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Roadmap to 2050

Planning for Utah's Future Infrastructure Needs



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The mission of Utah Foundation is to promote a thriving economy, a well-prepared workforce, and a high quality of life for Utahns by performing thorough, well-supported research that helps policymakers, business and community leaders, and citizens better understand complex issues and providing practical, well-reasoned recommendations for policy change.

Roadmap to 2050

Planning for Utah's Future Infrastructure Needs

Utah's population is projected to grow by 2.5 million people by 2050. This growth will result in an older, more diverse population. New Utahns will need places to live, reliable sources of energy to support their needs, and a good transportation network to get to work, entertainment, or school. This report focuses on three important facets of communities: development, transportation, and energy. Water is also a critical element to growth, but it will be discussed in a later report.

Utah's urban areas will continue to grow. In the case of existing urban and suburban areas, discussions about land use, maintenance and upgrades of infrastructure, and transportation will be key components to anticipating the needs of future residents. Additionally, growth will occur in areas that were formerly agricultural land, wildland urban interface, or undeveloped. Development in these areas raises a different set of considerations, including funding for new infrastructure development, feasibility of connecting an undeveloped area to the existing energy grid and travel network, loss of agricultural land and way of life, and increased fire danger. If new development is occurring in undeveloped areas, connections to jobs, schools, shopping, and entertainment could all potentially be farther from houses, leading to impacts on transportation cost.

Technologies and regulatory environments will change in the future, and their impacts are not all known yet. Changes in pricing and technology for renewable energy resources, restrictions on carbon emissions, and safety regulations all factor into the future of energy and transportation. The public's attitudes and awareness of changes in these sectors can also impact how investment rolls out. Additionally, regulatory decisions in other levels of government could indirectly affect infrastructure planning, including wildlife habitat designations and changes in the protected or endangered species lists. Public and private service providers and policy makers will need to adapt to new situations to ensure that future Utahns have the necessary access to housing, transportation and energy.

HIGHLIGHTS

- **Older individuals increasingly want to “age in place,” while younger individuals are delaying home purchases due to student debt.**
- **Utah's Energy Resource and Carbon Emission Reduction Initiative strives for renewable utilities to account for 20% of retail electric sales by 2025 – a goal which seems attainable under current projections.**
- **National annual vehicle miles traveled decreased over a seven-year span, and research on Utah shows trip rates rise as income rises.**
- **Households in the Wasatch Front spend 26% of annual income on transportation, which is 7% more than the national average – these costs could potentially increase as development moves farther out.**

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INTRODUCTION

Rapid population growth in Utah is a topic on the minds of many. A joint resolution passed during the 2013 Utah legislative session mandated that a planning conference be held every other year in which legislators convene with local leaders with the expressed goal of ensuring that Utah continues to grow in a way that maintains our quality of life. Envision Utah has a similar charge, working with the Governor, key stakeholders, and the public to develop the “Your Utah, Your Future” plan for future growth and development. Additionally, Utah Foundation is producing a series of reports in 2014 examining projected population growth and the impacts this will have through 2050. This is the second report of the series.

Numerous reports have been released regarding population growth in Utah. Depending on the report, there is a broad range of predictions, but all point to varying degrees of rapid growth in the state, and most of that growth will happen in the state’s metropolitan areas. The residents in these communities will need to have houses to live in and ways to get to where they work and play. This report focuses on three important processes required for growth to continue: community development, expansion of transportation options, and distribution of energy.

Development will not only happen in metropolitan areas; new development will spread into less densely developed areas. In areas where new development occurs it is likely that agricultural land will be converted into new suburban areas. This report examines several areas in Utah that could see immense growth out to 2050 and explores potential impacts to agricultural land in these areas.

Development into undeveloped areas increases the importance of effective transportation networks. Additionally, population growth places a greater strain on Utah’s existing roads and transit systems, and may create additional impacts from their use. This paper discusses the Unified Transportation Plan and potential future funding resources.

Lastly, for people to be comfortable in their homes they need basic utilities. Water is a key utility, but it will be discussed in a separate report later in 2014. This report focuses on energy in the form of electricity and natural gas.

DEVELOPMENT

Local headlines of late dealing with population growth describe a dim future for Utah. Opinions on projected population growth of 2.5 million new residents by 2050 and studies like one from NumbersUSA, an organization focused on immigration, showing that Utah has the second-fastest urban sprawl in the nation identify growth as a cause for concern.¹ However, other voices are not so alarmist. A recent study by SmartGrowth America places Utah cities in the middle of the pack nationally in regard to sprawl.² Regardless of which studies hit closer to the mark, increased awareness of the impacts of development is crucial to help maintain quality of life for Utahns. Changing attributes of the population including age, lifestyle, activities, and habits could impact how cities build in the future. This section discusses how these differing facets may require changes in future development.

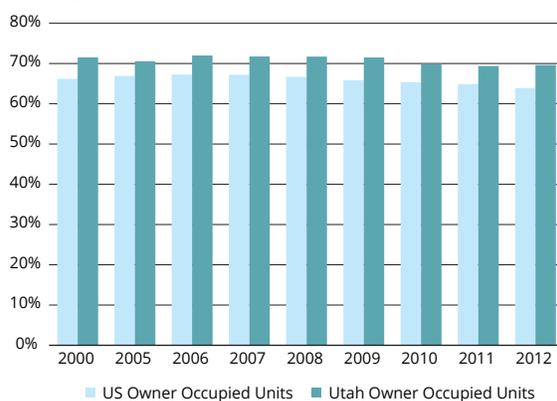
Who Will Live Here?

The population of Utah in 2050 will look much different than it does in today.³ We will see an older, more diverse population that will want and need different amenities in their homes, neighborhoods, and the larger community. Utahns age 60 years and older will become the fastest growing segment of the population by

2037.⁴ This bump in older residents will likely affect home trends. Recent survey work by the AARP supports academic research, showing that nationally most people 50 years and older want to age in their homes, and that access to bus stops is the top community amenity they want close to their homes.⁵ This concept of “aging in place,” of older people remaining in their homes and communities, is a bit of a shift from prior practices for older Americans.⁶ The body of research in this field suggests that the physical and social design of communities needs to be reexamined to support changing needs in mobility and accessibility for an aging population.⁷ Nationally, older homebuyers are focusing more on townhouse style developments and are moving so they can be closer to friends, family, and health services.⁸ Although there is a strong desire by the aging population to stay in their communities, older Utahns could also have more flexibility than their younger counterparts in the home market. According to 2012 American Community Survey data, 76% of Utah homeowners over the age of 75 do not have a mortgage. This lack of mortgage debt would allow older Utahns to purchase a new home with cash or a sizeable down payment, making them more competitive buyers than some first-time homebuyers.

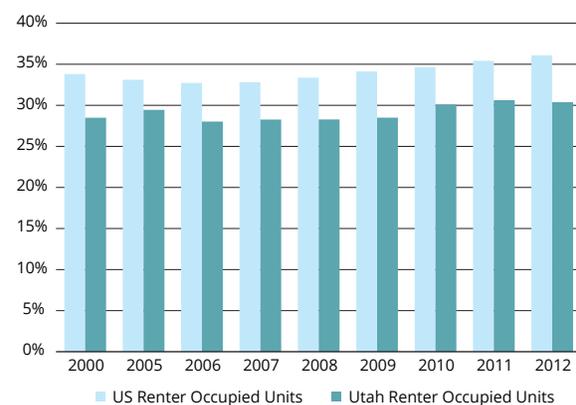
Utah has traditionally been a state dominated by homeowners. In 2000, 71.5% of housing units were owner-occupied, compared to 69.6% in 2012. In 2009 rental and ownership markets changed both nationally and in Utah. A slight decrease in owner occupied housing began in 2009, whereas a slight increase in renter occupied housing happened in the same timeframe (see Figure 1 and 2). However, for younger buyers certain issues could turn recent homeownership changes into long-term trends. Student debt constitutes the largest amount of debt in the country, recently surpassing credit card debt. The Federal Reserve Bank of New York released research stating this burden is seeping into consumption patterns. Young adults with debt are delaying the purchase of homes and other “grown-up milestones.”⁹ The Federal Reserve also makes note that those with student debt have historically had lower homeownership rates. Although Utah ranks 44th out of 48 states and Washington DC for undergraduate student debt, the average debt carried in Utah is still over \$20,000 – an increase of more than 50% from a decade prior, which may limit the home-buying opportunities for recent graduates.¹⁰

Figure 1: Owner Occupied as Percent of Total Housing Units, US and Utah



Source: U.S. Census Bureau.

Figure 2: Renter Occupied as Percent of Total Housing Units US and Utah



Source: U.S. Census Bureau.

In the short-term, the effects of the Great Recession, student debt, and other factors are affecting rental markets. Figure 3 compares urban Utah cities with several major U.S. and regional cities. Although some of the low vacancy rates in Utah can be attributed to cities with large college student populations, rental vacancy rates across the state are lower than the national average – 5.9% versus 7.4%. Additional local analysis conducted in 2013 showed a 3.9% vacancy rate in Salt Lake County. The projections from this analysis

predict that vacancy rates will remain under 5% and that “there is currently little threat to overbuilding.”¹¹ Although there seems to be an anecdotal aversion to multi-family units in suburban communities, market demands might require cities to adapt to accommodate a larger population of renters.

Figure 3: Vacancy Rates, Cities

	Homeowner Vacancy Rate	Rental Vacancy Rate
United States	2.3%	7.4%
San Francisco, California	1.2%	3.6%
Denver, Colorado	2.2%	4.7%
Chicago, Illinois	3.6%	7.8%
New York City, New York	2.5%	4.0%
Logan, Utah	0.6%	3.2%
Ogden, Utah	2.0%	8.0%
Provo, Utah	2.1%	2.5%
St. George, Utah	3.9%	7.1%
Salt Lake City, Utah	3.1%	5.1%

Source: U.S. Census Bureau.

Weber.¹² Had the study area been expanded to include counties adjacent to the Wasatch Front a different picture might have developed. Development would likely spread into counties of the Wasatch Back, including Summit and Wasatch counties, or west to Tooele County, and may have resulted in less intense development occurring in Utah County. Although continued development will occur in the Wasatch Front, adjacent, less-developed counties still need to be factored into the equation.

The GOMB projections indicate that population growth in existing urban areas will continue in the future. In order to accommodate new growth, innovative approaches to development need to occur. According to the RCLCo study, approximately 2,500 acres along the Wasatch Front have the potential for redevelopment in the next few decades. For the RCLCo analysis, these areas have or will have buildings over 30 years old, are of a certain acreage, and are not single family homes.¹³ According to research by Arthur Nelson at the University of Utah, the 30-year mark is the point where land value appreciation starts to overtake the depreciation of a nonresidential structure. Typically, the lifespan of residential buildings is over 150 years, whereas commercial and office buildings are generally 50 years or less.¹⁴ This redevelopment within existing built areas can be effective at accommodating shifting needs of the residential market, especially when working within limited spatial constraints. In the four-county Wasatch Front over the last decade, 25% of all housing units have been provided in areas that were already developed (infill) or through redevelopment. This rate significantly exceeds the infill and redevelopment activity for most of our peer regions including Denver, Sacramento, Las Vegas, and Phoenix.¹⁵ Over the next few decades areas including Salt Lake County, northern Utah County, and South Davis County will reach build out. This will likely lead to increased demand for infill and redevelopment activity in these areas and in Wasatch Front in the aggregate.

Despite changing demands placed on the housing market, the desire to own a single-family home will likely remain. Due to limits on existing supply, new housing developments will need to occur to accommodate future Utahns. These new developments will need to be in areas that are currently undeveloped. The Wasatch Front is spatially restricted by the Uintah and Oquirrh mountains and the Great Salt Lake, though there are still large undeveloped areas in Utah County, Tooele County, and the Wasatch Back. Areas projected to grow significantly in Utah County are, for the most part, cities that currently have small populations (under 1,000 people). Analysis of water-related land use for the cities most likely to grow in Utah County show these areas as being predominantly either rangeland or agricultural land. Although Utah saw an actual increase in the number of its farms, the acreage of farmland has decreased since the late 1990s.¹⁶ Historically along the

Where Will Development Occur?

The Utah Governor’s Office of Management and Budget (GOMB) provides useful population projections to help develop an idea of what Utah’s future may look like, but these projections are not definite. Envision Utah and other organizations have developed independent, market-based analyses to create other views of what the future might hold. A study from RCLCo, a real estate analysis firm, predicts more development in Utah County than GOMB projections. However the study was limited to four Utah counties – Salt Lake, Utah, Davis and

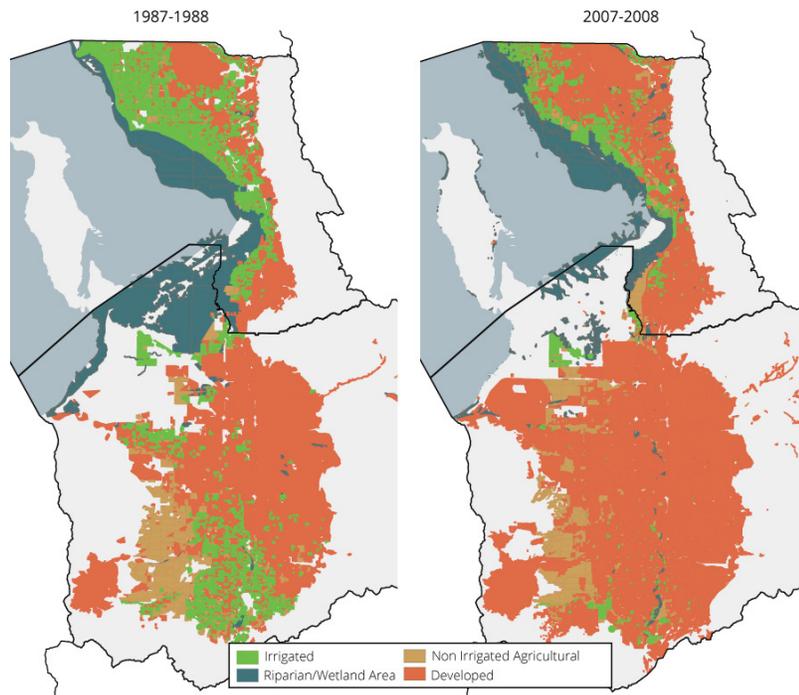
Wasatch Front, farmland has been consumed to accommodate growing urban development. Figure 4 shows how this change has occurred in Davis County from the 1980s to today. Red areas are urban development (residential, commercial, etc.), green areas are agricultural land, and the dark teal areas are riparian land. Figure 5 highlights existing land uses in the cities in Utah County projected to experience the most growth in the next 35 years. This increased pressure on agricultural land is of concern to the agricultural community in Utah. Agriculture and related employment comprise 14% of Utah's GDP annually. When smaller cities develop more rapidly, the role of agriculture in the region should be included in planning analysis.

An issue of concern for areas of new development is wildfire. There have been dramatic increases in

wildfires in recent years across the entire Mountain West. Although theories vary as to why this increase has occurred, monetary damages to homes are on the rise because of increased development. Expansion into undeveloped areas increases the risk of fire danger. A recent article by the Pew Foundation shows that 7% of the wildland urban interface in Utah – forests, grasslands, shrub lands and other natural areas – is currently used for homes.¹⁷ Fires in 2013 threatened homes in Summit and Cache Counties, which are both projected to see their population more than double by 2050.¹⁸ Although the bulk of the developable area in Utah falls in areas with low-mixed severity and 35-200 year frequency for wildfires, the recent bump in area fires has heightened awareness. As concern about water use and climate variability increases, opportunities exist for discussion of appropriate locations and types of building along the interface.

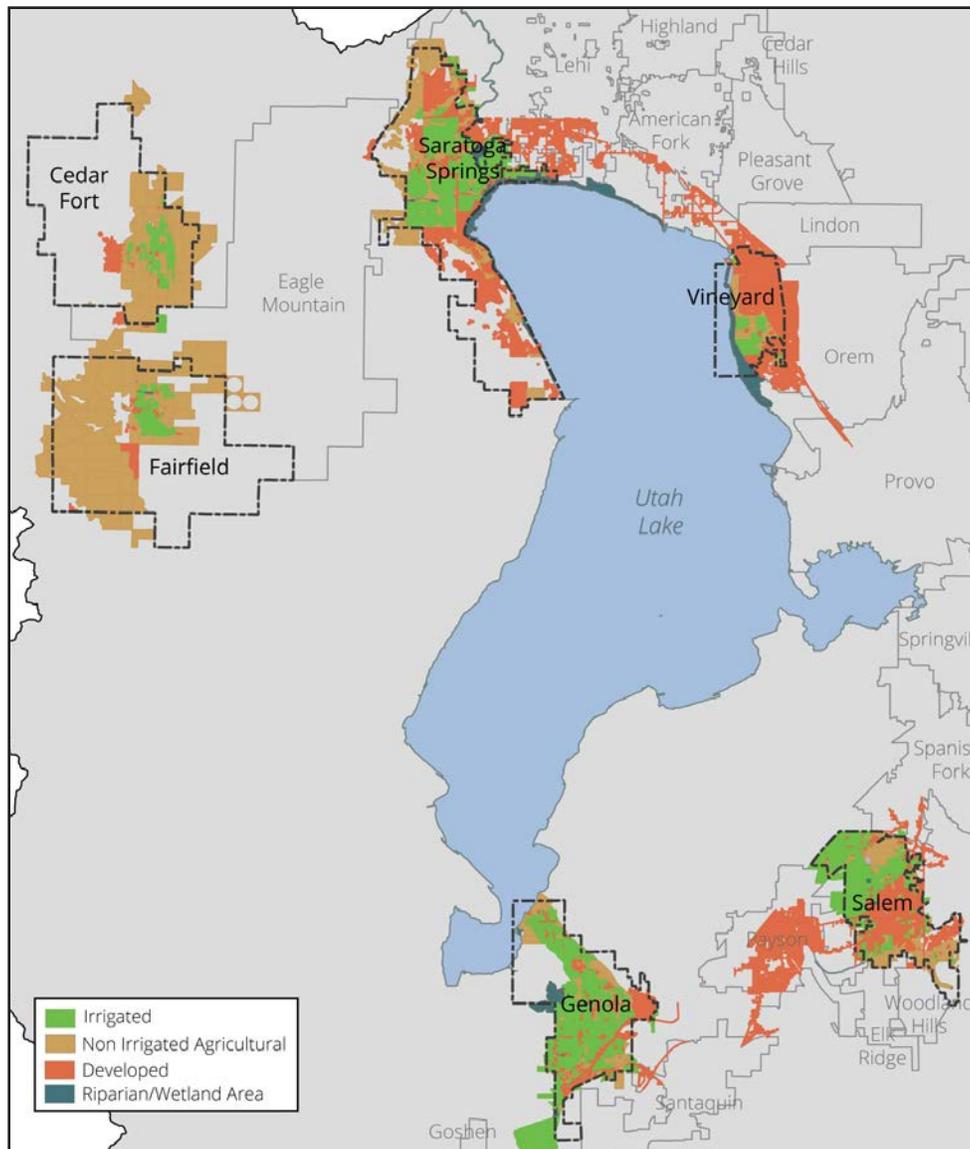
In addition to the concern over development on agricultural land and the increased risk of damage by wildfires, many areas that are projected to grow significantly lack the infrastructure necessary to accommodate commercial and residential development. Utility companies utilize GOMB projections to plan 10 to 15 years into the future. But who should pay for new infrastructure investments as these new developments grow? Past generations have paid for the infrastructure which benefits the majority of Utah's population. Should we have a commitment to the future of Utah and share the cost burden, or should those moving into new areas be held liable for the costs? Those are questions that need to be answered with in-depth public policy reports of their own.

Figure 4: Comparison of Land Use in Salt Lake and Davis County, 1987/88 and 2007/08



Source: Utah Foundation analysis of Utah Automated Geographic Reference Center (AGRC) data

Figure 5: Water Related Land Use, Utah County, Top Cities for Projected Growth



Source: Utah Foundation analysis of Utah AGRC data

ENERGY

In 2010, Governor Herbert announced the Utah Energy Initiative. This 10-year plan was created to help Utah be “at the forefront of solving the world’s energy challenges.”¹⁹ The Governor’s plan presented ten goals for Utah’s energy future. These goals are broad reaching, touching on energy development, relationships of energy to the economy, modernizing the regulatory environment, fostering relationships between diverse interested parties, and collaborating with our neighboring states. The Utah Energy Initiative goals and principles provide a guide for energy development into the future, and create an awareness and room for discussion around issues relating to energy in Utah.

Much of the state’s current effort is focused on conventional energy production. Development of these resources has led to population and building booms in the eastern part of the state with coal, oil, and natural

gas. These conventional sources have an impact on Utah's affordable energy costs. Utah's retail prices rank below the national average for natural gas and electricity (see Figure 6). Low energy costs provide a draw for companies to locate in Utah, and the state has a diverse array of energy resources.

Figure 6: Utah Energy Retail Price Comparison

	Natural Gas (dollars/thousand cubic feet; 2012)	Ranking	Electricity (cents/kilowatt hour; 2012)	Ranking
Residential	8.69	38	9.93	39
Commercial	7.00	43	8.06	41
Industrial	4.69	37	5.62	40
All Sectors	n/a		7.84	41

Source: EIA

response to a preliminary release of the rule in 2012 and comment period which elicited 2.5 million public comments. The newest version of the rule proposes to limit greenhouse gas emissions from new fossil fuel-fired power plants, with separate standards for natural gas-fired stationary combustion turbines and coal powered electric steam generating units.²⁰ Reductions of existing power plant emissions of 30% by 2030 were announced in June, 2014. These increasing demands for emission reductions definitely will have an impact on development and delivery of utilities in Utah.

Current projections show usage of utilities growing into the future – a 15% increase in gigawatt hours from 2013 to 2022 for electricity and a 19% increase in natural gas over the same timeframe caused primarily by the conversion from coal to natural gas for electric production.²¹ A recent study by the American Council for an Energy-Efficient Economy suggests that implementation of four proposed energy efficient policies (implementing an energy efficiency savings target, enacting national model building codes, constructing combined heat and power systems, and adopting efficiency standards for products and equipment,) could save Utah ratepayers \$100 million and meet the proposed EPA carbon reduction targets.²² Due to coal being the primary source for the majority of Utah's electricity and Utah's CO₂ emission rate being 6th highest in the nation, any changes to regulations that impact coal are being closely watched by utilities and end users.²³

In the 2000s, states across the nation began enacting Renewable Portfolio Standards, which require utilities to sell an allotted portion or amount of renewable electricity. At the time of this report, 35 states have established requirements or suggested goals. Utah is one of six states in the nation that has a goal instead of a requirement.²⁴ Utah's Energy Resource and Carbon Emission Reduction Initiative was enacted in 2008 and its directive is to expand use of renewable resources as long as it is cost-effective to do so. The goal is for renewable utilities to account for 20% of retail electric sales by 2025, and to offer net metering to customers who generate electricity using renewable resources.²⁵ The renewable resources considered eligible technologies are diverse, from those most people are familiar with – solar, wind, geothermal, hydroelectric – to others less familiar such as methane gas from abandoned coal mines, municipal solid waste, and compressed air storage under certain stipulations.²⁶ Under the goal, Rocky Mountain Power is required to file progress reports every 5 years, and current projections make the goal seem attainable.²⁷ Many states, especially those that are aggressive in their goals of changing their energy framework, have met earlier goals, revised their targets, and have more accelerated rates of change.

In Utah, transportation and industrial uses consume the most energy. However, energy expenditures in transportation and residential are the highest. This section will discuss electricity, natural gas, and renewables. Each of these resources utilize different planning horizons to determine their approach to future development and infrastructure. Although natural gas and electricity are delivered by different entities statewide, each resource has a privately-held, state-regulated company that services the majority of the state.

Nationally, changes to carbon emissions might affect these rankings and may guide energy development in the future. Two rules for new and existing power plants have been issued in the past several years by the EPA. The comment period for the revisions of the Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources issued by the EPA closed in March 2014, and the final rule is set to be released later this year. The revisions were in

Electricity

Since 2008, Utah's per capita energy consumption ranking has increased from the thirty-ninth highest in the nation to thirty-sixth. Utah's electricity generation comes primarily from coal.²⁸

There are two types of electric providers in the state – government-owned municipal power companies and Rocky Mountain Power, a privately-held, state-regulated company that provides electricity to approximately 80% of the state. Due to Rocky Mountain Power's market dominance, it is a regulated utility with rates set by the Utah Public Service Commission. Municipal power agencies have more flexibility in their rate structures. Figure 7 highlights the differences between several municipal power agencies and Rocky Mountain Power. Utahns have lower average electricity rates than the national average. In 2012, the average Utah retail price across all sectors was 7.84 cents per kilowatt hour versus 9.84 cents nationally.²⁹

Figure 7: Electricity Rate Comparison, Rocky Mountain Power and Municipal Agencies

Electricity Provider	Base Residential Rate (cents per kWh)	Amount of kWh at Base Rate	Additional kWh Rate	Amount of kWh at First Tier Additional Rate	Service Charge or Connection Fee
Rocky Mountain Power	8.8	400 kWh	11.5	400-1000 kWh*	\$5.00
Murray	8.6	600 kWh	9.6	over 600 kWh	\$3.35
Price	9.2	400 kWh	10.7	400-600 kWh*	\$3.74
Bountiful	9.25	all			\$7.14
Heber Light and Power	7.5	1000 kWh	9.4	over 1000 kWh	\$12.00
St George	7.5	800 kWh	8.1	over 800 kWh	\$15.65
Provo	8.35	500 kWh	9.7	500-1000 kWh*	\$6.25

* Additional rate for overage after top limit. Only two rates were included for each power entity in this table.

Source: Municipal Power Websites, Heber Light and Power 2014 Rate Study.

Both types of service providers recognize the importance of planning for the future, and therefore have planning processes in place. Rocky Mountain Power creates an integrated resource plan (IRP) every two years with an update published during the interim year. The IRP is filed with the Utah Public Service Commission. In the IRP, existing conditions are inventoried, GOMB population projections are considered, future energy sources are identified, and budgets are addressed. The IRP has a scope of 10 years, although planning without formal modeling occurs for longer timeframes. The current IRP shows that forecasted need and overall energy prices have declined since 2013. A major component of the near-term future planning is the Energy Gateway Transmission Expansion project, which creates major transmission lines to help support Utah, Idaho, and Wyoming. This project, spearheaded by Rocky Mountain Power, creates a triangle of reliability to ensure backup power to all their users in the Intermountain West. The project falls under the jurisdiction of the National Environmental Policy Act (NEPA), which seeks to ensure informed decision making through a systematic interdisciplinary approach.³⁰ The transmission projects implemented in the past 5 years and those planned for the near future are estimated to be sufficient for the next 30 to 50 years.³¹

Although the individual municipal electric entities operate on a smaller scale, organizations such as the Utah Associated of Municipal Power Systems (UAMPS) and the Utah Municipal Power Agency (UMPA) provide municipal electric providers with a collaborative environment for future planning. These organizations help to strengthen smaller networks, which are a minority in the state. Although some neighboring states are experiencing renewed interest in creating municipal electric companies, cost of acquisition of distribution

systems and power supplies make it unlikely that cities and towns in Utah would try to start new municipal electricity providers.³² Both UAMPS and UMPA recognize the potential impacts of new regulations regarding coal and fossil fuels for electric generation and are looking at other options to provide future baseload supply. UAMPS discusses nuclear resources and natural gas for generation of baseload supply.³³ Many of the municipal electric providers have agreements with Rocky Mountain Power and utilize shares of power generation facilities. The existing coal powered generation plants mentioned in the UMPA IRP are expected to be operational for the next 20 years under current programming.³⁴

Potential challenges in the future come from both regulatory actions and consumer preferences. Changes to environmental regulations will impact how power is produced in the U.S., and due to Utah's existing heavy dependence on coal the impacts could be noticeable. With a decision on the EPA Carbon rule expected to occur in 2014, the picture for decision makers and utility companies could become clearer soon. Additionally, public acceptance and desire for more renewable energy sources will impact how energy develops in the future. Although single-home renewables such as small wind turbines or solar panels do not currently make up a noticeable portion of the market, there is potential for change due to price changes and potential policy changes.

In the short term, regulatory reaction to single-home utilization of renewable resources could set precedent for future generations. In 2013, Utahns invested \$11 million installing solar panels on residences and businesses.³⁵ As mentioned previously, the state Renewable Portfolio Goal promotes the use of net metering to encourage system users to utilize renewable resources. Net metering is a billing mechanism used by utility companies to credit customers with solar panels for the electricity they add to the grid.³⁶ In Utah, a proposed rate restructuring from Rocky Mountain Power would charge solar users a base fee, and this is creating contention between users and the power company.³⁷ Solar energy is an intermittent resource, meaning that it cannot provide steady energy supplies to be used as a baseload source. This intermittent service creates a need for most solar users to still utilize the system in hours when the sun is not out. The response by the Public Service Commission and Rocky Mountain Power could potentially frame how small-scale solar develops.

Natural Gas

Natural gas is the predominant source of heat in Utah - 85.5% of Utah homes are heated by natural gas, which is significantly higher than the national average (49.4%).³⁸ Recent research by the Utah Geological Survey has identified "sweet spot" areas for shale-gas resources in Utah, and research by the Potential Gas Committee, an industry organization, shows that there is a natural gas supply within the U.S. that could sustain needs for over 100 years.³⁹ Although natural gas produces about half as much carbon dioxide per unit of energy as coal, it is composed heavily of methane, which can create greenhouse gas effects.⁴⁰ Due to its prevalence and lower environmental impacts, natural gas is gaining ground in energy markets around the U.S. Additionally, the lower environmental impact and convertibility of natural gas has made it a viable option for transportation fuel.

Questar is the natural gas provider for the majority of the state, though several cities independently provide natural gas to their residents. However, all natural gas providers in the state utilize the same interstate pipeline grid for conveyance. In areas such as the Wasatch Front and Washington County, with existing, close connections to infrastructure networks, residents have access to natural gas. In smaller, more remote

Utah's renewable portfolio goal strives for renewable utilities to account for 20% of retail electric sales by 2025.

regions of the state, there is no natural gas infrastructure. The potential for development of new infrastructure or connections for small cities to the interstate pipeline grid is largely dependent on other infrastructure projects in the area and potential usage of natural gas in the future.⁴¹ A cost-benefit analysis is conducted by Questar and presented to the Public Service Commission to determine whether connecting a small population to the network would be a prudent investment.

As regulated by the Utah Public Service Commission, Questar also produces an IRP to plan for the future. Due to Questar's market dominance, the Commission regulates rates. Questar utilizes modeling tools to project needs for a five-year window. However, they are constantly interacting with cities and towns to determine the needs of future generations. In the case of installation of compressed natural gas (CNG) stations for cars, partial funding was supplied through a 2009 Department of Energy grant.⁴²

For infrastructure improvements, the Public Service Commission examines plans created by Questar and determines whether the investment is prudent. Due to the expense of some larger scale projects, investments are phased over time. Due to continued growth in existing urban areas, improvements and safety upgrades to the existing system are a significant cause for investment.

Outside of funding and regulations placed on the interstate pipeline grid, specific events can create regulator response. An explosion in San Bruno, California in 2010 created a strong call to action for a nationwide response. The explosion was caused by a gas leak, destroyed 38 homes and killing eight people.⁴³ A disaster of this scale elicited strong response from the community, and Federal regulations were put in place to try and prevent another occurrence. The Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011 (H.R. 2845) was passed in 2011. It includes requirements for various types of testing, recording, and reporting of statistics, and installation of automatic or remote-controlled shut-off valves on new pipelines or as pipelines are replaced through 2015.⁴⁴ Local events in Utah in 2005 caused Questar to begin upgrading old pipes and technologies prior to San Bruno. Utah Public Service Commission has instituted tracking mechanisms to help incentivize investment by natural gas utilities in infrastructure.

85.5% of Utah homes are heated by natural gas – the national average is 49.4%.

Due to the nature of the regulated rate structuring and capital costs to both upgrade old systems and adhere to new safety regulations, there is potential for conflict regarding where investments are made. Although only 15% of incidents between 2002 and 2009 were related to the age of pipelines, utility companies want to upgrade old systems to newer technology.⁴⁵ The original natural gas pipelines in Utah were laid in the 1920s, with refurbishments in the 1950s and 1960s.⁴⁶ Questar is currently in the process of updating existing pipelines to the newest technologies, in addition to adding capacity where needed. The need to upgrade the system, plus additional safety features, testing, and reporting determined by Federal regulations create an environment with potential for competition between priorities. Additionally, the costs for installation of these improvements and safety measures for the Questar network are paid for upfront by Questar's capital fund. This system of investment is standard across the U.S., and creates a lag between when companies make investments and when they are able to recuperate expenditures via rates.⁴⁷ Although Utah currently utilizes an Infrastructure Rate Adjustment Tracker to compensate Questar for investments more quickly, the best practice for state utility commissions may shift as natural gas development increases.⁴⁸ As natural gas becomes a more dominant source for electric generation, regulations might need to be revisited to ensure that different types of investment and improvements receive equal weight.

Similarly to electricity, future impacts on natural gas will be affected by public opinion and regulatory acts. Although Utah has vast shale-gas assets, the process to attain those assets (hydraulic fracturing or "fracking") has elicited controversy in the U.S. in the past several years. Projects in other regions of the U.S. including Pennsylvania, Ohio,

West Virginia, and Texas have raised questions from residents and environmental groups about not only environmental impacts to water and the stability of ground, but also human health⁴⁹. Although research done by various Federal agencies in the past three decades concluded that the risk for problems was primarily from post-process handling of fluids, the EPA is currently working on a revised report on the environmental impacts of hydraulic fracturing to be released in 2014.⁵⁰ Continued development of natural gas resources will be impacted by the current gas-shale projects in the U.S. and the regulatory environment that is created.

Renewables

A Utah Foundation report from 2012 found that although Utah was then taking advantage of some renewable resources, there was potential for continued development.⁵¹ Increasing public awareness and excitement about renewable resources, as well as environmental impacts from current energy production methods, continue into the future. As research and development of renewable resources continues, issues such as storage capacity and cost effectiveness could become smaller hurdles for both individual energy users and large scale energy producers. In the short term, there are advancements nationally in supporting renewable energy development. In May 2014, President Obama issued multiple executive orders supporting renewable energy development, with a stated focus on job creation and carbon pollution reduction.⁵²

Currently, several large wind projects in Wyoming contribute to the Rocky Mountain Power system, and UAMPS recently completed the Horse Butte wind project in Idaho. First Wind, an independent energy company, is spearheading several three-megawatt solar projects in Beaver and Iron counties, which will provide solar power to Utah residents.⁵³ In late 2013, a geothermal plant in Cove Fort, Utah, capable of generating up to 160 GWh of power annually, was completed and connected to the grid.⁵⁴ In order for utility companies to meet the goal of 20% of adjusted retail sales by 2025 of the Energy Resource and Carbon Emission Reduction Initiative, projects like these need to continue into the future. Potential growth of renewable resource development in neighboring states could also give Utahns additional access to nontraditional energy. A recent study by the National Renewable Energy Laboratory shows wind power from Wyoming as a reasonable, low-cost energy supply to help the state achieve the 2025 goal.⁵⁵

Wind power from Wyoming may be a reasonable, low-cost energy supply option for Utah by 2025.

The potential dispersed nature of renewable energy projects also raises questions of conveyance. Large-scale renewable resources are dependent on a transmission grid, just as natural gas or conventional electricity. In order for Utah to receive wind power from inside or outside of the state, the production facilities need to be connected to the larger transmission network. A discussion paper from Resources for the Future suggests that in order for states to achieve their renewable standard portfolios, renewable policies should go hand-in-hand with transmission policies.⁵⁶ In practice, this is already occurring. The siting of the Rocky Mountain Power transmission project was heavily influenced by projected development of wind farms in Wyoming and Idaho.⁵⁷ Transmission costs are recoverable according to the text of the Utah standard, however who pays for the cost is not discussed.⁵⁸ Rocky Mountain Power utilized its existing structure, capital financing, and connections to the grid. As renewable technologies continue to grow and change in the future, discussions should continue over best practices for both financing and siting transmission resources to move renewable resources.

TRANSPORTATION

In the eastern half of the U.S., cities and development have occurred primarily on or near waterways. Due to the fact that Utah is a landlocked state, early connectivity was created by wagon trails, early roads, and

in the late 1860's, interstate rail. The continued development patterns of ensuing decades was influenced heavily by the location of the interstate highway system. Approximately 85% of Utah's population lives in the Wasatch Front or St. George/Washington County areas. Both of these areas fall along I-15 and I-80. In freight and shipping, Salt Lake City is considered the crossroads of the West, due to the east-west and north-south connections via interstate and rail. Questions about funding of future transportation projects have been identified, and potential shortfalls of billions of dollars could be in the future. The addition of 2.5 million people by 2050 projected by GOMB will put serious strains on the continued performance and connectivity of the transportation network, although there are some signs that needs could be changing in the future.

Utah's Unified Transportation Plan 2011-2040 is the guiding document for long-range planning of the transportation system in the state. This document compiles the plans of metropolitan planning organizations (MPOs) and the Utah Department of Transportation (UDOT). Although the practice of planning is required of both MPOs and the state by federal law under the Safe, Accountable, Flexible, Efficient Transportation Act: A Legacy for Users (SAFTEA-LU), the Unified Plan concept for a holistic view of the statewide transportation network is something Utah initiated independent of regulation in 2007. The federal regulations require the state to plan for regular auto travelers and for freight traffic. The majority of the projects listed on the Unified Plan are for maintaining or improving existing infrastructure. Approximately one third of the projects are new construction, as seen in Figure 8.

This emphasis on maintenance and improvements to existing infrastructure will be of critical importance in future decades. Well-maintained infrastructure costs less in the long run because it can reduce the need for, or significantly delay, costly rehabilitation. A current snapshot shows that Utah roads are already in need of maintenance and improvements. The American Society of Civil Engineers produces a state-by-state Infrastructure Report Card, which inventories infrastructure within states including roadways, bridges, airports, and water projects. According to the Report Card for Utah in 2013, 25% of major roads are poor or

Figure 8: Breakdown of Unified Transportation Plan

	New Construction or New Construction Combined with Project	Upgrades or Improvements to Existing Roadways
Phase 1: 2011-2020	33%	64%
Phase 2: 2021-2030	34%	65%
Phase 3: 2031 – 2040	33%	67%
Unfunded Phase	35%	65%

Source: Utah Foundation analysis of Unified Transportation Plan project list.

leaves a gap of \$11.3 billion yet to be accounted for. Work by Utah Foundation in 2013 discussed several different methods that could help complete the funding picture. Changing tax structures or rates at state and/or local levels, implementing congestion pricing, and public/private partnerships were all discussed in regards to their viability and monetary results for the state. Different aspects of transportation from vehicle miles traveled (VMT), to combined housing and transportation costs, to access to different modes of transportation can all end up impacting the funding picture for the state.

Vehicle Miles Traveled

Although from 1990 to 2010, VMT outpaced population increase by 18%, data from the U.S. Department of Transportation shows a recent reduction in overall VMT nationwide. The National Household

mediocre quality and 4.3% of bridges were considered structurally deficient. Additionally, the report cites that driving on roads in need of repair costs \$197 per motorist in extra vehicle repairs and operating costs.⁵⁹ These statistics speak to the ongoing nature of roadway and transportation infrastructure investment, which requires a continuing funding pool.

The current Unified Transportation Plan is slated to cost \$54.7 billion, with \$43.4 billion already being identified through current funding sources. This

Transportation Survey (NHTS) shows that Americans drove 30 billion fewer vehicle miles in 2008-2009 than in 2001-2002, despite population growth of almost 10%.⁶⁰ In the same timeframe, youth (ages 21 to 30) travel decreased from previous generations. According to Federal Highway Administration analysis of the NHTS, economic situations, more stringent licensing laws, and geographic location have all played roles in this decrease. The FHWA report suggests that as urbanization increases, transportation options will broaden and younger travelers will be less auto reliant.⁶¹ Although some organizations cite the change from 2001 to 2009 as a definitive trend, further analysis needs to be done after the next NHTS to see if the decrease continues. Population growth will continue to impact VMT. If VMT declines per capita but the population is significantly increased, the strain on the transportation system may not change.

Analysis of the impact of various factors on VMT shows that increased population, income, and freeway capacity increase VMT while increased gasoline prices, development density, and transit service levels can decrease VMT.⁶² Nationally, the NHTS showed a similar level of daily VMT between 2001-2002 and 2008-2009, with the exception of August 2008 when daily vehicle miles traveled dropped to 20.8 from 24.0 in August 2001. The suggested explanation for this drop is a delayed response to increased gas prices, with the public waiting to see how long the high prices would continue.⁶³ Similarly, a study of travel habits of Utahns shows that statewide as household income increased, daily trip rates increased. Additionally, transportation system decisions impact land use and new development. Increased accessibility to undeveloped areas created by new infrastructure tends to reduce market demand for living and working in existing areas and increases market demand in new growth areas. This tends to drive dispersal of growth, which has the potential to reduce the viability of transit infrastructure and may necessitate driving to reach basic destinations such as work, food, play, or other services.⁶⁴ This increase in VMT not only creates environmental impacts but creates economic impacts on travelers. Without careful planning, the potential exists for these dispersing forces to undermine the initial intent of new infrastructure – to help residents accomplish their day-to-day needs.

In 2008-2009, Americans traveled 30 billion fewer vehicle miles than in 2001-2002.

Transit

In 2014, the American Public Transportation Association reported that 2013 had the highest total transit trips since 1956. Within Utah, the Utah Transit Authority (UTA) saw an increase in ridership on TRAX light rail of 6.8% between 2012 and 2013.⁶⁵ With the addition of the FrontRunner commuter rail system in December 2012, the Wasatch Front has a truly multi-modal transit system. Research shows that more comprehensive transit systems get more efficient use, and that “one mile traveled on transit corresponds with a disproportionately higher reduction in automobile travel.”⁶⁶

Transit development is planned to continue into the future. In addition to roadway projects, the Unified Transportation Plan includes planning from the four public transit systems around the state: Utah Transit Authority (UTA), Cache Valley Transit District, Park City Transit, and SunTran in St. George. Projects slated for development between 2011 and 2040 include: 41 projects from enhanced buses to expansion of the commuter rail system; 18 facilities including park and rides, transit hubs, and transit-only interstate ramps; and a handful of corridor preservation projects to preserve space for future transit development. There are numerous additional similar types of projects currently unfunded. In the Unified Transportation Plan, these projects would require \$8.7 billion. Although the majority of these projects fall within the Wasatch Front, the agencies in Cache County and St. George have multiple projects in each phase of the plan.

Costs

As mentioned above, statewide transportation funding faces an \$11 billion shortfall between the demands laid out in the Unified Transportation Plan and allocated funding. Previous Utah Foundation work looked extensively at future funding opportunities, and Figure 9 highlights the policy options discussed. One potential issue with the GOMB population projections is that they do not consider land use, which has close ties to transportation. Potential changes in fees and taxes, in addition to potential increases in transportation energy costs, could change the picture of where future growth will occur.

In order to get a background of what types of policy changes the public might support or resist, it is important to understand the context of transportation in constituents' lives. As discussed in previous sections, current projections forecast expansion into undeveloped areas. This continued outward development could push lower-cost housing farther from city centers. The Department of Housing and Urban Development considers families who spend over 30% of their household income on housing as "cost burdened."⁶⁷ In order

Figure 9: Selected Policy Options Discussed in Fueling Our Future, 2013 - 2040 (2010 Dollars)

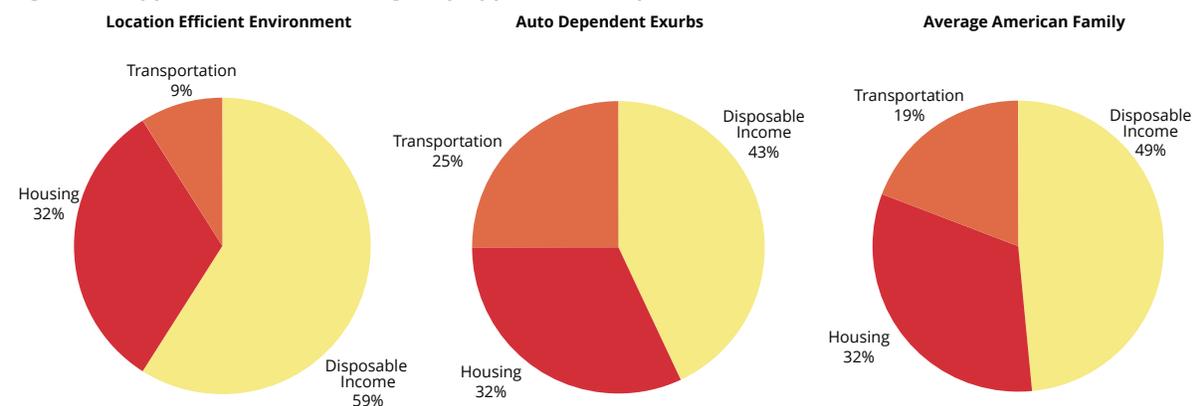
	2011-2040		Implementa- tion Level	Equity	Demand Management	Revenue Stability
	Total Revenue (millions)	Increased Revenue (millions)				
Motor and Special Fuel Excise Tax						
No Change in Taxes	\$11,193	\$0	State	Regressive	Taxes users of highways and roads, which can reduce demand.	Purchasing power of tax will continue to decline
Unified Plan Taxes (5 cent increase every 10 years starting in 2014)	\$15,188	\$3,995	State	Regressive	Taxes users of highways and roads	Purchasing power of tax will decline after each increase
Increase Fuel Tax by 9 Cents and Adjust Annually for Inflation	\$18,033	\$6,840	State	Regressive	Taxes users of highways and roads	Stable, except that fuel purchases decline when prices rise
Sales Tax on Gasoline						
4.7% Sales Tax on Fuel Price Including Current Excise Taxes		\$10,766-	State	Regressive	Taxes users of highways and roads	Fluctuates with strength of economy and fuel prices
		\$19,667				
4.7% Sales Tax on Fuel Price Excluding Current Excise Taxes		\$9,845-	State	Regressive	Taxes users of highways and roads	Fluctuates with strength of economy and fuel prices
		\$18,747				
Other State Options						
Increase Motor Vehicle Registration Fees by \$10	n/a	\$1,370	State	Regressive	Taxes users of highways and roads	Fluctuates with strength of economy
Funding Options from the Local or Regional Levels						
Increase Local Option Sales Tax for Transit by 0.25%	n/a	\$3,754	UTA service area	Regressive	No tie to users and funding source	Fluctuates with strength of economy
Enact a Transit Property Tax of 0.1% in UTA Counties	n/a	\$5,779	UTA service area	Somewhat regressive but less than sales or fuel taxes	No tie to users and funding source	Fluctuates with strength of real estate market
Vehicle Miles Traveled Tax						
Motor Fuel Equivalent, Adjusted Annually by CPI	\$17,125	\$5,932	State, city, county or regional	More equitable than sales or fuel taxes	Taxes users of highways and roads more directly for road usage than other taxes	More stable than fuel taxes, but mileage driven is affected by fuel price fluctuations

Source: Utah Foundation Report 713

to avoid this, many families drive until they qualify for an affordable mortgage, which puts them farther from schools, jobs, shops, and entertainment, just to obtain the housing they desire.

An unintended consequence of the “drive until you qualify” mentality is increased transportation costs. Research by the Center for Housing Policy shows that in cities surveyed, housing and transportation were the top two expenses for residents. For working families with incomes between \$20,000 and \$50,000, the percentage of an average household budget dedicated to transportation was actually more than for housing.⁶⁸ The average American family spends about 19% of their income on transportation, compared to only 9% for people living closer to community resources. Compare that to 25% for people in auto dependent outlying areas (see Figure 10).⁶⁹ In the four-county Wasatch Front, the average household spends 26% of household income on transportation. The population growth projected by GOMB and the Envision Utah RCLCo Study both point to a continued dominance of the “auto dependent exurbs,” which potentially leads to increased costs for families.

Figure 10: Typical Household Budget by Type of Development



Source: U.S. Department of Transportation

PLANNING FOR THE FUTURE

If Utah’s population grows as projected, there will be many opportunities for innovation; however, there will also be a need for conscious, well-reasoned policy. Planning efforts such as the Unified Transportation Plan and those made by the Office of Energy Development provide guidance for policy leaders. Although much of the cost for infrastructure in the future will be dedicated to providing maintenance and updates to existing infrastructure, new investment in areas that are projected to see significant growth is essential.

Continued development into agricultural land or open space require thoughtful analysis of the importance to Utah of its agrarian economy and way of life. Although metropolitan area dwellers may not see farmland in the same light as their rural counterparts, an increasing awareness and desire for local foods could have an impact on the type of development that occurs in currently undeveloped areas. In 2013, the number of farmers markets nationally almost tripled from 2000, although growth slowed between 2012 and 2013 compared to previous years.⁷⁰ U.S. Census data indicates that direct-to-consumer sales, such as CSAs, farmers markets, or other operations where the consumer is in direct contact with the grower is a growing segment of U.S. agriculture.⁷¹ These trends are alive and well in urban areas in Utah and are supported by many local organizations. This resurgence in the importance of locally grown food, together with implications of combined housing and transportation costs could create changes in anticipated development patterns.

Additionally, development into formerly undeveloped areas will require jurisdictions to work with utility providers to create cost-effective solutions to connect these new communities to the existing transportation and utility networks. Although existing upgrades and improvements to the interstate grids are occurring for both natural gas and electricity, a continued focus on how renewable resources will be integrated into these systems in the future is needed. Similarly to transportation, funding is an issue for energy infrastructure, although costs will be impacted by technological changes in the future.

Twenty-five years is quite a horizon for planning, especially when trying to forecast potential changes to technology or policies. Changing regulatory structures and public sentiment will also have impacts on how the transportation and utility networks grow and change in the future. Public and private service providers and policy makers will need to adapt to new situations to ensure that future Utahns have the necessary access to housing, transportation and energy.

ENDNOTES

1. A. O'Donoghue, "Utah among states with greatest urban sprawl," *Deseret News*, 21 April, 2014, <http://www.deseretnews.com/article/865601517/Utah-among-states-with-greatest-urban-sprawl.html>
2. R. Ewing, S. Hamidi, *Measuring Sprawl 2014*, Smart Growth America, April 2014
3. Utah Foundation. *A Snapshot of 2050, An Analysis of Projected Population Change in Utah*. April 2014.
4. Ibid.
5. R. Harrell et al., "What is Livable? Community Preferences of Older Adults," AARP Public Policy Institute, April 2014
6. A. Bookman, "Innovative models of aging in place: Transforming our communities for an aging population," *Community, Work & Family*, Vol 11 No 4 (2008): 419-438
7. Ibid and R. Alsnih, DA Hensher, "The mobility and accessibility expectations of seniors in an aging population," *Transportation Research Part A* 37(2003) 903-916
8. Ibid and National Association of Realtors, Real Estate Division "Home Buyer and Seller Generational Trends," (NAR, 2014)
9. M. Brown, S. Caldwell, S. Sutherland, "Just Released: Young Student Loan Borrowers Remained on the Sidelines of the Housing Market in 2013," 13 May 2014, <http://libertystreeteconomics.newyorkfed.org/2014/05/just-released-young-student-loan-borrowers-remained-on-the-sidelines-of-the-housing-market-in-2013.html#.U4ZfKjRZbW>
10. Project on Student Debt, "Utah," http://projectonstudentdebt.org/state_by_state-view2013.php?area=UT, Data for North Dakota and Hawaii not included in Project on Student Debt analysis
11. "Apartment Market Report: Greater Salt Lake Area," Cushman & Wakefield, Commerce Real Estate Solutions, (Summer 2013)
12. Robert Charles Lesser & Co, "Wasatch Front 2050, Market-Driven Growth Scenario" Prepared for Envision Utah (Salt Lake City: RCLCO, 2014)
13. Ibid.
14. Arthur C. Nelson, *Reshaping America's Built Environment*, presentation for Utah APA, 2010
15. EPA, "Residential Construction Trends in America's Metropolitan Regions: 2012 Edition," Office of Sustainable Communities, Smart Growth Program, (Washington DC, December 2012)
16. USDA, "Historical Highlights: 2012 and Earlier Census Years, Utah" 2012 US Census of Agriculture, http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_1_State_Level/Utah/st49_1_001_001.pdf
17. J. Malewitz, *In West's Expanding Tinderbox, Questions About Development*, Pew Charitable Trusts; State and Consumer Initiatives, August 19, 2013
18. J. Stecklein, "Utah wildfires continue to burn, evacuations remain," 18 August, 2013, <http://www.sltrib.com/sltrib/news/56750292-78/fire-sunday-canyon-homes.html.csp>
19. Governor's Energy Initiative Plan
20. US EPA, "EPA FACT SHEET: Reducing Carbon Pollution from Power Plants, Details About the Proposal for New Sources," EIA
21. T. Wilde, "Easiest Carbon Reduction for Utah? Energy Efficiency," *Cache Valley Daily*, 2 June 2014 AND S. Hayes et al., "Change Is in the Air: How States Can Harness Energy Efficiency to Strengthen the Economy and Reduce Pollution," (American Council for an Energy-Efficient Economy, Washington DC) April 2014
22. M. J. Bradley & Associates. (2014). *Benchmarking Air Emissions of the 100 Largest Electric Power Producers in the United States*
23. National Conference of State Legislatures, "State Renewable Portfolio Standards," August 2010, <http://www.ncsl.org/research/energy/state-renewable-portfolio-standards.aspx>
24. Database of State Incentives for Renewables & Efficiency, "Utah: Incentives/Policies for Solar," 3 April 2013, http://www.dsireusa.org/solar/incentives/incentive.cfm?Incentive_Code=UT04R&re=1&ee=1
25. US Department of Energy, "Renewables Portfolio Goal: Utah," <http://energy.gov/savings/renewables-portfolio-goal>
26. PacifiCorp IRP, 2013 Update
27. EIA
28. EIA, Table 2.10 Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State, 2012 and 2011.
29. US EPA, "National Environmental Policy Act," 25 June 2012, <http://www.epa.gov/compliance/basics/nepa.html>
30. Authors' Interview with Rod Fisher, Rocky Mountain Power, May 7, 2014
31. <http://www.bcb.com/article/20140507/NEWS/140509949> and Communication with Ted Rampton
32. UAMPS video AND Authors' Correspondence with Ted Rampton, UAMPS, 26 May 2014
33. Ibid.
34. Solar Energy Industries Association, "State Solar Policy: Utah Solar," <http://www.seia.org/state-solar-policy/utah-solar>
35. Solar Energy Industries Association, "Issues and Policies: Net Metering," <http://www.seia.org/policy/distributed-solar/net-metering>
36. B. Maffly, "Utah's solar power homeowners fight proposed utility fee," *The Salt Lake Tribune*, 22 May 2014, <http://www.sltrib.com/sltrib/news/57966967-78/power-solar-customers-net.html.csp>

ENDNOTES

38. EIA
39. UGS Survey Notes, May 2014 AND Questar IRP
40. S. Zielinski, "Natural Gas Really is Better than Coal," *Smithsonian.com*, 13 February 2014, <http://www.smithsonianmag.com/science-nature/natural-gas-really-better-coal-180949739/?no-ist>
41. Authors' interview with Scott Brown, Questar, April 30, 2014
42. Questar IRP
43. NTSB, "Pipeline Accident Report: Pacific Gas and Electric Company Natural Gas Transmission Pipeline Rupture and Fire," (San Bruno, California), 9 September 2010, <http://www.nts.gov/investigations/summary/PAR1101.html>
44. USDOT, Pipeline Safety Act, "Track PHMSA'S Progress," <http://phmsa.dot.gov/pipeline/state-programs>
45. J. Kiefner and M. Rosenfeld, "The Role of Pipeline Age in Pipeline Safety," The INGAA Foundation, Inc., (Worthington, Ohio), November 2012,
46. Authors' interview with Scott Brown, Questar, April 30, 2014
47. American Gas Association, "Natural Gas Rate Round-Up: A periodic update on innovative Rate designs," June 2012
48. USDOT, Pipeline Safety Awareness, "Pipeline Materials, State Replacement Programs," <http://opsweb.phmsa.dot.gov/pipelineforum/pipeline-materials/state-pipeline-system/pipeline-replacement-programs/>
49. R. Drouin, "As Fracking Booms, Growing Concerns About Wastewater," *Yale Environment* 360, 18 February 2014, http://e360.yale.edu/feature/as_fracking_booms_growing_concerns_about_wastewater/2740/
50. Questar IRP 2013
51. Is the Price Finally Right?, Utah Foundation, Report 705, March 2012
52. Office of the Press Secretary, "Fact Sheet: President Obama Announces Commitments and Executive Actions to Advance Solar Deployment and Energy Efficiency," The White House, 9 May 2014, <http://www.whitehouse.gov/the-press-office/2014/05/09/fact-sheet-president-obama-announces-commitments-and-executive-actions-a> AND K. Begos, "4 states confirm water pollution from drilling," *Associated Press/USA Today*, 5 January 2014, <http://www.usatoday.com/story/money/business/2014/01/05/some-states-confirm-water-pollution-from-drilling/4328859/>
53. Utah State Legislature, Utilities Committee, 5/21/14 (audio recording)
54. "Enel Green Power: The Cove Fort Geothermal Power Plant Starts Operations in Utah," Enel Green Power, 27 November 2013, http://www.enelgreenpower.com/en-GB/ena/events_news/press_releases/release.aspx?iddoc=1661220
55. D. Hurlbut, J. McLaren, and R. Gelman, "Beyond Renewable Portfolio Standards: An Assessment of Regional Supply and Demand Conditions Affecting the Future of Renewable Energy in the West," National Renewable Energy Laboratory (Denver, CO, 2013)
56. RFF.org <http://www.rff.org/Documents/RFF-DP-08-06.pdf>
57. Authors' interview with Rod Fisher, Rocky Mountain Power, May 7, 2014
58. <http://le.utah.gov/~2008/bills/sbillenr/sb0202.pdf>
59. American Society of Civil Engineers, "2013 Report Card for America's Infrastructure: Utah," <http://www.infrastructurereportcard.org/a/#p/state-facts/utah>
60. USDOT, "Household Travel and Freight Movement," 2013 Conditions and Performance, (Washington DC) 31 January 2014
61. USDOT, Policy and Governmental Affairs Transportation Policy Studies, "Then Next Generation of Travel: Research, Analysis and Scenario Development," 29 May 2014, http://www.fhwa.dot.gov/policy/otps/nextgen_finalreport.cfm#ch1
62. R. Ewing et al., "Structural equation models of VMT growth in US urbanized areas," *Urban Studies*, (2004) 1-18
63. USDOT 2013 Household Travel and Freight Movement
64. R. Ewing et al., "Structural equation models of VMT growth in US urbanized areas," *Urban Studies*, (2004) 1-18
65. J. Pritchard, "Utah leads rise in commuter rail ridership; U.S. transit use up," *The Salt Lake Tribune*, 10 March 2014, <http://www.sltrib.com/sltrib/world/57659202-68/ridership-public-transit-transportation.html.csp>
66. R. Ewing et al., "Structural equation models of VMT growth in US urbanized areas," *Urban Studies*, (2004) 1-18
67. US Department of Housing and Human Development, "Affordable Housing," http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/affordablehousing/
68. Center for Housing Policy, "A Heavy Load," (Washington D.C.), 2006
69. USDOT, Livability Initiative, "Transportation and Housing Costs," January, 31, 2014 https://www.fhwa.dot.gov/livability/fact_sheets/transandhousing.cfm
70. USDA Agricultural Marketing Service, "Farmers Markets and Local Food Marketing," August 2013, <http://goo.gl/bfNn1T>
71. S. Martinez, "Varied Interests Drive Growing Popularity of Local Foods," *Amber Waves*, USDA, "<http://www.ers.usda.gov/amber-waves/2010-december/varied-interests-drive-growing-popularity-of-local-foods.aspx#.U5Yq1PldX95>

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