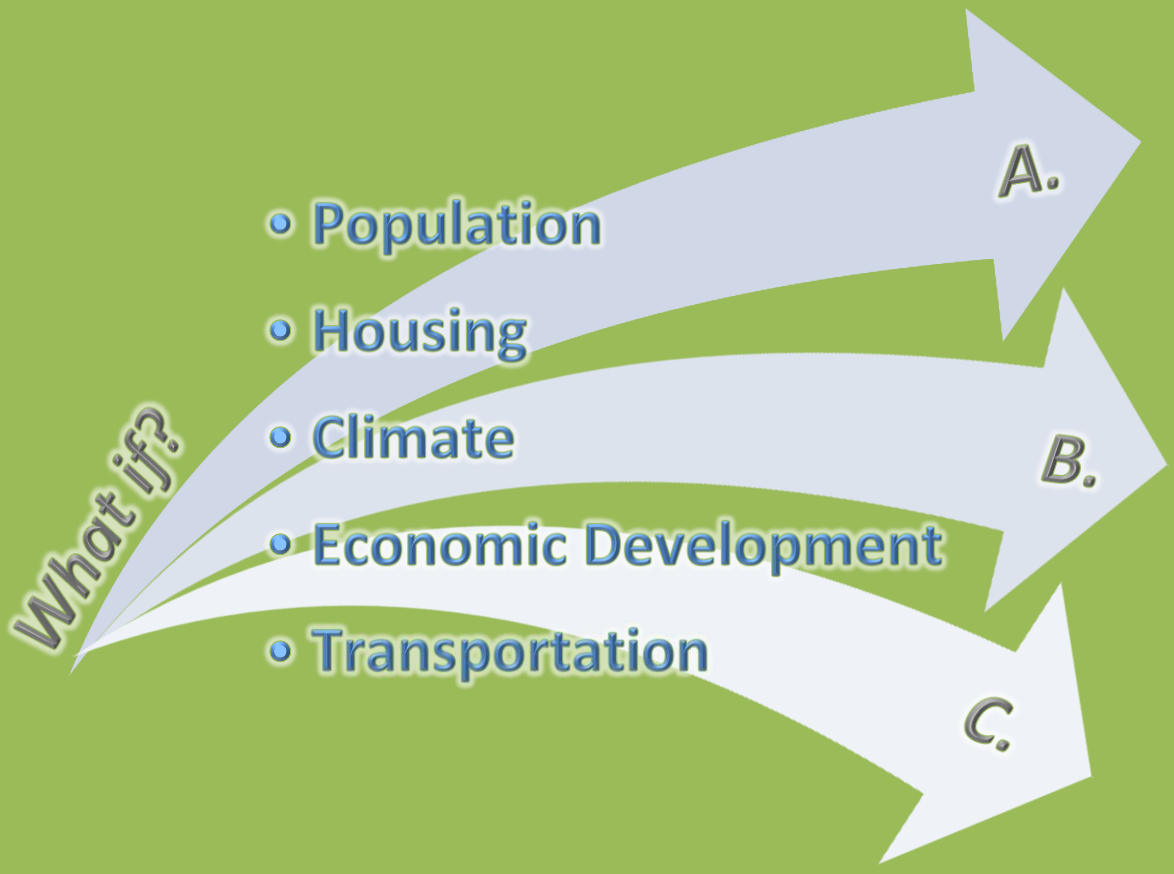
Scenario Analyses for Regional Planning in Southwest New Hampshire



SWRPC
37 Ashuelot Street
Keene, New Hampshire 03431
(603) 357-0557
fax: (603) 357-7440
http://www.swrpc.org/
email: admin@swrpc.org

Contents

Introduction

This document provides a summary of the scenario planning conducted by Southwest Region Planning Commission (SWRPC) as part of its work on Monadnock Region Future (MRF), an initiative to develop a regional plan for the Southwest Region of New Hampshire. "Scenario planning" describes a process that helps communities test how trends or decisions may impact the future based on projections using the best evidence available. Scenario planning should hardly ever be used to predict precise outcomes, because there tend to be countless variables that can shape an outcome. Many scenario models are not capable of tracking all variables due to limits in their sophistication, the lack of data that is available, or the lack of model computational power to assess numerous data and trends to inform a scenario. However, scenario planning is often used to understand the likely direction of impact -positive, negative or unchanged - and the potential scale of impact - small, large, or insignificant change. This information can help communities make informed decisions about how they want to plan for their future.

Scenario planning is often guided by the question "what if?" What if we do nothing about a trend? What will happen if we intervene with a policy, program or other action? In order to answer these questions and test potential scenarios, we use the most reliable data available and thoughtful reasoning to develop assumptions and a methodology. Scenario planning often involves asking two or more questions at the same time so that communities and others can compare and contrast alternatives. Sometimes only one scenario is tested in order to address how existing trends might unfold into the future.

Throughout the regional planning process, several questions about future conditions and trends emerged. Some of these questions, which are organized below by themes, were examined in greater detail using scenario models. All themes and related scenarios are explored in this document. In each theme section, some context is provided about the theme area as well as a summary of the scenario exercise and its key findings and limitations. More information on methodology is offered in Appendix A of this document for each theme.

- **Population**: What will our population look like in the future? More specifically, do we need to be concerned about an aging population and the outmigration of young adults in the Southwest Region?
- **Housing**: Is our housing stock suitable for future populations and anticipated household trends?
- **Climate**: How is climate change likely to affect our Region?
- **Economy**: Our communities are interested in advancing certain sectors of our Region's economy. What would investment in these sectors mean for our economy?
- **Transportation**: Many people in the Region have identified the need for improved transportation options for populations that do not or prefer not to drive, and expressed concern about the high cost of maintaining our transportation system. How might we address these issues?

Scenario 1. Population

Understanding future local and regional population change can help inform public policy and can be used to gauge future demand for services and goods such as housing, energy, and water. Population projections also provide useful baseline assumptions for developing other scenarios. However, population growth can be difficult to project, and needs to be updated and recalculated often. In small communities, like those in the Southwest Region, a sudden event, such as the opening or closing of a major employer, can impact population size significantly due to the availability of employment to sustain that population.

Population growth has changed dramatically over the Southwest Region's recent history. The population growth rate in the 1970s was nearly 4 times the growth rate of the population in the 2000s. In fact, the 2000s was the first decade in recent history in which towns lost population. These towns include Alstead, Greenville, Hancock, Harrisville, Hinsdale, Jaffrey, Marlow, Roxbury, Sharon and Sullivan. Meanwhile, other communities like Stoddard, New Ipswich and Langdon had strong growth rates at 32.8%, 18.9% and 17.4% respectively.

Table 1: Population Growth Rates by Decade

	1970-1980	1980-1990	1990-2000	2000-2010
United States	11.4%	9.8%	13.2%	9.7%
New Hampshire	24.8%	20.5%	11.4%	6.5%
Cheshire County	18.6%	12.9%	5.3%	4.5%
Hillsborough County	23.5%	21.4%	13.4%	5.2%
Sullivan County	16.5%	7.0%	4.8%	8.1%
Southwest Region	19.7%	15.9%	6.0%	5.0%

Questions

In recent years, questions have been raised about the future of our Region's population. School boards are considering the opening and closing of schools based on population projections. New Hampshire has been identified as having one of the oldest populations in the nation and it is estimated that there will be a significant increase in the state's senior population, which could have major impacts on our healthcare, housing and transportation systems. Others are concerned that the Region is losing its younger populations and that there are not enough jobs to attract young professionals to the area.

To provide some tenable information on future trends that might help address these issues, the nine regional planning commissions in New Hampshire worked with the NH Office of Energy and Planning (OEP) to develop population projections at the state, county and municipal level. Among the key questions raised by SWRPC on behalf of the Region were:

- What might we expect for school-age population change in the Southwest Region?
- What types of migration patterns can we expect for young professionals?
- How can we expect our senior population to grow in the Southwest Region?

The model employed by OEP relies on a number of assumptions, which are explained in greater detail in Appendix A. A central assumption of the scenario model, is that future population growth will look similar

to the period between 2001 and 2010. This was a period of moderate growth that was reduced near the end of the decade by the Great Recession.

Table 2: County and Town Population Projections, 2010-2040

	Actual	Projections		Change
	2010	2025	2040	2010-2040
New Hampshire	1,316,470	1,388,884	1,427,098	8%
Cheshire County	77,117	79,085	80,471	4%
Hillsborough County	400,721	423,117	433,381	8%
Sullivan County	43,742	46,650	49,249	13%
Southwest Region	102,313	106,101	108,168	6%
Alstead	1,937	1,890	1,923	-1%
Antrim	2,637	2,848	2,917	11%
Bennington	1,476	1,560	1,598	8%
Chesterfield	3,604	3,598	3,661	2%
Dublin	1,597	1,694	1,724	8%
Fitzwilliam	2,396	2,621	2,667	11%
Francestown	1,562	1,654	1,694	8%
Gilsum	813	835	850	5%
Greenfield	1,749	1,853	1,898	8%
Greenville	2,105	1,974	2,022	-4%
Hancock	1,654	1,561	1,599	-3%
Harrisville	961	819	834	-13%
Hinsdale	4,046	3,926	3,994	-1%
Jaffrey	5,457	5,326	5,420	-1%
Keene	23,409	23,842	24,260	4%
Langdon	688	792	836	21%
Marlborough	2,063	2,079	2,116	3%
Marlow	742	722	734	-1%
Nelson	729	816	830	14%
New Ipswich	5,099	6,003	6,148	21%
Peterborough	6,284	6,734	6,898	10%
Richmond	1,155	1,215	1,237	7%
Rindge	6,014	6,496	6,609	10%
Roxbury	229	216	220	-4%
Sharon	352	343	352	0%
Stoddard	1,232	1,533	1,560	27%
Sullivan	677	589	600	-11%
Surry	732	780	794	8%
Swanzey	7,230	7,545	7,677	6%
Temple	1,366	1,444	1,479	8%
Troy	2,145	2,298	2,338	9%
Walpole	3,734	3,809	3,875	4%
Westmoreland	1,874	1,972	2,007	7%
Winchester	4,341	4,464	4,543	5%
Windsor	224	250	256	14%

Findings

Population projections for geographies associated with the Southwest Region are shown in Table 2 to the left. Based on the model, which used data from the 2000s, it is anticipated that the Southwest Region as a whole will grow approximately 6% between 2010 and 2040 - a much lower rate than the previous thirty year period. Some communities are projected to lose population from 2010 to 2040, including Alstead, Greenville, Hancock, Harrisville, Hinsdale, Jaffrey, Marlow, Roxbury and Sullivan.

Based on the birth, mortality and migration rates used in the model, there are several interesting trends worth noting. Table 3 below shows the number of births in 5 year intervals, as well as the trend relative to the previous 5 year period. Due to the fairly high proportion of older individuals living in our Region, there is expected to be an overall trend of fewer births into the 21st century. Some increases in births will occur early on, but this trend is expected to plateau around 2020 or 2025. This is because the proportion of the population with lower fertility rates (i.e. seniors) is expected to increase.

Table 3: Number of Births in 5 Year Intervals, 2011-2040

		New Hampshire	Cheshire County	Hillsboro County	Sullivan County
Births	2011-2015	63,003	3,603	21,994	1,996
	2016-2020	64,359 ↑	3,836 ↑	22,566 ↑	1,984 ↓
	2021-2025	64,590 ↑	3,830 ↓	22,761 ↑	1,961 ↓
	2026-2030	63,142 ↓	3,605 ↓	22,254 ↓	1,940 ↓
	2031-2035	61,058 ↓	3,435 ↓	21,399 ↓	1,911 ↓
	2036-2040	59,035 ↓	3,413 ↓	20,598 ↓	1,877 ↓

Meanwhile, the model projects that the number of deaths will continue to increase as New Hampshire and its counties progress into the 21st century. Although this increasing trend is displayed with green arrows in Table 4, greater deaths represents a negative loss of population over time. In other words, as births decrease and deaths increase, the Region will need to rely on in-migration to maintain or grow the population. This is a statewide trend.

Table 4: Number of Deaths in 5 Year Intervals, 2011-2040

		New Hampshire	Cheshire County	Hillsboro County	Sullivan County
Deaths	2011-2015	51,795	3,225	14,128	2,012
	2016-2020	56,016 ↑	3,367 ↑	15,199 ↑	2,158 ↑
	2021-2025	61,172 ↑	3,563 ↑	16,680 ↑	2,333 ↑
	2026-2030	69,344 ↑	3,848 ↑	18,757 ↑	2,584 ↑
	2031-2035	78,955 ↑	4,230 ↑	21,330 ↑	2,918 ↑
	2036-2040	89,449 ↑	4,650 ↑	24,152 ↑	3,281 ↑

Table 4: Number of Net Migrants in 5 Year Intervals, 2011-2040

		New Hampshire	Cheshire County	Hillsboro County	Sullivan County
Net Migrants	2011-2015	3,154	(362)	(3,208)	784
	2016-2020	20,650 ↑	450 ↑	1,608 ↑	1,159 ↑
	2021-2025	26,167 ↑	770 ↑	2,679 ↑	1,525 ↑
	2026-2030	29,379 ↑	1,023 ↑	3,160 ↑	1,843 ↑
	2031-2035	31,246 ↑	1,317 ↑	3,424 ↑	1,891 ↑
	2036-2040	32,161 ↑	1,328 ↑	3,668 ↑	1,926 ↑

If the economy strengthens as it is projected to do in this model, we can expect an increase of migrants coming into the Region; although, this increase will not be substantial. Economic development (or the lack thereof) will have a strong impact on the in-migration or out-migration of residents. Note the difference between the 2011-2015 time period and the subsequent 5 year period from 2016 to 2020. The Great Recession had a tremendous impact on Cheshire and Hillsborough Counties, resulting in the first loss of population in many decades. This is expected to change, however, because the modelers project a migrant growth rate closer to the 2001-2010 period.

Three subsets of the population were analyzed to help answer our chief questions about the future of the Southwest Region's school-age children, young professionals and elderly populations. Since the population was based on five-year cohorts, the analysis used the cohorts of 5-19 for school-age children, representing grades K-12. For young adults, the analysis examines ages 20-34, the ages in which a young adult might come back from college and make decisions on whether to start and maintain a career. For the elderly, ages 70 and over were used. These are the ages when our population is expected to begin experiencing more health complications, personal mobility may begin to change, and there may be a need for new services to assist these individuals with the challenges of aging.

Age cohort data was not developed at the municipal level for this projection exercise, so the analysis examines the counties that are part of the Southwest Region. Care should be used in examining Hillsborough County, which reflects a much more urban population outside of the Southwest Region. The Southwest Region includes Sullivan County in that it includes the town of Langdon, however it should be noted that Langdon is only approximately 1% of the Sullivan County population.

This data analysis shows that if birth, death and migration trends remain similar to the 2000s, we can expect an overall downward trend of students in each county. When examining the data every 5 years, the

Table 5: Number & Proportion of School-Age Children, 2010, 2025 & 2040

			2010	2025	2040
School Age Children Ages 5-19	Cheshire County	Total	14,988	13,659	13,745
		Proportion of Total Population	19%	17%	17%
	Hillsboro County	Total	80,449	70,248	69,048
		Proportion of Total Population	20%	17%	16%
	Sullivan County	Total	7,776	6,868	6,619
		Proportion of Total Population	18%	15%	13%

model projects a slight uptick in student populations in Cheshire County in 2025 and 2030 and in Hillsborough County in 2035. However, Table 5 shows the overarching trend, which projects that the proportion of the student population to the total population will decrease slightly in Cheshire County, and will change more significantly in Hillsborough County and Sullivan County. Apart from the apparent need to invest in the rehabilitation, replacement or modernization of existing schools over time, this data suggests that school expansions, creation of new schools, or creation of new classroom spaces and teacher jobs are not likely to be significant in the next 35 years in the Southwest Region.

In this scenario, young adult population trends are similar to those of school-age children. This is not surprising since the young adult age cohort represents the majority of those parenting school-age children. Like the school-age children figures, the projection shows a decrease overtime of young adults living in the Southwest Region. However, unlike the school-age children figure, there is no anticipated uptick of young adults living in the Region during the 2025 and 2030 period. The results clearly show that young adults in all three counties are expected to decrease in number as well as in proportion to the total population. This loss could present a challenge for developing new civic and business leadership as well as a loss of tax payers with growing incomes. Attracting young professionals should be a major consideration for the future economic development of the Region.

Table 6: Number & Proportion of Young Adults, 2010, 2025 & 2040

			2010	2025	2040
Young Adults Ages 20-34	Cheshire County	Total	14,951	14,706	13,804
		Proportion of Total Population	19%	19%	17%
	Hillsboro County	Total	73,351	77,660	68,773
		Proportion of Total Population	18%	18%	16%
	Sullivan County	Total	6,627	6,467	6,084
		Proportion of Total Population	15%	14%	12%

The growth in the senior population from 2010 to 2040 is the sharpest projected change of the three analyses, with the 70+ population more than doubling in Cheshire County, nearly tripling in Sullivan County, and exceeding three times its population in Hillsborough County. This is partly due to the model's assumption that most seniors will want to age in place and outmigration will remain fairly low. The sheer number of additional people age 70+, as well as the proportion of those 70+, is a stark projection. The aging of our population is expected to present a variety of new challenges to our existing healthcare system, the accessibility of housing, and our automobile-based transportation system. In addition, it suggests that the demand for municipal services may be expected to increase in new ways as a proportion of fixed income households is likely to increase, perhaps creating a gap between the demand for services and available property tax revenue to pay for those services.

Table 7: Number & Proportion of Seniors, 2010, 2025 & 2040

			2010	2025	2040
Senior Adults Ages 70+	Cheshire County	Total	7,778	12,841	16,946
		Proportion of Total Population	10%	16%	21%
	Hillsboro County	Total	29,482	58,533	90,297
		Proportion of Total Population	7%	14%	21%
	Sullivan County	Total	3,246	5,223	9,099
		Proportion of Total Population	7%	11%	18%

Limitations

As explained earlier, there are limitations to the projections above, and care should be used in relying on the data, particularly as time moves forward and new population data becomes available. The overlying assumption in this population scenario is based on birth, death, and migration trends in the 2000s. While this is logical approach at this point in time, it will need to be revisited. The Southwest Region's experience with population change in the 2000s was sharply different from its experience in the 1970s and 1980s, two to three decades earlier. This model projects population out to 2040, two to three decades later than today. The variability in population change that the Region experienced in the past is perhaps as likely as the variability of population change in the future. There is no guarantee that birth, death, and migration trends will follow the path of the 2000s. Still, it is a plausible scenario of how our Region may experience the future. As new data and other information become available, it will be important to revisit the model and adjust the projections as necessary.

Scenario 2. Housing

Housing can have social and economic impacts, and therefore deserves thoughtful consideration and planning. The cost, design and location of housing can have major effects on certain segments of society, depending on household size, physical ability, budget, access to jobs and services and other factors. Younger people starting out may have a need for rental housing or smaller inexpensive homes. Households growing families may need a supply of larger homes to grow into. Older households may have a need to downsize. Seniors or others with disabilities may need to one-floor living spaces with accessible kitchens, bathrooms and bedrooms.

Housing can be a driver for economic development. Residential construction was considered a major economic catalyst for the growth of New Hampshire's economy prior to the Great Recession. However, there are some experts, such as the New Hampshire Center for Public Policy, that think housing may slow the economy in the coming decades. A contributing factor to this projection is stricter lending standards imposed by the housing finance industry since the Great Recession. These new practices are projected to hinder housing rehabilitation and construction as well as homeowner financing into the future. In addition, there is a sentiment that local regulations can sometimes create unnecessary barriers to developing new or retrofitting older housing units.

Questions

A population-based housing model employed by the New Hampshire Housing Finance Agency (NHHFA) and the New Hampshire Center for Public Policy Studies, provided SWRPC an opportunity to ask some basic questions about projected housing demand, and the demand for rental and owner occupied housing in the Region. The model provides information on how housing demand might develop in the next several decades and how local homebuilders and land use boards can respond to demand. Some questions considered by SWRPC include:

- How much housing should the Region be expected to produce annually based on our projected population growth and expected demand?
- What can we expect in the way of demand for housing for seniors? Rental units versus owner occupied units?

Findings

Although population growth in the first half of the 21st century is projected to be slow, growth is expected to occur nevertheless. Average household sizes are anticipated to decrease over time as the population ages. The model projects that the average household size is anticipated to change from 2.42 in 2010 to 2.23 in 2040 due to the

Table 8: Forecast for Population & Household Growth by Age of Head and 15 Year Trend Direction for 2010, 2025 & 2040

	2010		2025		2040	
Age Group	**Population**	**Households**	**Population**	**Households**	**Population**	**Households**
Under 15	16,801	---	16,573	--- ↓	15,684	--- ↓
15 to 24	16,677	1,759	14,138	1,491 ↓	14,555	1,535 ↑
25 to 34	10,148	4,438	12,436	5,439 ↑	10,896	4,765 ↓
35 to 44	12,439	6,505	13,833	7,234 ↑	12,366	6,467 ↓
45 to 54	16,482	9,196	11,297	6,303 ↓	15,282	8,526 ↑
55 to 64	14,671	8,611	13,988	8,210 ↓	11,282	6,622 ↓
65 to 74	8,049	5,035	13,451	8,414 ↑	11,034	6,902 ↓
75 to 84	4,900	3,243	7,774	5,145 ↑	11,370	7,525 ↑
85 & older	2,146	1,330	2,610	1,617 ↑	5,699	3,532 ↑
Total	102,313	40,117	106,101	43,854 ↑	108,168	45,874 ↑

overall aging of the population. Consequently, the housing model projects the growth of nearly 6,000 new households between 2010 and 2040. Notice the significant growth of households 65 and older between 2010 and 2040 in Table 8. With the exception of some slight growth expected from the 25-34 age cohort, the overall number of young to middle-age head of households are expected to decrease between 2010 and 2040.

Table 9 distributes the household numbers from Table 8 into the projected number of owners and renters by age cohort. In 2010, head of households 65 or older, accounted for 26% of owners and 19% of renters. By 2040, the same age group is projected to account for 41% of owners and 33% of renters.

Table 9: Forecast for Owner and Rental Households by Age of Head for 2010, 2025 & 2040

	2010		2025		2040	
Age Group	Owners	Renters	Owners	Renters	Owners	Renters
Under 15	---	---	---	---	---	---
15 to 24	229	1,530	194	1,297	200	1,335
25 to 34	2,090	2,348	2,561	2,877	2,244	2,521
35 to 44	4,550	1,955	5,060	2,174	4,523	1,944
45 to 54	7,233	1,963	4,958	1,346	6,706	1,820
55 to 64	7,141	1,470	6,809	1,402	5,491	1,130
65 to 74	4,200	835	7,019	1,395	5,758	1,145
75 to 84	2,451	792	3,889	1,257	5,687	1,838
85 & older	806	524	980	637	2,140	1,392
Total	28,700	11,417	31,469	12,385	32,750	13,124

As the population age 85 and older continues to grow, demand for group quarters for ages 65 and older is projected to almost triple to over 1,700 beds. This is when a large proportion of baby boomers will begin reaching advanced age and many may need nursing home care. Group quarters facilities for the population under age 65 refers to college, correctional facilities and other similar group facilities, and is expected to decrease because that segment of the population will decrease.

Table 10: Forecast for Group Quarters for 2010, 2025 & 2040

	2010	2025	2040
Total	5,089	4,929	5,771
Under Age 65	4,447	4,149	4,066
65 & Older	642	781	1,705

Table 11 shows owner, rental and total housing unit demand (excluding group quarters) in the Southwest Region out to 2025 and 2040. The model projects that we may have a need for more than 4,000 new owner occupied units and nearly 2,000 new rental units by 2040. Demand includes a projected vacancy rate of 1% for owner-occupied units and 4% for rental units.

Table 11: Forecast for Housing Demand for 2010, 2025 & 2040 (excluding group quarters demand)

	2010	2025	2040
Total Ownership Unit Demand	29,285	32,007	33,520
Total Rental Unit Demand	12,304	13,085	14,040
Total Housing Stock Demand	41,589	45,092	47,561

Assuming that a large proportion of the existing housing stock will be flexible enough in its design to meet the changing needs of the aging population, the scenario projects that a significant amount of additional housing will still need to be built. Specifically, the model projects that an annual average of 196 owner occupied units and 64 rental units would need to be built in the Region out to 2025. From 2010 to 2040 the rate for building owner occupied units would be lower at 156 units per year, but slightly higher for rental units at 70 units per year because rental demand is anticipated to pick up during the last fifteen years of the scenario. These production estimates take into account the need to replace housing lost to disaster or demolition.

Table 11: Projected Housing Production Required for Year-Round Units for 2025 & 2040 (Excluding Group Quarters)

	2025	2040
New Ownership Units Needed to Produce	2,942	4,674
Average Annual from 2010	196	156
New Rental Units Needed to Produce	966	2,105
Average Annual from 2010	64	70
New Housing Stock Needed to Produce	4,104	6,780
Average Annual from 2010	261	226

Based on the model's findings, it appears that attention to housing will need to be paid by local and regional stakeholders. A typical home in the Region today is 75 years old or older, it is multistory, it has 3 or more bedrooms, and it is located in an area where a vehicle is necessary to reach basic needs like groceries, jobs or medical services. Many seniors have a desire to age in place, yet there are questions as to whether the current housing stock is ideal or efficient for an aging population. How can seniors afford to maintain an increasingly old housing stock with fixed incomes? How will they reach medical and other basic services if their personal mobility is compromised? If the housing market continues to improve, some housing experts believe that senior households will seek out smaller homes, perhaps closer to services. A consequence of this is that seniors may compete with first time homebuyers and young adults, the very segment of population that the Region may want to attract in order to sustain the regional economy.

A closer look at the anticipated demand for senior group quarters merits extra attention. Currently, Cheshire County's nursing home facility, Maplewood, has 150 beds available or about 29% of the 521 senior group quarters beds in Cheshire County today. According to the model, 150 beds would only meet 12% of the demand for senior group quarters beds in Cheshire County in 2040. In order for Cheshire County to maintain the same proportion of senior group quarters beds that it currently provides today, it would have increase its supply of beds to 284.

Limitations

The limitations discussed in the previous section about the population scenario apply to this housing scenario as well, because the housing scenario is based on population projections using trend data from 2001 to 2010. New economic activity or other major changes could easily shift the population trend on a different trajectory. Therefore, changes in population and household growth should be monitored over time to determine if the housing scenario remains relevant.

Another limitation of the model is that it does not examine household income and household cost by age cohort. NHHFA did have projections of household income distribution, but this was not tied to age cohorts. Yet, we can reasonably expect that as the population ages, the number of households with fixed or declining incomes will also increase. We can also expect housing affordability to be an issue for younger householders.

Scenario 3. Climate Change

Climate change continues to be an important issue for many people in the Southwest Region. Some towns are responding to the issue by forming local committees focusing on climate adaptation and mitigation. Others are hoping to impact greenhouse gas emissions by working on energy conservation and "carbon neutral" energy projects. The Region has experienced severe storms and flooding events over the past decade that has led to loss of life, private property and public infrastructure. These are good examples of the kind of events that are projected to increase in frequency and intensity as the global climate continues to warm.

Questions

On behalf of New Hampshire's regional planning commissions, the Sustainability Institute at the University of New Hampshire (UNH) conducted an assessment of past, present, and future climate change trends in southern New Hampshire. As part of this study, climate scientists analyzed data from local meteorological stations using several global climate models in order to provide some scenarios of how southern New Hampshire might experience climate as we advance into the 21st century. The scenarios looked at a future in which no significant action is taken to curb greenhouse gas emissions (a high emissions scenario) versus a future in which significant action is taken (a low emissions scenario).

One of the current issues with discussing climate change at the regional level is that it is a global phenomenon and climate change models are global models. Yet, our personal experience with climate and weather is local. To address this concern, SWRPC asked the following questions:

- What will our local climate be like if no significant actions are taken to reduce the global emissions of greenhouse gases into the atmosphere?
- Conversely, what will the local climate be like with moderate reductions in global greenhouse gas emissions?

Findings

UNH analyzed historical data and provided projection data for three meteorological stations in the Southwest Region including Keene, Peterborough and Surry Mountain. A sampling of the data for those stations is presented on the next page in Table 13. The data provides a good sense of the variability of anticipated changes to the climate during the 21st Century in our Region, but it also shows that trends are moving in a similar direction no matter the location. More data and information on these sites are available in Appendix A as well as in the 2014 Report, *Climate Change in Southern New Hampshire: Past, Present and Future*.

Table 12: Climate Projections for Lower Emissions and Higher Emissions Scenarios: Selected Climate Indicators

Indicators	Locations	Historical 1980-2009	Short Term 2040-2069		Long Term 2070-2099	
			Lower Emissions Scenario	Higher Emissions Scenario	Lower Emissions Scenario	Higher Emissions Scenario
Average # of Days < 32°F	Keene	163	153	150	141	115
	Peterborough	161	152	150	141	115
	Surry Mountain	174	165	163	156	131
Average # of Days > 90°F	Keene	9	14	15	28	62
	Peterborough	2	4	4	12	34
	Surry Mountain	4	6	7	16	45
Annual probability of event with at least 4" precipitation in 48 hours	Keene	15%	37%	19%	65%	75%
	Peterborough	35%	43%	38%	74%	67%
	Surry Mountain	15%	24%	23%	62%	65%

UNH's models project that the current trend of warming and more precipitation is anticipated to continue into the middle part of the 21st century regardless of whether we follow the course of a higher emissions or a lower emissions scenario. Indicators like temperature, precipitation and snow covered days, for instance, will trend in a fairly similar way regardless of the world's global emissions output. For example, the projected number of days below freezing are estimated to decrease by up to two weeks, regardless of the two scenarios Similarly, the number of days above 90°F may increase to nearly a week. The annual probability of heavy rainfall events is projected to increase more than what we experienced in the period between 1980 and 2009.

The observation that the climate is expected to become noticeably hotter and wetter than it is today no matter what local or global mitigation actions are taken underscores the importance of climate adaptation strategies even if emissions are curbed soon. Adaptation refers to the purposeful adjustment of human settlements to be able to withstand and recover from changing climate conditions. An example of adapting to more hot days is to paint or cover rooftops with the color white to reflect the sun. Other adaptation strategies and resources for forming adaptation strategies are located in the Southwest Region Natural Resources Plan, which was developed by SWRPC in 2014.

Although climate change impacts are expected to be similar up until the midpoint of the 21st century no matter the emissions scenario, the impacts of a higher emissions scenario will begin diverging with a lower emissions scenario at the midpoint of the century (2070-2099). The higher emissions scenario is projected to have significantly hotter days, more extreme precipitation events, and more snow- and ice-free days. For example, the model projects that Keene could have one and a half fewer months of temperatures below freezing under a high emissions scenario instead of 3 fewer weeks of temperatures below freezing under the low emissions scenario. The number of 90°F days could increase by up to two additional months under a high emissions scenario as opposed to one additional month under a low emissions scenario.

If we want to reduce the number and severity of hotter and wetter days in the future, action is required to reduce overall global greenhouse gas emissions. Communities, regions and nations would need to rethink current practices relating to energy, transportation and land development in order to mitigate greenhouse gas emissions. The sooner that greenhouse gas mitigation can start occurring in an impactful way, the easier it will be to avoid a hotter and wetter future.

Limitations

The models used to inform this scenario were based on well-established models that have been extensively peer reviewed, have strong climate sensitivity to temperature changes based on carbon dioxide concentrations, and are based on reliable, historical temperature and precipitation data collected at local meteorological stations. The models represent the best scientific understanding of the climate available today. Four models were used for the analysis instead of relying on just one model.

Despite this very comprehensive methodology, climate models are constantly being enhanced as the scientific understanding of climate improves and as computer computational power increases. In addition to the limits of scientific understanding, another limitation is the ability of scenarios to predict human behavior. It will be difficult to predict how the global community will respond to climate change during the 21st century. Developing countries like China or India can significantly impact future outcomes based on the sheer size of their population and their development decisions. Likewise, established developed countries with high per capita greenhouse gas emissions like the United States are likely to face difficult choices of changing behavior. Examining a lower and higher emissions scenario can provide insight on anticipated trends and the magnitude of those trends. These are useful tools for making educated decisions, however, how human behavior plays out over the 21st century may not follow the model's assumptions.

Scenario 4. Economic Development

Strengthening the local and regional economy is widely recognized as an important goal for the Southwest Region. However, loss of locally owned businesses and manufacturing jobs in recent decades have presented challenges to achieving this objective. One way the Region can address this challenge is by investing in locally-based, advanced skills training programs that are responsive to existing and future manufacturers' needs. An excellent local example of such a program was the recent creation of the Regional Center for Advanced Manufacturing (RCAM), a partnership of the Greater Keene Chamber of Commerce, Keene State College, River Valley Community College and the Keene School District. RCAM's goal is to establish a clearly defined set of training opportunities for both potential and incumbent workers in the manufacturing sector.

In addition to growing the manufacturing sector, several in the community have recognized the potential impact that increased tourism can have on the regional economy. There are a number of recreational, cultural and scenic assets that could be better promoted and marketed to increase tourism to the Region. "Discover Monadnock," a collaborative initiative of the Greater Keene Chamber of Commerce, the Monadnock Travel Council, Monadnock Arts Alive! and a number of other businesses and organizations, has developed a website for one-stop tourism information about the Region and it is attempting to better brand and promote its assets to others.

Agriculture and local food is an industry cluster that has gained a great deal of momentum in the Region over the last decade. Today there are several municipal agricultural committees working to address farming issues in the Region; six farmer's markets in Hancock, Jaffrey, Keene, Peterborough, Rindge and Walpole; the creation of the Monadnock Food Coop in Keene; the introduction of new awareness and promotion publications including the bimonthly *Monadnock Table* and its farm directory; and the creation of the Monadnock Farm and Community Coalition. A great deal of discussion has been had about developing more food preparation capacity in the Region as well as ways for connecting local foods to local people by improving distribution with local vendors.

A final economic cluster that has received a great deal of attention in the Region is the creative economy. In 2008, Monadnock Arts Alive!, a non-profit organization, commissioned a study to understand the economic impact that the arts have on the regional economy. The *Arts & Economic Prosperity III* study provided new evidence that the nonprofit arts and culture organizations and individuals in the Southwest Region are a $16.6 million annual industry. The study states that the arts and culture industry supports 477 full-time equivalent jobs and generates $1.3 million in local and state government revenue each year. It also concluded that nonprofit arts and culture organizations, which spend $13.1 million each year, leverage $3.5 million in additional spending by arts and culture audiences into other sectors of the economy including local restaurants, hotels, retail stores, parking garages, and other businesses.

Questions

These four industry clusters - manufacturing, tourism and travel, agriculture and local food, and the creative economy - appear to be sectors of the economy that many Southwest Region residents are excited about and want to see grow.

Although the Arts Alive study has provided a snapshot view of the economic impact of arts and cultural institutions, it is less clear what the long-term economic impact will be. As for the other sectors of the economy, there are no known studies that have tried to measure their economic impact. The focus of this scenario planning inquiry was based on the following question:

- How will these four sectors impact the rest of our economy in terms of the creation of jobs, personal income and the value of our regional economy over the long term?

In order to explore this question, SWRPC partnered with the New Hampshire Department of Employment Security (DES) to employ its REMI Policy Insight model. The scenario examined the impact of investing in 10 jobs in each of the four sectors over a ten year period. Since employment data was only available by county, the scenario examined Cheshire County alone. For more detail on the employment sectors used to define each economic cluster, visit Appendix A.

Findings

In using the REMI model to project job impacts, a key factor is the job multiplier for each category of employment programmed into the model. A job multiplier refers to a "ripple effect" that direct jobs have in creating other direct, indirect and induced jobs. Manufacturing is one sector that has long been found to have a strong job multiplier effect. Unlike a service-based industry, manufacturing often requires other component parts and services, which creates the opportunity to purchase goods and spend money in the regional economy, supporting a greater number of indirect jobs. In addition, manufacturing as a whole tends to produce higher wage jobs than other sectors. Historical data suggests that the people taking these higher wage jobs are also active consumers, which can help spur the development of induced jobs.

According to the REMI model and the scenario of adding ten jobs per year for a decade to the manufacturing, tourism and travel, agriculture and local food, and the creative economy industry clusters, manufacturing would result in the creation of the most additional jobs. However, each sector is likely to propel additional job growth. More specifically, for every 1 direct job created in the manufacturing sector scenario, 0.76 additional jobs are created. By contrast every direct job created by the creative economy, agriculture and local food, and tourism and travel economic clusters would translate into the creation of 0.32, 0.31 and 0.27 additional jobs respectively. The REMI model also projects that the manufacturing job multiplier is likely to increase over time to 0.8 (0.76 is the average), while job multipliers for the other sectors are projected to be relatively flat. In the end, manufacturing produces about 35% more jobs than any of the other economic clusters over the same ten year period.

While manufacturing is projected to create about 44 more jobs on its own than any of the other sectors by 2023, the growth of personal income by the manufacturing sector is projected to be about 200% greater than any of the three sectors.

By 2023 manufacturing is expected to increase Cheshire County personal income by $8.9 million dollars compared to agriculture and local food, tourism and travel, and creative economy which are calculated to grow county personal income by $4.6, $3.6 and $3.8 million respectively.

By 2023, Gross Domestic Product (GDP) in the Region will have grown to $16.1 million in fixed 2005 dollars above the baseline due to the creation of 100 manufacturing jobs. The impact of 100 new jobs on GDP by the other three sectors is approximately half the amount of the manufacturing sector. The agriculture and local food and the creative economy sectors each contributing approximately $6.1 million to the economy, and tourism and travel contributing about $5.3 million.

Examined together, the findings on personal income and gross domestic product illustrate that although manufacturing creates much more wealth than the other sectors of the economy, each sector will contribute to economic growth.

Table 13: Result of 100 Jobs Gradually Introduced to Four Economic Clusters of the Cheshire County Economy from 2014 to 2023

Economic Cluster	Manufacturing	Creative Economy	Agriculture/ Local Food	Tourism & Travel
Total Jobs	176	132	131	127
Number of Direct Jobs Introduced to Economy thru Investment	100	100	100	100
Number of Additional Jobs Created Due to Original Job Investment Above	76	32	31	27

Figure 1: Projected Annual Personal Income (In Million Dollars) by Economic Cluster in Cheshire County, 2014-2023

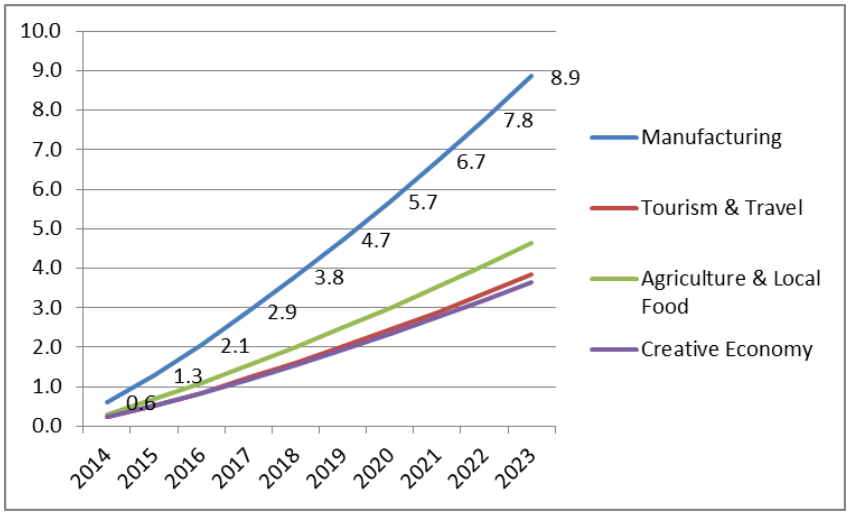
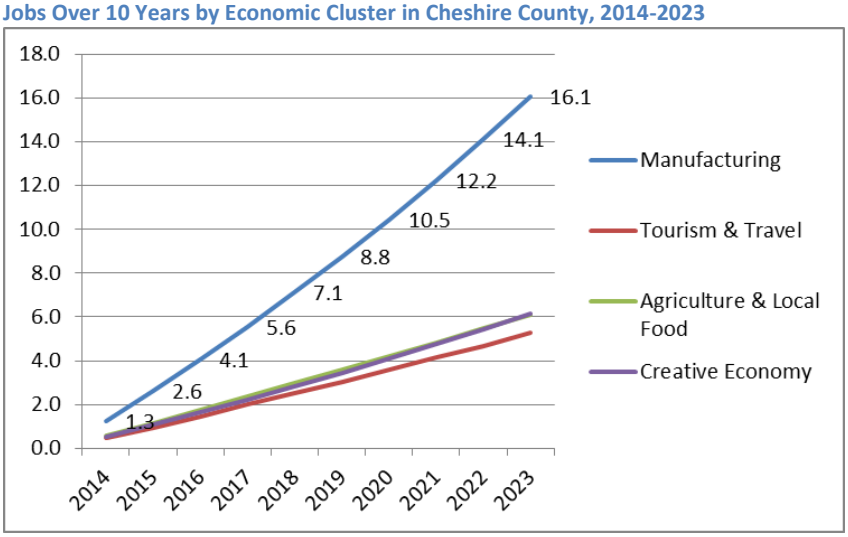


Figure 1: The Projected Impact on GDP (In Million Dollars) from the Creation of 100 Jobs Over 10 Years by Economic Cluster in Cheshire County, 2014-2023



A diversified regional economy can help insure the Region can weather external economic impacts that may enhance or reduce the vitality of a

particular economic cluster. Manufacturing, in many cases, may lead to the introduction of larger employers, which can have a positive impact on employment. However, if this sector experiences a downturn, its impact can also be severe.

Limitations

REMI Policy Insight is a model based on cause and effect relationships uses variables such as base population, the labor market population, tax rates, and historic market demand indicators, in addition to the variables introduced to the model. Cause and effect calculations are based on algorithms that simulate two underlying assumptions from mainstream economic theory. The first is that households can be expected to maximize utility and the second is that producers can be expected to maximize profits. While this economic analysis is very helpful for understanding economic impact, there are some limitations. Jobs were an important indicator that the scenario examined. Unfortunately, the model was not able to differentiate full-time from part-time jobs.

Another potential limitation with this scenario is that it doesn't recognize the influence of non-economic preferences by households and non-economic considerations made by producers. Although these non-economic factors can be very difficult to quantify, they still warrant recognition. Many households and businesses are drawn to the Region by its natural beauty as well as the close knit, sociable culture. It is fair, therefore to assume that the Region will continue to draw and support employers and a labor force that is interested in careers, which are compatible or complementary with the local landscape and culture, such as those in the agriculture and local food, creative economy, and tourism and travel sectors.

Scenario 5. Transportation

A consistent concern raised through the outreach process employed by SWRPC in developing the Regional Plan was that the Southwest Region may not have the makings of a transport system that is responsive to changing needs of our population, and therefore, may not be sustainable over the long term. Examples of concerns raised by residents include lack of mobility options for people that don't drive, lack of regional passenger transportation options, the volatility of gas price costs, the costs and difficulty in paying for deteriorating highway infrastructure, greenhouse gas emissions, etc. Themes that were discussed mostly revolved around a need for solutions that address a) transportation options for non-drivers or people that prefer not to drive, and b) how to pay for the high expenses associated with our rural transportation system. These two concerns are the emphases of this scenario planning query.

Today, it is estimated by the U.S. Census that about 4% of households in Cheshire County do not have a personal vehicle. Of that 4%, it is anticipated that approximately 50% of these non-driving households are part of the workforce. Other non-driving households are likely to be households with disabilities that prevent them from working or people that have discontinued driving due to old age. As discussed earlier in the Population section of this document, age cohort population projections suggest that the Region's proportion of seniors will increase dramatically over the next few decades. This is a potential concern because driving statistics from an AARP (American Association of Retired Persons) analysis of the two most recent National Housing Travel Surveys (2001 and 2009) shows that the number of nondrivers has remained consistent at 21% of all people age 65 and older.

In addition to the non-driving households that don't drive because they do not have the means to drive, we might expect a rise in households that choose not to drive whether it is to save money, be environmentally friendly, or another reason. Recent research suggests that the millennial generation is the first generation in recent history with a large population subset that has a low car ownership rate. Whether this consumer behavior carries on into their life as older adults is difficult to predict. However, the MRF outreach efforts suggests that people of all generations feel that the lack of transport options is a weakness of the Region. The lack of transportation options has led to the creation of groups such as the Monadnock Region Transportation Management Association and the Monadnock Region Coordinating Council for Community Transportation, both of which were created to stimulate the development or improvement of travel options for non-drivers or people that choose not to drive.

Another concern about our car dominant transportation system is its high household cost. The majority of the general public tends to perceive the high cost of transportation as the cost of gas, as well as the cost of gas tax or registration fees used to pay for highway and bridge infrastructure. However, the Bureau of Labor Statistics Consumer Expenditure Survey demonstrates that the transport system is also supported by many other hidden costs including vehicle payments, insurance, maintenance and repairs. Data from 2012 shows that the approximately 14% of average household income is dedicated to transportation expenses, second only to housing expenses. The American household spent about $8,456 per year on vehicles in 2012. The data also shows that transportation household expenses are regressive. The poorest 20% of the U.S. population spends an average of 34% of their household income on transportation. The second and third poorest 20% or our population (our lower middle and middle class) spend 22% and 18% of their pre-tax

household income on transportation respectively. Transportation cost is a serious issue, significantly impacting households, including those in the middle class.

Questions

In an effort to address these concerns, SWRPC established scenarios that focused on the household unit budget for transportation and reductions in vehicle-related expenses. It explored the question:

- What is the potential impact on household income and mobility if a percentage of people shifted some of their household budget from vehicle expenses to other modes of transportation?

More specifically, the scenario explores the household income and mobility impacts of reducing the ratio of vehicles per household by 1/100th of a point each year starting in 2016 out to 2025. Today's vehicle per household ratio is 1.85 vehicles per household. By 2035, twenty years later, the scenario examines the effects of an average of 1.65 vehicles per household. What reduces vehicles per household is not the concern of this scenario. It could be a combination of factors - the cost of gas, new settlement patterns, technological innovation, taxes or some other input.

A loss of vehicles could be harmful to society if no other mobility alternatives were introduced to help people get to jobs, medical care, shopping, errands and other trip purposes; especially, in an area like Cheshire County, which is 109 people per square mile. This scenario shifts 50% of the funding that would have been spent on vehicle expenses and reinvests it in public transportation, sidewalk repair, new sidewalks and multiuse trails. The other 50% of what were formerly vehicle expenses are set aside as new household discretionary income.

Findings

By 2035 the scenario points to a future in which even though there would be 2,848 more households living in Cheshire County, there would also be 6,781 fewer vehicles on the road then there are today. Table 15 outlines a number of changes that would occur based on the scenario.

Table 14: Projected Results of Scenario Reducing Vehicles per Household Ratio, 2015-2035

	Scenario					
Category	**2015**	**2016**	**2020**	**2025**	**2030**	**2035**
Projected Households in Cheshire County	31,056	31,244	31,996	32,778	33,433	33,904
Ratio of Vehicles to Household	1.85	1.84	1.80	1.75	1.70	1.65
Estimated Vehicle Change with Scenario	57,454	57,489	57,593	57,362	56,836	55,942
Difference in Estimated Vehicles	-	(312)	(1,600)	(3,278)	(5,015)	(6,781)
Extreme Maximum Number of Households with 0 Vehicles Available	1,360	1,538	2,290	3,309	4,414	5,595
Extreme Maximum Number of Households with 1 Vehicle Available	8,317	8,680	10,168	12,056	13,968	15,860
Projected Households with Head of Household at 65+	8,484	8,806	10,092	11,700	12,970	13,519
Year's Dollar Amount of Household Income Diverted from Vehicle-Related Expenses ***(X)***	-	$1.6 M	$8.9 M	$20.6 M	$35.8 M	$54.7 M
Year's Dollar Amount of New Discretionary Income (DI): ***if DI = X * 50%***	-	$.8 M	$4.5 M	$10.3 M	$17.9 M	$27.3 M
Year's Dollar Amount of New Expenditures in Public Transit ***if PT = X * 30%***	-	$.5 M	$2.7 M	$6.2 M	$10.7 M	$16.4 M
Projected Number of Fixed Route and Demand Response Buses That Investment Would Sustain = **PT *if FR = PT * 76% and DR = 24%***	-	2 FR/ 2 DR	11 FR/ 9 DR	22 FR/ 19 DR	33 FR / 29 DR	45 FR/ 39 DR
Year's Dollar Amount of New Expenditures in Complete Streets (CS) ***if CS = X * 20%***	-	$.3 M	$1.8 M	$4.1 M	$7.1 M	$10.9 M
Cumulative Mileage of Repaired Sidewak (RS) ***if RS = CS * 34%***	-	.7 mi	10.7 mi	39.8 mi	88.2 mi	156.2 mi
Cumulative Mileage of New Sidewalk (NS) ***if NS = CS * 33%***	-	.2 mi	3.3 mi	12.2 mi	27.1 mi	48.0 mi
Cumulative Mileage of Multiuse Path (MUP) ***if NBP = CS * 33%***	-	.2 mi	3.6 mi	13.4 mi	29.7 mi	52.6 mi

This outcome could play out in any number of ways depending on the combination of households with one, two, three or no vehicles as long as the vehicle to household ratio matches the average vehicles to household benchmark for each year. One could argue that the most challenging scenario might be if the number of zero-vehicle households was maximized in order to reach the 1.65 vehicles per household figure (see Extreme Maximum Number of Households with 0 Vehicles Available in Table 15). This extreme case could result in up to 5,595 households or 17% of all households in Cheshire County without any vehicle by 2035 (5,596 households is equivalent to about 62% of households living in the City of Keene today).

While the number of zero-vehicle households will present a challenge to mobility, some might argue that a large number of one-vehicle households could be an even greater challenge to mobility. Therefore, an even greater, more extensive challenge would be if the number of one-vehicle households were maximized (while still accounting for a steady rate of roughly 4% of the households with no vehicles included in this calculation). This scenario would result in 15,860 households or 47% of Cheshire County households with one vehicle. This would account for about 1.75 times the number of households in present day Keene.

If up to 15,860 households had access to only one vehicle and an additional 1,434 households had access to no vehicle, would the scenario of reallocating 50% of former vehicle-related expenses towards ground transportation and other transportation infrastructure meet their mobility needs? The answer would depend on where the services were provided. By 2035, the scenario projects that if just 50% of the savings from former vehicle related expenses were reinvested in other transportation choices, one could fund 45 fixed route buses and 39 demand response buses in the year 2035 and there would have been a cumulative investment of $97 million dollars in transportation infrastructure, which is projected to be the amount of money a set of communities might need to maintain 156 miles of sidewalk, build 48 miles of sidewalk and build 52 miles of multiuse pathways.

Table 15: Projected Investment Outcome Based on Reallocating 50% of Vehicle Related Expenses into Public Transit, Sidewalks and Multiuse Paths, 2035

Buses Operating in 2035		Cumulative Miles (Investment from 2016 to 2035)		
Fixed Route Buses	Demand Response Buses	Repaired Sidewalk	New Sidewalk	Multi Use Path
45	39	156	48	52

If the bus services, sidewalk and bicycle infrastructure were applied to an area with some population density such as the Keene, Swanzey and Marlborough area, it appears that it would be a very robust multimodal transportation system. If the bus services, sidewalk and bicycle infrastructure were applied to a larger

Table 16: Investment Impact Based on Two Geographical Area Scenarios

	Buses per hour passing fixed point on Transit Route in 2035*	Number of Minutes for All Buses to Cover Entire Road Network**	Transportation Infrastructure Built by 2025 as Percent of 2014 Public Road Network		
	Fixed Route Buses	Demand Response Buses	Repaired Sidewalk	New Sidewalk	Multi Use Path
Keene-Swanzey-Marlborough	6	14	50%	15%	17%
Cheshire County	1	68	10%	3%	3%
*If buses travel average speed of 10 mph covering 25% of public road network					
**If buses travel average speed of 35 mph					

area, such as Cheshire County, the mobility would be more challenging because the same number of transportation resources would be spread out over a larger geographical area. Table 17 on the previous page shows these two scenarios. In the case of it being applied to the smaller area, the model projects that a bus might pass by a given stop every 10 minutes if the route covered 25% of the Keene, Swanzey, and Marlborough public road network. Under the same framework, a fixed route bus would pass by a given spot in Cheshire County every hour. Demand Response buses would be able to respond to pick up requests fairly rapidly in the case of the smaller geographical area. The efficiency in building sidewalk would also be realized more in the smaller geographic area.

Limitations

The transportation scenarios posited here are based on the availability of relevant data available to SWRPC for calculating the outcomes. Some of this information comes from data sets that encompass other parts of the country because sufficient local data doesn't exist. For example, the Consumer Expenditure Survey data used for accounting household vehicle expenses is based on national data, because that data is not collected at the state or more local level. The sidewalk and multi-use cost data comes from actual average costs of repairing and constructing sidewalks, and multiuse paths comes from Vermont, because that data is not available for New Hampshire. The costs used to estimate public transit are based on the Pioneer Valley Transit Authority's actual capital and operating costs in Massachusetts, because it was deemed the closest type of public transit system that might fit within the context of Cheshire County, New Hampshire. Despite these challenges, the model does appear to show the direction of impact and the potential scale of impact of reinvesting vehicle expense dollars into alternative transportation.

Another worthwhile endeavor with this model would be to try and understand the impact of new disposable income on the local economy. SWRPC did try to do this using the REMI Policy Insight model used in the previous scenario, however, the cost assumptions made by the REMI model were not congruent with the Consumer Expenditure Survey data on vehicle expenses. In addition, the model lacked sophistication to account for the value of the personal vehicle industry to the local economy versus its value to the larger national or international economy.

Appendix A: Scenario Methodologies

Population Scenario Methodology

Three data set drivers - birth rates, mortality rates, and migration rates - were the basis of the population projections used by the regional planning commissions and OEP for this scenario. These rates are tailored to correspond to the sex and age of the population as well as the county they live in. Ages and their respective birth, mortality, and migration rates are provided in age cohorts of 5 years starting with the cohort 0-4 years old, 5-9 years on and so on. As people age, their birth, mortality and migration rate will change. County historical data from 2001 to 2005 and 2006 to 2010 were used to develop these rates and in some cases more than one county was grouped together to better form rates. This was the case for Cheshire with Sullivan County. Hillsborough was not grouped with another county due to its relatively larger population. In each county's case, the records show that as people age beyond 45, their mortality rate increases significantly. Fertility rates, on the other hand, are highest for women aged 25 to 35. Migration rates are variable based on the time in a person's life cycle, whether they are seeking employment, starting families, retiring or making other life decisions.

College students, military and prison populations present a segment of the population that provide some challenges to any population projection, especially on migration and fertility rates. For example, college populations, which are concentrated in 15 to 19 and 20 to 24 age groups tend to be replaced by same age students every year, therefore the college population does not "age" in the same sense that the rest of the population ages. Since students do not remain in place, if the college is not removed from the base population, the students would be presented as aging along with the general population, therefore distorting the projection. While it is true that some students may decide to live in the same locality after they have graduated, the model appropriately treats them as a fixed population only after they are no longer associated with the school. This model therefore removes known institutional populations, such as populations from Keene State College and the Cheshire County House of Corrections, from the aging aspects of the projection before adding them back into the projection after aging calculations are performed for the resident population.

Sources of Data

A number of sources were used to develop the population projection. These sources are listed below.

- New Hampshire Bureau of Public Health Statistics and Informatics; New Hampshire Department of Health and Human Services; New Hampshire Department of State, Division of Vital Records Administration, 2000-2010
- New Hampshire Department of Corrections
- New Hampshire Office of Energy and Planning
- U.S. Department of Education; National Center for Education Statistics; Integrated Postsecondary Education Data System (IPEDS); IPEDS Interactive Data Center
- U.S. Census Bureau
    - 2000 Census of Population, Summary File 1, Table PO12 Sex by Age
    - 2010 Census of Population, Summary File 1, Table P12 Sex by Age
    - 2010 Census of Population, Summary File 1, Table P43 Group Quarters by Sex and Age and Group Quarters Type

    - Intercensal Estimates of the Resident Population by Five-Year Age Groups, Sex, Race, and Hispanic Origin: April 1, 2000 to July 1, 2010
- U.S. Department of Health and Human Services; Centers for Disease Control; National Center for Health Statistics
- US Social Security Administration, *Life Tables for the United States Social Security Area, 1900-2100*, Actuarial Study No. 120.

Housing Scenario Methodology

To explore housing, SWRPC utilized models recently developed by NHHFA and the New Hampshire Center for Public Policy Studies in its 2014 publication of *The Evolving Environment and Housing's Future*. The model utilized two approaches to calculating anticipated housing need. The first was a population-based housing production model, which used assumptions from the population growth model discussed in the previous section to determine housing unit need. The second model was an employment based model based on economic forecasts of labor force, employment, county commuting patterns with the help of the Department of Employment Security. Unfortunately, the employment based scenario only looks six years into the future, whereas the population model helps describe a scenario of housing needs up to 2040. The employment model is also only county-based. The focus of this scenario is on the population model and the housing need results up to 2040 in the entire Southwest Region. A mid-year period check at 2025 is also analyzed.

Several base year assumptions were used for this scenario. One of the assumptions used to determine housing needs was the calculation of the headship ratio for 10 year age cohorts (15 to 24 years old, 25 to 34 years old, etc.) based on 2010 headship ratios. The headship ratio refers to the number of household heads in an age cohort divided by the number of people in that age cohort. For example, for household heads from the age of 15 to 24, the headship ratio is 0.1055 which was determined by dividing the number of household heads at in that age cohort (1,759) by the population of that age cohort (16,677). Another assumption applied to the model is the use of 2010 numbers that describe the proportion of housing owners to renters by age cohort. For example, for head of households age 15 to 24, the model assumes that the proportion of those that own and rent will be 13% and 87%, respectively. By contrast, head of households age 75 to 84 own 75.6% of their housing and rent 24.4% of their housing. A third assumption uses base year group quarters populations (nursing homes, colleges, prisons, etc.) based on the 2010 base year data. The model's group quarters populations, which are split up into group quarters for ages less than 65 and over 65, change based on the overall population growth rates. In the case of those 65 and under the group quarters population changes based on the overall growth rate of the 65 and under population. The group quarters population over age 65 is assumed to increase at the same rate as the 85+ population growth, which is the subset of the population likely to enter nursing homes at a greater rate.

Since all housing has a lifespan, the model also makes an assumption that 1% of owner housing is replaced per year and 2% of rental housing is replaced per year due to demolition or disaster. A final assumption used in the model is that there will be at least 1% vacancy rate of owner housing each year and at least 4% vacancy rate for rental housing. These vacancy rates are considered to be healthy rates according to experts at the NHFFA. By taking into account these assumptions, the model is able to determine the estimated demand for

housing into the future as well as the projected need for the development of new owner occupied and rental housing.

Sources of Data

As explained above, the data that is used for the housing methodology came from the New Hampshire Center for Public Policies based on data that the organization collects, US Census data, and population projection data from the New Hampshire Office of Energy and Planning.

Climate Change Scenario Methodology

Climate change scenario planning was incorporated into the MRF planning process by taking advantage of technical assistance from the Sustainability Institute at the University of New Hampshire (UNH). UNH projections of future climate were developed using four internationally reputable global climate models that incorporated the latest scientific understanding of the atmosphere, oceans and Earth's surface. With these models, two different climate scenarios were run showing a case in which virtually no interventions were made to decrease greenhouse gas emissions (called the higher emissions A1fi scenario) and a second case in which significant interventions were employed to reduce greenhouse gas emissions (called the lower emissions B1 scenario). Both models examined greenhouse gas emission impacts on a variety of climate indicators relating to temperature and precipitation out to the year 2099.

Since climate models are necessarily global in scope, new state of the art processes called dynamic and statistical downscaling were used to better understand possible changes to the climate in smaller geographic areas. In order to achieve this downscaling process, UNH used reliable historical data from meteorological stations across New Hampshire including a meteorological site in Keene that has reliably collected climate data over the past century. For more details about the methodology employed by UNH, visit its 2014 online report: Climate Change in Southern New Hampshire: Past, Present and Future.

Sources of Data

Sources of data used for this projection included the basis of historical data from 25 New Hampshire meteorological stations located in Southern New Hampshire. Other sources of data and information are far too many to document here. Please visit Climate Change report referenced above for those sources.

Economic Development Scenario Methodology

In order to tackle this question, SWRPC worked with the Economic and Labor Information Bureau of the New Hampshire Department of Employment Security to run a scenario through the State's econometric model, called REMI Policy Insight. Since economic and labor market information is county-based, the model focused on Cheshire County only. Hillsborough data was not used, because of anticipated economic distortions coming from the Manchester, Nashua and other eastern Hillsborough County communities.

For the first question, the scenario estimated the number of direct, indirect and induced jobs created, as well as the change in Cheshire County's overall gross domestic product. Since direct, indirect and induced jobs

and overall gross domestic product are not common parlance, we provide an example of each of these terms in the context of the creative economy. A painter would be considered one "direct" job in the creative economy. This painter can support other sectors of the economy by spending his/her money locally, but these jobs are considered "indirect" or "induced" jobs. The person who frames paintings or sells paint would be considered an "indirect" job. In contrast, the café worker that sells the painter a cup of coffee would be considered an induced job. It is easy to see in this example how indirect and induced jobs are often accounted for as fractions of a job, since it would likely take a number of painters to sustain a

framing job or a café job. Gross domestic product refers to economic activity in the County caused by the creative economy. It represents the market value of goods and services of the creative economy.

In order to define the four economic clusters, definitions were created and are described below. This allowed SWRPC to single out specific business activities in which data is collected by the Economic and Labor Information Bureau.

Manufacturing: This economic cluster includes all manufacturing-related industries, with the exception of food manufacturing, which is included in the agriculture and local food cluster described below.

Tourism and Travel: Travel and tourism industries support economic activity generated inside the county by visitors of all types - for business or for pleasure. These industries can include accommodations such as hotels or bed and breakfasts, spectator sports and recreation, transportation specific to travel, etc. Retail trade is not included in this definition.

Agriculture and Local Food: Agricultural industries are composed of business activities that support the direct operation of farms and sale of farm products, examples of which include: livestock; freshwater fish; and horticultural, agricultural, viticultural, or forestry crops (including berries, herbs, honey, maple syrup, fruit, vegetables, tree fruit, flowers, seeds, grasses, sod, trees, tree products, Christmas trees, compost, etc.). It includes activities that are incident to, or in conjunction with farm operations, such as farmers markets, slaughterhouses, preparation for market, delivery and transportation to market, marketing or selling farm products, or the production and storage of compost.

Creative Economy: The creative industries are composed of arts businesses that range from non-profit museums, symphonies, and theatres to for-profit film, architecture and advertising companies. Other businesses in this category include arts schools and services, design and publishing, museums and performing arts, or visual arts and photography.

For each of the four industry clusters, direct jobs were phased into the REMI model for Cheshire County between 2014 and 2023, by introducing 10 jobs into each niche sector each year. Each of the clusters was evaluated separately in order to provide a side by side comparison. The selection of 100 jobs for each cluster over a ten year period was hypothetical in the sense that the Region has not set specific goals for job creation in each of these areas. However, it was assumed to be a plausible scenario based on the existing marketing activities and other investments that are currently occurring within each of the four sectors. The new direct

jobs, 10 every year for each cluster for ten years, were added to the projected baseline employment estimates for each cluster, which was determined by the REMI model using existing data. Employment numbers were based on the Bureau of Economic Analysis (BEA) definition of employment in order to account for self-employment.

Sources of Data

Sources of data used for this projection were derived from the New Hampshire Department of Employment Security which used data in 2005 dollars encompassing 156 categories of employment. Information about the individual categories of employment used for each sector cluster were based on the definitions of each cluster above.

Transportation Scenario Methodology

The methodology used to test this question looks at the impacts and opportunities of reducing Cheshire County's ratio of vehicles to households (currently 1.85) by 1/100th (.01) each year starting in 2015 with a vehicle to household ratio of 1.85 and finishing twenty-one years later in 2035 with a vehicle to household ratio of 1.65.[1] No specific policy, program or action is being tested to meet the reduction goal. The scenario was created to serve solely as an illustration of the kinds of impacts that would occur if some Cheshire County residents reallocated part of the household budget they would normally invest in personal vehicles towards shared community transportation services and facilities. In 2012, the Bureau of Labor Statistics Consumer Expenditure Survey found that the American household budget was $8,456 for vehicle expenses. In Cheshire County that is equivalent to the average household spending an equivalent of $4,571 per vehicle. In addition to reducing the vehicles to household ratio, the scenario projects impacts of reinvesting some of the former vehicle-related expenses into other transportation mode services and infrastructure that do not exist today, in order to continue to provide mobility options for people that have lost access to a vehicle. For the purposes of having a baseline to measure from, this scenario reallocates 50% of the former vehicle-related expenses towards ground transportation and towards transportation-related public infrastructure. Examples of ground transportation could include operational and capital costs associated with maintaining fixed transit, demand response transit, or other motorized ground transportation. Examples of transportation infrastructure might include items such as sidewalks, bikeways, crosswalks, bicycle racks, bus shelters, bus stations, pedestrian benches, etc. The remaining 50% of former vehicle expenses are set aside as household discretionary income that could be put towards household savings, investments or other expenses.

The scenario goes further to subdivide the 50% of ground transportation and infrastructure expenses so that 30% is spent on ground transportation services and 20% is spent on bricks and mortar transportation infrastructure. For ground transportation, the 30% spent is further subdivided so that 22.8% of the ground transportation expenses go towards fixed route transit and 7.2% go toward demand responsive transit. This budget ratio of fixed route to demand response transit is derived from the 2012 budget of the Pioneer Valley Transit Authority (PVTA) in Western Massachusetts, a nearby transit operation that operates in an area with

[1] Cheshire County data was used instead of Southwest Region data because of the limitations of some data not breaking down to the municipal level. SWRPC presents this option because Cheshire County is useful for illustrative purposes for any municipality in the SW Region.

population density, topography and built environment that is comparable to a future Southwest Region. For bricks and mortar transportation infrastructure, the scenario subdivides the 20% budget so that 1/3 of the budget is applied towards maintenance and repair of sidewalks, the construction of new sidewalks and the construction of new multi-use paths.

Because this scenario looks at cost, historic annual inflation rates were considered and employed for all cost calculations including the household cost of vehicle-related expenses, as well as the costs of operating a PVTA style transit system, and costs of transportation infrastructure including the average unit costs of repairing and maintaining sidewalks, the unit cost of new construction sidewalk and the unit cost of new construction multi-use pathways. The annual inflation rate used for this analysis is 2.5%. For the sake of simplicity, the analysis of transportation infrastructure is confined to these three categories, although it could certainly be applied to other types of infrastructure. The fixed route criteria of 25% of the public road network traveling at 10 mph was based on an analysis of route and the speed of the bus according to the current schedule of the City Express route in Keene.

The baseline ratio of vehicles to household examines the number of registered passenger vehicles and light duty or passenger trucks in 2012 only. It does not include registered buses, single unit trucks or combination trucks or motorcycles registered in Cheshire County.

Sources of Data

- New Hampshire Housing Finance Authority
- New Hampshire Department of Motor Vehicles
- US Bureau of Labor Statistics, 2012 Consumer Expenditure Survey
- National Household Travel Survey, 2009
- National Transit Database
- Vermont Agency of Transportation, “Report on Shared Use Path and Sidewalk Costs”, 2010