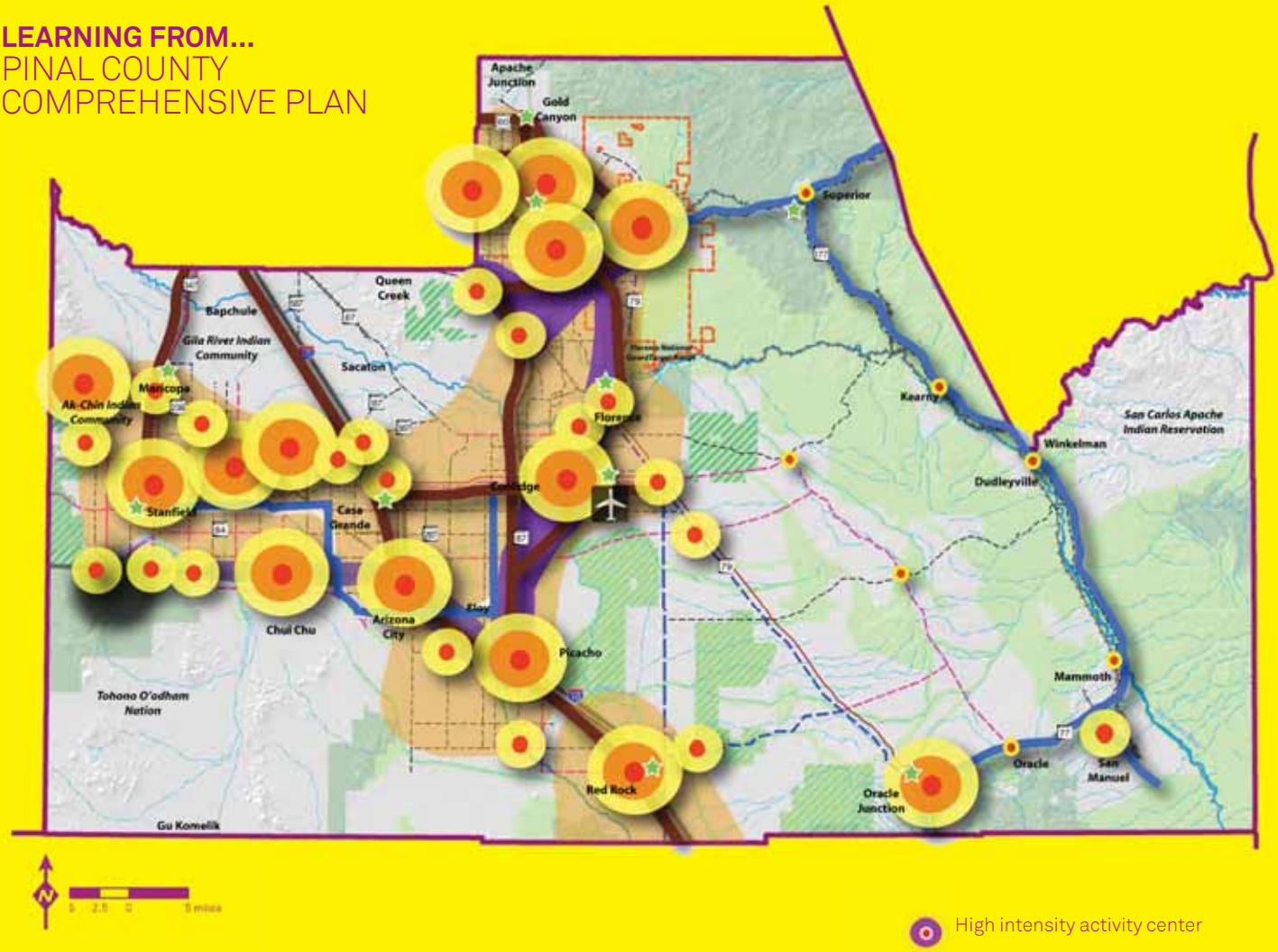
A transportation framework for the Sun Corridor, and the whole state, has recently been developed by the ADOT through the *Statewide Transportation Planning Framework Program*, a 40-year vision for multimodal transportation in Arizona. This was an innovative program because it realized that transportation is only one element of the built environment

and communities in which we all reside. Creating linkages among multimodal transportation land use, economic development, and the natural environment is critical. This framework was developed based on a change in development philosophy. Instead of extending population and employment demographics, the statewide transportation framework program envisioned a future of connected activity centers and multimodal travel. While this visioning occurred in coordination with local jurisdictions, the future challenge for the Sun Corridor lies with these same entities to truly implement a coordinated local and regional development pattern. Current development trends typically include subdivision-style residential development, supportive strip commercial development, and isolated employment centers. Such land development patterns continue the trend of consumption of agricultural and sensitive environmental land, significant road/pavement construction, and high local infrastructure requirements—clearly at odds with the overall vision. The *Statewide Transportation Planning Framework Program* provides a sound foundation for transportation interconnectivity throughout the state; however, the real challenge for the Sun Corridor lies with the local communities to supplement this network of statewide multimodal transportation corridors with coordinated local and regional land development patterns and economic opportunities, timed to ebbs and flows of the global economy.

Just as important as the state and Sun Corridor's transportation framework is an energy framework. The region cannot reach levels of sustainability by relying on international energy sources. The Sun Corridor, located in the Sonoran

Desert that receives more than 300 days of sunshine per year, is well positioned to take advantage of the sun for solar energy generation and use. The Bureau of Land Management (BLM) is in the process of evaluating leases for thousands of acres of federally-protected land for development of wind, solar, and geothermal energy production. Maricopa County is installing solar arrays atop public buildings and

LEARNING FROM...
PINAL COUNTY COMPREHENSIVE PLAN



Much of the projected future growth in the Sun Corridor is expected to occur in the 5,386 square miles of Pinal County, located between Maricopa and Pima counties—or between the Phoenix and Tucson metropolitan areas. As growth from the metropolitan areas has historically "spilled over" into Pinal County, significant growth is now occurring within Pinal County itself—setting a course for development of this primarily rural area. Understanding the opportunities, as well as the potential threats, involved with this scale of growth, the County updated its Comprehensive Plan in 2009 to reflect the direction they would like growth to take.

This document approaches growth holistically, aiming for sustainable future development patterns that pay equal attention to creating job centers as well as growing population, linking land use decisions to a multimodal circulation system, and preserving the natural environment and rural lifestyle of the county's eastern portion, while concentrating growth in the western portion of the county that is already served by infrastructure.

The *Pinal County Comprehensive Plan* charts a positive course of action for the county and can be used as a model for other community planning efforts, concentrating future development in connected centers, conserving and managing natural resources, diversifying the economic base, and establishing and nurturing strong local and regional partnerships.

- High intensity activity center
- Mid-intensity activity center
- Low-intensity activity center
- Future urbanized area
- Employment corridor

TRANSIT NETWORK
- High capacity regional transit
- Medium capacity regional transit
- Transit center

ROADWAY NETWORK
- Interstate highway
- Enhanced parkway
- Parkway
- Principal arterial
- Potential regional airport

NATURAL INFRASTRUCTURE
- Existing/planned open space
- Proposed open space
- Proposed regional park
- Restricted-use open space
- Superstition Vistas Planning Area

parking garages to offset their electricity use within county buildings, as well as to power a potential electric vehicle fleet. Arizona State University (ASU) has set a goal of becoming carbon neutral by 2025. By offering their rooftops and parking lots to private universities, ASU enters into a power purchase agreement without bearing the cost of installation.

Civano, a master planned community in metropolitan Tucson, was planned to reduce energy consumption and demonstrate that such conservation can be economically viable. Streets and lots are designed to optimize solar exposure; vegetation is used to manage micro-climates; district heating and cooling is managed within high-density core areas; and irrigation occurs through non-potable water and/or rainwater harvesting. Again, the challenge for the Sun Corridor will be to learn from these local examples and adopt a regionally-coordinated and comprehensive plan for energy use. The Sun Corridor is currently powered by fossil fuels and other non-renewable resources. Someday in the future, it may be known for its innovative use of solar and other renewable resources.

According to ULI's *Connected Centers* study, comparing the "business as usual" development pattern to one of "connected centers" could save 842 square miles of open desert and agricultural land, eliminate the need for 33 million miles of driving daily, and save ten billion dollars in transportation capital costs. Additionally, the compact development inherent to a connected centers development pattern reduces typical water usage by more than ten percent, properties are valued fifteen percent higher than the same houses in conventional subdivisions, and compact developments tend to have up to 40 percent of employment for their residents on-site or nearby, creating a live-work-play environment.

Again, two-thirds of the region's anticipated development on the ground will be built after 2007. This is a huge opportunity for the Sun Corridor to shape growth, to establish a new sustainable development paradigm, to become a model for urban living in the desert. As the Sun Corridor develops, a mix of centers could be established, offering a variety of employment opportunities and housing types. To be successful, each Sun Corridor center must realize the unique character of the area and promote high quality of life standards that encourage and support social and economic interaction and diversity so that the region does not find itself in the same situation that exists today: a major economic recession due to the domination of one industry (e.g., construction) or lifestyle.

Redevelopment of the Sun Corridor is already leading to one focused around activity centers. The *Pinal County Comprehensive Plan* proposed a land use pattern that encouraged redevelopment and infill of existing historic downtown areas, industrial centers located along high-capacity transportation corridors, and new activity centers in suitable development and high growth areas —purposely steering growth away from environmentally-sensitive lands. Within the Phoenix metropolitan area, a major activity center centered on the development of the biotechnology industry is emerging in downtown Phoenix. Here, corporate headquarters and professional services are clustering in northeast Phoenix/north Scottsdale along Loop 101. Reinvestment in research and development is springing up in the

Discovery Triangle Area located within Phoenix, Tempe and Scottsdale. A similar direction is currently occurring in metropolitan Tucson, with activity center clusters in downtown Tucson, in Oro Valley, and at the University of Arizona.

The ULI *Connected Centers* study identifies five types of activity centers that could be used within the Sun Corridor to help guide future growth. While it is important that all centers reflect and enhance their own unique and special features, it is equally important that the centers are integrated regionally with an efficient multimodal transportation system, contain an array of high quality employers, offer a range of housing and retail/service opportunities, and preserve open space and natural features. Most importantly, a mechanism for regional coordination of activity center development is necessary. In a megaregion comprised of a large number of individual jurisdictions, competition for revenue (e.g., tax base) can ultimately overrule smart development and appropriate economic development siting. For example, it may not be efficient to develop many small clusters of solar energy development. However, the whole region should have the ability to benefit from the industry. When moving forward in planning for connected centers, a strategy should be developed to capture economic opportunities in appropriately-sized and placed centers throughout the Sun Corridor as a whole. The five centers discussed in the ULI report include: Metropolitan center, urban center, suburban center, rural center, and job/industrial center.

A MECHANISM FOR REGIONAL COORDINATION OF ACTIVITY CENTER DEVELOPMENT IS NECESSARY.

Examples: Downtown Phoenix,

Sun Corridor centers

METROPOLITAN

Examples: Downtown Phoenix, Downtown Tucson.

Pictured: Downtown Phoenix.

Target density minimums: +/- 75 dwelling units (du)/acre, 80 employees/acre.[20]

Characterized by mid- and high-rise residential, office and commercial buildings (contains primary businesses, civic institutions, commercial and cultural venues).

The sphere of influence spreads across the region and goes beyond the region's borders. It is connected to the other major centers by freeways, freight rail, and rail transit.

Open space, including plazas and parks, play a crucial role in the character of a metropolitan center, providing a balance to the density of the surrounding buildings.

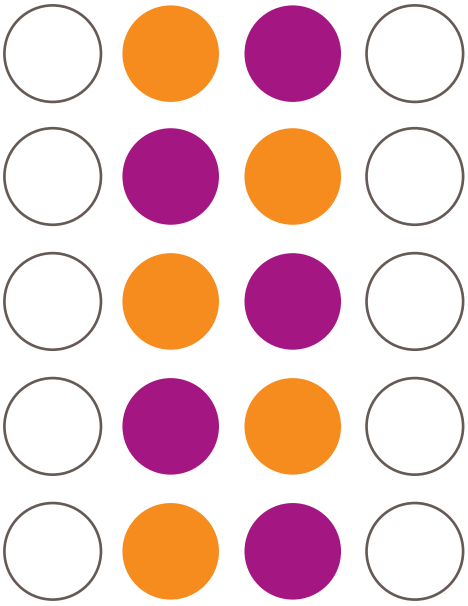
The livability and attractiveness of the streetscape is defined in part by the quality of the easements, medians, and linear parks that provide tree cover for shaded sidewalks and encourage pedestrian use.

A large portion of the parking is located beneath buildings that have active ground floors and attractive street facades.

Major employer headquarters are based in metropolitan centers.

Sun Corridor centers

URBAN



Examples: Downtown Tempe, Downtown Scottsdale.

Pictured: Downtown Tempe.

Target density minimums: 40 du/acre, 50 employees/acre.

An urban center is formed around sub-regional type businesses, civic, commercial, and cultural uses developed at a medium- to high-density.

Preferred building types include mid- to high-rise residential and office/commercial. Parking is generally accommodated through on-street parking garages, and lots located behind buildings.

Existing development such as retail crossroads, malls, and neighborhood centers could evolve to become urban centers.

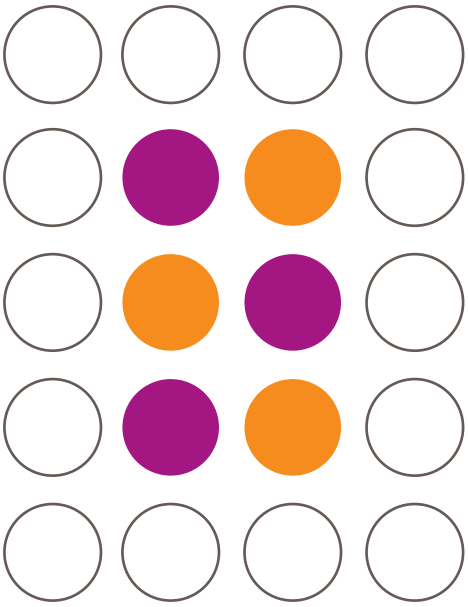
Transportation options for this type of center include freeway and freight rail connections, and regional (e.g., commuter rail, bus rapid transit) and local transit lines (e.g., light rail, bus).

Open spaces play an important role in the urban center, as a need exists for city parks, plazas, and linear parks to connect people at the street level and bring vitality to the urban core.

A mix of housing types are available for different needs and incomes, although typically housing is located in higher-density developments.

Sun Corridor centers

SUBURBAN TOWN



Examples: Kierland Commons (Phoenix), Westgate City Center (Glendale).

Pictured: Kierland Commons (Phoenix).

Target density minimums: 20 du/acre, 30 employees/acre.

Suburban town centers (e.g., downtowns or lifestyle/entertainment centers) are characterized by low- and mid-rise residential, office, and commercial buildings, including ground floor mixed-use development.

Suburban town centers cater to local demand for employment and services, and draw resources from immediate sub-regional areas.

Businesses are located closer together to reduce the cost of moving goods and services within centers and regions, making the region more efficient, more competitive, and more prosperous.

Transportation options typically include regional and local vehicular and transit opportunities, as well as bicycle and pedestrian linkages. Suburban town centers are generally proximate to freeway corridors and arterial linkages.

Open space is connected to the community, providing both cultural and biological value to its residents.

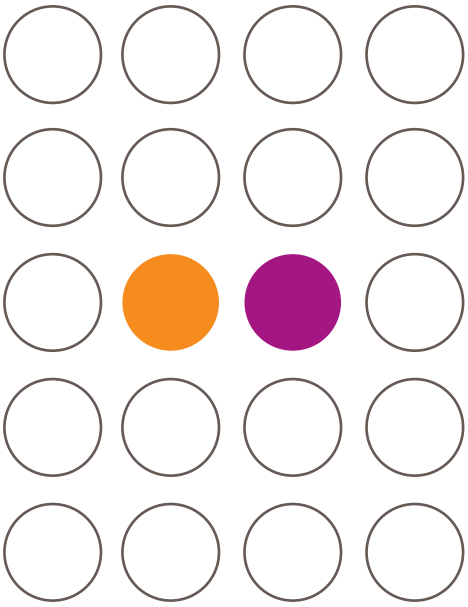
Development focuses primarily in and around established neighborhoods taking advantage of infill and redevelopment opportunities, as opposed to leapfrog development patterns.

In a polycentric development pattern, as preferable for the Sun Corridor, suburban town centers form important 'hubs' and 'links' for rural areas.

A mix of housing types are available for different needs and incomes, although typically housing is located in higher-density developments.

Sun Corridor centers

RURAL TOWN



Examples: Downtown Florence, Downtown Casa Grande.

Pictured: Downtown Florence.

Target density minimums: 10 du/acre, no employment minimum.

Rural centers are characterized by low-density development and are typically composed of a horizontal mix of uses with occasional (low-rise) vertical mixing of office or residential above limited retail/services.

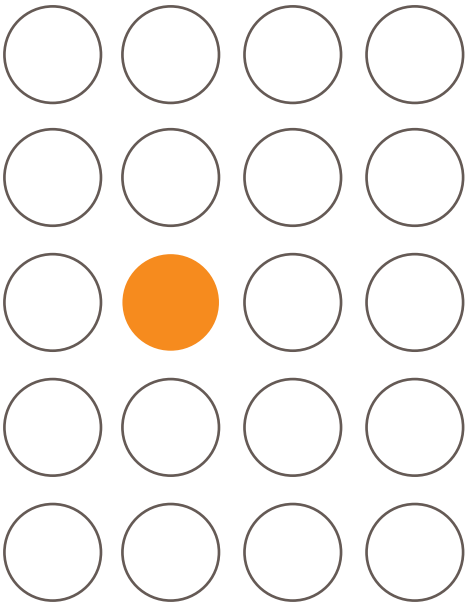
Rural heritage is preserved and enhanced.

Modern telecommunications technology and services support the development in the more inaccessible areas.

Transportation options include compact local road networks that include buses, bicycle, and pedestrian facilities. Regional connections to larger centers must also be a major component.

Sun Corridor centers

JOB/INDUSTRIAL



Examples: Papago Park Center (Phoenix), Rancho Vistoso Tech Center (Oro Valley), University of Arizona Science and Technology Park (Tucson).

Pictured: University of Arizona Science and Technology Park (above), Papago Park Center (below).

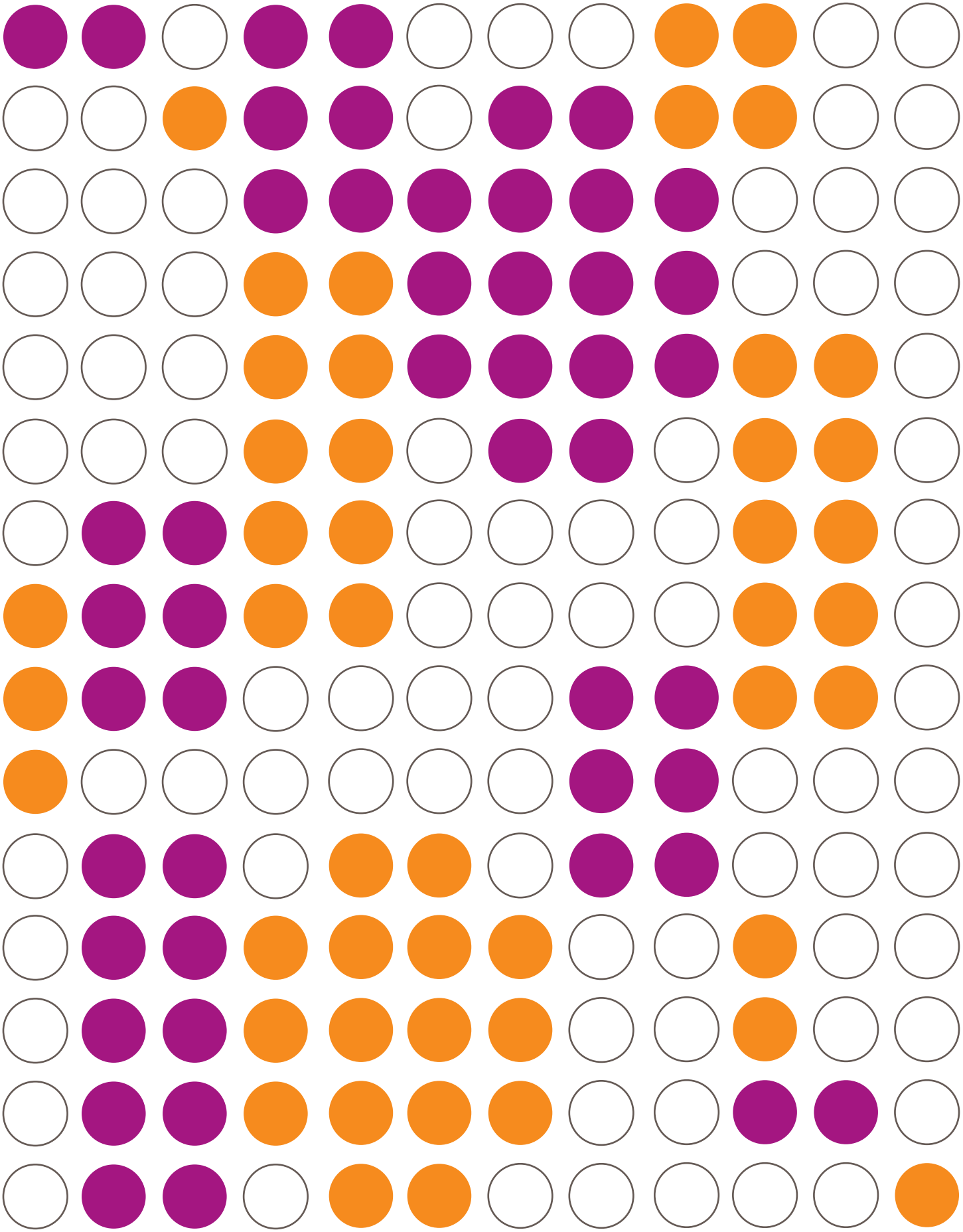
Target density minimums: (varies) 45 employees/acre, or depending on industry or nature of employment.

Job/industrial centers primarily draw employees from throughout the region. They are located where there is potential for a "special use" such as medical, hospitality, transportation logistics, manufacturing, etc. to broaden the center's appeal in the region.

Job/industrial centers are typically dominated by one specific industry.

The center may contain a small degree of retail and other amenities and services for the community housed in a variety of low- and mid-rise buildings, however, much of the employment base will be traveling to the activity center from another location.

Job/industrial centers are served by immediate freeway and freight rail access, regional transit service and potential local transit services.
A mix of housing is varied to meet all levels of income.



PRINCIPLE 03

BETTER JOBS NEAR MIXED HOUSING

The housing industry has long been an influential force in Arizona, both accommodating and encouraging expansive growth in many areas of the state. Among the areas most impacted by this growth have been Arizona's agricultural lands. These flat sections of agricultural land, with water rights and conveniently divided into mile squares, gave birth to large-scale, low-density, suburban development. Metropolitan Phoenix and Tucson are known for their large master planned communities, ranging in size from 1,000 acres to more than 35,000 acres. While housing can provide stability to neighborhoods, communities and families, it also represents a burden on Arizona households. In 2008, it was estimated that a minimum of 591,000 Arizona households were in financial distress paying more than 30 percent of their household income for housing costs.[21] A general rule of thumb is that no more than 28 to 30 percent of gross monthly income should go to housing-related debt.

The rapid growth of the region also contributed to a significant increase in vehicle miles traveled (VMT). After housing, transportation is the second greatest expense for the average American household (Figure 17). According to the American Automobile Association (AAA), it costs approximately $9,519 to drive a medium sedan 15,000 miles a year (excluding loan payments). In the Sun Corridor, most homes are highly-automobile dependent, a situation that contributes to continued ecological and environmental damage. Transportation and electricity generation are the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ENCOURAGE NEW RESIDENTIAL DEVELOPMENT IN AREAS THAT ARE WELL-SERVED BY PUBLIC TRANSIT.

state's principal greenhouse gas (GHG) emissions sources, with the transportation sector being the largest contributor. Transportation sources such as on-road diesel vehicles contributed 39 percent of Arizona's carbon emissions in 2002. Together, the combustion of fossil fuel in these two sectors accounts for nearly 80 percent of Arizona's gross GHG emissions. Figure 18 illustrates that areas with higher residential density have low average emissions per household, and when comparing with the CO_2 per acre per household auto-use, illustrates that location —efficiency reduces per household emissions.

With the Sun Corridor population projected to grow up to 11.5 million over the next 40 years, there is an opportunity to help lower the costs of transportation and reduce environmental impacts with integrated land use and transportation policies that encourage new residential development in areas that are well-served by public transit or near job centers. In many areas around the country, where the jobs are located near public transit, the combined costs of housing plus transportation are lower than in non-transit accessible neighborhoods. In addition to supporting transit, compact land use patterns help in lowering per-capita GHG levels. Multifamily units in an urban setting are usually smaller than single-family detached units in suburban areas and are, therefore, more thermally efficient. This could mean reducing energy consumption associated with heating and cooling by up to 50 percent per household. Also, more densely developed communities, are generally estimated to have substantially fewer vehicle miles traveled than the suburban and rural communities.

Figure 19 illustrates the relationship between the travel time to work and the location of employment for both the Phoenix and Tucson metropolitan areas, and are captured in portions of Pinal County to begin to create an understanding of employment access and travel time for the whole of the Sun Corridor.

Activity centers have long been recognized for concentration of economic activity, cultural, and residential uses that can form dynamic places that support a low-carbon environment. Described previously, activity centers are not created or meant to be equal in their makeup, offerings, and the demographics they attract. From an economic development perspective, the location and physical makeup can attract a certain industry, or more importantly, attract the talent necessary for a particular industry to thrive. Based on the economic sectors described as part of the previous chapter, one could develop a possible investment strategy around activity centers and the talent and human capital they attract. To explore a non-traditional way of looking at employment growth is to either move the jobs to the talent, or create the environment that will attract the talent. Using commute time typical of a particular talent pool, it would be logical to evaluate the living environments available within the commute-shed of that talent pool. For example, a 20-minute commute time is typical of the biotech or high-tech industry workforce. This workforce represents scientists, engineers, and technicians who tend to live in high quality-of-life communities that offer amenities and good education for their children while still affordable. Applying jobs to where they live, it would be an advantage to promote biotech and high-tech employment locations near high quality communities.

Figure 17
Housing costs vs. housing transportation costs, Phoenix and Tucson metropolitan areas.
Source: Center for Neighborhood Technology, Housing + Transportation Affordability Index, 2010.

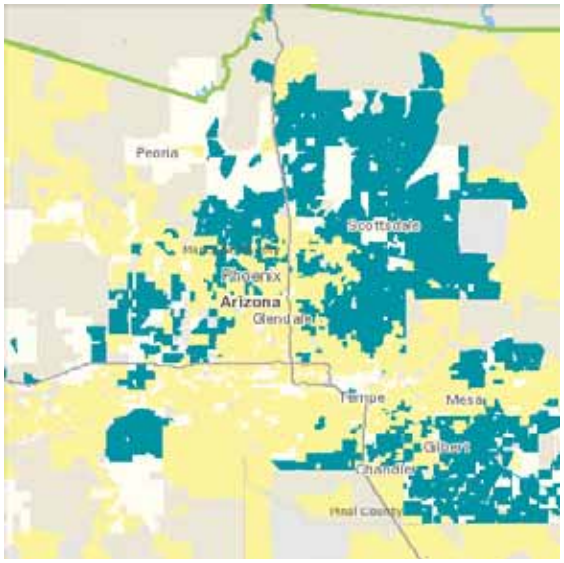
PHOENIX METROPOLITAN AREA

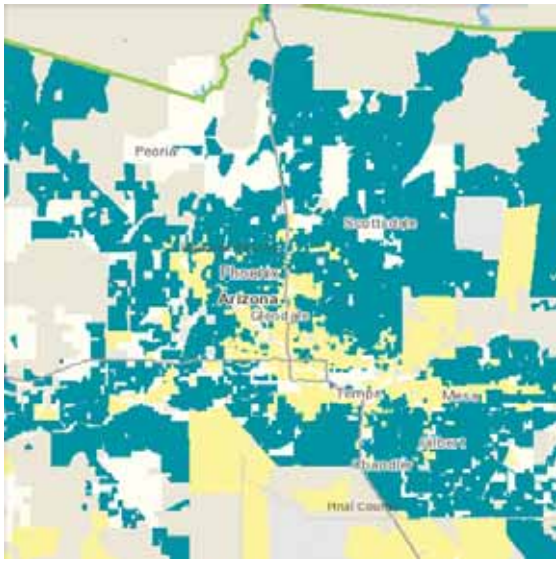
Housing costs - % income

- Data not available
- Less than 30%
- More than 30%

Housing and transportation costs - % income

- Data not available
- Less than 45%
- More than 45%





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TUCSON METROPOLITAN AREA

Housing costs - % income

- Data not available
- Less than 30%
- More than 30%

Housing and transportation costs - % income

- Data not available
- Less than 45%
- More than 45%

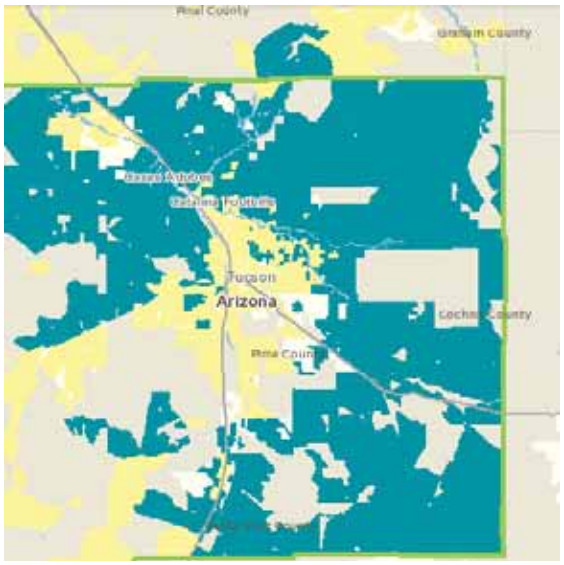

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Figure 18

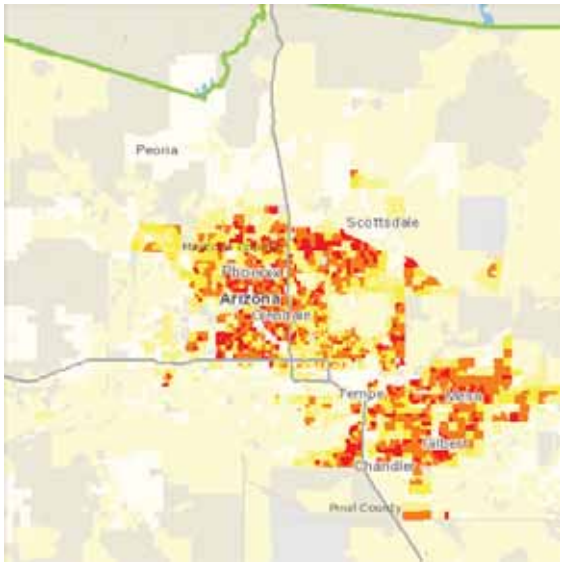
CO_2 per acre household auto use vs. CO_2 per household from household auto use, Phoenix and Tucson metropolitan areas.

Source: Center for Neighborhood Technology, Housing + Transportation Affordability Index, 2010.

PHOENIX METROPOLITAN AREA

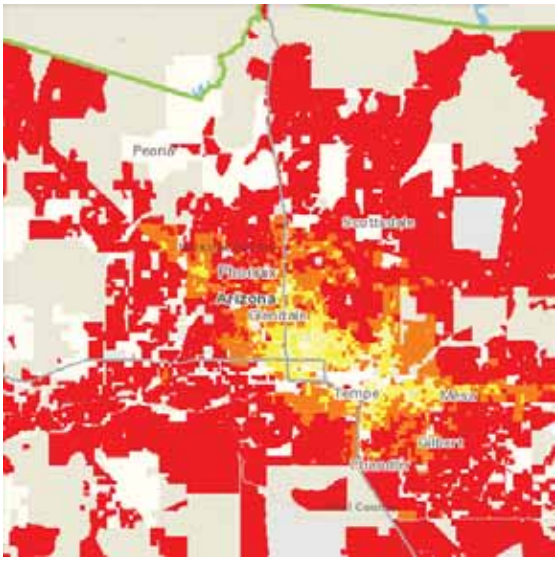
CO_2 per acre from household auto use

- Data not available
- Less than 6 metric tons/acre
- 6 to 14 metric tons/acre
- 14 to 20 metric tons/acre
- 20 to 30 metric tons/acre
- Greater than 30 metric tons/acre



CO_2 per household from household auto use

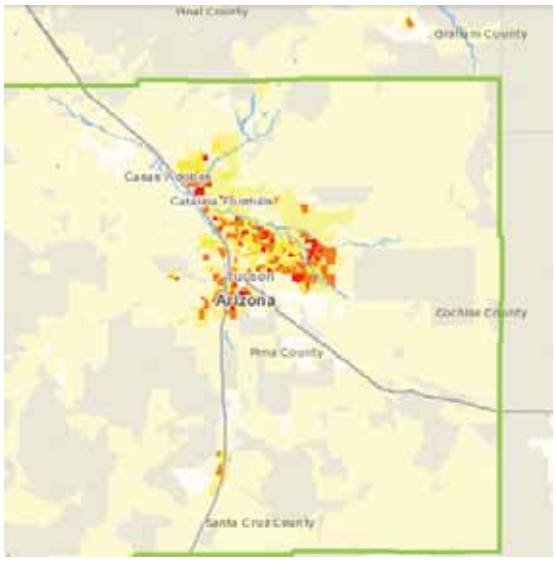
- Data not available
- Less than 3.3 metric tons/household
- 3.3 to 5.1 metric tons/household
- 5.1 to 6.5 metric tons/household
- 6.5 to 8.6 metric tons/household
- Greater than 8.6 metric tons/household



TUCSON METROPOLITAN AREA

CO_2 per acre from household auto use

- Data not available
- Less than 6 metric tons/acre
- 6 to 14 metric tons/acre
- 14 to 20 metric tons/acre
- 20 to 30 metric tons/acre
- Greater than 30 metric tons/acre



CO_2 per household from household auto use

- Data not available
- Less than 3.3 metric tons/household
- 3.3 to 5.1 metric tons/household
- 5.1 to 6.5 metric tons/household
- 6.5 to 8.6 metric tons/household
- Greater than 8.6 metric tons/household

Figure 19

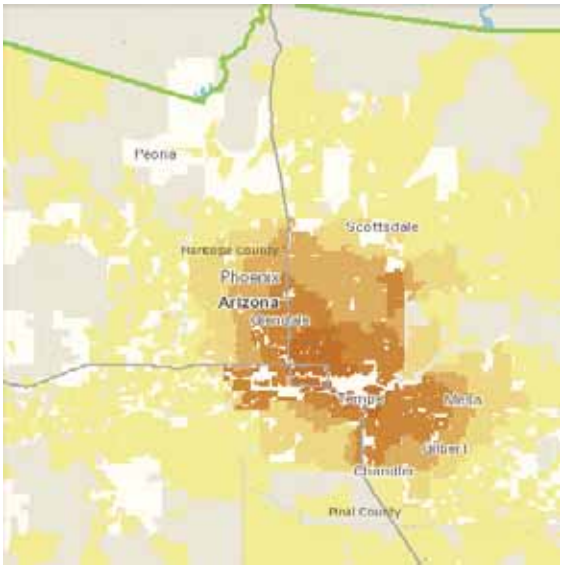
Employment access index vs. travel time to work, Phoenix and Tucson metropolitan areas.

Source: Center for Neighborhood Technology, Housing + Transportation Affordability Index, 2010.

PHOENIX METROPOLITAN AREA

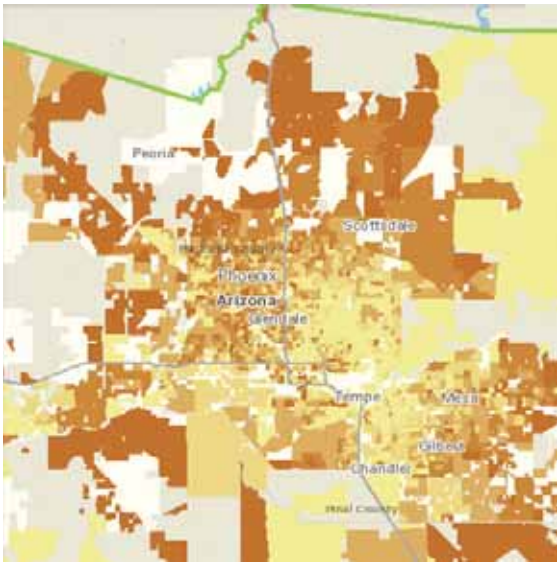
Employment access index

- Data not available
- Less than 12,000 jobs/mi²
- 12,000 to 22,000 jobs/mi²
- 22,000 to 35,000 jobs/mi²
- 35,000 to 62,000 jobs/mi²
- Greater than 62,000 jobs/mi²



Travel time to work

- Data not available
- Less than 22 minutes
- 22 to 25 minutes
- 25 to 29 minutes
- 29 to 33 minutes
- Greater than 33 minutes



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TUCSON METROPOLITAN AREA

Employment access index

- Data not available
- Less than 12,000 jobs/mi²
- 12,000 to 22,000 jobs/mi²
- 22,000 to 35,000 jobs/mi²
- 35,000 to 62,000 jobs/mi²
- Greater than 62,000 jobs/mi²

Travel time to work

- Data not available
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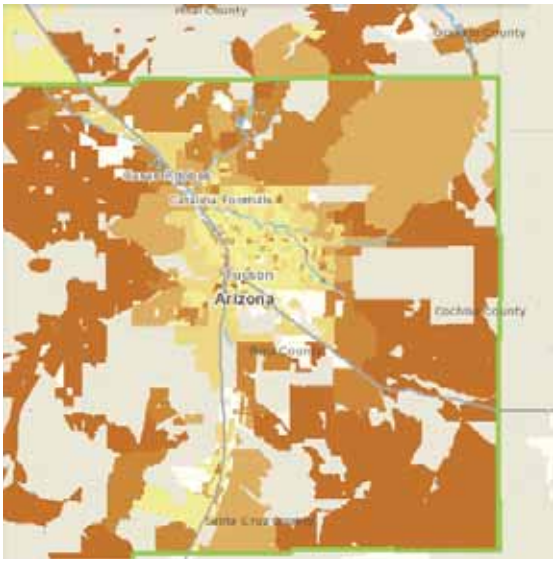
- 22 to 25 minutes
- 25 to 29 minutes
- 29 to 33 minutes
- Greater than 33 minutes



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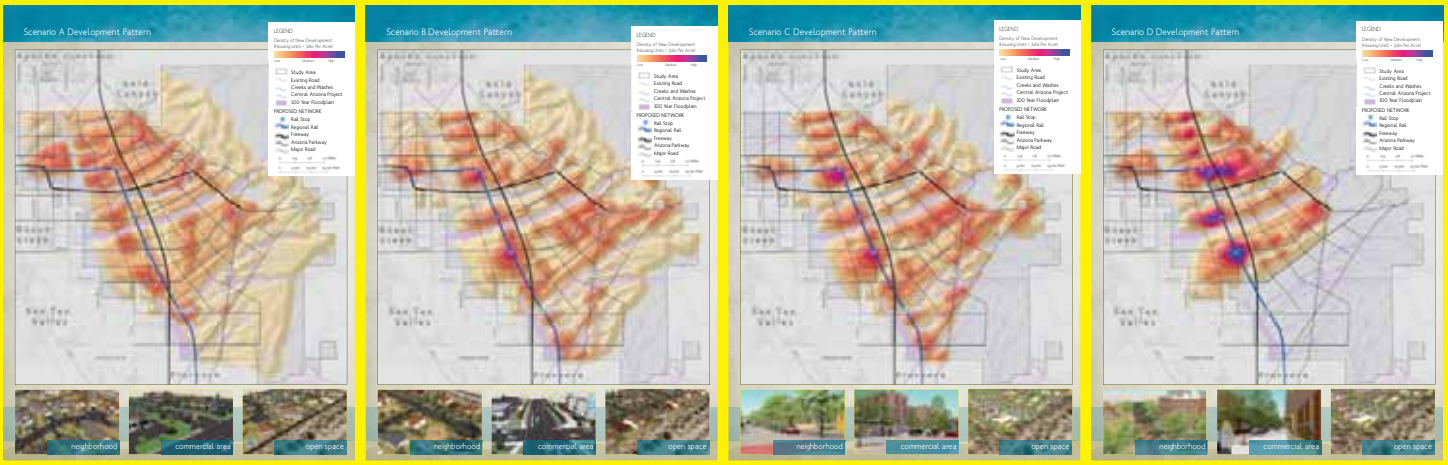
EITHER MOVE THE JOBS TO THE TALENT, OR CREATE THE ENVIRONMENT THAT WILL ATTRACT THE TALENT.

To advance the activity center concept, the Sun Corridor must identify the makeup of existing centers and evaluate them to make them more robust in the form of job offerings, living options, and cultural experiences, feeding on the very elements that attract the appropriate talent pool. In addition, the Sun Corridor is still expected to see substantial growth. By targeting emerging activity centers within the Sun Corridor that may offer the quality of life and amenities around which a job center could be built, infrastructure can be put in place to provide a foundation and foster future growth. For example, Oro Valley, located northeast of Tucson, is becoming an emerging research and development location for biotechnology and pharmaceuticals due to its proximity to a potential talent pool from the University of Arizona, access to transportation and telecommunications infrastructure, and high quality of life offered in an environmentally-attractive location.

Another example of an emerging Sun Corridor economic sector is the transportation logistics industry and related manufacturing. This industry typically does not require a highly-skilled and highly-educated workforce. It also is not conducive to urban locations. This industry is driven by substantial available land and access to multiple high-capacity shipping and transportation facilities. Typically, the workforce suffers from lower-wage jobs while absorbing high transportation costs and long commutes. However, as with other workforce groups, those employers in the transportation and logistics manufacturing industry are equally interested in reducing commute times. A robust transportation system and additional housing options become important aspects of this typically undeserved centers element. Opportunities to increase the strength of activity centers, and therefore employment attraction, exist in identifying the economic drivers that align with the industry and pairing them with workforce and amenities that promote that particular industry. According to research of fifteen regions conducted by Robert Charles Lesser & Company, there is a recurring pattern that shows 30 to 40 percent of regional employment is located in defined activity centers; the majority of higher-paying, basic industry jobs locate in activity centers; the number of region's cores correlate to total employment; and new cores emerge around transportation infrastructure. With an average U.S. commute time of 100 hours a year, low commute times is an amenity preferred by the majority of residents.

LEARNING FROM...
SUPERSTITION VISTAS PLANNING EFFORTS



Source: Superstition Vistas Scenario Report, 2010.

Superstition Vistas is an approximate 275-square mile tract of undeveloped State Trust Land, located in northern Pinal County. Master planning efforts are currently underway to provide a vision for coordinated growth of this area, which could result in a series of new communities over the next several decades. The goal is to create an exemplary example of a sustainable desert community armed for the 21st century; a community where long- term economic and social value are based on an ongoing commitment to sustainability and preservation of the desert ecosystem. Planning for this land focuses on a number of sustainable principles, including a balanced development pattern, water conservation, energy-efficient buildings, and integrated land use and transportation systems, and also seeks to build an economy where people of all incomes and backgrounds can afford to live, work, and play. The proposed development patterns all focus around activity center growth—concentrating and clustering compatible developments together, forming a polycentric economy.

A series of scenarios were developed and evaluated against each other, proposing different intensities of development and overall land development patterns. For each scenario, factors such as economic development potential, housing mix and densities, job development, multimodal transportation options, and environmental impacts were compared. At the heart of the plan is an environmental framework that protects cultural heritage sites and natural resources—promoting open space and conservation of washes and habitat areas, and concentrating development in suitable areas.

A goal of the Superstition Vistas plan was to achieve a balanced job to housing ratio. A ratio of 1.0 notes an equal balance of jobs to housing units. A number over 1.0 represents more jobs than housing; a number below 1.0 represents fewer jobs than housing units. In metropolitan Phoenix, the average is 1.5, in metropolitan Tucson, it is 1.2. Understanding that the large population in Pinal County will likely draw jobs from within the county, as well as both metropolitan Phoenix and Tucson, their updated comprehensive plan strives for a balance of 0.5, which will improve it from its current ratio of 0.1.

The planning scenarios demonstrated how different development patterns can sustainably meet the housing needs of a wide range of population in the coming decades, including housing of different sizes, for all income levels, and for people of different ages. These scenarios also tested the argument that successful cities have quality jobs that are available and housing nearby for the employees to affordably live in, as well as amenities and services nearby. Although located in Pinal County, the current workforce attraction of Superstition Vistas is the East Valley of metropolitan Phoenix. Therefore, to understand the projected housing need for Superstition Vistas, the future housing need for the entire Phoenix metropolitan area was modeled, based on current preferences, with some adjustments based on expected demographic shifts. Next, it was assumed that Superstition Vistas could accommodate all ranges of the metropolitan region's housing needs, based on assumptions of age, income, and current housing preferences. For example, Scenario A closely resembled the type of housing development that exists today, only about 20 percent higher density than in Phoenix, and not necessarily placed in proximity to employment. There is limited multifamily apartments and condos, and no mixed use development. On the other end in Scenario D, multifamily housing comprises the majority of the housing stock (55 percent), with many mixed-use areas. Single-family homes are placed on small lots. All levels of housing are clustered around activity centers.

PRINCIPLE 04

BETTER REGIONAL + COMMUNITY MOBILITY

Transportation planning in Arizona has historically focused on robust roadway networks. While this is still important, demographics reflect an aging population and one with differing values, placing much higher priority on offering transportation options for the myriad of public mobility needs.

Pinal County completed the *Regionally Significant Routes for Safety & Mobility Plan* (RSRSM), a study of transportation needs in the county, aimed at developing a network that provides a high level of service for automobiles and transit, access management, safety, connectivity between urban areas and major activity centers, and continuity across county boundaries. This was coordinated with similar planning efforts occurring in both Maricopa and Pima counties, including a series of coordinated framework studies in Maricopa County and Pima County's newly updated *Regional Transportation Plan* (RTP).

Within Maricopa County, MAG has completed the *I-10 Hassayampa Valley Transportation Framework Study*, the *I-8 and I-10 Hidden Valley Transportation Framework Study*, the *Transit Framework Study*, and the *Commuter Rail Strategic Plan* that establish a framework for future transportation planning to reflect the forecasted population. In conjunction with planning conducted by ADOT, Valley Metro/RPTA, and METRO Rail, and the Maricopa County Department of Transportation, an interconnected network of local, regional, and high-capacity roadways are planned, along with bus service, light rail, and future commuter rail. All of these elements will support the upcoming update of MAG's RTP.

Within Pima County, PAG has just finalized their updated RTP, which lays out a comprehensive plan for roadway, transit, and bicycle/pedestrian corridor planning – going a step above and beyond typical transportation plans, to link the implications of transportation planning with land use, economic development, and the environment. Like Maricopa County, they have preliminary corridors outlined for a regional commuter rail system. In fall 2010, ADOT will embark on a new study to preliminarily define alternatives for intercity rail between Phoenix and Tucson. This multimodal transportation "spine" will connect communities within the Sun Corridor, providing an alternative travel option,

ARIZONA HAS HISTORICALLY FOCUSED ON ROBUST ROADWAY NETWORKS; NOW IT HAS A MYRIAD OF PUBLIC MOBILITY NEEDS.

and a corridor carefully linked to local and regional transit systems.

All of these plans provide a proactive approach to addressing regional concerns such as demographic changes, air quality issues, climate change, workforce movement, environmental impact, freight travel, and economic competitiveness through integrated multimodal solutions, with a strong emphasis on transit options, including intercity rail and potential high-speed rail through the Sun Corridor with local mobility linkages. These ideas were all pulled together in the *Statewide Transportation Planning Framework Program*, prepared by ADOT, to create a 40-year vision for the future of transportation in Arizona, accepted by the State Transportation Board (STB) in January 2010 (Figure 20).

In addition to achieving transportation outcomes, the final recommended scenario of the statewide program:

- Links transportation to smart growth planning principles.
- Addresses climate change through focused growth and travel demand reduction.
- Links activity centers.
- Maximizes environmental sensitivity through use of existing corridors.
- Promotes economic diversification and coordination of land use with transportation.
- Includes multimodal transportation options, including commuter, intercity and potentially high-speed rail options.
- Promotes the use of alternative financing options for transportation investments.

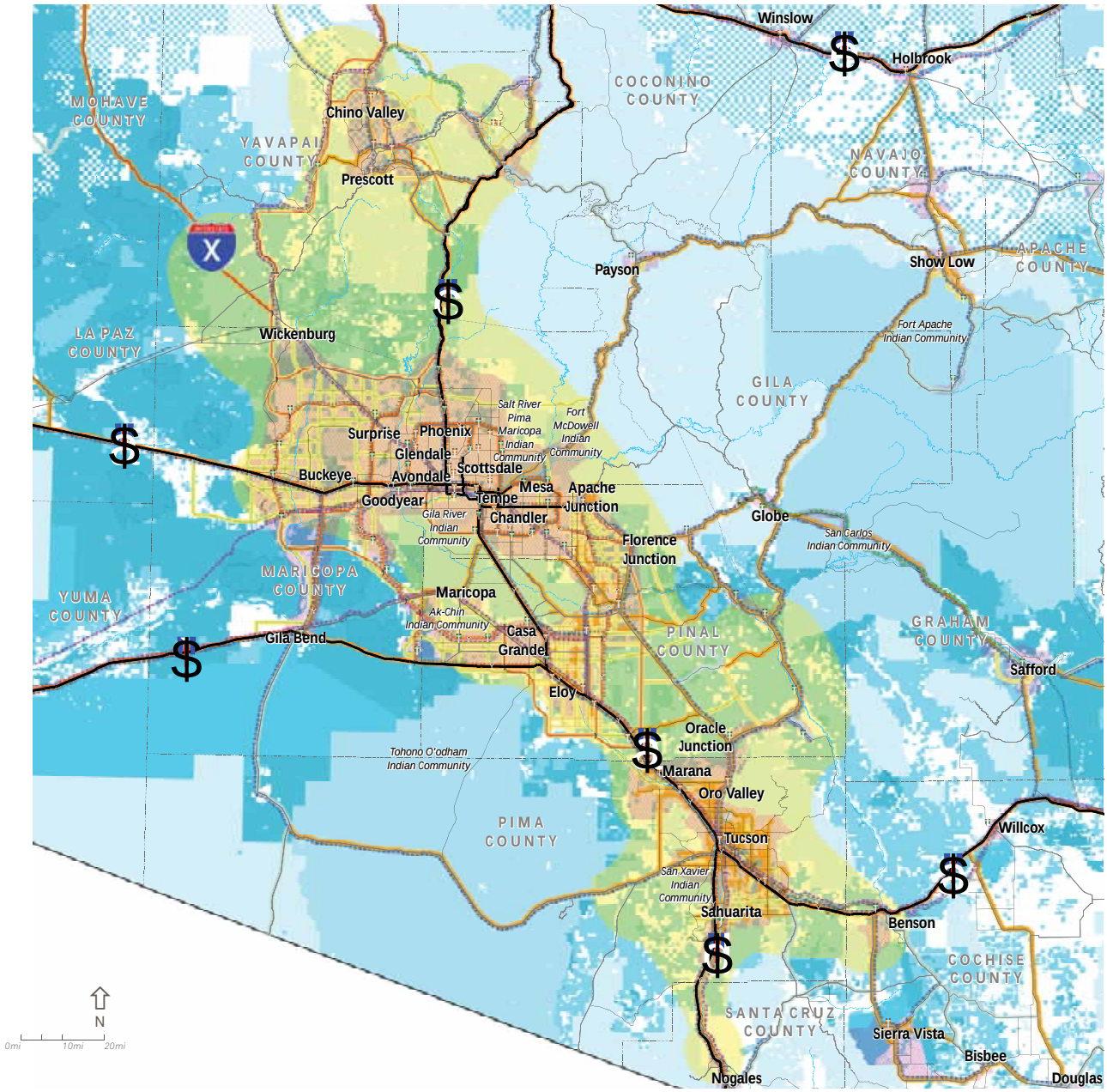
In addition to personal mobility, the Sun Corridor's transportation network also needs to support a growing and diversifying economy by providing intermodal access and intercontinental efficiency. While for two of the proposed economic engines discussed earlier in this report: (1) air transportation and (2) transportation logistics and warehousing, success is directly linked to the transportation facilities themselves, many of the other proposed economic engines for the region also depend upon a reliable multimodal transportation system to function. These include computer and electronic component manufacturing, aerospace and defense, renewable energy, niche agriculture, bioscience and related pharmaceutical services that require goods to be imported/exported and/or the transfer of intellectual talent.

Such a system needs connectivity of multiple modes—air, highway, and rail. A multimodal transportation system in place increases economic development opportunities for freight-related industries; improves the economic competitiveness of the state by helping to attract jobs, skilled workers, and visitors; and reinforces the Sun Corridor as a key economic activity center at the national level. Additionally, because population and employment locations depend upon one another, a transportation corridor developed primarily for freight purposes will likely influence employment center siting, which will eventually generate a population base. The interconnected nature of these factors brings the transportation network's purpose back to passenger travel as well, for which transit station locations can serve as potential hubs in community

Figure 20

Statewide Transportation Planning Framework.

Source: Arizona Department of Transportation, 2010



Facility type*

- Freeway
- State highway
- Arizona parkway
- Principal arterial
- Potential new Interstate

Improvement type

- Conceptual new roadway
- Widen/upgrade roadway
- Improved roadway
  Shoulders, passing lanes, drainage, etc.
- New system traffic interchange

Transit network

- Express bus
- Intercity bus
- Passenger rail
- Local transit service
  Fixed route, community circulator, dial-a-ride service
- Major transit center
- Minor transit center
- High occupancy vehicle (HOV) lane

Existing features

- Freight railroad
- Tourist railroad
- River
- Other road
- Framework study boundary
- County boundary
- Wilderness area
- Sun Corridor Megaregion

Land ownership

- BLM
- State
- Parks
- Military
- Tribal land
- Private

**Only regionally significant corridors have been illustrated.*

THE CHALLENGE: TO DEVELOP AN INTER-CONNECTED MULTIMODAL SYSTEM THAT SUPPORTS INDIVIDUAL JURISDICTIONS AND THE COHESIVE WHOLE.

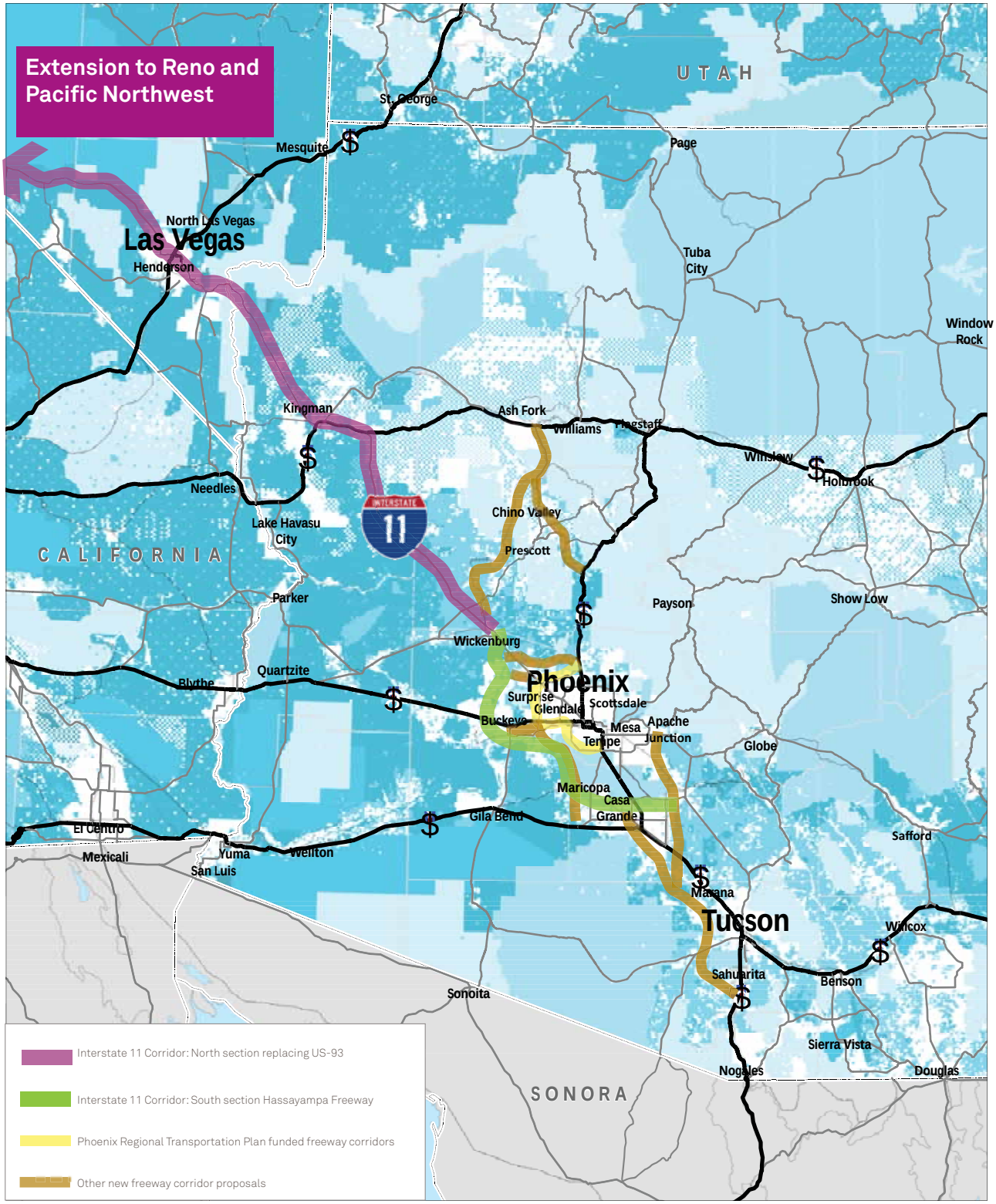
economic activity centers – fulfilling a smart development pattern which clusters sources of employment, population, and other services and amenities.

So what does this recipe for a successful and sustainable multimodal transportation system boil down to? It needs to include local roads, pedestrian pathways, and bicycle lanes to get around the neighborhood and for the children to get to school; it needs higher-capacity roads to supplement a regional freeway system so people can get to work; it needs transit options (bus, light rail, commuter rail) as alternate transport options for work and play; it needs interstate highways, airports, and railroads for intercontinental passenger and freight travel; it needs to include safe and efficient border crossings for international movement; and lastly, because Arizona and the Sun Corridor are noted for the natural environment, it needs to respect wildlife habitats/corridors and natural resource features.

"Interstate 11," as it is preliminarily being named, is a new corridor (highway, and potentially rail) that was first planned in the MAG *Hassayampa Valley Framework Study* as a ring road, or bypass, around the western edge of metropolitan Phoenix (Figure 21). It was then extended into Pinal County through the MAG *I-8 and I-10 Hidden Valley Framework Study* to intersect with a proposed bypass to the east, a potential new regional airport, and future intercity rail corridor. An extension via I-19 could potentially connect south to Tucson and Nogales to reach existing and future deep-water ports in Mexico, and extended north to connect with Las Vegas, Reno, and eventually Canada through Oregon and Washington. It offers a prime opportunity for potential right-of-way sharing for high-speed rail in the future. It can serve as a major north-south trade corridor in the western United States. Its nature as a bypass allows for development of activity centers that are not suitable for central population centers (e.g., industrial, manufacturing, warehousing and distribution). Because it will bisect extensive natural lands, planning and design of I-11 will be required to employ a context-sensitive process to avoid environmental impacts, and to incorporate mitigation strategies such as wildlife over and/or under passes, as needed.

Because at least half of the transportation infrastructure needed in 2050 has yet to be built, I-11 will not be the only new transportation facility to be contemplated, planned, and constructed in the region. The challenge for the Sun Corridor will be to develop an interconnected multimodal transportation system that supports community development goals within the individual jurisdictions, while providing a cohesive framework for the region and state. Transportation facilities have the capability of expanding opportunities for future development, but also for centering redevelopment in chosen areas. To move toward a smarter development pattern, deliberate, hard choices will need to be made on access management to minimize new freeway and rail corridors from opening up environmentally-sensitive lands to new development. Transportation networks within activity centers need to be linked to other activity centers. The build-out of a robust public transit and rail system within the Sun Corridor should be coordinated early on to reduce duplicity in sharing planning and technology opportunities. The megaregion as a whole needs to move as one.

Figure 21
Preliminary Interstate 11 corridor through the Sun Corridor
Source: Maricopa Association of Governments, 2010.



PRINCIPLE 05

WIRED, INFORMED COMMUNITIES

Just as community planning integrates land use, transportation infrastructure, and economic development into the urban design of a city or region to optimize the conveyance of people and products, regional and municipal governments, urban planners, architects, engineers, and community residents now must include the Internet superhighway to provide for virtual goods and services at the onset of planning regions, cities, and neighborhoods in order to achieve economic, environmental and social sustainability goals.

Society has now moved into the third phase of the Internet. The first phase was developed for business applications; the second became a people- and consumer-oriented environment for online shopping and social networking; and the third phase is now where 'all things' are being connected into the Internet. This third phase incorporates communication devices—including but not limited to mobile phones, two-way radios, and video—for transportation logistics, health care, and educational solutions, to brick and mortar building systems, and even down to household lamps and appliances, all integrated with the Smart Grid that requires the Internet to operate.

Good urban planning and design can provide the linkage between various components of the built environment, along with community accessibility to live, work, learn, and play functions on a local, national, and global basis. While traditional planning of integrated land use with transportation can significantly alleviate Arizona's dependency on the combustion of fossil fuel contributing to nearly 80 percent of Arizona's gross GHG emissions, it is now possible to exceed the capability traditional methods can achieve by integrating Internet-based technology in to the fabric of the community. Neither a great community plan nor an information and communication technology plan alone can equal the return on investment a well-crafted model combining the two can provide.

Examples of the components within the Sun Corridor that can benefit from an integrated approach include:

- Transportation
- The Built Environment
- Smart Grid
- Government
- Healthcare
- Education
- Safety and Security

INCLUDE THE INTERNET SUPER-HIGHWAY AT THE ONSET OF PLANNING IN ORDER TO ACHIEVE SUSTAINABLE GOALS.

Transportation

Currently, residents are generally comfortable in their automobile commuting to work, school and recreation. However, as the population grows and urban areas expand and densify, the integration of public transportation systems creates more affordable means of mobility, often more efficient utilization of existing infrastructure investments, and a reduction in GHG emissions from transportation sources. To attract riders to alternative modes, the trip must be efficient, affordable, convenient, and safe. What can be done to incentivize the public to use mass transit?

- *Productive Time:* By incorporating broadband access on buses and trains, riders can increase their productive time by connecting to the web to access email, business or school applications, collaborative solutions including Voice over Internet Protocol (VoIP) for phone calls, collaborative tools including on-line conferencing with video, as well as social media sites for business and personal use.

- *Intelligent Transportation Corridors:* Intelligent information networks connect disparate systems to improve the flow of traffic, reduce and minimize roadside incidents, and provide a central view of the highway system, including road conditions and transit information. Such systems may include traffic management solutions for roadside data collection, management, and surveillance – allowing city, state, and county DOTs to share information on a real-time basis with each other, with incident response agencies, and with other government agencies. Currently, ADOT, Maricopa County, and Pima County operate such systems within the Phoenix and Tucson metropolitan areas, which could be expanded Sun Corridor-wide. From a highway perspective, variable messaging signs can provide travelers warning of traffic conditions for many miles ahead, providing alternative options in emergency incident or major congestion situations. From a transit perspective, information systems can provide real time arrival/departure details, including information on connections to other routes and/or modes, as well as parking availability at park-and-ride locations. Additionally, more efficient transit trips can be made with such elements as signal priority treatments – allowing the signals to change in anticipation of a street-running transit vehicle (e.g., light rail, streetcar, bus rapid transit) to cause less required stops.

- *Improved Travel Experience:* The United States lags behind other countries around the globe in the use of mobile phones. Intermodal mobile ticketing solutions can use mobile phone global positioning system (GPS) location data for transit trip planning and management, creating destination routing information to calculate travel time and fare, as well as purchase of the ticket via a point of sale (POS) transaction with their phone. Throughout the trip, passengers can be provided with location-based information about the sites and neighborhood features nearby, including historical and travel guides, upcoming events, and community offerings. Additionally, such mobile phone

technology does not apply simply to mass transit, but is also a great tool in the emerging networks of car and bicycle sharing programs. By logging onto the Internet via a mobile phone or home computer, individuals can locate a car share program vehicle, check availability, make a reservation, gain access to the vehicle, and drive away – creating an efficient transportation choice when other options are not available, and also reducing the need for personal vehicle ownership.

The Built Environment

Planners, architects, engineers, developers, owners, operators, and regulatory agencies play a critical role in the design of new and revitalized communities and their overall consumption of energy, water, and fossil fuels, as well as the generation of GHGs.

According to the World Business Council for Sustainable Development (WBCSD), buildings are one of the largest end users of energy accounting for 25 to 40 percent of the all energy demand. Globally, carbon could be reduced by 715 million tons a year by improving the energy efficiency in buildings and appliances.

Intelligent building design can go a long in way in reducing the annual energy consumption in a city. Such design elements include optimizing sun orientation, harvesting daylight, shading south facing walls, and using energy-efficient construction materials and techniques (e.g., air flow, heat exchange, etc.). These and other design elements have been integrated in the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) green building program for neighborhoods and buildings—providing a framework and guide for maximizing the efficiency of the built environment.

From a technology perspective, innovative technology-based products are available to monitor and control a wide variety of building and grounds systems, which can be particularly important for the Sun Corridor's demanding desert environment. Individual pieces of equipment within building systems such as lights, electrical receptacles, elevators, residential and commercial appliances, motorized window coverings, video surveillance cameras, utility smart meters, landscape irrigation, fire and alarm systems, and many other devices are now being connected to the Internet via embedded microchips, each having a unique identification code that can be monitored and controlled securely from anywhere on the globe with desktop computers or handheld devices such as mobile phones. Studies by Forrester Research and Cisco Systems anticipate over one trillion devices will be connected to the Internet by 2013. By monitoring and controlling these devices, owners, operators, and tenants can lower motorized window coverings to minimize heat gain in warm months and heat loss in cold months, offsetting demand on the building's heating, ventilation and air conditioning system, which is the largest consumer of electricity and natural gas in the built environment.

Converging building systems through the Internet enables owners and operators to optimize operating costs by consolidating maintenance, security and IT functions into a single command center for multiple sites and buildings. Additional solutions include:

- Monitoring and controlling landscape zones with moisture sensors allowing for spot watering.

- Monitoring individual pieces of operating equipment provides early notification when operating limits are exceeded, allowing maintenance workers to plan downtime and repairs, increasing the asset's lifecycle value, and minimizing utility costs.

- Converged building systems can provide credits toward LEED certification, specifically in the indoor air quality, materials, innovation, site, energy, and water categories.

Smart Grid

Utility companies—in conjunction with government agencies, private sector industry, and non-profit organizations—are collaborating to develop a smart electrical grid that integrates information transmitted securely via the Internet with the electrical infrastructure from power generation to transmission to the consumer.

Smart meters are currently being installed throughout the United States are designed to provide utility companies, building owners, operators, and tenants with near real-time energy consumption and billable rates, allowing consumers to make informed operating and financial decisions about their energy, natural gas, and water use. This smart grid has the potential to not only provide such information regarding utilities, but could provide an intelligent infrastructure grid for the transmission of other information.

Healthcare and Education

Healthcare administration and delivery is also using the Internet as a platform from which industry-specific solutions are created, evolving at a rapid pace in the United States and around the globe. For example, using bi-directional high definition video, patients are now beginning to meet their healthcare provider from remote locations (e.g., their home, neighborhood clinic, pharmacy), minimizing the need to travel within a city, across a state, or even internationally to obtain the healthcare specialists they need.

This technology transcends many industries. From an education point of view, the University of Colorado at Colorado Springs (UCCS) and Cisco Systems have implemented distance learning solutions using bi-directional high definition video solutions to deliver live curriculums to students in remote areas who were previously required to drive hundreds of miles to campus to attend classes. New and revitalized Sun Corridor activity centers could reduce vehicular travel by connecting centers, business districts, and outlying areas together for education and healthcare needs.

Safety and Security

Recent developments in technology for emergency services, first responders, and law enforcement are also reshaping the urban landscape and community infrastructure. High definition digital video surveillance technology with high capacity computer hard drives can be employed by local government agencies, as well as building owners and operators to increase safety and security. High definition digital video provides a significant advancement

BROADBAND ACCESS IS NOW THE FOURTH CORE UTILITY, AFTER WATER, NATURAL GAS AND ELECTRICITY.

and numerous advantages over traditional analog cameras that use video tape storage. The use of GPS also provides safety and security industries with a wide variety of aerial photography and mapping to help address location-specific issues and derive realistic, context-specific solutions.

A looming issue for the Sun Corridor also includes international border safety and security. The abovementioned video surveillance technology, combined with container x-ray scanning and real time cargo processing and tracking abilities can enhance monitoring of people and goods passing through the border, as well as reduce commute times to increase crossing efficiency, allowing larger volumes of daily crossings and less wait times.

Collaboration Technology

Collaborative technologies for work and social interaction have been in use for several years, becoming an essential workplace tool responsible for significant reductions in business travel – allowing more people to work from anywhere, anytime. High definition bi-directional video conferencing connects multiple participants located throughout the world as if they were all in the same room, simultaneously viewing and collaborating on the same project application such as word documents, spreadsheets, engineering and architectural drawings, legal documents, or advertising graphics. These face-to-face sessions are highly effective in productivity and eliminating travel related costs, as well as GHG emissions. Virtual private networks (VPNs) allow employees to access all the software and documents at a home office while they are away (e.g., traveling, telecommuting), increasing productivity and daily efficiency.

Fiber to the Premise

Broadband access is now being referred to as the fourth core utility after water, natural gas, and electricity. This will be a primary requirement for Sun Corridor activity centers to attract and retain business, and allow those businesses to communicate efficiently and affordably on a global basis. Broadband access is required to take advantage of the aforementioned technologies and is commonly known as Fiber to the Premise (FTTP). Several cities have undertaken information and communication technology studies and plan to roll out FTTP. All new and revitalized activity centers within the Sun Corridor should be planned to incorporate FTTP technology to both commercial and residential land uses to provide the most up-to-date communications technology capability today, as well as to provide the framework connectivity for communications, data processing, and information technologies yet to be invented and commercialized in the future.

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As the region searches for ways to lead its future growth, it must take a careful look at its assets and challenges. The future cannot follow the current growth patterns and evolve into a sustainable environment for new generations. Importance must be placed on creating a better mix of jobs and housing and better accessibility. The current development pattern creates long commutes to and from work, and trips become increasingly more difficult to make by means other than by automobiles, which means more expensive transportation costs, increase in air pollution, more land used for highways, and a drain on people's time and health.

Whereas, concentration of activity centers facilitates other modes of transportation, resulting in a more evenly distributed demand for transportation resources, reduction in carbon emissions, a decrease in congestion and economically more attractive communities for residents.

In order to meet the population growth, a more diversified mix of housing will need to be provided and located within accessible distances from employment areas.

Arizona jurisdictions have already started preparing for the growth by entitling tens of thousands of units. However, this growth has been planned in the traditional edge-type development pattern, continually expanding the urban fringes of the Sun Corridor. Therefore, cities and towns are being encouraged to lean towards more conservation, better land planning, and increased intergovernmental cooperation, because where future growth is located in the Sun Corridor will have a significant impact on the amount of land consumed and quality of the natural, and therefore built, environments. Encouraging infill and redevelopment and promoting more compact development patterns will allow more preservation of open space for recreation, wildlife habitats, and continued agricultural purposes. It will bring jobs and housing closer together. Arizona can remain a place known for its scenic beauty.

THE FUTURE CANNOT FOLLOW THE CURRENT GROWTH PATTERNS.

MEASURING THE SUN CORRIDOR'S SUSTAINABILITY PERFORMANCE:

This section presents a series of performance indicators that the JPAC, or other regional and local entities, could use to quantify the principles of sustainability discussed in this chapter and measure regional effectiveness in meeting objectives. Establishing a baseline for these indicators will allow measurement of change and progress in meeting sustainability goals over time. The indicators could also be used to calculate the amount of change needed in various measures in order to achieve goals based on projected growth models and scenarios.

The following tables present the indicators/metrics in broad categories, with subcategories to assist in organization. Actual measurements are presented in the indicator/metric column. The scale column indicates whether the indicators represent effects at local (neighborhood to city level), regional (county, corridor, or state level), or global-scale (national, continental or global) levels. Several indicators may be applied at a range of levels depending on the data sets selected to calculate them. Many indicators apply to more than one of the principles emphasized in this report, as indicated in the columns on the following pages.

In summary, the five sustainability principles are:

01
PRESERVE OPEN SPACE AND THE NATURAL ENVIRONMENT.

02
ENABLE DEVELOPMENT OF MULTI-USE ACTIVITY CENTERS COMPOSED OF LOCATION EFFICIENT LAND USES.

03
CREATE QUALITY JOB CENTERS PROXIMATE TO A RANGE OF HOUSING OPTIONS.

04
DEVELOP A MULTIMODAL TRANSPORTATION NETWORK FOR EFFICIENT COMMUNITY AND REGIONAL MOBILITY AND TO CREATE ECONOMIC OPPORTUNITY.

05
SHAPE COMMUNITY ENVIRONMENTS THROUGH INFORMATION AND COMMUNICATIONS TECHNOLOGY.

NATURAL ENVIRONMENT

GOAL	INDICATOR/METRIC	SCALE	SUSTAINABLE DEVELOPMENT PRINCIPLE				
			01 OPEN SPACE	02 ACTIVITY CENTERS	03 JOBS + HOUSING	04 MOBILITY	05 TECH.
PROTECT THE NATURAL ENVIRONMENT	Percent wildlife habitats protected	Regional	X				
	Percent change in local species requiring special protection	Regional	X				
	Percent change in riparian and wetland areas	Regional	X				
	Impact to federally designated natural resource areas	Regional, Global	X	X			
	Percent protected open space	Local, Regional	X	X			
USE WATER RESOURCES EFFICIENTLY	Percent water used for agriculture, urban and industrial uses	Local, Regional	X	X			X
	Percent effluent / graywater use	Local, Regional	X	X			X
	Per capita water usage	Local, Regional	X	X			X
IMPROVE AIR QUALITY	Days exceeding air quality standards	Regional	X			X	
	Per capita emissions of conventional air pollutants	Regional	X			X	X
	Percent increase in alternative fueled vehicles used	Local, Regional	X			X	
MAINTAIN ENVIRONMENTAL IDENTITY	Increase in positive response regarding changing landscape (e.g. tourism)	Local, Regional, Global	X				
	Percent cultural resource protected sites identified	Local, Regional, Global	X				

LAND USE AND URBAN FORM

GOAL	INDICATOR/METRIC	SCALE	SUSTAINABLE DEVELOPMENT PRINCIPLE				
			01 OPEN SPACE	02 ACTIVITY CENTERS	03 JOBS + HOUSING	04 MOBILITY	05 TECH.
CLUSTER DEVELOPMENT IN ACTIVITY CENTERS	Proximity of new development to existing development	Local, Regional	X	X			
	Proximity of development to both goods and services	Local, regional		X		X	
	Proximity of new development to existing infrastructure	Local, Regional		X		X	X
	Attractions within a threshold distance	Local, Regional		X	X	X	
	Percent increase in new construction on previously developed land	Local, Regional	X	X			
	Percent of population and employment located in activity centers	Local, Regional		X	X	X	
	Mobility access points to activity centers	Local, Regional		X		X	
INCREASE PROXIMITY TO JOBS	Average commuting travel time and distance	Local, Regional		X	X	X	
	Percent of jobs within a particular distance of transit or other transportation nodes	Local, Regional		X	X	X	
	Percent housing mix within threshold distance of employment centers	Local, Regional		X	X	X	
	Jobs to housing ratio	Regional		X	X		
	Percent low-income households within a 30-minute transit commute of a major employment center	Local, Regional		X	X	X	
FOSTER A SENSE OF COMMUNITY	Length of time residents remain in the region	Regional	X				
	Decrease in crime index	Local, Regional	X				
	Increase in positive responses regarding neighborhood	Regional	X				X
	Percent households with fiber optic connectivity to the premise available	Local			X		X

GOAL	INDICATOR/METRIC	SCALE	SUSTAINABLE DEVELOPMENT PRINCIPLE				
			01 OPEN SPACE	02 ACTIVITY CENTERS	03 JOBS + HOUSING	04 MOBILITY	05 TECH.
REDUCE THE NEGATIVE IMPACT OF THE BUILT ENVIRONMENT	Percent impervious surfaces	Regional	X	X		X	
	Heat island index	Regional	X	X			
	Number of LEED-certified buildings	Local, Regional	X				X
	Decrease in or maintenance of nighttime temperatures	Regional	X				
	Use of existing corridors for new infrastructure development	Regional	X	X		X	X
	Conversion of undeveloped land	Local, Regional	X				
	Loss of farmland, open space, habitat, forest land, historic structures and/or visual resources	Local, Regional	X	X			
	Carbon/energy performance of new and existing buildings	Local, Regional	X	X			X
INCREASE PUBLIC HEALTH	Community obesity index	Local, Regional		X		X	
	Number of designated bicycle routes	Local, Regional		X		X	
	Quality and quantity of sidewalks	Local, Regional		X		X	
	Percent school children who can safely walk and/or bike to school	Local, Regional		X		X	
	Density of public parks per activity center	Local, Regional	X	X			
	Number of community gardens and local agriculture	Local, Regional	X	X			
	Number of facilities available for public fitness (eg. sports fields, in-door malls for walking)	Local, Regional		X			

ECONOMIC GROWTH

GOAL	INDICATOR/METRIC	SCALE	SUSTAINABLE DEVELOPMENT PRINCIPLE				
			01 OPEN SPACE	02 ACTIVITY CENTERS	03 JOBS + HOUSING	04 MOBILITY	05 TECH.
FOSTER ECONOMIC TRADE	Travel time required to cross bi-national border with Mexico	Regional, Global				X	X
	Percent goods destined for Arizona (as opposed to pass through)	Regional, Global	X			X	
	Increase in public infrastructure investments	Regional, Global	X			X	
DIVERSIFY ECONOMIC BASE	Available venture capital	Regional			X		
	GDP growth	Regional, Global			X		
	Public spending in R+D	Regional			X		
	Number/type of new employers attracted to existing industry clusters	Regional		X	X		X
	Number of new industry clusters	Regional		X	X		
	Percent businesses/institutions with fiber optic connectivity available on premise	Local			X		X
ATTRACT TALENT AND HUMAN CAPITAL	Labor force quality	Regional		X	X		
	Brain drain/gain index	Regional		X	X		
	Housing affordability	Local, Regional		X	X	X	

MULTIMODAL MOBILITY

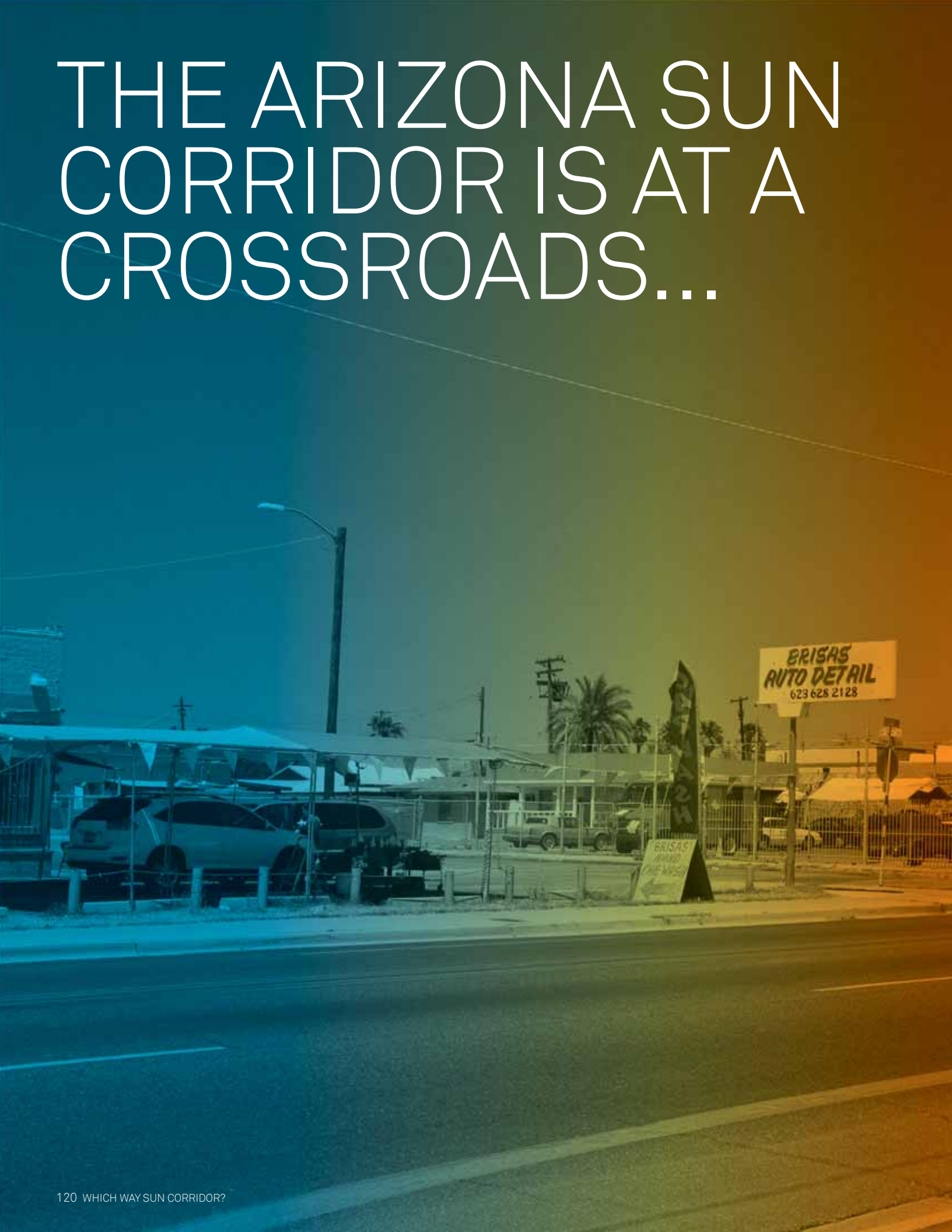
GOAL	INDICATOR/METRIC	SCALE	SUSTAINABLE DEVELOPMENT PRINCIPLE				
			01 OPEN SPACE	02 ACTIVITY CENTERS	03 JOBS + HOUSING	04 MOBILITY	05 TECH.
IMPROVE MULTIMODAL NETWORK CONNECTIVITY	Number of passenger terminals served by two or more transportation modes (including air) other than private vehicle access	Regional		X		X	
	Number of intersections of transportation facilities	Regional				X	
INCREASE MODAL CHOICE	Miles of high-capacity transit	Regional		X		X	
	Miles of local transit	Local, Regional		X		X	
	Mode split/portion of travel by non-auto	Local, Regional		X		X	
	Number of car sharing programs available	Local				X	X
PROMOTE TRANSPORT EFFICIENCY AND CONGESTION RELIEF	Vehicle miles traveled per day	Regional				X	X
	Vehicle hours traveled per day	Regional				X	X
	Percent vehicle miles of congestion per day	Regional				X	X
	Expansion of intelligent transport systems into Pinal County	Regional				X	X
	Number of high capacity transit routes with signal priority treatments	Regional				X	X
	Number of transit routes with real time arrival and departure information signs	Local, Regional				X	X
PROMOTE TRANSPORTATION COST EFFICIENCY	Portion of household expenditures devoted to transportation	Local, Regional		X		X	
	Percent increase of road and parking costs borne by user	Local, Regional		X		X	
IMPROVE FREIGHT ACCESS	Speed and affordability of freight and commercial transport	Regional, Global				X	
	Number of intermodal centers	Regional, Global				X	
	Miles of high-capacity roadways	Regional, Global				X	
	Miles of Class 1 railroads	Regional, Global				X	
	Tonnage of air transport cargo	Regional, Global				X	

ENERGY PRODUCTION/USE

GOAL	INDICATOR/METRIC	SCALE	SUSTAINABLE DEVELOPMENT PRINCIPLE				
			01 OPEN SPACE	02 ACTIVITY CENTERS	03 JOBS + HOUSING	04 MOBILITY	05 TECH.
INCREASE RENEWABLE ENERGY PRODUCTION AND USE AND ENERGY EFFICIENCY	Percent homes, businesses and institutions with solar photovoltaic energy systems	Local, Regional		X			
	Percent commercial energy generated from on-site renewable energy	Regional		X			
	Total energy resold to utility companies	Regional, Global		X			X
	Number of renewable energy manufacturing firms	Local, Regional		X	X		
	Acres of land devoted to solar farms	Regional, Global	X	X			
	Acres of land devoted to wind farms	Regional, Global	X	X			
	Number of plug-in facilities for electric and hybrid electric vehicles	Regional, Global		X		X	X
REDUCE GREENHOUSE GAS (GHG) EMISSIONS	GHG emissions per vehicle miles traveled	Local, Regional		X		X	
	Energy use for heating and cooling	Local, Regional					
	Percent homes, offices and businesses with smart meters	Local, Regional					X
	GHG emissions per residential dwelling unit by size	Local, Regional		X			X
	GHG emissions per business/institution by size	Local, Regional		X			X
	Energy use for heating and cooling	Local, Regional		X	X		X
RETROFIT EXISTING BUILDINGS TO REDUCE ENERGY CONSUMPTION	Percent commercial and industrial building stock retrofitted with energy saving components	Local, Regional		X			
	Energy use for heating and cooling	Local, Regional		X			X

4. WHICH WAY SUN CORRIDOR?

THE ARIZONA SUN CORRIDOR IS AT A CROSSROADS...

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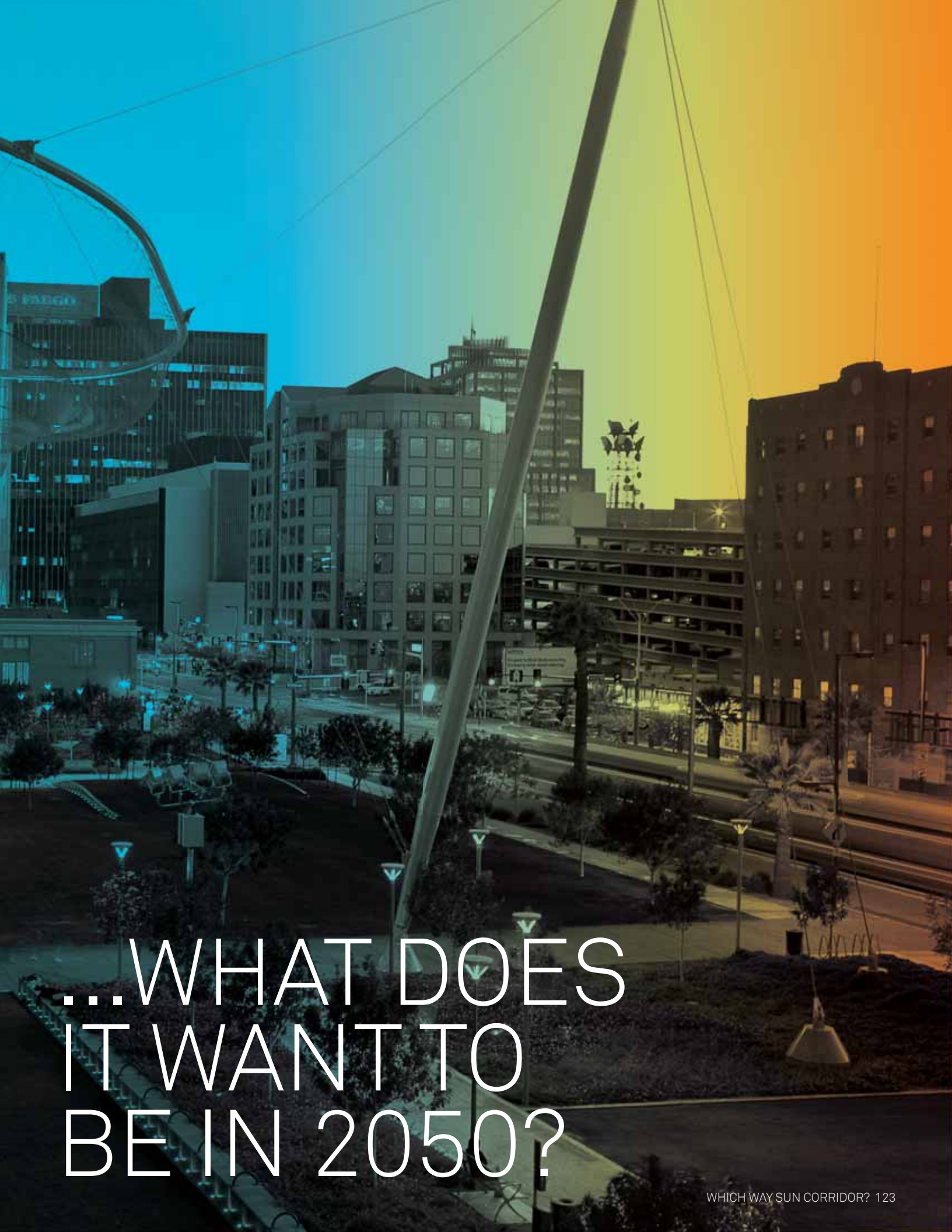
MOTORS



...WHAT DOES IT WANT TO BE IN 2050?

IDENTITY AND POSITIONING OF THE SUN CORRIDOR

Introduction

Over the past few years, based in large part on research spearheaded by the Regional Plan Association of New York, the Lincoln Institute for Land Policy, and the Metropolitan Institute at Virginia Tech, metropolitan areas around the United States have begun to think of themselves as part of networks of urban, suburban, and rural areas linked by physical infrastructure and proximity, common environmental concerns, and social, cultural, and economic relationships. It is assumed that these networks, known as "megaregions" or "megapolitans," could benefit from coordinated policies related to a wide range of issues, including economic development, sustainable development and infrastructure investments.[22]

The megaregion/megapolitan concept is not entirely new. In 1961, the geographer Jean Gottman described the growing integration of the Boston-Washington corridor, which he termed "Megalopolis." In Europe, the image of the "Blue Banana" stretching from London through the Netherlands, Belgium, and the Rhine region to Milan, has been used to describe the heart of economic activity on the continent. Europeans have begun developing spatial strategies based on the realization that the cities of Europe form polycentric networks, and the idea that strengthening these networks will result in increased economic prosperity. This approach attempts to address issues of growth, mobility, environmental protection, and economic development at multiple levels, some of which cross political boundaries.

Recent research in the United States has noted that the Boston-Washington corridor is no longer the only place where individual cities and their surrounding areas have started to form larger networks. Inspired in part by the European example, planners in the United States have begun to examine these megaregions and ask how thinking at this scale can lead to policies and investments that will strengthen economic competitiveness in an increasingly global world, enhance quality of life, and preserve natural resources.

The Sun Corridor is the term used to describe the emerging Arizona megaregion that stretches roughly from Prescott south through Phoenix and Tucson to the Mexican border at Nogales. The concept of the Sun Corridor and the benefits of policy and strategy coordination have been recognized by researchers and regional stakeholders alike. Recent studies have included the Morrison Institute's *Megapolitan: Arizona's Sun Corridor* (2008) and the Brookings Institution *Mountain Megas: America's Newest Metropolitan Places and a Federal Partnership to Help them Prosper* (2008), which includes the Sun Corridor as one of five megapolitan corridors in the Intermountain West.

This section will identify who lives in the Sun Corridor now, how the corridor relates to the rest of the world, and begin to outline what this means for the corridor as it develops over the next forty years. In addition, this section will show how other areas in the United States and around the world are addressing similar challenges.

WILL THE SUN CORRIDOR LOOK FOR A NEW PARADIGM?

SUN CORRIDOR MEGAREGION

The Sun Corridor is at a crossroads. Over the past 30 years, the Sun Corridor has been one of the fastest growing regions in the United States, as people were attracted to the abundant sunshine, spectacular physical setting, and high quality of life. The region's population, which has grown by over 150 percent since 1980, is expected to double between now and 2050. By 2040, according to estimates by the Brookings Institute, two-thirds of the housing units will have been built since 2005. In addition to housing, this growth will mean new offices, retail spaces, schools, parks, and infrastructure to supply water, energy, information, and facilitate movement within the region. In short, although both Tucson and Phoenix were incorporated as cities over a century ago in the late 1800s, more than half of the Sun Corridor that will exist at mid-century has yet to be built.

The plans and policies that Sun Corridor communities adopt now will have disproportionate influence on its mid-century reality. These represent a once-in-generation opportunity to shape urban and economic outcomes and the stakes are high. Once the building stock needed to accommodate the anticipated growth is in place, it is costly to retrofit or rebuild, often prohibitively so. Moreover, these investments become sunk costs, representing an irrevocable commitment of physical resources that cannot be re-used for an alternative purpose. This inertia extends beyond the physical to the social and civic as communities tend to continue doing things in ways that have served them well in the past, even if those ways will not necessarily serve them well in the future. As the Sun Corridor's economy emerges from the current slowdown, will the region continue to build facilities and infrastructure in the same way it has always done, or will the Sun Corridor

LEVERAGE NATURAL ADVANTAGES TO COMPETE FOR QUALITY JOBS AND WELL-EDUCATED YOUNG PEOPLE.

look for a new paradigm? Given the scale of the opportunity and the costs of getting it wrong, what does the Sun Corridor want to be in 2050?

Who Lives in the Sun Corridor?

The Sun Corridor's population mirrors the nation as a whole in terms of income, educational attainment, and age structure in many respects (Figures 22 and 23). This should come as no surprise, considering that it attracts people from across the country. However, it is important to note that differences do appear when the Sun Corridor is compared to the Front Range (a megaregion including the metropolitan areas of Cheyenne, Wyoming through Fort Collins, Denver, and Colorado Springs, Colorado), which is in many ways a peer and a competitor. In the Front Range over 25 percent of households earn over $100,000 a year (compared to 21 percent in the Sun Corridor), and 37 percent of residents, as a share of the total population, have a bachelor's degree or higher, compared to 27 percent in the Sun Corridor.

Arizona has long been one of the fastest growing states in the country, and much of this growth has been accommodated within the Sun Corridor, which is home to over 80 percent of the state's population. It should come as no surprise, then, that only 35 percent of Sun Corridor residents were born in the state of Arizona. The Sun Corridor is home to a highly mobile population – it is estimated that close to 21 percent of residents move in a given year, with 4 percent coming from out of state. By contrast, 60 percent of U.S. residents live in the state of their birth, and only 3 percent moved between states. Based on estimates from the American Community Survey (ACS), by far the greatest percentage of domestic migrants to Arizona, 29 percent, come from California. The next closest origin of new Arizona residents is Texas, although that state accounts for only 6 percent of new residents. In addition, 16 percent of Sun Corridor residents were born abroad, the majority in Latin America.

The large numbers of Californians moving into the Sun Corridor reinforce the ties between the states—the Phoenix and Tucson metropolitan areas have long been destinations for Californians seeking a higher quality of life and lower cost of living than can be found in their native state. However, as Arizona and the Sun Corridor continue to grow, it is important to take a view about how attractive the region has been as a destination for the so-called "creative classes" and what can be done to improve the region's attractiveness as a destination for these highly educated and entrepreneurial people. The Front Range has many of the same advantages as the Sun Corridor – natural beauty, strong universities, a relatively low cost of living, and high quality of life, but has been more successful at using these advantages to attract industries that employ their college graduates and attract other highly educated people from across the country. In the future, how can Arizona and the Sun Corridor leverage their natural advantages to compete for quality jobs and well-educated young people? In terms of global competition, it is essential that the Sun Corridor improve its ability to attract and retain an educated workforce. Businesses will seek locations where they can easily draw on a highly qualified labor force.

Relationships with the World

The Sun Corridor is a southwestern gateway which links the state of

Arizona with the world. It is the economic anchor for the state of Arizona, representing 88 percent of the state's Gross Domestic Product (GDP), shares a border with Mexico, the 13th largest country in the world according to World Bank statistics (2008), and is part of the CANAMEX trade corridor. It is home to one of the largest airports in the US, intercontinental rail and highway corridors, and to major research institutions. These factors all enable the Sun Corridor to position itself as a major player within the Southwestern United States, and with the world. These factors help to support the growth outlook for the Sun Corridor.

With the exception of the agriculture and mining industries (which still produce about half of their GDP in the corridor), the Sun Corridor dominates private enterprise within the state of Arizona. It is home to the businesses and institutions that drive the state's economy, and provides the infrastructure and proximity to other businesses necessary for companies to grow and thrive. Rural and small towns outside the Sun Corridor benefit from having access to the specialized medical, professional, and recreational opportunities there. The Sun Corridor benefits, too, as this outside demand helps offset the cost of investing in leading-edge medical equipment and staff in major league sports teams for example.

The CANAMEX trade corridor, designated by Congress as a High Priority Corridor in 1995, begins at the bi-national border at Nogales and travels through the Sun Corridor north through Nevada, Utah, Idaho, and Montana to Canada. Implementation of the CANAMEX corridor has focused more than improved transportation linkages for the purpose of freight movement. As stated in CANAMEX Corridor Coalition literature, the goal "is to strategically invest in infrastructure and technology to advance a focused agenda to increase competitiveness in global trade, create jobs and maximize economic potential" along the corridor. The continued development of this corridor will strengthen the Sun Corridor's position as a southwestern gateway, particularly as Mexico's economy grows and matures, generating trade and investment opportunities that will benefit the region. The corridor represents an important early interjurisdictional collaboration supporting sustainable mobility and economic development.

In addition to the advantages of its physical location for trade with Mexico and the Western U.S., the Sun Corridor is home to Phoenix Sky Harbor Airport, which is one of the ten busiest airports in the United States and is among the twenty busiest airports in the world. This airport, which currently generates $90 million per day in economic impact according to a 2007 Arizona State University study, is the key to the global connectivity the Sun Corridor needs in order to take advantage of trade and investment opportunities.

As the Sun Corridor grows over the next 40 years, its economy will need to grow, and the region is well positioned to do so and to continue building relationships not just with its traditional partners, but with the wider world. Investments made now will support that development.

Vision for the Sun Corridor

The Sun Corridor's rapid growth over the past decades has been based on its comparative advantages relative to other communities. However, comparative advantage is not fixed. As communities grow, they are often

Figure 22
Educational attainment as a share of population.
Source: American Community Survey, US Census, 2005.

HOW EDUCATED?

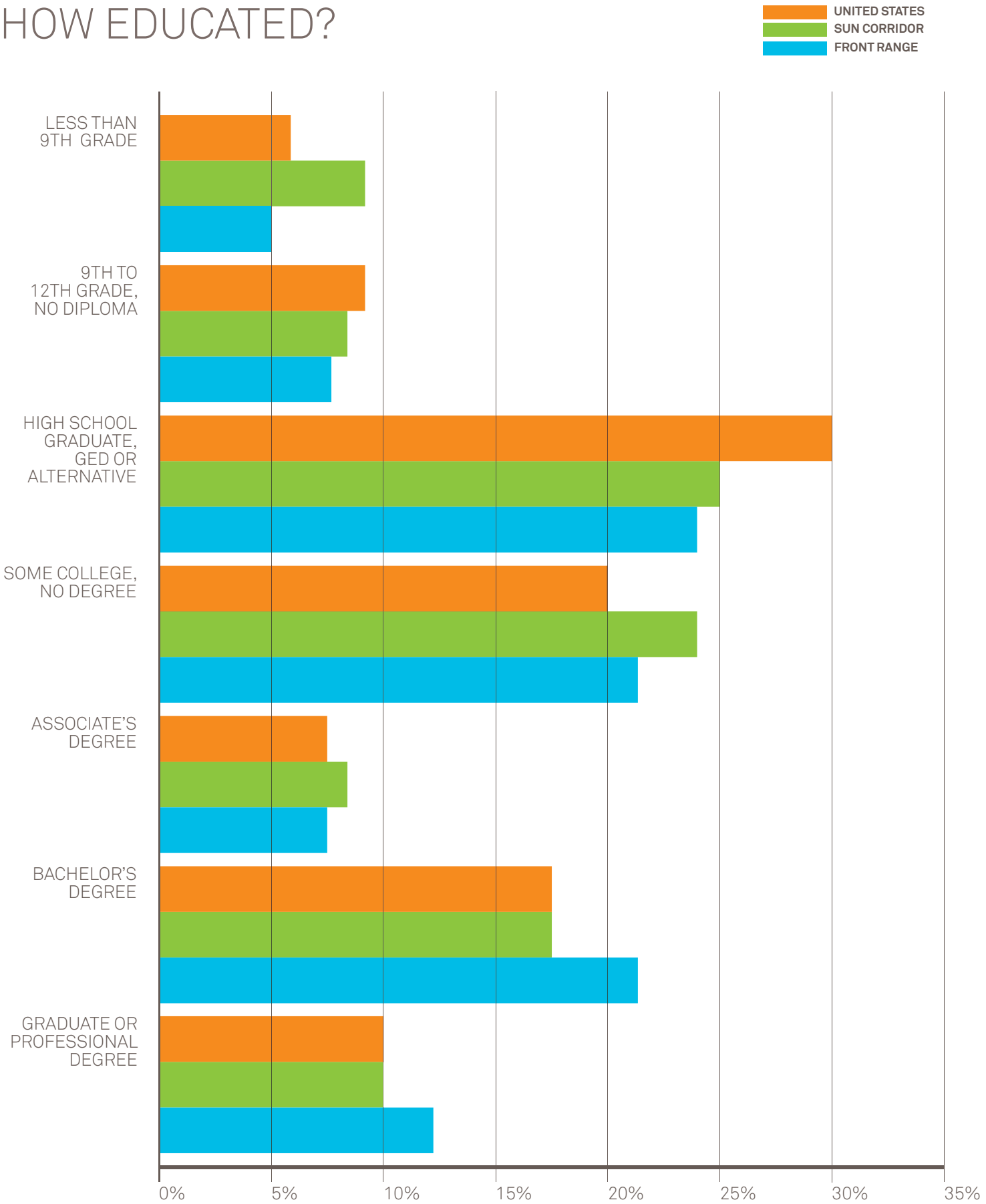
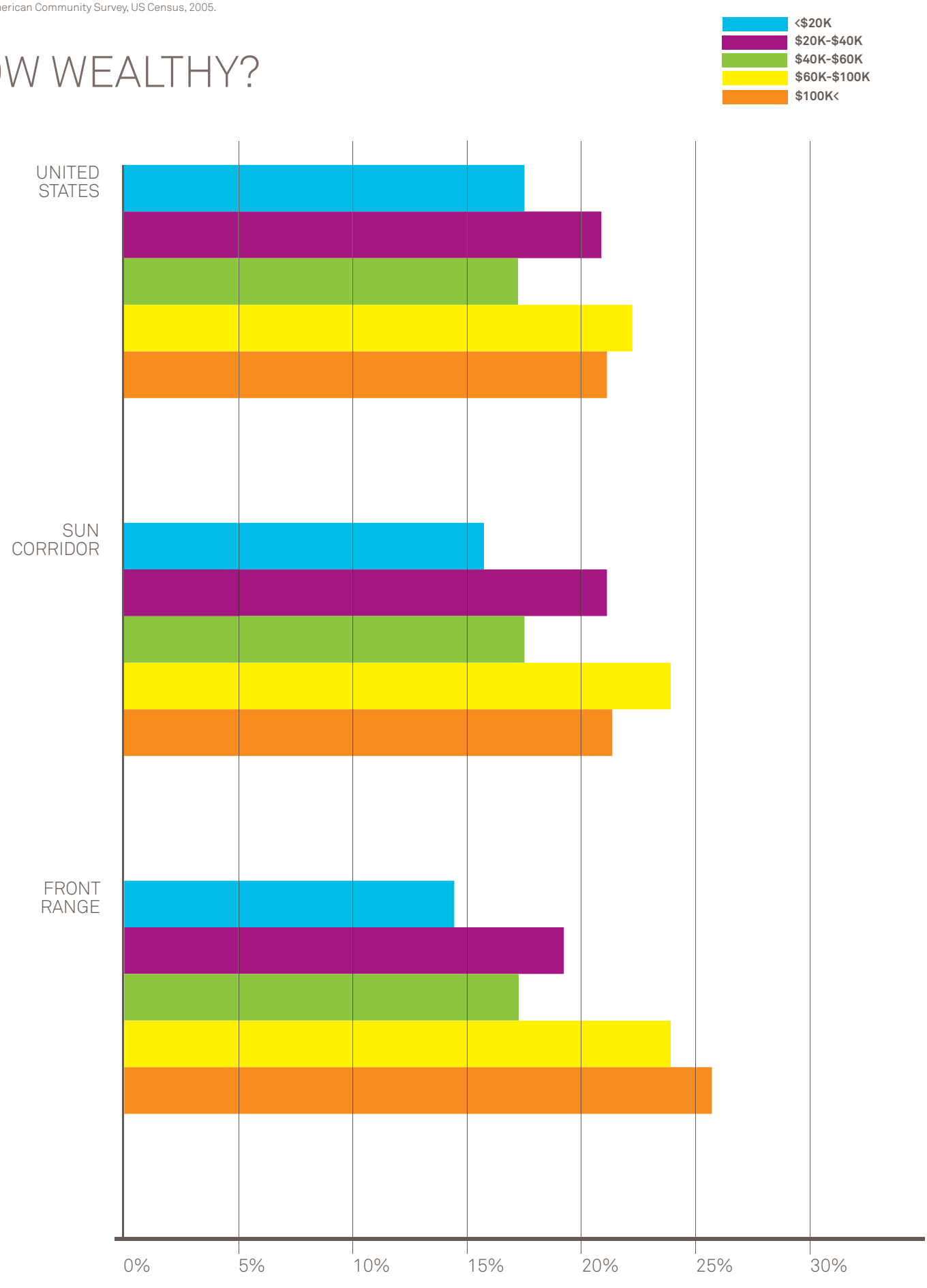


Figure 23
Average income as a share of population.
Source: American Community Survey, US Census, 2005.

HOW WEALTHY?



BUILDING RELATIONSHIPS NOT JUST WITH TRADITIONAL PARTNERS, BUT WITH THE WIDER WORLD.

challenged to preserve the things that made them attractive in the first place, while also taking advantage of the opportunities offered by size. Growth can mean environmental degradation, congestion, inefficient governance, and higher cost of living. Size can also benefit business through agglomeration economies and increased economic and social opportunity for residents. Decisions made in the Sun Corridor now will affect how well the region addresses these challenges and takes advantage of these opportunities.

Arizona is a place people choose to move to for its high quality of life. A recent Gallup poll found that Arizonans rate their communities highly when it comes to the beauty of the physical setting, availability of parks, playgrounds, and trails, and providing a good place to raise a family. However, they found their communities lacking in entertainment destinations, the quality of public schools, and job opportunities. In addition, only 19 percent of poll respondents rated their communities as "very good" communities for immigrants.

As the Sun Corridor moves forward, policies need to focus on preserving and enhancing quality of life, as well as creating a diversified, stable economy that can provide opportunity for current and future residents. Strategies based on this reality can address decisions that will need to be made at a larger scale than previously.

The following section will discuss how other areas around the United States and around the world are conceiving of and addressing similar issues.

PRACTICAL IMPLICATIONS OF TRANSITION TO THE SUN CORRIDOR MEGAREGION

In practice, communities adapting to their transition into a megaregion around the world have focused on infrastructure investments and issues that lend themselves easily to a regional outlook, such as preservation of natural and cultural heritage. Europe and Asia both provide examples of the megaregion idea in action. Examples, shown on the following page, suggest the continuing challenge of coordinating project investments across jurisdictional and national borders. They also illustrate a way in which the megaregion concept can have real impact, through creating strategies that inform decision-making. Finally, they show the importance of investment in both knowledge and physical infrastructure to implementation of strategies focused on the development of megaregions.

Governance and Regional Cooperation

Development of plans and strategies on a megaregional scale is made more difficult by the large numbers and multiple levels of jurisdictions involved. This is true not just in the Sun Corridor or in the United States, but around the world. Even in parts of Europe and China, which we tend to think of as more centralized than the United States, attempts to guide development need to take into account the sometimes competing goals of various cities and regions. The European Union mainly influences spatial development in member states through allocation of funding for a variety of programs (similar to the United States federal government). In China, the central government also has a certain amount of power over national investments, but does not have complete control over the actions of individual jurisdictions.

However, there are examples of voluntary coordination based on the recognition of common goals. In the Yangtze River Delta, the mayors of the major cities have begun meeting regularly and have signed agreements to work together on certain issues. In Europe, countries within close proximity to each other have either coordinated plans (as in the case of the Republic of Ireland and Northern Ireland), or have even developed regional spatial strategies under the auspices of the European Union. Examples of regional cooperation can also be found in the United States for specific purposes, such as the I-95 Corridor Coalition, focused on transportation, or the Great Lakes Commission, focused on environmental preservation within the Great Lakes basin.

A key recommendation to support this coordinated planning is regular data collection and reporting on a megaregion basis, with the components of the region shown as parts of the whole. A number of regional initiatives have begun this process in selected reports, but this data reporting needs to be ongoing to facilitate continuing planning and performance monitoring. This is a departure from our current system of national statistics collection, but this could readily be implemented in state and local statistical reporting. It is an essential step for several reasons: First, good planning requires readily available, consistently reported, reliable data. Second, it permits the region to see itself and track

LEARNING FROM... THE GREAT LAKES COMMISSION

The Great Lakes Commission consists of the eight Great Lakes states (Illinois, Indiana, Minnesota, Michigan, Ohio, New York, Wisconsin and Pennsylvania) and Ontario and Quebec, the two Canadian provinces bordering the Great Lakes. The goal of the Commission is to promote "the orderly, integrated and comprehensive development, use and conservation of the water and natural resources of the Great Lakes basin and St. Lawrence River."

Each jurisdiction appoints three to five members, who include senior agency officials, legislators, and appointees of the governor or premier. The Commission, supported by professional staff, uses a committee and task force structure to identify and address issues and recommend the adoption of policy positions by the membership. Efforts focus on communication; policy research, development, and coordination on issues of regional interest, and advocacy. The Commission's work addresses the following program areas:

- Communications and Internet Technology
- Data and Information Management
- Environmental Quality
- Regional Coordination
- Resource Management
- Transportation and Sustainable Development

LEARNING FROM... I-95 CORRIDOR COALITION

The I-95 Corridor Coalition is an alliance of transportation agencies, toll authorities, and related organizations from Maine to Florida, with affiliate members in Canada. The organization was established as a forum for key decision and policy makers to address transportation management and operations issues of common interest. Members include state and local departments of transportation, transportation authorities, transit agencies, and federal agencies. Although the Coalition began in the early 1990s with a focus on real-time traffic operations along I-95, its mission has broadened over the years to include multimodal transportation, economic vitality, and environmental quality. Committees within the Coalition focus on the following issues:

- Policy and Strategic Planning
- Travel Information Services
- Coordinated Incident Management
- Intermodal Transportation
- Safety

LEARNING FROM... SPATIAL PLANNING IN FRANCE

The tradition of spatial planning in France was one of the inspirations for the European Spatial Development Perspective. The French have been practicing spatial planning for many years, and have highly evolved structures to support spatial planning. These structures exist at the national, regional, and local levels. At the national level, the Interministerial Agency for Spatial Planning and Competitiveness (DIACT) has a number of responsibilities, including preparing and implementing central government policies; providing coordination for the implementation of major regional programs in partnership with local governments and other central government agencies; and coordinating, implementing, and monitoring European regional policies for economic and social cohesion. In addition to DIACT, the National Spatial Planning and Development Council (CNADT), which is made up of local and national elected officials and private sector stakeholders, acts in an advisory role in the drafting of spatial planning and sustainable development policies.

DIACT has responsibility for administering programs related to economic development, access to new information and communication technologies, major transportation infrastructure, rural development, public services, and balanced development of coastal areas. DIACT also administers a number of financial tools that can be used in support of local and regional goals, including the local development bonus for business and job creation, the National Spatial Planning and Development Fund, and allocation of European structural funds.

LEARNING FROM... EUROPEAN SPATIAL DEVELOPMENT PERSPECTIVE (ESDP)

The ESDP provides a framework for achieving balanced and sustainable development within the European Union (EU). The document lays out three policy guidelines for the spatial development of the EU:

1. Development of a balanced and polycentric urban system and a new urban-rural relationship;

2. Securing parity of access to infrastructure and knowledge; and

3. Sustainable development, prudent management and protection of nature and cultural heritage.

These guidelines relate to the goals of European policy, which have long been concerned with social equity, development of underachieving regions to create "balanced competitiveness" within the European territory, and conservation of natural and cultural resources.

The ESDP is meant to influence decision-making for EU policies that have a spatial impact – these include infrastructure investment (particularly in transportation, telecommunications, and energy), structural aid to underperforming regions, agricultural policy, environmental policy, and research and technological development.

LEARNING FROM... IRISH NATIONAL SPATIAL STRATEGY

In 2002, the Irish government published the National Spatial Strategy (NSS) 2002-2020, which serves as a 20-year national planning framework for Ireland. The NSS focuses on balancing social, economic, and physical development across the country.

The NSS contains strategic policies that are implemented through plans and programs at a number of levels. These include:

Regional Planning Guidelines. These guidelines are intended to aid in implementation at the regional and local levels. Regional and local development plans are required to be consistent with the NSS.

National Development Plan (NDP). Capital infrastructure investments at the national level are informed by the NSS.

Gateway Innovation Fund (GIF). The 2007-2013 NDP contained a €300 million fund (to be distributed over 2008-2010) for strategic projects aimed at triggering development in cities and towns designated as Gateways in the NSS. These projects should be developed in coordination with the private sector and should complement other NDP investments.

In addition to the above plans and programs, the Irish government in the NSS recognizes the need to address spatial issues for the entire island of Ireland and to strengthen cross-border cooperation with Northern Ireland. The governments of the Republic and Northern Ireland are collaborating on strategies intended to enhance the global competitiveness of the entire island by targeting appropriate infrastructure investment and coordinating public services.

LEARNING FROM... TRANS-EUROPEAN NETWORKS

The Trans-European Networks (TENs) originated from recognition within the European Union (EU) of the importance of providing for movement of goods, people, energy, and information in order to support European goals. The EU provides funding and support for transportation and energy infrastructure that is of regional and European importance.

The program for the Trans-European Transport Networks (TEN-T) is focused on building missing links, removing bottlenecks, ensuring the future sustainability of transportation networks, and integrating environmental protection. The program includes 30 priority projects. The majority of funding for these projects comes from national and regional governments and the private sector. However, these projects are also the recipients of the bulk of EU funding for transportation. The European Investment Bank (EIB) also provides long-term loans and other financing for these projects. Projects include highways, rail (both conventional and high speed), airports, and ports. Some specific projects include the expansion of the Port of Rotterdam, high speed rail in Spain, and the upgrade and expansion of Madrid's airport.

The Trans-European Energy Networks (TEN-E) focus on funding for electricity and gas transmission infrastructure projects that help advance European goals. These projects are intended to reduce the negative impact of energy production and consumption on the natural environment and to increase the security of the energy supply through diversification and reducing dependence on external supplies.

its performance as the whole Sun Corridor rather than the fragmented sum of its parts—Phoenix, Tucson, and smaller communities. Third, by including the component parts in the megaregion reporting, individual communities begin to see their roles and contribution to the larger megaregion economy. Regional planners can monitor and address inter-regional inequities, and avoid unnecessary duplication.

Stakeholders within the Sun Corridor have started forming partnerships to advance common interests. "Arizona Sun Corridor: Open for Business" is a partnership launched in 2009 between the Greater Phoenix Economic Council (GPEC) and Tucson Regional Economic Opportunities, Inc. (TREO) with the goal of attracting high wage jobs and investment to the region. The partnership now also includes the Greater Yuma Economic Development Corporation and the City of Flagstaff. In December 2009, the Maricopa Association of Governments (MAG), the Central Arizona Association of Governments (CAAG), and the Pima Association of Governments (PAG) created the Joint Planning Advisory Council (JPAC), with the intent of jointly coordinating planning efforts in the Sun Corridor.

In Arizona, as in the United States as a whole, communities value their independence and are wary of structures that might seem to add another layer of government or take away their right to develop as they see fit. The Sun Corridor benefits from its location within a single state. The state already has a role in setting policies and developing programs for energy, water, and transportation infrastructure. Creating policies that support economic growth and sustainable development for the Sun Corridor as a whole can be done at the state level without impacting local sovereignty. Voluntary cooperation among government, business, and citizen stakeholders can also point the way forward as the Sun Corridor Megarergion develops.

Creation of Strategies for the Megaregion

Beyond cooperation among disparate communities and stakeholders, development into a megaregion requires the development of plans and strategies that acknowledge this direction and aim to support it with specific policies and investment decisions. Ireland provides a very good example of the use of a national strategy based on similar thinking. The *European Spatial Development Perspective* (previous page) is also a guidance document that outlines policy guidelines for European programs. These strategies inform not just infrastructure decisions, but also affect investment in social programs, research and development, and educational institutions.

The Role of Infrastructure

Infrastructure investment is key to implementation of strategies to guide growth on a megaregional scale. Infrastructure investments, whether in transportation, water, energy, or telecommunications, are often made at a scale that transcends jurisdictional boundaries for practical reasons. Municipalities and states are used to the coordination involved in these efforts, and see the benefit.[23] In addition, high-quality infrastructure ensures that a region functions at a level that makes it attractive to businesses. Highways, railroads, and airports are essential links providing connectivity between cities in the region and globally in order to ensure the free flow of

goods and people so important in the world economy. Telecommunications infrastructure enables a continual flow of information and also interaction when personal contact is not feasible or necessary. Water and energy provision are both necessary and increasingly precarious.[24] Coordination among jurisdictions is necessary in many cases to secure the water supply and encourage development of new energy sources. Many types of infrastructure, including transportation and water, can be provided more efficiently when they serve a large population catchment. For instance, airports can provide better connectivity, with more direct services and higher frequency, the larger their catchment areas. Coordination among stakeholders can help ensure that projects chosen provide the most benefit for the region.

Providing infrastructure on a megaregion scale will require new funding approaches. The JPAC has just recently applied for a $5 million U.S. Department of Housing and Urban Development grant through the Sustainable Communities Regional Planning Grant Program. This three-year federal partnership grant supports the creation of a regional plan for sustainable development. The plan is intended to coordinate housing, transportation, and the economy in a way that protects the environment and promotes social equity. The overall goal is to enhance the megaregion's resiliency using sustainable development practices that conserve natural and economic resources, resulting in communities that enhance quality of life and promote unique social and environmental assets. The grant was submitted through the JPAC as part of the "Sun Corridor Consortium" comprised of 120 partners.

Six initiatives are envisioned to inform development of the Sun Corridor plan, including:

- Regional Housing Plan to address fair housing issues and the range of housing needed within the Sun Corridor to support a sustainable economy and housing policies free from discrimination.
- Cluster/Economic Development Study to identify the industries that have the most potential for success in the Sun Corridor and elements needed to support them.
- Canal Path Integration Study to identify missing segments in the trail along the canals that run throughout the Sun Corridor and strategies to complete the trail system, resulting in an environmentally friendly alternative mode of transportation.
- Native American Communities Transit Study to connect Native American Indian community residents with employment opportunities to reduce poverty and increase employment.
- Connected Centers Framework Study to synthesize the results of the other studies and determine the steps needed to make current and emerging centers sustainable.
- Arizona Health Survey to track indicators related to health, quality of life, and social equity.

These new federal programs, such as the Sustainable Communities Regional Planning Grant program, provide opportunities for additional funding for projects that support

INFRA-STRUCTURE INVESTMENTS GENERALLY TRANSCEND EXISTING JURISDICTION BOUNDARIES.

development of the megaregion. However, federal funding often requires a local match. Thus, in order to unlock and apply federal funding to megaregion projects, the Sun Corridor will need to identify funding mechanisms beyond traditional sources, which are limited. It is unlikely that traditional sources such as sales taxes will provide the support that they have in the past, as demographic trends result in less consumption of durable goods. Providing infrastructure on a megaregional scale will require new funding structures such as special purpose taxing districts, organizations such as the WMATA Compact, and dedication of innovative new taxes that promote sustainable activities such as taxes on the amount of impermeable surface on properties.

TAKING UP THE CHALLENGE

Over the past few years, there has been a great deal of research into megaregions within the United States. Various regions, particularly the Piedmont, Cascadia, and the Sun Corridor, have made strides toward development of strategies that are based on recognition of the challenges and opportunities presented by this emerging urban form. At the federal level, the megaregion idea is gaining traction, particularly in the discussion of high-speed rail investments. As planning moves forward, each megaregion will need to address the fractured nature of governance within their sphere, develop meaningful strategies to guide policy and investment decisions, and finally identify the investments that will lead to socially, environmentally, and economically sustainable regions.

The Sun Corridor is well positioned to take up this challenge. Its high level of growth is expected to continue over the next forty years, providing the opportunity to shape the built environment in ways not available to slower growth regions. It benefits from being contained within a single state, making coordination of policies and infrastructure investments much easier. It is also poised to take advantage of economic opportunities presented by its position as a southwestern gateway sharing a border with Mexico and located along the CANAMEX corridor. In addition, stakeholders within the Sun Corridor have recognized its potential and have already begun efforts to coordinate planning and economic development efforts so that as the Sun Corridor Megapolitan emerges into the Sun Corridor Megaregion, it remains a place distinguished by natural beauty, a high quality of life, and economic opportunity.

ADDRESSING THE FRACTURED NATURE OF GOVERNANCE AND DEVELOPING MEANINGFUL DECISIONS WILL LEAD TO A SUSTAINABLE FUTURE.

5. THE WAY FORWARD: A GLOBAL MEGA-REGION

THE SUN CORRIDOR: EXPLORING PROMISING DIRECTIONS.

This chapter brings together the findings and crystallizes them through a discussion of promising directions for sustainable, long-term development of the Sun Corridor Megaregion. This section is divided into three main implementation directions: (1) transportation and other public infrastructure, (2) knowledge infrastructure, and (3) trade and innovation. Transportation and other public infrastructure are discussed in the most detail, as they set the foundation for building a knowledge base and fostering trade and innovation. A series of next steps are suggested to guide future actions in the Sun Corridor.

1. TRANSPORTATION AND OTHER PUBLIC INFRASTRUCTURE

Investment in public transportation infrastructure can be an important driver of economic growth by improving mobility and reducing business costs of other infrastructure services, such as water, wastewater services and public facilities (e.g., schools, parks). In the transportation sector, the economy-wide benefits of infrastructure development are three-fold:

- Enabling more efficient goods movement;
- Increasing the breadth and depth of the Sun Corridor's labor markets through better matching of local labor demand and available talent; and
- Promoting trade in professional services and other markets where businesses rely on timely and cost-effective air connectivity for regional and global destinations.

Promoting infrastructure investment is subject to two interrelated challenges which are not unique to the Sun Corridor:

1. Public entities and stakeholders have proposed investments in multiple projects in each class of infrastructure. While this may be warranted in a high-growth megaregion like the Sun Corridor, the question remains whether all these projects are equally

important or whether they should be prioritized and if so, on what basis should that be done.

2. With the sharp decline in state and local government revenues in the Sun Corridor, there is a large gap between the funding requirements for new and upgraded infrastructure and the funds available and allocated to infrastructure projects. While the funding gap may ease somewhat as government revenues rise with the recovery, it is likely to persist well into the medium term without new measures to raise revenues or additional measures to cut spending.

A Programmatic Approach

In light of these challenges, it is recommended that Sun Corridor governments undertake a programmatic approach to assessing proposed infrastructure investments, perhaps separately for each infrastructure asset class (e.g. roads and bridges, public transit, other freight infrastructure, etc). This approach would involve undertaking a high-level assessment of the implications of infrastructure investments for economic performance and for environmental, air quality and land use impacts, as was already done in the case of transportation framework studies, prepared by regional partners and ADOT. This practice could entail a transformation in the Sun Corridor's approach to infrastructure investments, whereby such investments are no longer undertaken only to meet current and expected capacity requirements, but also to meet overall economic performance and sustainability objectives of the communities in the Sun Corridor. In addition, such a programmatic or framework approach to infrastructure investments should also look at the lifecycle operating costs of the resulting infrastructure, in order to ensure that the infrastructure services are delivered efficiently, be it in transportation, water, energy (including sources of renewable energy) and other public facilities (such as schools, colleges and universities). This would at least avoid building infrastructure that creates future unfunded public sector liabilities (e.g., major operating subsidies) and potentially stranded assets.

A programmatic approach could also provide the basis for prioritizing potential infrastructure investments. This can be done based on a high-level quantitative assessment of the benefit-cost ratio of these investments, which would include not only the economic, social and safety impacts, but also the environmental and air quality impacts, all of which can be valued in monetary terms. In some cases, where quantitative assessments may not capture all objectives being pursued by Sun Corridor governments, project prioritization can also be done on the basis of a multicriteria evaluation process, although this can lead to arbitrary results without appropriate weighting of the objectives. Like the programmatic approach, the prioritization can be done within each infrastructure asset class in order to avoid potentially difficult comparisons between different types of infrastructure assets and services.

A prioritization of infrastructure projects may well be worth undertaking at this juncture in the Sun Corridor's development, because many projects are worth revisiting in light of the structural changes being wrought by the current recession. Some of the infrastructure projects

FIND A NEW VEHICLE FOR PROCURING INFRASTRUCTURE INVESTMENTS.

were studied well before the current recession took hold. The impacts of these projects may now be worth revisiting in light of the structural changes occurring in the Sun Corridor economy, which will become increasingly evident as the recovery takes hold and growth returns, though not necessarily in proportion to the decline in output experienced by each sector. The same infrastructure projects may no longer be required, or if they are required, the scope could well have changed substantially by the recession.

A programmatic approach may also be a valuable tool for addressing some of the governance challenges involved in prioritizing and choosing the right infrastructure projects for the Sun Corridor. Many infrastructure projects, such as highway or passenger rail projects, tend to cross local government borders or may provide benefits which are concentrated in a few areas. These jurisdictional issues should not be an impediment to an effective prioritization of infrastructure projects. Multijurisdictional framework assessments could help achieve this objective.

Addressing the Funding Gap

The Sun Corridor is not alone in facing major infrastructure funding gaps. Perhaps because so many other megaregions also face funding gaps —which in some cases are much larger, due to older infrastructure that needs replacement—there may be some misunderstanding about the respective roles of different funding and financing sources.

First, it is important to grasp the distinction between funding and financing of infrastructure. All infrastructure is ultimately funded (i.e., paid for – either through direct or indirect taxes and public funding or through user charges, or private funding). The primary role of financing, either public or private, is to delay the timing of payment obligations for the planning, construction and sometimes also for the operation of the infrastructure in question. Financing has a particularly important role to play in the infrastructure space. Public entities are often willing to entertain the additional costs associated with financing (i.e., borrowing costs) because these costs can be more than offset by the future economic benefits of the infrastructure investments. Yet, it remains that infrastructure is ultimately funded and paid for either by users and/or by taxpayers.

This takes us back to funding gaps and how these can be addressed. While it is important to consider the full range of funding sources for a project—or more appropriately, for a program of infrastructure projects —it is also important to appreciate that different funding sources have different costs associated with raising

each additional dollar of revenue. Some funding sources may entail relatively low administrative costs, such as sales taxes or fuel taxes. Other funding sources entail relatively low economic costs (i.e., they don't distort consumption and saving decisions), such as tolling and other schemes where the charges are used for cost recovery. In fact, if user-pay schemes are well-designed, they may provide significant economic benefits (e.g., managing highway congestion or moderating peak demand, resulting in the infrastructure not needing to be built to meet peak capacity) and at lesser cost. It is also worth noting that some revenue sources are referred to as "taxes", but they tend to work much like user charges in that they are only incurred when making use of the road infrastructure (e.g., fuel taxes). Therefore, it is advisable that if state and local governments in the Sun Corridor should choose to close some or all of the funding gap for infrastructure—after having undertaken a prioritization of projects in each infrastructure asset class—they should do so by drawing additional revenues from current and new sources of revenues that minimize the combination of economic and administrative costs of revenue collection. In practice, the right source of additional revenues may also depend on the policy objectives at hand. For example, it may make sense to rely on revenue tools with higher administrative costs (e.g., tolling), if the resulting demand-management benefits cannot be easily achieved through revenue tools with lower administrative costs.

Role of Public/Private Partnerships (PPPs) in Addressing Funding Gaps

Since the state of Arizona already has enabling legislation for PPPs, the question arises as to its role relative to conventional design-bid-build procurements. The term PPPs has been used very broadly and in some cases refers to the privatization of public assets or the monetization of a revenue stream derived from a public asset (e.g., Chicago Skyway). Our focus here is instead on PPPs as a new vehicle for procuring infrastructure investments, which take the form of a Design-Build-Finance project through to a Design-Build-Finance-Operate-Maintain project.

At the heart of this new form of procurement is the private financing (primarily debt and a much smaller tranche of equity) that is provided by the concessionaire. While private financing replaces the public financing associated with design-bid-builds, it is typically more expensive than public financing (unless the public sector entity in question has a particularly low credit rating). However, private financing is the key device for transferring selected risks to the private sector concessionaire. The latter must finance their capital spending by taking on debt and putting some equity at risk. Hence, should the PPP be late or have other difficulties in meeting its delivery obligations, it would automatically incur additional interest costs as a result of delayed payments from the public sector client (unless the delay is due to the client agency). In principle, if the PPP transaction transfers the right risks to the private concessionaire (e.g., those risks which are better mitigated and managed by private concessionaires, such as construction cost escalation during the contract term), the final cost of the project may be lower than under a conventional procurement, where the public sector retains most of the risks. When considering alternative modes of procurement for infrastructure investments, relevant public agencies

PROMOTE KEY PROJECTS THAT SUPPORT ECONOMIC GROWTH, SUSTAINABLE DEVELOPMENT AND COHERENT REGIONAL PLANNING.

in the Sun Corridor to undertake a value-for-money assessment of the full range of procurement alternatives. This is the only widely-accepted methodology available to test what procurement strategy is likely to deliver savings from a public sector perspective.

Selected Transportation Infrastructure Projects Worthy of Further Consideration

The following list identifies a variety of key transportation infrastructure projects that have resulted from earlier study processes that appear to have significant benefits in achieving the multiple purposes of supporting economic growth, sustainable development, and coherent regional planning of the Sun Corridor Megaregion, as discussed earlier.

- *I-11 Multimodal Transportation Corridor:* I-11 is a proposed new Interstate highway, first envisioned in a series of regional transportation framework studies conducted in Maricopa County. It would connect Phoenix and Las Vegas – the two largest metropolitan areas in the U.S. with no Interstate connection – and possibly extend south to Nogales and north to eastern Oregon, linking to I-82 in Washington. This corridor could serve as a bypass around major metropolitan areas, as a reliever to I-5 along the West Coast, well as serve as the national CANAMEX corridor, providing a major high-capacity, north-south transportation corridor from Mexico to Canada to accommodate North American trade. This corridor is envisioned to include a joint freeway/railroad corridor, which could serve both freight and passenger needs.
- *Phoenix to Tucson Intercity Rail Corridor:* ADOT has received federal grant monies to conduct the first phase of an Alternatives Analysis (AA)/Environmental Impact Statement (EIS) in support of a new passenger rail service between Phoenix and Tucson, assessing feasibility and determining an alignment. This corridor would contribute to a "Sun Corridor multimodal transportation spine," providing a transportation alternative for the most heavily traveled corridor in Arizona. This intercity rail corridor will link into local transit systems at major station locations, and could be co-located with regional commuter rail systems. This corridor also complements ongoing improvements to I-10, which is currently the only high-capacity transportation corridor connecting Phoenix and Tucson and serving the Sun Corridor. Because of various restrictions, ultimate widening of the corridor is capped to ten lanes, requiring other transportation solutions to support the forecast travel demand.
- *North-South Freeway Corridor (Pinal County):* This new corridor has been noted in a series of past feasibility and framework plans, based on forecasted travel demand in the Sun Corridor. An AA/EIS is currently underway for the corridor. This new freeway will become part of the larger Sun Corridor transportation system, providing a parallel route to I-10 within Pinal County and running adjacent to an existing freight railroad route. Because of the planned roadway and rail access, the recently updated Pinal County Comprehensive Plan calls for industrial and employment

development surrounding this corridor, specifically large warehousing and manufacturing uses that would not be compatible in more developed areas, as well as the potential for long-range development of a regional airport in central Pinal County near the future junction of I-11 and the North-South Freeway.

- *Hassayampa Freight Rail Connector:* To lay the foundation to take advantage of future deep-water port improvements and/or development in Mexico, and a potential new industrial/manufacturing base in the Sun Corridor, new freight rail corridors are required to support transportation logistics needs. A freight rail connector (Hassayampa Freight Rail Connector) has been envisioned in western Maricopa County to provide a link between the UPRR and BNSF Railway Class I railroads and their ancillary facilities, promoting increased economic development opportunities in the western portion of the Sun Corridor and potentially accommodating shared passenger rail service in urban areas. The Secretaria de Comunicaciones (SCT) in Mexico (federal transportation agency), is studying the feasibility of developing of a new mega container port in Punta Colonet, on the west coast of Baja California. They have indicated the requirement of connecting to both BNSF and UPRR Class I railroad corridors in the United States. The Hassayampa Freight Rail Connector would accomplish that goal in Arizona.

- *Wellton Branch Reactivation:* The Wellton Branch is a segment of the UPRR Phoenix Subdivision, extending westward from the Phoenix metropolitan area connecting to the UPRR mainline east of Yuma in Wellton. Rehabilitating and reactivating this corridor could open up the rail line for freight and passenger traffic, including renewed Amtrak service to Phoenix. This corridor traverses predominantly flat and private land, opening up the possibility for locations of inland ports or other transportation freight logistics centers. The Wellton Branch meets the UPRR mainline near Yuma, and could be extended south to serve as the rail connection into Mexico and to a future port at Punta Colonet. The Wellton Branch could therefore provide the corridor for freight from Mexico to interchange with the UPRR mainline, as well as with BNSF, which can be accessed through the Wellton Branch's intersection with the Hassayampa Freight Rail Connector.

- *Border Port of Entry Improvements:* The states of Arizona and Sonora are planning to conduct a coordinated Border Master Plan to assess, and update as necessary, existing plans for multimodal transportation infrastructure 100 km (60 miles) on both sides of the border, make recommendations for any additional infrastructure required, and determine an implementation program for both states to work together on a bi-national basis. Increasing the efficiency and safety of the border ports of entry between Arizona and Sonora will support increased economic development and bi-national trade.

2. KNOWLEDGE INFRASTRUCTURE

THE SINGLE MOST IMPORTANT DETERMINANT TO THE SUN CORRIDOR'S FUTURE.

A LONG-TERM INVESTMENT WELL WORTH THE COST.

The Sun Corridor's knowledge infrastructure is almost certainly the single most important determinant of the megaregion's productivity performance and potential standard of living which it is able to achieve. It consists primarily of human capital, but also the facilities and equipment required to train students and conduct research in the university network. The human capital vested in the Sun Corridor labor force is the result of multifaceted investments, consisting of formal training, from K-12 through to post-secondary levels; on-the-job training, which can be both formal and informal; as well as intermediate arrangements, such as temporary placements or internships for post-secondary students.

In the second chapter of this report, "In the Global Economy", we found that the 64.1 percent of the Sun Corridor labor force has an Associate degree or higher, which compares well with the U.S. average (62.4 percent), but not as well with the Front Range (69.5 percent). However, the real challenge for the Sun Corridor and for Arizona as a whole is the lower educational attainment of the youngest age cohorts. Only 31.8 percent of the 25-34 age cohort have attained an Associate's degree or higher, as compared to 37.2 percent of the 45-54 age cohort, and 38 percent of the 55-64 age cohort (Figure 24). This is an unusual age distribution of educational attainment when compared to other developed economies—such as in Japan, Sweden, Canada, Ireland, and Norway —where the youngest cohorts have much higher rates of educational attainment than the older ones. The latter countries have a built-in driver of productivity growth as the younger and more educated cohorts replace older and less-educated cohorts in the labor force. This positive impact over time is accentuated by the fact that people with higher educational attainment tend to have higher rates of labor force participation, so that labor capacity grows over time even if population remains unchanged. For Arizona, the same process of younger cohorts replacing older ones in the labor force will tend to undermine productivity and competitiveness, in the absence of any concerted action to address the education gap.

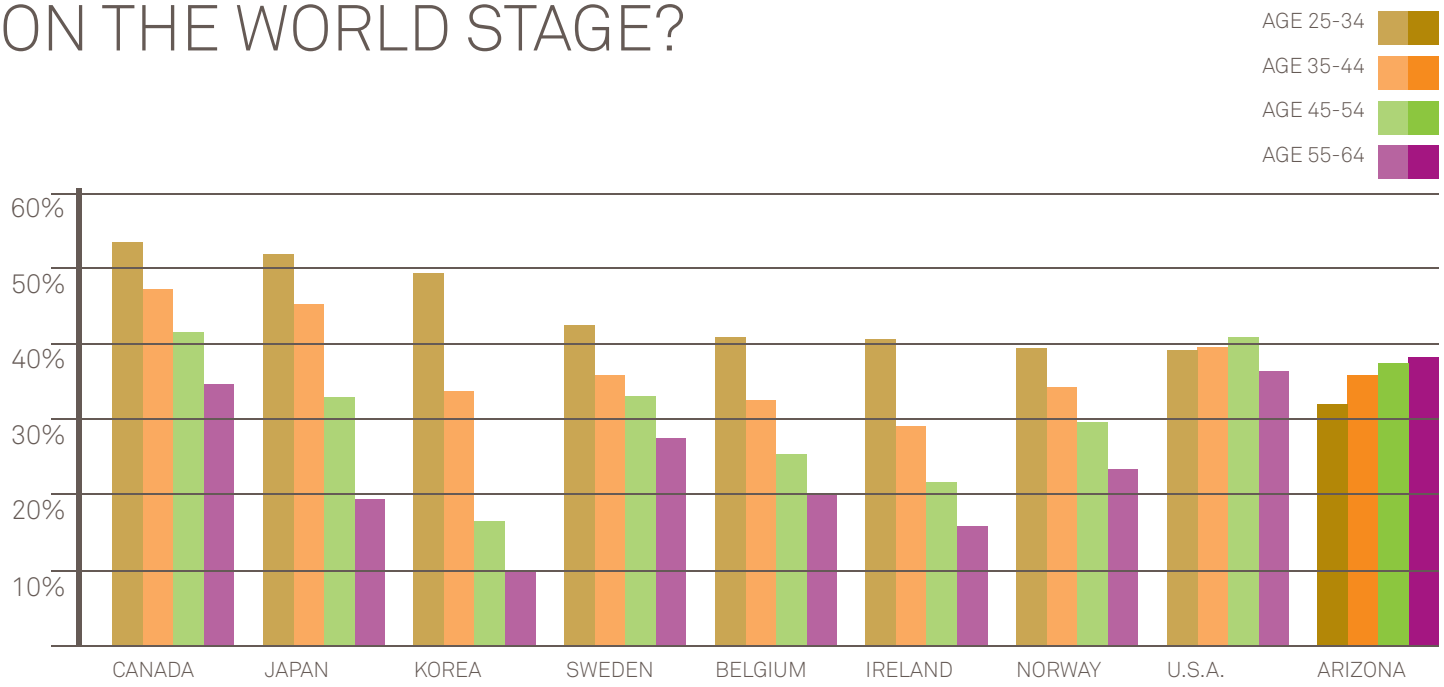
Sun Corridor stakeholders are already heavily engaged in attempting to improve educational attainment, as evidenced in the Arizona Board of Regent's 2020 Vision, which calls for reform in both the instructional delivery model and the financing of the university system. Of particular importance is the collaborative effort entitled "Getting AHEAD – Access to Higher Education and Degrees", which is seeking to improve access to higher education in a state where 45 percent of high school leavers (the lowest rate among 50 states) do not pursue any form of higher education. However, we believe that additional efforts will be required to address the low educational attainment of the youngest cohorts, particularly among the fast-growing foreign-born population. Most of these younger people with low educational attainment have already left the school system, which means that effective outreach programs are required to ensure that they are able to attain high school equivalency (e.g., English language skills for adults,

Figure 24

Percent of adults with Associate's Degrees and higher by age-group: Top countries, the U.S., and Arizona.

Source: Dennis Jones and Patrick Kelly. The Emerging Policy Triangle: Economic Development, Workforce Development and Education: Updated Profiles for All 50 States and Including International Comparative Data. National Centre for Higher Education Management Systems, May 2007 p. 28.

THE SUN CORRIDOR, ON THE WORLD STAGE?



adult basic education and adult secondary education, which are some of the adult education programs offered by Pinal and other counties in the Sun Corridor).

Other efforts will be required to draw back those who have left the educational system after high-school in order to enable them to supplement their skills development through targeted training programs. For a reasonable chance of success, these high school leavers should be targeted within the first five-to-ten years after graduation, through programs that draw them back into the vocational or community college system, or even through evening adult education classes. In fact, unemployment during the current recession is a golden opportunity to attract these young people back into the educational fold – a long-term investment well worth the short-term cost.

3. TRADE AND INVESTMENT

There is an increasingly broad consensus among economic policy-makers that as the U.S. emerges from the current recession, it will not be able to rely on domestic consumption as a key driver of economic growth—at least not to the same extent as in past recessions. It is also widely recognized that investment in both private and commercial real estate may not play the same prominent role it has since the early 1980s. These two observations have led to the conclusion in some quarters that the U.S. will need to shift towards a more export-oriented economy over the next decade – a perspective that is at least equally applicable to the Sun Corridor economy as to the whole U.S. economy.[25]

The chapter of this report which explored the Sun Corridor's economic potential led to several conclusions in relation to trade and investment opportunities:

- The greatest opportunities lie in emerging market economies such as China, India, and Brazil, which are likely to continue to grow at two-to-three times the rates of growth of mature economies, such as California and other mature economies that are currently the Sun Corridor's major trading partners. Neighboring Mexico and other Latin American economies also represent emerging markets with similar long-term growth potential. Sun Corridor entrepreneurs and governments should therefore

TARGET NEW TRADE AND INVESTMENT WITH THE WORLD.

target new trade and investment opportunities with Mexico and other emerging markets in Latin America and other parts of the world.

- Growth opportunities in emerging markets are best realized by participating in regional and global supply chains. The traditional focus on exports and inward investments may be understandable because these flows add to output and jobs, while imports and outward investments detract from output. However, this accounting view of trade and investment fails to recognize the new reality of regional and global supply chains, where outward investments are used to establish new beachheads in emerging markets and where imports are a critical element of the multiple cross-border flows that support efficient supply chains. Therefore, Sun Corridor firms should participate in global supply chains, which means bringing down trade and investment barriers and recognizing the importance of outward investments and imports as tools for building and operating supply chains.

- The role of Sun Corridor governments is not to favor some sectors over others. While certain sectors—like computer and electronic product manufacturing and air transportation—have exhibited strong growth rates historically, the past is not necessarily a helpful guide for future opportunities. The role of Sun Corridor governments and public policy is to establish the right conditions for growth, which enable firms and entrepreneurs to identify and realize individual opportunities. This means developing and maintaining public infrastructure, supporting education and training, promoting trade and investment and doing the same for innovation, from basic research, and commercialization activities through to development of more efficient production and delivery methods for existing goods and services.

EXPLORING NEXT STEPS

This concluding section explores the most promising next steps for promoting the future economic and social development of the Sun Corridor in a framework of sustainable growth. One of these is best expressed in the concept of an inland port for the Sun Corridor. This is not because the feasibility of such a major project has been proven within the next decade, but rather because it has the potential to provide a powerful vision that can rally and motivate the diverse stakeholders from the public, private and non-profit sectors to adopt behaviors and make decisions that will be tremendously beneficial to future development of this megaregion, regardless of whether the inland port vision is realized.

In practice, this means exploring the feasibility of an inland port as a single site for a transportation, logistics, and warehousing hub in the Sun Corridor. An inland port consists of the co-location of intermodal terminals (for transferring goods between rail, trucks and possibly air modes) and logistics warehouses for retailers, manufacturers and industrial suppliers. Inland ports are relatively

new in North America—most having emerged in the last decade—but they have the potential to attract a wide array of ancillary production and service activities that provide additional value to goods either transported through the Sun Corridor or shipped to/from Sun Corridor locations. This is why the inland port vision has the potential to generate economic activity and jobs for a wide range of goods- and service-producing sectors. It also suggests why this vision can rally a wide range of industry stakeholders and why it needs the same stakeholders to help realize the full benefits of the inland port, including an environmental footprint that ensures that the inland port is a source of sustainable growth in the long-term.

An inland port may make sense for the Sun Corridor because it is at the juncture of two major trade corridors: the East-West corridor that carries goods and commodities between Asia-Pacific economies through the ports of Los Angeles and Long Beach to the Midwest and the Southern United States, and the North-South CANAMEX trade corridor that links western mainland Mexico to the western United States and western Canadian markets—although trade along this corridor is not as well developed as for the East-West corridor. The market rationale for an inland port is based on continued growth in intermodal freight traffic and reduced drayage costs (i.e., reduced costs of truck shipments between intermodal terminals and warehouses), which also entail fewer environmental impacts, since drayage typically relies on relatively old truck fleets. The Sun Corridor is also an attractive location for an inland port, because of its two Class I railways (BNSF and UPRR) and because it is positioned to benefit from capacity constraints, high labor costs and congestion at the ports of Los Angeles and Long Beach. In addition, it could also benefit from the opening of a Punta Colonet deep-water port in Mexico, with a rail line connecting into the U.S. through Yuma, Arizona, or the significant expansions to existing deep-water ports in Mexico, such as Guaymas or those located further to the south. Specifically, the key requirements for a major inland port include:

- A minimum of 500 acres of flat land.
- Easy access to Class I railroad mainlines, highways and air cargo.
- Designated Foreign Trade Zone (FTZ) status for tax relief on goods stored on site.
- Major public sector investment in supporting infrastructure.

In addition to these requirements, this project would also require a workforce skilled in logistics, warehousing and storage—an area in which the Arizona labor force may be under-represented.

It follows from these requirements that an inland port for the Sun Corridor will need a multipronged effort consisting of:

- Trade and investment promotion with Mexico and other emerging markets, as well as Western Canada. This would involve reducing barriers to trade and investment with these markets, including tariff barriers as well as non-tariff barriers (NTBs), such as transportation and logistics barriers in processing goods at border crossings, as well as NTBs in local government procurement markets. The North American Free Trade Agreement (NAFTA)

FOUR ENABLING CONDITIONS FOR FUTURE DEVELOPMENT.

between Canada, the U.S., and Mexico provides a framework for these trade and promotion efforts, but some NAFTA provisions have not yet been implemented

- Supporting public infrastructure, particularly highways and facilities for intermodal freight yards. The challenge in this area is to identify the appropriate public infrastructure requirements, including the location, capacity, and estimated timing of the required capital investments. This could be achieved through a programmatic approach to prioritizing and choosing the right infrastructure projects, based on a high-level cost/benefit assessment of alternative projects, including the environmental and safety impacts of each project.

- Further development of the Sun Corridor's knowledge infrastructure in order to meet the demand for transportation, logistics and warehousing professionals. It is also important to recognize that fulfilling the need to improve the educational attainment of the youngest cohorts in the Sun Corridor could prove to provide a built-in mechanism for trade and investment promotion with Mexico and other emerging markets in Latin America.[26] This is because many of these young adults have emigrated from these emerging markets and they can provide the economic linkages back into these markets, as skilled workers with Sun Corridor based enterprises and eventually as entrepreneurs and investors in emerging markets based in the Sun Corridor.

- Recognition of the innovation imperative for the private, public and non-profit sectors of the Sun Corridor economy. Retailers, shippers, and industrial suppliers will only use this facility if it makes commercial sense—that is, if it helps reduce their costs and/or increase the value they are able to offer customers in their respective end markets. In other words, a Sun Corridor inland port will have to be competitive with other intermodal facilities and this will require a strong and consistent innovation effort across all stakeholders in order to deliver a project that can deliver services valued by end customers.

These represent the four enabling conditions for an inland port in the Sun Corridor Megaregion. The Global Cities Sun Corridor Team believes that each of these four areas point to highly desirable behaviors which will benefit the future development of the megaregion, regardless of whether or not the inland port is realized as currently envisioned.

CONNECTED
OPEN
DYNAMIC

AMERICA'S NEW INLAND PORT

ENDNOTES

1. Page 29
During the current recession, Arizona suffered a 9.9 percent drop in employment levels between 2007 to 2009 – one of the largest experienced by at the state level, along with Nevada (-9.8%), Michigan (-9.4%) and Florida (-7.8%).

2. Page 32
Bureau of Economic Analysis for Arizona Gross Domestic Product; and WISERTrade for exports; both in current dollars.

3. Page 33
IMF *World Economic Outlook Update: Restoring Confidence without Harming Recovery*, July 7, 2010. All growth rates cited in this paragraph are IMF forecasts for 2010 and 2011.

4. Page 34
David Aschauer "Is Public Expenditure Productive?" *Journal of Monetary Economics*, 23, 2 (1989): 177-200; and Alicia Munnell "Why Has Productivity Growth Declined?" *New England Economic Review* (January 1990).

5. Page 34
T.E. Keeler and J.S. Ying "Measuring the Benefits of a Large Public Investment: The Case of the US Federal-Aided Highway System" *Journal of Public Economics* 36, 1 (June 1988) and C. Shirley and C. Winston "Firm Inventory Behaviour and the Returns from Highway Infrastructure Investments" *Journal of Urban Economics* 55, 2 (March 2004): 398-415.

6. Page 39
Bureau of Labor Statistics: *Multifactor Productivity Trends for Detailed Industries*, 2006 (August 29, 2008)

7. Page 39
See *http://azeconomy.eller.arizona.edu/AZE10Q1/Recession_Is_Over.aspx*

8. Page 39
Multifactor Productivity and Related KLEMS Measures from the NIPA Industry Database, 1987 to 2007.

9. Page 39
According to *Mountain Megas: America's Newest Metropolitan Places and a Federal Partnership to Help Them Prosper*, the air network remains relatively underdeveloped for the southern part of the Intermountain West region, which includes Arizona, Colorado, Nevada, New Mexico and Utah.

10. Page 39
Bureau of Economic Analysis (U.S. Department of Commerce). See *http://www.bea.gov/regional/gsp/action.cfm.*

11. Page 41
Jeffrey Spivak "Freight Finds its Niche" *Planning* (May/June 2010).

12. Page 41
"UP Marks Construction Work for Joliet Intermodal Terminal" *Railway Age* (September 23 2009).

13. Page 42
Arizona's Aeropsace and Defense Commission Strategic Plan (December 31 2009).

14. Page 48
Freight rail infrastructure is largely privately owned, although there is a role for public investments in selected areas such as intermodal terminals and passenger rail services.

15. Page 48
This type of human capital, which is lost when workers move to a new firm, is usually contrasted to general human capital or transferable skills, which workers retain when they switch firms.

16. Page 50
Brookings Institute, *Mountain Megas*, pp. 37-38.

17. Page 62
Megapolitan, Arizona's Sun Corridor, Morrison Institute for Public Policy, Arizona State University.

18. Page 62
Central Arizona Project; *http://www.cap-az.com*

19. Page 63
Jovana J. Brown, *When Our Water Returns: Gila River Indian Community*.

20. Page 78
Land use intensity targets are taken as examples from the *Smart Growth Area Classifications, Regional Comprehensive Plan for the San Diego Region*, 2004. Land use intensity targets would have to be defined specifically for the Sun Corridor Region.

21. Page 84
A Snapshot of Housing in Arizona, Improving the availability And Quality of Housing For All Arizonans, 2008.

22. Page 124
The distinction between megaregions and megapolitans has been proposed by Robert Lang of the Metropolitan Institute at Virginia Tech. Key among the characteristics of a megapolitan is proximity – a megapolitan consists of 2 or more metropolitan areas with anchor cities 50-200 miles apart. Key to the understanding of a megaregion is the idea of networks (economic, cultural, and environmental). A megaregion may consist of one or more megapolitans. The Arizona Sun Corridor is both a megapolitan and a megaregion.

23. Page 134
It should be noted that telecommunications infrastructure can act against the forces that create the megaregion, by enabling people to accomplish a number of functions remotely. However, modern and efficient telecommunications infrastructure is also important if a region aspires to be globally competitive, in that it facilitates communication and enhances connections with the world.

24. Page 135
Final Arizona Greenhouse Gas Inventory and Reference Case Projections 1990-2020, formally approved by the Arizona CCAG In March 2006; and Energy Information Administration. *2005 Residential Energy Consumption, Expenditures, and Intensities*, 2005, Part 1: Housing Unit Characteristics and Energy Use Indicators.

25. Page 149
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CONTRIBUTORS

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Claire has extensive experience working on sustainable design and construction projects for a range of private and public sector clients both at a strategic and implementation level. She is working on climate action plans currently and sustainability design guidelines. Claire has been involved in the development of AECOM's Sustainable Systems Integration Model™ (SSIM™), a system to help developers of new communities assess the most cost-effective carbon saving strategies for a particular site. Claire is also serving as an advisor on the Global Cities Program: Beijing, China.

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Bob directs AECOM in Multinational Client Initiative, promoting the achievement of AECOM's full service delivery to major private sector clients. He provides organizational, business development, and service delivery support for cross operational program pursuits, partnering, and relationship development with AECOM's Fortune 500 and Global 500 key clients. Bob is currently working to develop corporate partnership initiatives with CISCO, IBM, Siemens, Eaton, and others.

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Daniel blurs the lines between marketing and practice, conceiving, leading, writing, and designing special initiatives that will enhance AECOM's reputation, expand its remit, and support the company's strategic objectives. An avid visual designer, Daniel is also the author of numerous articles, reviews and essays on issues related to the built environment in an array of publications including *Topos*, *Architectural Record*, and *The Wall Street Journal*, is a contributor to Phaidon's *Atlas of Contemporary Architecture*, and co-editor of two recent AECOM books: *Asia Beyond Growth* and *Climate Design*.

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Lee is an urban planner who has worked with elected officials, agency staff, community members, and other stakeholders to ensure that implementation of transportation, land use, and economic development plans are consistent with and supportive of each other. As a graduate student, Lee was intimately involved in the initial thinking and formation of the megapolitan/megaregion concept, forming the basis of the widespread research and publication of megaregions through the Regional Plan Association and the Brookings Institute.

Andy Fuhrman
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Andy's career includes twenty years of commercial construction for Silicon Valley's high tech industry. Two notable projects include playing a strategic role in Silicon Valley's 'Smart Permitting' program designed to allow the public to submit plans and specification to the planning department on-line via the web for electronic plan check, reducing cycle time, operating costs, natural resources, travel and floor space for paper file storage. The second being a co-founder of the Virtual Builders Roundtable that continues to lead the way in Virtual Design and Construction practices – adopted and rebranded by the industry as Building Information Model (BIM). In 2003 Andy became CEO of the Open Standards Consortium for Real Estate (OSCRE) developing interoperable data exchange standards designed to minimize the need for manual data entry and data scrubbing allowing industry stakeholders to automate the Business-to-Business (B2B) and Business-to-Consumer (B2C) exchange of business data. Andy presently works as a Director for Cisco's Smart+Connected Communities on large scale urban development projects.

Lance Harris
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Lance has a diverse background in various aspects of land use economics, providing clients with market demand and feasibility studies, mixed use programming recommendations, transit-oriented development planning, financial analysis, economic and fiscal impact assessments, and economic development strategies. He has vast experience with both fiscal/economic impact analysis and economic development strategies, creating a variety of fiscal models and provided economic impact analysis at the city, county, and state level.

Fran Hegeler
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Fran's professional experience ranges from leading marketing departments for high profile professional practices, to overseeing external relations for a professional architecture school. Her work is informed by a deep passion for cities and ideas, coupled with an academic grounding in Political Science. Fran helps forge connections and advance the ideas of AECOM's Global Cities Institute.

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Toni is a Senior Consulting Manager in AECOM's Transportation Consulting Practice specializing in analyzing how transportation investment changes local economies. Her experience includes benefit cost analysis, forecasting economic and fiscal concepts, the development of short-term leading indexes for states and metropolitan areas to predict the near-term direction of regional economies, the development of custom forecasting model applications for clients, and detailed demographic analyses. Dr. Horst is an experienced presenter of economic analysis and formal reports before business-oriented audiences and has edited several publications.

Jay Hicks, ASLA
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Jay is a landscape architect and planner with extensive experience in high plains and desert environments. His work in Arizona is based in both planning and design on a variety of scales that incorporate the latest technology and design philosophy that result in high performance projects. His most noted local projects include Kierland Commons, a mixed use development in Scottsdale, AZ; the West Valley Recreation Corridor, a 42-mile desert river restoration project; Westgate Town Center, entertainment district for the Coyote's (NHL) and the Cardinals (NFL) in Glendale, AZ; and the

Civic Space Park in Downtown Phoenix featuring a major work by international artist Janet Echelman. His international work includes work in Mexico, Morocco, Dubai and Bahrain. Jay is very involved in his community specifically regarding regional growth issues within the Phoenix metropolitan area and the state of Arizona. He is currently the Chair of Urban Land Institute's Reality Check Program.

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Mario is a distinguished economist with an international track record in economic analysis, transportation and infrastructure policy and business strategy. He leads AECOM's economics practice in Canada and also provides procurement advice to AECOM's Alternative Delivery Group.

Bob Johansen
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Bob has diversified experience in planning, design, project management, and construction management. His current practices support port master planning efforts both domestically and internationally. A portion of his time is focused on the master planning, conceptual design, and detailed design of maritime and intermodal facilities, however with the move toward larger ships and automated terminal design, his team has been involved with the extensive use of simulation modeling to develop new operating paradigms such as the "ship-in-a-slip" concept for CERES Amsterdam, and to develop automated terminal design concepts for facilities such as the EUROMAX terminal in Rotterdam.

Diana Mendes, AICP
Senior Vice President, Transportation
Diana is the Director of Strategic Investments for AECOM Transportation, and serves as the Executive Director of the AECOM Global Cities Institute. For the last 25 years, she has focused her work on implementing environmentally responsible transportation solutions that enhance community livability and vitality. Her work has been recognized by local, state and federal awards from the Environmental Protection Agency and the American Public Transportation Association. She is a past recipient of the Women's Transportation Seminar Washington Chapter Woman of the Year Award (2005). Diana will begin her appointment to the American Public Transportation Administration (APTA) Board of Directors in October 2010. In October 2008, Ms. Mendes became the Chair of the APTA Policy and Planning Committee, after serving two years as Vice Chair. In 2008, she was appointed to the American Planning Association (APA) Legislative and Policy Committee and as the Transportation co-Chair for APA's National Infrastructure Task Force on Rebuilding America.

John McNamara, AIA FAICP
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John has extensive experience in transportation, community planning, urban design, and economic development through the U.S., as well as in Canada, Asia, and Europe. He is a nationally recognized expert in the planning and design of multimodal transportation systems and corridors, specializes in the land use relationships with such investments, including devising strategies to address regional urban form, smart growth, transit-oriented development, community revitalization, and context sensitive solutions. Recent project experience includes the bqAZ Statewide Transportation Planning Framework Program; high-capacity transit planning and design in Tampa, FL, Phoenix, AZ, San Diego, CA, and Grand Rapids, MI; masterplanned communities throughout the Southwest U.S.; and former military base economic redevelopment across the U.S., Canada, and Europe. John is also serving as an advisor on the Global Cities program in Beijing.

Jaclyn Pfeiffer, AICP
Community and Transportation planner, Transportation
Jaclyn has extensive experience in transportation and community planning throughout the Midwest and Southwest U.S. She is well-regarded for expertise in project research, mapping, strategy development, writing, graphic design, management support, and community participation facilitation. Recent experience includes the bqAZ Statewide Transportation Planning Framework Program, including the Statewide Rail Framework Study and State Rail Plan; the Pinal County Comprehensive Plan; the I-10 Hassayampa Valley Transportation Framework Study and the I-8 and I-10 Hidden Valley Transportation Framework Study; and masterplanned communities such as Estrella Mountain Ranch for Newland Communities and Mesa Proving Grounds for DMB Associates.

Ximena Zamora
Urban Planner, Design + Planning
Ximena is a planner whose skills have enhanced architecture, urban design, and urban planning projects. She has worked with city officials, private developers, community leaders and members on a wide array of private and public sector development projects, including master planning, community design, development standards and design guidelines, urban revitalization plans, mixed use redevelopment, and streetscape design. Many of these projects utilize innovative and sustainable solutions to address the current transportation, land use, environmental and socio-economic challenges.

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A core initiative of AECOM, the AECOM Global Cities Institute is an urban laboratory that goes beyond traditional practice. Our work addresses the evolving role of cities and regions in realizing social, economic and environmental aspirations. Our city teams bring together a wide range disciplines: from architects and environmental planners, to transport engineers and development economists to advance urban progress.

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