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ESTIMATION OF ECONOMIC IMPACTS OF LAKE TAHOE AIRPORT ON THE ECONOMY OF SOUTH LAKE TAHOE STUDY AREA

University of Nevada, Reno
Center for Economic Development

Estimation of Economic Impacts of Lake Tahoe Airport on the Economy of South Lake Tahoe

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EXECUTIVE SUMMARY

The University Center for Economic Development, in the College of Business, at the University of Nevada, Reno completed an analysis of the multi-regional economic impacts of the operation, construction, tenant, and visitor activities of the Lake Tahoe Airport on the economy of City of South Lake Tahoe, California and South Lake Tahoe areas of Nevada. Highlights of the study are presented below**:**

Introduction

- In 1959, the Lake Tahoe Airport (LTA) officially opened. In 1983, the City of South Lake Tahoe purchased the airport for the asking price of $1. By 2006, the airport became the City of South Lake Tahoe Administrative Service Center and City Hall for the City of South Lake Tahoe. The Lake Tahoe Airport also serves as a summer base for U.S. Forest Service contract aerial fire-fighting assets and supports numerous military training missions for both the U.S. Navy and U.S. Marine Corps. The Airport is also the City of South Lake Tahoe's Emergency Operations Center (EOC) and is key in prioritizing climate resiliency efforts through active forest management.
- LTA plays a critical role in the economic vitality of City of South Lake Tahoe by creating jobs and income for City residents through normal airport operations, airport-related industries, general aviation opportunities, and visitors in South Lake Tahoe.
- LTA plays a key role in the future of City of South Lake Tahoe, California economic development efforts, as industries seeking to locate or relocate into an area rate the quality of local airport as an important locational factor.
- LTA significantly impacts the quality of life and community sustainability.

Methodology

- Operation and construction expenditures by LTA, airport tenants, and general aviation visitors in California and Nevada and related employees impact the economic activity of the South Lake Tahoe Study Area and Nevada Study Area through the multiplier effect.
- Eight zip codes comprise the South Lake Tahoe (SLT) California Study Area: 96150, 96151, 96152, 96154, 96155, 96156, and 96158.
- The Nevada Study Area is comprised of three zip codes: 89413, 89448, and 89449.
- Because the study areas for the SLTA includes both California and Nevada, a multi-regional input-output model was employed to derive potential spillover impacts between the two states. Therefore, procedures developed by IMPLAN. LLC (2019) were employed to derive a multi-regional input-output analysis.

Results

- LTA spent $3.92 million on operations in the South Lake Tahoe (SLT) California Study Area. When the expenditures between other businesses and households in the SLT California Study Area are included, LTA generated a total of $5.44 million in economic activity in the SLT California Study Area economy**.**
- LTA employed 3.0 individuals. When employment created by other LTA-related businesses and household linkages is included in the analysis, LTA total operations generated and supported a total of 12.9 jobs in the SLT California Study Area economy.
- LTA had $479.9 thousand in labor income. When the income created by other businesses and households linked to the LTA in the SLT California Study Area is included, LTA

was responsible for $1.03 million in labor income for the SLT California Study Area economy.

- LTA tenants' activities have economic impacts in the study area. The economic, employment, and labor income impacts of these economic sectors were also estimated.
- LTA tenants spent $6.10 million in the SLT California Study Area. When the expenditures by other businesses and households in the SLT California Study Area linked to tenants at the LTA are added, LTA tenants generated a total of $8.98 million in economic activity in the SLT California Study Area.
- LTA tenants employed 46.0 individuals. With the employment created by other businesses and households linked to the LTA tenants in the SLT California Study Area, a total of 65.9 jobs in the SLT California Study Area economy are supported.
- LTA tenants had labor incomes of $2.93 million. With the income created by other businesses and households linked to LTA tenants in the SLT California Study Area, total labor income in the SLT California Study Area is estimated to at $3.89 million.
- From conversations with the LTA manager (2020), an estimate of construction activities at the LTA were derived. The economic, employment, and labor income impacts of these construction activities were estimated for the SLT California study Area based on these amounts.
- Direct expenditures for LTA construction were estimated to be $849.9 thousand in the SLT California Study Area. When the expenditures by other businesses and households in the SLT California Study Area linked to construction at the LTA are added, LTA construction generated a total of $1.28 million in economic activity in the SLT California Study Area.

- For construction activities at the LTA, 8.9 individuals were hired. With the employment created by other businesses and households linked to the LTA construction in the SLT California Study Area, a total of 11.8 jobs in the SLT California Study Area economy are generated.
- Construction activities at LTA had labor incomes of $635.0 thousand. With the income created by other businesses and households linked to LTA construction in the SLT California Study Area, total labor income in the SLT California Study Area is estimated to be $779.6 thousand.
- Lake Tahoe Airport is a key mode of transportation for visitors to the SLT California Study Area and adjacent state of Nevada for casino gaming and recreation. From previous study by RRC Associates, Inc. (2007), visitor activities from people who enplane at the LTA in both California and Nevada are estimated. The study provides estimates of percentage of visitor expenditures by economic sector expended in the City of South Lake Tahoe and nearby Douglas County, Nevada. For example, all gaming expenditures are spent in the Nevada Study Area (as no gaming properties are in the California Study Area), while 65% of accommodation expenditures occur in the City of South Lake Tahoe. By employing a multiregional input-output model, the spillover effects of visitor expenditures in the SLT California Study Area on the Nevada Study Area can be estimated as well as spillover impacts in the SLT California Study Area from Nevada Study Area visitor expenditures.
- Airport passengers at the LTA spent $2.32 million in the SLT California Study Area. When the expenditures by other businesses and households in the SLT California Study Area linked to tourism in the SLT California Study Area are added, SLT California Study

Area visitors generated a total of $3.28 million in economic activity in the SLT California Study Area.

- SLT California Study Area visitor expenditures support 30.1 direct employees in the SLT California Study Area. With the employment created by other businesses and households linked to the SLT California Study Area tourism, a total of 37.0 jobs in the SLT California Study Area economy are supported.
- The SLT California Study Area had direct labor incomes of $967.1 thousand from visitor activities. When these expenditures are linked with business and household activity linked to tourism in SLT California Study Area, total labor income in the study area is estimated to be $1.28 million.
- Using the multiregional input-output model, the spillover impacts of visitor impacts in the SLT California Study Area on the Nevada Study Area were derived. Total economic impact in the Nevada Study Area from SLT California Study Area visitor activities is estimated to be $1.33 million, with employment and labor income total impacts of 9.1 employees and $404.7 thousand, respectively.
- Airport passengers at the LTA spent $2.55 million in the Nevada Study Area. When the expenditures by other businesses and households in the Nevada Study Area linked to tourism in the Nevada Study Area are added, Nevada Study Area visitors generated a total of $3.21 million in economic activity in the SLT California Study Area.
- Nevada Study Area visitor expenditures support 26.2 direct employees in the Nevada Study Area. With the employment created by other businesses and households linked to the Nevada Study Area tourism, a total of 30.7 jobs in the Nevada Study Area economy are supported.

- Nevada Study Area had direct labor incomes of $1.09 million from visitor activities. When these expenditures are linked with business and household activity linked to tourism in the Nevada Study Area, total labor income in the study area is estimated to be $1.27 million.
- Using the multiregional input-output model, the spillover impacts of visitor impacts in the Nevada Study Area on the SLT California Study Area were derived. Total economic impact in the SLT California Study Area from Nevada Study Area visitor activities is estimated to be $1.63 million, with employment and labor income total impacts of 11.4 employees and $924.7 thousand, respectively
- Using data and procedures from RRC Associates, Inc. (2017), City of South Lake Tahoe 2020 annual budget (2020), and IMPLAN model (2020b), impacts to City of South Lake Tahoe Transient Occupancy Tax (TOT) and sales taxes were estimated. Under average visitor assumption, total TOT revenues are estimated to be $167,925 under 12% TOT rate or $195,911 at 14% TOT tax rate. Given an alternative assumption of contribution analysis and visitors at their highest levels, TOT revenues at 12% were estimated to be $268,171 while at the 14% TOT tax rate receipts were estimated to be $312,867. The sales tax rate for the City of South Lake Tahoe is 0.05%. Under the assumption of average visitor expenditures and impact analysis, sales taxes for the city are estimated to be $11,452. Under high tourism expenditures and contribution procedure, sales tax receipts from visitors in City of South Lake Tahoe would are estimated to be $15,552.
- In addition to its quantitative impacts on the SLT California Study Area economy and Nevada Study Area economy, the presence of an airport improves the region's attractiveness, as businesses consider airport proximity in their location decision.

- These impacts demonstrate that LTA is a critical player for current and future economic development in the SLT California study Area, as well as the neighboring Nevada Study Area**.**
- Economic development agencies, business groups, and local leaders should be aware of the importance of LTA as a key partner and primary sector for current and future economic development opportunities in SLT California Study Area, as well as the neighboring Nevada Study Area.

SECTION 1: INTRODUCTION

The primary purpose of this report is to document the impacts of the Lake Tahoe Airport (LTA) on the economy of South Lake Tahoe Study Area (SLTSA). This will be a multi-regional analysis in which the SLTSA will be divided into two regions: South Lake Tahoe California Study Area (to be designated as SLT California Study Area) and the Nevada Study Area. The SLT California Study Area will consist of eight South Lake Tahoe, California zip codes: 96150, 96151, 96152, 96154, 96155, 96156, and 96158 (Datasheer LLC, 2020). The Nevada Study Area will consist of three zip codes: 89413, 89448, and 89449.

LTA supports general aviation and government agencies including the U.S. Forest Service, the U.S. Navy, and the U.S. Marines (City of South Lake Tahoe, 2020). Data presented in this report reveal that LTA has an impact on SLTSA economic activity, employment, and labor income (employee compensation and proprietor income). These impacts to the study area economy are often overlooked in public policy discussions. LTA plays an important role in current and future study area economic development efforts by creating jobs and income for residents through normal airport operations, grant funded airport development, and general aviation activities. Economic linkages of LTA are also responsible for generating economic activity, employment, and labor income in other economic sectors in the SLTSA, which contribute revenue to the City of South Lake Tahoe General Fund. Also, as shown in Figure 1, Lake Tahoe Airport links the City of South Lake Tahoe, California to approximately 50 markets nationwide which enhances current and future local visitor and business activities.

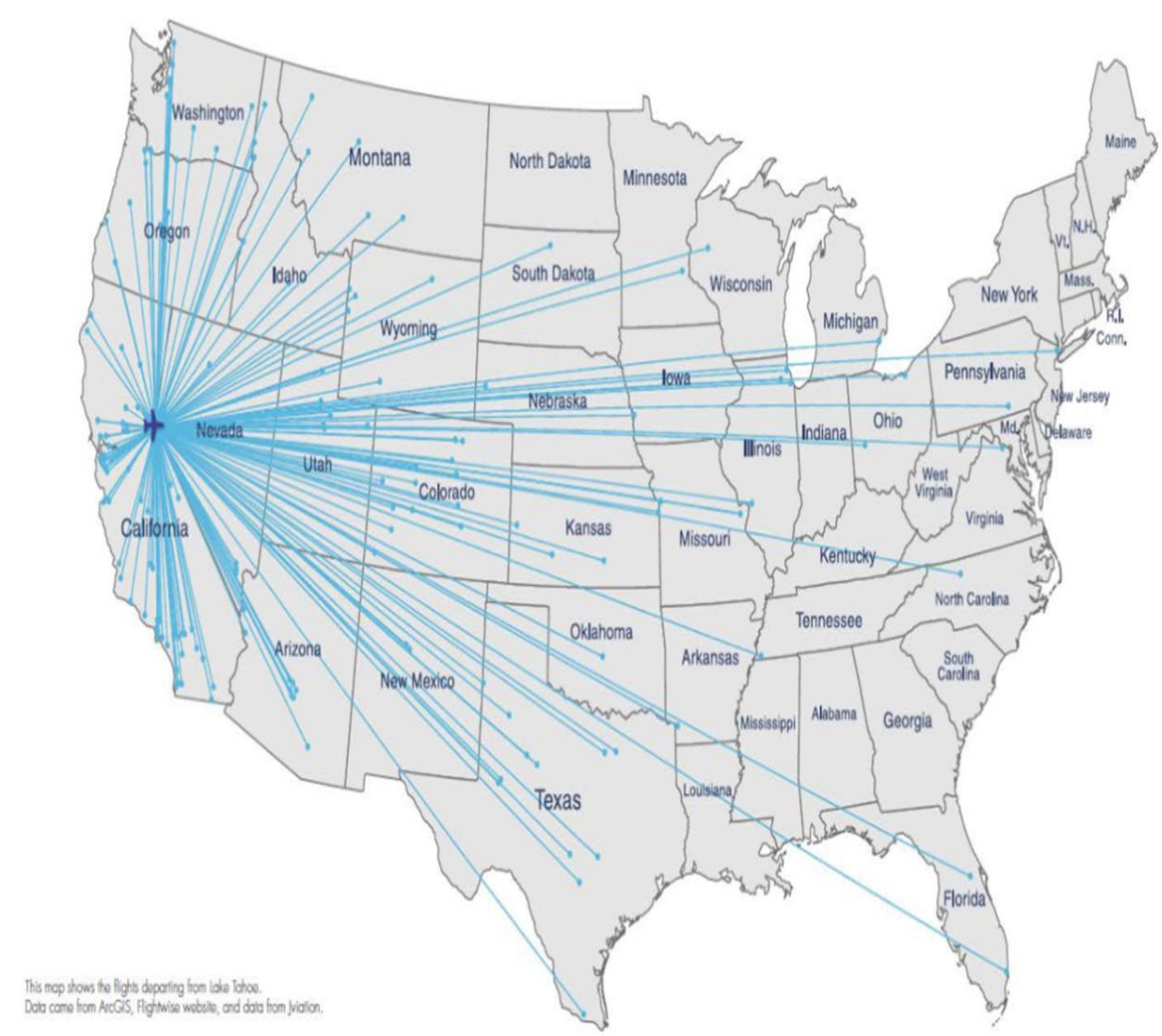


Figure 1: Linkages of Lake Tahoe Airport to Other Airports Nationally.

Utilizing data provided by the LTA staff (2020) and the multi-regional input-output model (IMPLAN Group, LLC, 2019), the economic, employment, labor income (employee compensation and proprietor income), and local tax revenues impacts in the SLT California Study area from activities of the LTA were estimated. A multi-regional input-output model was used to derive linkages and spillovers in the economic activity between the states of California and Nevada in the overall South Lake Tahoe Study Area. Analysis presented in this study shows

that LTA operations, LTA construction, LTA tenants, and visitors to the SLT California Study Area had direct expenditures of approximately $13.2 million. Given expenditures by other impacted businesses in the SLT California Study Area and tourism linkages with the Nevada Study Area (including spillovers to the SLT California Study Area), activities associated with the LTA generated a total of $20.7 million in the SLT California Study Area.

Activities by LTA had employment impacts in the SLT California Study Area of 215.3 jobs with total labor income (employee compensation and proprietor income) impacts of $8.3 million.

Also using results of the multi-regional input-output model, Transient Occupancy Tax (TOT) revenues at the 12% tax rate were estimated to be $167,925 while under the 14% rate, TOT revenues were estimated to be $195,911. In addition, employing principles of contribution analysis and under high visitor expenditures, TOT revenues were estimated to be $268,171 at the 12% rate while TOT revenues would rise to $312,867 at the 14% rate. City of South Lake Tahoe sales tax rate is 0.05%. Under average visitor expenditures and impact analysis, sales taxes were estimated to be $11,452 while under high visitor expenditures and contribution analysis, City of South Lake Tahoe sales taxes were estimated to be $15,552.

As local and state policymakers consider economic development opportunities for their areas, they should bear in mind the importance of airports to local and regional economies. As this report demonstrates, LTA provides much more than necessary transportation. Employment, income, and economic benefits created in other businesses, as well as tax revenue generated by all economic sectors for the City of South Lake Tahoe's General Fund represent additional contributions to economic well-being in the SLTSA economy.

Estimation of economic impacts of LTA on the economy of SLTSA is divided into four sections. The first section briefly discusses the role of the airport sector in economic development, highlighting financial and non-financial linkages between the airport sector and the rest of the local economy. The second section provides an overview of the demographic and economic context of SLTSA. The third section discusses the airport industry within SLTSA in the context of other industries present on the South Shore of Lake Tahoe. The fourth, and final, section demonstrates the direct, indirect, and induced economic impact of LTA on the economic, jobs and labor in the SLTSA economy, as well as the revenue impacts of these operations for the City of South Lake Tahoe, including the Transient Occupancy Tax.

Utilizing the IMPLAN (IMPLAN Group LLC, 2019) multi-regional economic impact model procedures, this report provides estimates of the direct economic contribution of airport operating activity, as well as the indirect and induced or secondary output, income, and employment impacts in other businesses resulting from airport activity. Output, employment, and income generated in other businesses are estimated based on output, employment and income multipliers derived for the SLT California Study Area economy. The model employed in this study is a multi-regional input-output model. The model derives economic, employment, and labor income impacts of LTA activities on the SLT California Study Area economy, but also the spillover economic impacts on the Nevada Study Area. Additionally, Nevada Study Area visitor expenditure spillovers can be estimated for the SLT California Study Area. The report also the contains an appendix that summarizes the model and data used to estimate economic, employment and income multipliers.

SECTION 2: LOCAL AIRPORTS AND LOCAL ECONOMIC DEVELOPMENT

As shown in a study by the California Airport Council (2013), the airport sector has become an integral partner and resource in the overall growth of the California economy. The airport sector includes local airport operations, supporting airport industries, and activities of general aviation visitors. The California Airport Council Study (2013) found no industry unaffected by California airports activities. The study found that California airports contributed $63.2 billion to California's economy with employment contributions of 386,422 jobs. The premise of this report is to provide to City of South Lake Tahoe, California leaders and populace information to improve their understanding of the importance of the airport sector to their local economy, including the amount of jobs and income it provides, directly and indirectly, and its role in generating additional economic activity, employment and labor income to the residents in the entire SLTSA economy. The nexus between airport services and economic development is typically overlooked. An airport can attract and maintain businesses and job growth for the entire SLTSA economy.

Current Airport Role for the South Shore of Lake Tahoe

The Lake Tahoe Airport was purchased by the City of South Lake Tahoe from El Dorado County in 1983. The Lake Tahoe Airport served as a commercial service airport with regularly scheduled airline service from 1958 until 2001. After the loss of commercial airline service, the City expended significant resources to re-establish airline service until 2015 when City Council decided to surrender the airport's commercial airport certificate to the Federal Aviation Administration. Since 2015 the Lake Tahoe Airport has served as a regional general aviation airport. The airport's Fixed Based Operator maintains an aviation services contract with the U.S.

Defense Logistics Agency and the airport maintains a healthy mix of U.S. military, fire-fighting and general aviation traffic.

The airport also serves as the City Hall for the City of South Lake Tahoe, in addition to the office location for City Administrative Services. The Lake Tahoe Airport has a range of private sector tenants including a bar/restaurant, air ambulance, environmental engineering company, real estate, photography and two helicopter charter operators. In 2020, the airport had sixty-nine tenants excluding City Departments. The Lake Tahoe Airport has three primary missions for the communities of the South Lake Tahoe:

1. Community Emergency Preparedness and Emergency Response
2. Community Economic Development
3. Achieve Financial Self-Sufficiency from the City's General Fund

During the period of 2006-2018, the Lake Tahoe Airport has increased revenues by 5.67% while keeping expenses below the rate of inflation at 2.03%. The airport's primary challenges are limits to developing airport property and complex regulatory hurdles regarding growing aviation traffic at the airport. Without changes to local environmental regulations, it will be exceedingly challenging for the airport to achieve financial self-sufficiency now or into the foreseeable future.

Local Business and Job Growth

The dynamic infrastructure provided by civil aviation not only supports businesses in their ability to innovate, create new jobs and explore economic opportunities, civil aviation also provides us with vital connectivity to family, friends, and new frontiers (U.S. Department of Transportation, 2015). From previous airport impact studies in the state of California (Economic Research Associates, 2003; California Airport Council, 2013), the entire aviation system is

important to the state and its local economies for several reasons. One, the network of airports extends commerce and economic development opportunism throughout the state. Two, while some individual airport impacts are relatively small on a statewide basis, they are nonetheless meaningful to their communities at the local level. Lastly, airports make important economic contributions to the local economy besides impacts associated with value of output, employment, or labor income. The mere existence of an airport derives benefits to the local populace in knowing the community has access to aviation services.

SECTION 3: DEMOGRAPHIC AND ECONOMIC CONTEXT OF SOUTH LAKE TAHOE

This section discusses the socio-economic characteristics of the City of South Lake Tahoe. The majority of the characteristics described in this analysis were developed by the Economic Modeling Specialists, Inc. (EMSI) using data from the state of California Employment Development Department, Training, and Rehabilitation; the U.S. Bureau of Labor; Regional Economic Information System data from the U.S. Department of Commerce, Bureau of Economic Analysis; and occupational staffing patterns from the Occupational Employment Statistics.

Demographic Characteristics

Social characteristics described in following text are for the City of South Lake Tahoe. This includes population, households, age, race, and educational attainment.

Population

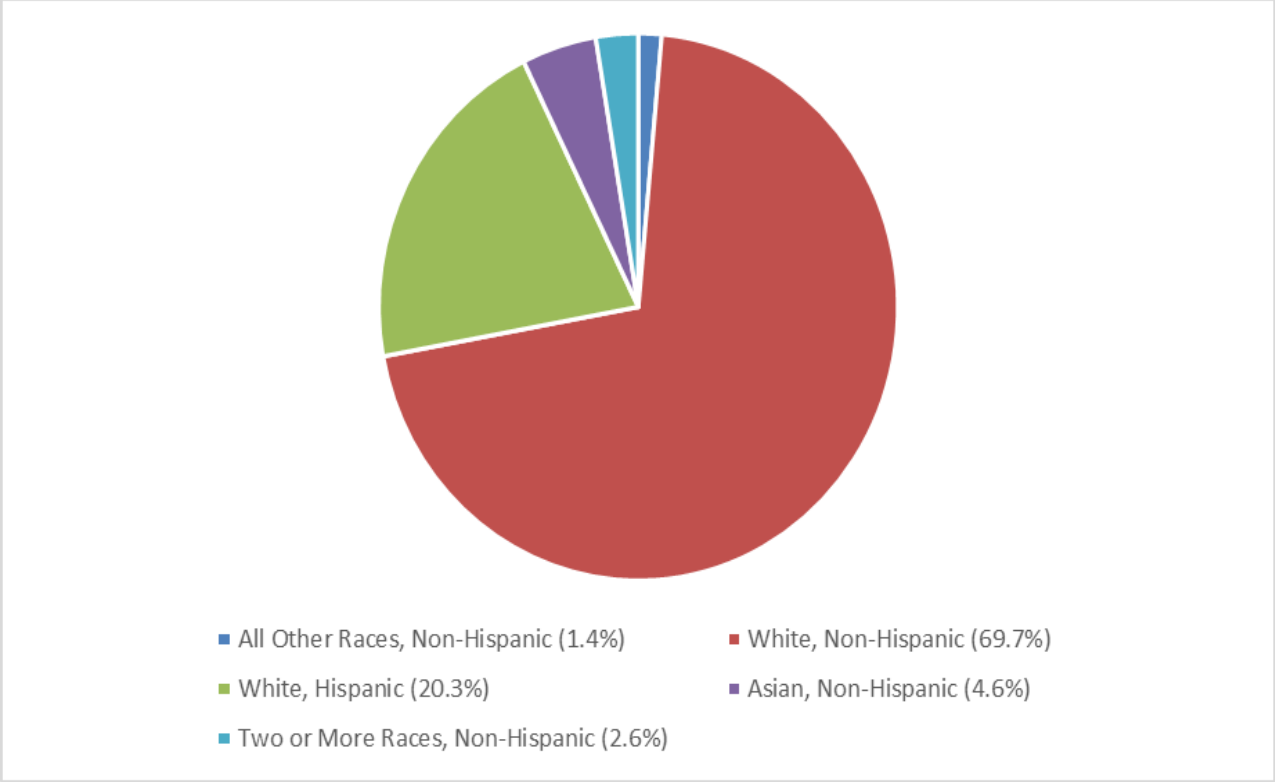
The region's 2018 population of 30,401 represented a 4.4% increase over the past five years. This is higher than the 3% population increase for the State of California during the same period. Overall, the region represents 0.08% of total state population. According to EMSI (2020a), the regional population is projected to increase 5% by 2024.

Race

Approximately 69.7% of the region's population is White, Non-Hispanic, followed by White, Hispanic (20.3%), Asian, Non-Hispanic (4.6%) and others. This is seen in Figure 2.

EMSI (2020a) estimates the percentage of White residents is decreasing in the region, from 69.7% of total population in 2018 to 67.7% in 2024. The population of residents of Hispanic origin (any race) is expected to increase from 20.3% in 2018 to 21.2% in 2024.

Figure 2: 2018 Race Demographics for the City of South Lake Tahoe.



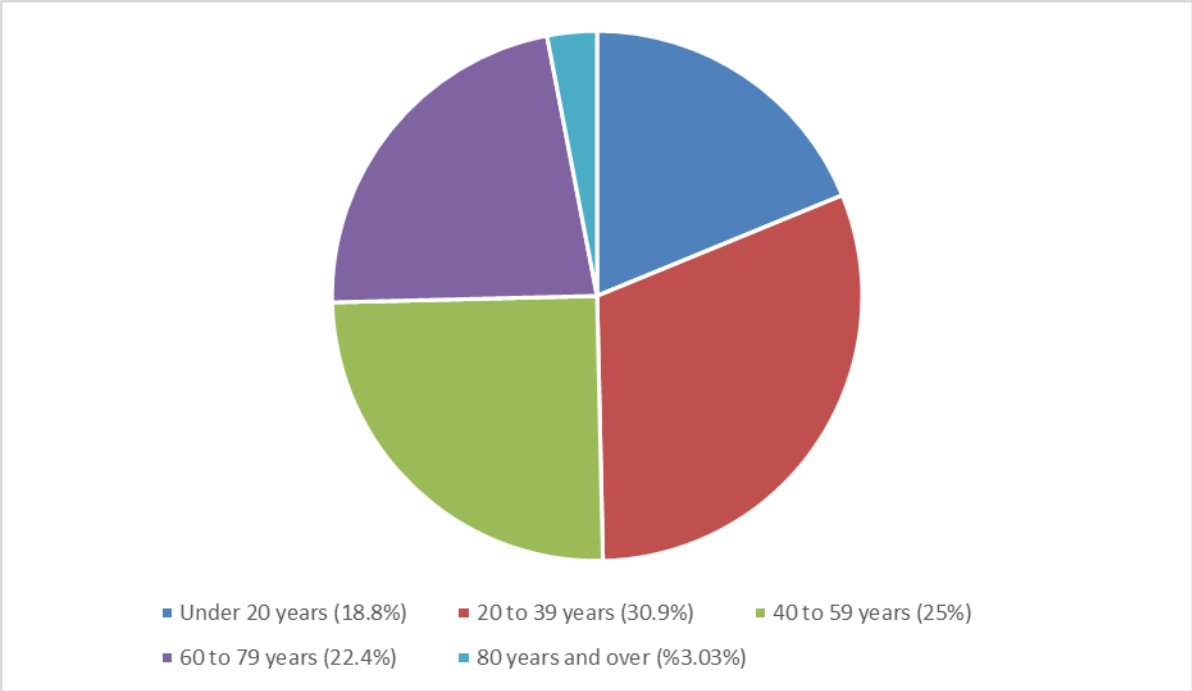
Source: EMSI, 2020a.

Age

Most of the region's population (55.9 %) are between the ages of 20 and 59, with the highest percentage in the 20 to 39 age group (30%). This has changed since 2014, when the 40 to 59 age range had the highest percentage of population at 30.7%. The biggest change between 2014 and

2018 was in the 40 to 59 age range, which decreased by 5.7%, lowering percentage of the age group to 24.96% of the total population in 2018. This decreasing trend is expected continue, according to the EMSI data (2020a), to 22.8% in 2024.

Figure 3: 2018 Age Demographics for the City of South Lake Tahoe.

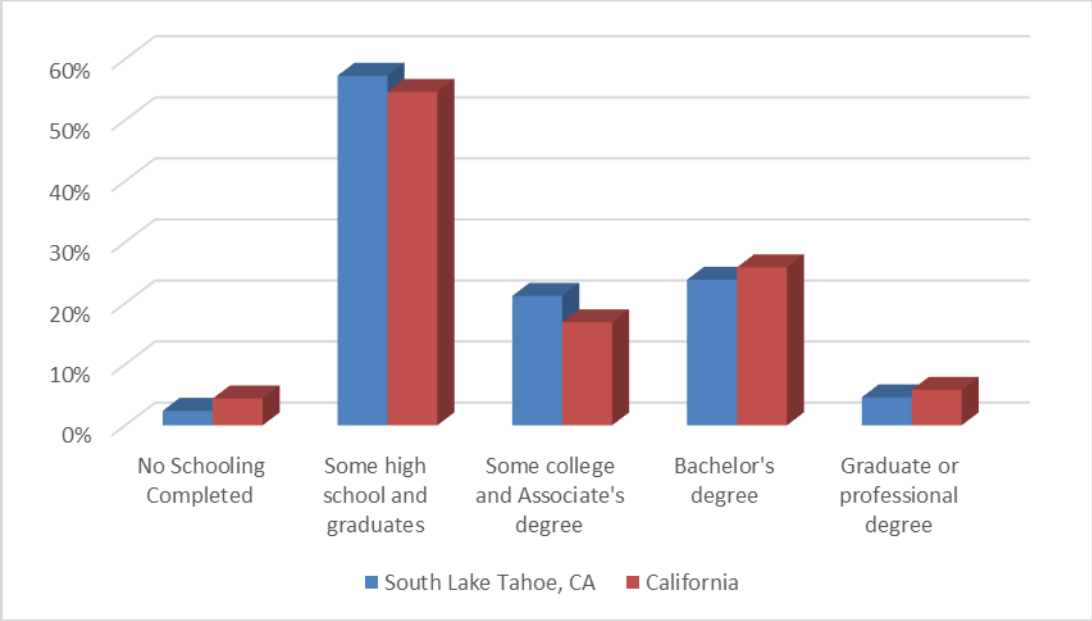


Source: EMSI, 2020a.

Educational Attainment

According to data provided by the U.S. Census American Community Survey (2020), approximately 50% of the total regional population have some college education. Approximately 29% of total population have at least completed a bachelor's degree and have further completed a Graduate degree (5%). Overall, 49% of California residents have some college education, similar to the 50% in the region.

Figure 4: 2014-2018 Educational Attainment for the City of South Lake Tahoe vs. State (California).



Source: U.S. Census: American Community Survey, 2014-2018.

Economic Characteristics

Economic characteristics of communities and counties of the region describe the key economic factors that contribute to an area's economic viability. These factors can assist with economic development efforts and can provide a basis to how a specific industry will adapt or help grow a community. For this study economic characteristics are defined as: housing units, median and average home value, median household income, average household income, per capita income, industry employment and payroll, and Region's major employers.

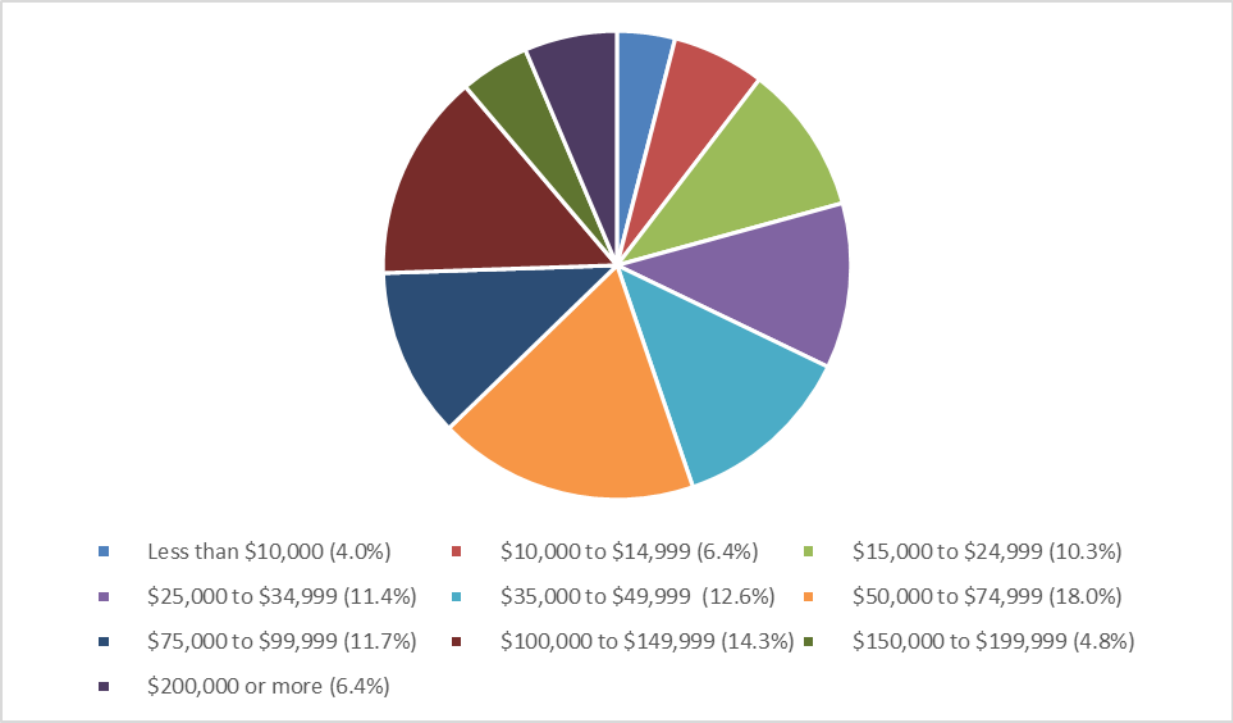
Housing Characteristics

There were 23,913 housing units in the region in 2018, a 4.4% increase from 2014. Of these, a total of 11,536 were occupied residential units, a 1.3% increase from 2014. Approximately 25.9% (6,195) of these units were owner occupied in 2018, an increase of 1.49% since 2014. The median housing unit value in 2018 was $426,200, an increase of 22.19% from 2014, when the median housing unit value was $348,800.

Income Characteristics

The median income for the households in the region was estimated at $56,321 in 2018. This is lower than the median household income of $71,228 for the state of California.

Figure 5: 2018 Household Income Breakdown for the City of South Lake Tahoe.



Source: U.S. Census: American Community Survey, 2014-2018.

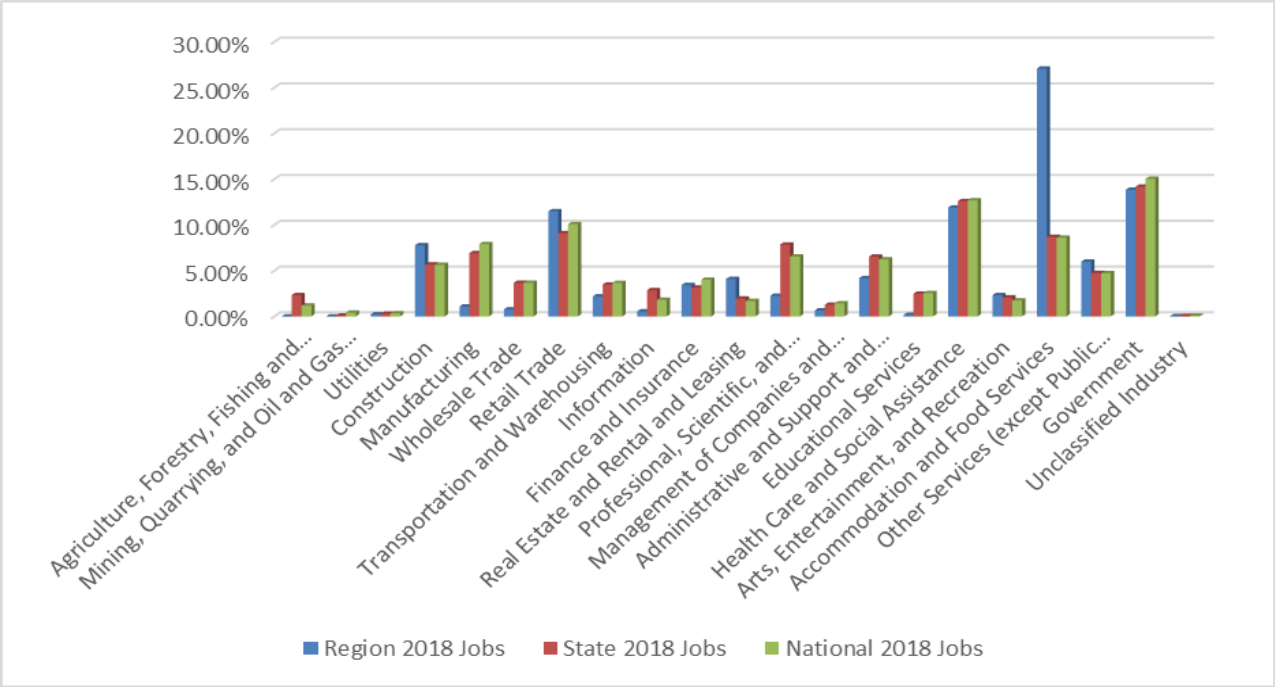
Average household income for the City of South Lake Tahoe was estimated to be $79,542, an increase of 18.6% since 2014. The 2018 average household income for the City of South Lake Tahoe is lower than the State average household income of $101,493.

Industry Characteristics

From data provided by EMSI (2020b), the City of South Lake Tahoe had a total of 14,587 jobs in 2018. Of these, the highest number of jobs were in the Accommodation and Food Services Sector, at 37.07% of total employment. The Government Sector had the second highest number of jobs at 13.8%, which includes the local government subsector relating to public airports. This

was followed by the Healthcare and Social Assistance Sector at 11.9% of the total regional employment.

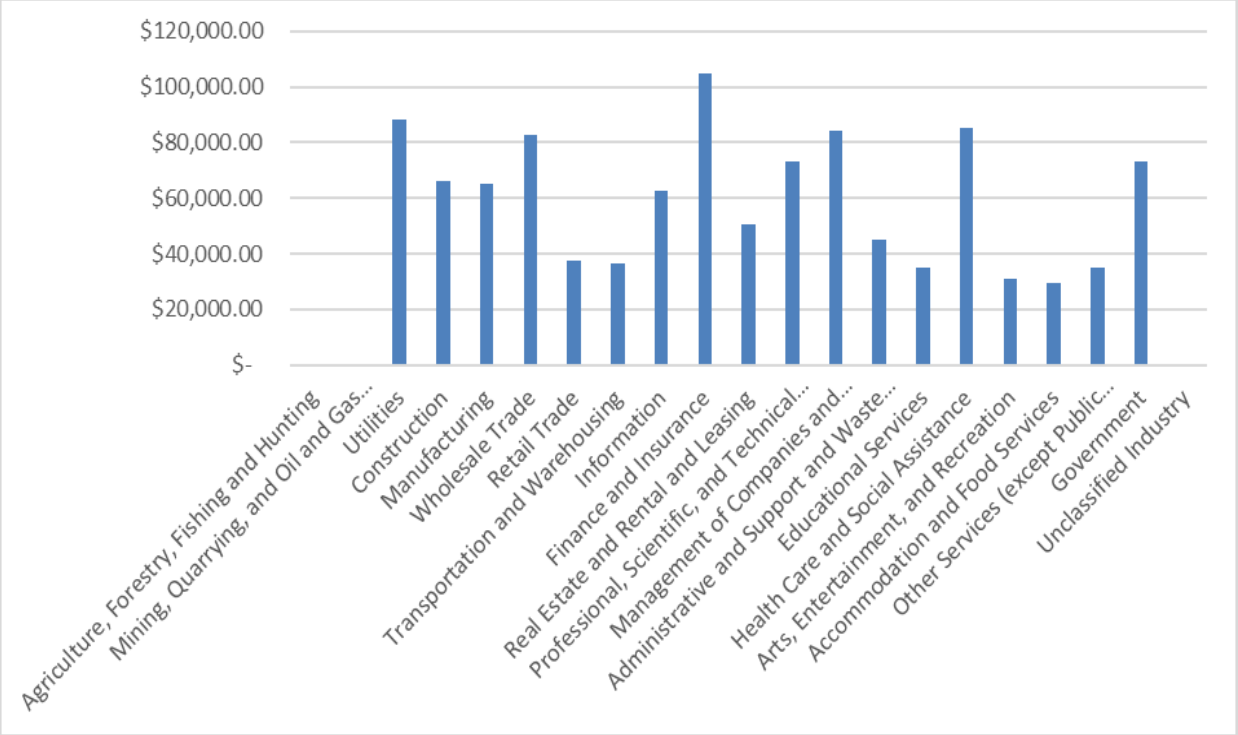
Figure 6: 2018 Jobs by Industry-Region, State and US.



Source: EMSI, 2020b.

The Finance and Insurance Sector had the highest average earnings in the region with $105,109. This was followed by the Utilities Sector with earnings of $88,154 and the Health Care and Social Assistance Sector, with $85,060. The Government Sector had average earnings of $73,393 in 2018, this was still higher than the average earnings for the entire region in 2018 of $52,592.

Figure 7: 2018 Average Earnings by Economic Sector for SLTSA.



Source: EMSI, 2020b.

Between 2014 and 2018, the three highest growing occupations (in terms of employment) included the Postsecondary Teachers Occupations, the Insurance Sales Occupations and the Emergency Medical Technicians and Paramedics Occupations, respectively. The fastest declining sectors during this period included the Heavy and Tractor-Trailer Truck Drivers Occupations, the Automotive Service Technicians and Mechanics Occupations, and the Food Preparation Workers Occupations. The Insurance Sales Occupations is part of the Finance and Insurance Sector, which in 2018 made up a total of 3.43% of total study area employment. The Emergency Medical Technicians and Paramedics Occupations are part of the Health Care and Social Assistance Sector, which made up 11.89% of total study area employment.

In terms of occupations, the highest growing occupations between 2014 and 2018 were the Computer and Mathematical Occupations, Education, Training, and Library Occupations, and

the Sales and Related Occupations. The fastest declining occupations were the Military-only Occupations, the Community and Social Service Occupations, and the Protective Service Occupations.

SECTION 4: IMPACT OF LAKE TAHOE AIRPORT ON THE SOUTH LAKE TAHOE STUDY AREA ECONOMY

The Multiplier Effects

The impact of airport-related operating and employee expenditures are called multiplier effects. Multiplier effects are a simplified and compact way of representing these effects on the local economy. The multiplier is interpreted as the impact of a one-unit change in sales, employment, or income that results in a corresponding total impact on sales, employment, or income in the larger economy. The multiplier represents the recycling of dollars and income in a specified geographic unit, such as the SLTSA economy. This recycling creates new job opportunities and higher wages for individuals.

There are three types of multiplier effects based on the type of economic impact analysis undertaken: direct, indirect, and induced. These types are illustrated in Figure 8. The *direct multiplier effect* is based on an industry's initial economic impact on the region's economy. For example, if the airport has expenditures of $5 million, then this figure becomes the direct economic impact on the community. The *indirect multiplier effect* is based on industry-to-industry transactions only. For example, the airport sector purchases local accounting services, supplies, and other contracted services. The indirect multiplier effect does not include the effect of airport-related employee spending on retail and service sectors such as housing, groceries, and real estate. For this purpose, the *induced multiplier effect* includes both the industry-to-industry transactions and household purchases, including employee spending. The *total economic impact* is defined as the direct plus indirect and induced economic impacts.

Figure 8: Airport Related Economic Impact Multipliers.

Type of Multiplier	Direct	Indirect	Induced
Output Multiplier	Airport Expenditures	Airport Supplier Expenditures	Local retail & service expenditures related to airport spending
Employment Multiplier	Airport Jobs	Airport Supplier Jobs	Local retail & service jobs related to airport employee spending
Income Multiplier	Airport Employee Income	Airport Supplier Employee Income	Local retail & service income related employee spending

The direct, indirect, induced, and total impact multiplier effects can be classified as output, employment, and income multipliers. An output multiplier of 2.0 indicates that if one dollar is spent by the airport, an additional dollar is spent in other sectors due to business and household spending. An employment multiplier of 2.0 indicates that if one job is created in the airport sector, 1.0 additional job is created in other sectors due to business and household spending. Likewise, an income multiplier of 2.0 indicates that for every dollar of income created in the airport sector, an additional dollar of income is created in other sectors due inter-industry spending by airport related businesses and employees. The measurement of multiplier effects, the input-output model, and IMPLAN data utilized in this report are explained in Appendix A.

Multi-Regional Input-Output Modeling

Early versions of single region input-output models suffered criticism for failing to consider inter-regional linkages and feedbacks between economies. For this study, the study area is split between two states, California, and Nevada. For the SLT California Study Area, the following

zip codes cover the City of South Lake Tahoe which are zip codes 96150, 96151, 96152, 96154, 96155, 96156, 96157, and 96158 (Datasheer, 2020). For the state of Nevada, zip codes 89413, 89448, and 89449 make up the Nevada Study Area. Using the IMPLAN software (IMPLAN LLC, 2019), a multi-regional input-output model was developed. The multi-regional input-output model derives estimates of economic, employment, labor income, and tax impacts between the two regions of the study area from activities at the LTA.

The multi-regional input-output (MRIO) model expands economic linkages within the SLTSA by comparing commodity trade and commodity flows to derive changes in study area (Nevada Study Area) stemming from changes in production and/or income in the other study area (SLT California Study Area). In MRIO analysis, the direct effect in one study area (the SLT California Study Area) can trigger indirect and induced effects in the linked study area (the Nevada Study Area).

Section 5: ESTIMATED MULTI-REGIONAL IMPACTS of LAKE TAHOE AIRPORT (LTA) on the SOUTH LAKE TAHOE STUDY AREA (SLTSA)

The Impact of the Lake Tahoe Airport Construction on South Lake Tahoe Study Area Economy

Table 1 summarizes the impacts of LTA construction on expenditures, employment, and labor income in the SLT California Study Area's economy. From conversations with the LTA staff (2020), financial information regarding construction costs and grants to LTA were collected and in the in the analysis. Table 1 reveals that LTA spent $849.9 thousand locally on construction-related operations, which created total economic activity in the SLT California Study Area of $1.28 million. LTA construction expenditures created an additional $425.2 thousand in economic activity in SLT California Study Area through indirect and induced economic activity. LTA construction directly hired 8.9 employees and created a total employment impact in the SLT

California Study Area of 11.8 employees through economic linkages. This means that LTA construction created an additional 2.9 jobs through its indirect and induced linkages in the SLT California Study Area. Finally, LTA construction directly contributed labor incomes of $635.0 thousand and created a total of $770.7 thousand in labor income in the SLT California Study Area through its economic linkages. This means that LTA construction created an additional $135.7 thousand in labor income in the SLT California Study Area through its indirect and induced economic linkages.

Table 1. Economic, Employemnt, and Labor Income Impacts of the LakeTahoe Airport Construction on the SLT California Study Area Economy.

ImpactType	Value of Output	Employment	Labor Income
Direct Effect	$849,924	8.9	$635,018
Indirect Effect	$97,586	0.6	$29,782
Induced Effect	$327,621	2.3	$105,862
Total Effect	$1,275,131	11.8	$770,663

Table 2 summarizes the multi-regional indirect and induced impacts of the of LTA construction in the SLT California Study Area on expenditures, employment, and labor income in the Nevada Study Area. Table 2 reveals that the LTA construction in the SLT California Study Area created an additional $44.500 thousand in economic activity in the Nevada Study Area through multi-regional indirect and induced economic activity. LTA construction in the SLT California Study Area directly hired 8.9 employees and created a total employment impact in the Nevada Study Area of 0.2 employees through its economic linkages. Finally, LTA construction in the SLT California Study Area created a total of $770.7 thousand in labor income which resulted in $7.9 thousand in labor income in the Nevada Study Area economy through its multi-regional indirect and induced economic linkages.

Table 2. Economic, Employment, and Labor Income Impacts of Lake Tahoe Airport Construction on the Nevada Study Area.			
Impact Type	Value of Output	Employment	Labor Income
Direct Effect	$0	0.0	$0
Indirect Effect	$18,466	0.1	$5,509
Induced Effect	$25,990	0.1	$2,381
Total Effect	$44,456	0.2	$7,889

The Impact of the Lake Tahoe Airport Tenants on South Lake Tahoe Economy

Table 3 summarizes the impact of LTA tenants on the SLT California Study Area economy. From conversations with the Lake Tahoe Airport staff (2020) a list of airport tenants at the LTA were derived. Their employment, value of production, and labor income were estimated from data provided by the LTA staff (2020) and IMPLAN database (IMPLAN, LLC, 2020a). Table 3 shows that LTA tenants spent $6.096 million locally on operations, which created total economic activity in the SLT California Study Area economy of $8.980 million. This means that the LTA tenants created an additional $2.884 million in economic activity in SLT California Study Area through indirect and induced economic activity.

LTA tenants directly hired 46.0 employees and created a total employment impact in the SLT California Study Area of 65.9 employees through its economic linkages. This means that the LTA created an additional 19.9 jobs through its indirect and induced linkages in the SLT California Study Area economy. Finally, LTA tenants directly had labor incomes of $2.933 million and created a total of $3.893 million in labor income in the SLT California Study Area economy through its economic linkages. This means that the LTA tenants created an additional $960.0 thousand in labor income in the SLT California Study Area economy through its indirect and induced economic linkages.

Table 3. Economic, Employment, and Labor Income Impacts of the Lake Tahoe Airport Tenants on the SLT California Study Area Economy.			
Impact Type	Value of Output	Employment	Labor Income
Direct Effect	$6,095,907	46.0	$2,933,359
Indirect Effect	$1,230,154	8.4	$425,102
Induced Effect	$1,653,735	11.5	$534,333
Total Effect	$8,979,796	65.9	$3,892,794

Table 4 summarizes the indirect and induced impacts of the of LTA tenants in the SLT California Study Area on expenditures, employment, and labor income for the Nevada Study Area economy. Table 4 shows the LTA tenants in the SLT California Study Area created an additional $472.9 thousand in economic activity in the Nevada Study Area through indirect and induced economic activity. LTA tenants in the SLT California Study Area directly hired 46.0 employees and created a total employment impact in the Nevada Study Area of 2.9 employees through its economic linkages. Finally, LTA tenants in the SLT California Study Area created a total of $3.892 million in labor income which resulted in $108.9 thousand in labor income in the Nevada Study Area economy through its indirect and induced economic linkages.

Table 4. Economic, Employment, and Labor Income Impacts of Lake Tahoe Airport Tenants on the Nevada Study Area Economy.			
Impact Type	Value of Output	Employment	Labor Income
Direct Effect	$0	0.0	$0
Indirect Effect	$312,040	2.0	$87,465
Induced Effect	$160,855	0.9	$21,399
Total Effect	$472,895	2.9	$108,864

The Impact of the Lake Tahoe Airport Operations on South Lake Tahoe Economy

Table 5 summarizes the impacts of LTA operations on the SLT California Study Area economy. From conversations with the Lake Tahoe Airport staff (2020) a budget of airport expenditures

and revenues at the LTA was derived. Employment, value of production, and labor income were estimated from data provided by the LTA staff and IMPLAN database. Table 5 shows SLTA spent $3.915 million locally on operations, which created total economic activity in the SLT California Study Area economy of $5.441 million. This means that LTA operations created an additional $1.526 million in economic activity in the SLT California Study Area through indirect and induced economic activity.

LTA operations directly hired 3.0 employees and created a total employment impact in the SLT California Study Area of 12.9 employees through its economic linkages. This means that the LTA created an additional 9.9 jobs through its indirect and induced economic linkages in the SLT California Study Area. Finally, LTA operations directly had labor incomes of $479.9 thousand and created a total of $1.026 million in labor income in the SLT California Study Area economy through its economic linkages. This means that the LTA operations created an additional $545.9 thousand in labor income in the SLT California Study Area economy through its indirect and induced economic linkages.

Table 5. Economic, Employment, and Labor Income Impacts of Lake Tahoe Airport Operations on the SLT California Study Area.

ImpactType	Value of Output	Employment	Labor Income
Direct Effect	$3,915,044	3.0	$479,949
Indirect Effect	$1,091,283	6.9	$405,493
Induced Effect	$434,620	3.0	$140,398
Total Effect	$5,440,946	12.9	$1,025,840

Table 6 summarizes the indirect and induced impacts of the of LTA operations in the SLT California Study Area on expenditures, employment, and labor income for the Nevada Study Area economy. Table 6 shows LTA operations in the SLT California Study Area created an additional $281.8 thousand in economic activity in the Nevada Study Area through indirect and

induced economic activity. LTA operations in the SLT California Study Area directly hired 3.0 employees and created a total employment impact in the Nevada Study Area of 1.7 employees through its economic linkages. Finally, LTA operations in the SLT California Study Area created a total of $1.026 million in labor income which resulted in $67.0 thousand in labor income in the Nevada Study Area economy through its indirect and induced economic linkages.

Table 6. Economic, Employment, and Labor Income Impacts of South Lake Tahoe Airport Operations on the Nevada Study Area.

Impact Type	Value of Output	Employment	Labor Income
Direct Effect	$0	0.0	$0
Indirect Effect	$219,366	1.3	$55,073
Induced Effect	$62,438	0.4	$11,911
Total Effect	$281,804	1.7	$66,984

The Impact of the Lake Tahoe Airport Visitors on South Lake Tahoe California Region Study Area Economy

Lake Tahoe located on the California-Nevada border has long been recognized as a national and international destination for vacations, leisure, gaming, and conventions. With approximately 2.7 million visitors per year (Lake Tahoe Visitors Bureau, 2020), LTA plays an important and significant part in Lake Tahoe's tourism/visitor's economic cluster. From the LTA staff (2020) and LTA airport operations reports, the number of enplanements that occurred at LTA in 2018 were estimated. To derive the direct visitor expenditures, information from published studies by RRC Associate (2007) and SMG (2004) were applied to estimate visitor expenditures in South STL California Study Area and Nevada Study Area. Table 7 was developed from study by RRC Associates (2007). Average or medium data points were used in the analysis to derive factors for visitor spending impacts. From table 7, Using average conditions, 11.25% of people who enplaned at the Lake Tahoe Airport were residents of the City of South Lake Tahoe. Following

this procedure, the number of enplanements from outside the SLT California Study Area was derived. Also, the RRC Associates (2007), 32.5% of the remaining visitors would have visited the City of South Lake Tahoe, California even if the airport did not exist. Applying these two factors, the number of tourists who enplaned at South Lake Tahoe Airport that lived outside the City of South Lake Tahoe and visited South Lake Tahoe because the airport existed, was derived. This type of analysis derives impacts, not contributions of the airport[1]. Also, the visitor expenditures were inflated to 2018 values by using the GDP price deflator (Federal Reserve Bank of St. Louis (2020).

Table 7. Model Assumptions at Midpoints for Visitor Expenditures.

Description	Cells Which User Can Change	Range of Values
Rate of Passenger Ramp Up	Medium	Slow, Medium, or Fast
Percent Local Residents of City of South Lake Tahoe	11.25%	7.5% - 15.0%
Percent of Victors Otherwise Not Captured	32.50%	25.0% - 40.0%
Spending Per Visitor Per Visit	$650	$500 - $800

Source: RRC Associate (2007).

Table 8 shows the visitor expenditures and location of expenditures that were employed to derive visitor impacts.

Table 8. Estimation of Share of South Shore Visitor Expenditures Accruing to City of South Lake Tahoe		
CATEGORY	SHARE OF SPENDING	CITY of SOUTH LAKE TAHOE SHARE OF VISITOR SPENDING
Lodging	23%	60%
Food & Beverage	22%	65%
Entertainment	25%	50%
Retail Shopping	9%	80%
Daily Transportation	2%	80%
Gaming	19%	0%
TOTAL	100%	50%
Source: SMG Consultants (2004). First Quarter South Shore Survey.		

Table 9 shows LTA tourists spent $2.32 million in the SLT California Study Area, which created total economic activity in the SLT California Study Area economy of $3.28 million. LTA tourism created an additional $956.8 thousand in economic activity in SLT California Study Area through indirect and induced economic activity.

SLT California Study Area tourism expenditures supported direct employment of 30.1 and created a total employment impact in the SLT California Study Area of 37.0 employees through its economic linkages. This means that SLT California Study Area tourism created an additional 6.9 jobs through its indirect and induced economic linkages. Finally, SLT California Study Area tourism had direct labor incomes of $967.1 thousand and created a total of $1,28 million in labor income in the SLT California Study Area economy through its economic linkages. This means that the LTA tourism created an additional $311.4 thousand in labor income in the South Lake Tahoe economy through its indirect and induced economic linkages.

Table 9. Economic, Employemnt, and Labor Income Impacts from Visitors in the SLT California Study Area from Lake Tahoe Airport Landing Parties.			
Impact Type	Value of Output	Emplyment	Labor Income
Direct Effect	$2,324,112	30.1	$967,112
Indirect Effect	$415,452	3.1	$136,498
Induced Effect	$541,311	3.8	$174,855
Total Effect	$3,280,875	37.0	$1,278,465

Table 10 summarizes the multi-regional indirect and induced spillover impacts of the of SLT California Study Area tourism on expenditures, employment, and labor income in the Nevada Study Area. Table 10 shows that the LTA tourism in the SLT California Study Area created an additional $1.33 million in economic activity in the Nevada Study Area through multi-regional indirect and induced economic activity. LTA tourism in the SLT California Study Area directly hired 30.1 employees and created a total employment impact in the Nevada Study Area of 9.1 employees through its economic spillover linkages. Finally, LTA tourism in the SLT California Study Area created a total of $1.28 million in labor income which resulted in $404,700 in labor income in the Nevada Study Area economy through its multi-regional indirect and induced linkages.

Table 10. Spillover Economic, Employment, and Labor Income Impacts from Visitors in the SLT California Study Area on the Nevada Study Area by Lake Tahoe Airport Landing Parties.			
Impact Type	Value of Output	Employment	Labor Income
Direct Effect	$0	0.0	$0
Indirect Effect	$606,464	4.2	$191,744
Induced Effect	$724,038	4.9	$212,946
Total Effect	$1,330,501	9.1	$404,690

The Impact of the Lake Tahoe Airport Visitors on South Lake Tahoe Nevada Region Study Area Economy

Table 11 summarizes the impacts of LTA tourism on expenditures, employment, and labor income for the Nevada Study Area. Because of the Accommodation Sector which includes Casinos in the Nevada Study Area, economic impacts of expenditures in the Nevada Study Area and subsequent spillover impacts to the SLT California Study Area need to be estimated. From the LTA staff (2020), an airport operations report consisting of general aviation enplanements to LTA were derived and applied to a previous model results by RRC Associates, Inc. (2017). Their employment, value of production, and labor income were estimated from data provided by the LTA staff (2020) and IMPLAN database (2020a). Table 11 reveals that LTA tourism spent $255 million in the Nevada Study Area, which created total economic activity in the Nevada Study Area economy of $3.21 million. LTA tourism created an additional $609.1 thousand in economic activity in the Nevada Study Area through indirect and induced economic activity. LTA tourism expenditures caused directly hiring of 26.2 employees and created a total employment impact in the Nevada Study Area of 30.7 employees through its economic linkages. This means that LTA tourism created an additional 4.5 jobs through its indirect and induced economic linkages. Finally, LTA tourism directly had labor incomes of $1.09 million and created a total of $1.27 million in labor income in the Nevada Study Area through its economic linkages. This means that the LTA tourism expenditures created an additional $186.8 thousand in labor income in the Nevada Study Area economy through its indirect and induced economic.

Table 11. Economic, Employment, and Labor Income Impacts from Visitors in the Nevada Study Area from Lake Tahoe Airport Landing Parties.			
Impact Type	Value of Output	Employment	Labor Income
Direct Effect	$2,547,180	26.2	$1,087,556
Indirect Effect	$437,996	3.0	$131,353
Induced Effect	$221,103	1.5	$55,530
Total Effect	$3,206,278	30.7	$1,274,439

Table 12 summarizes the multi-regional indirect and induced impacts of the of LTA tourism in the Nevada Study Area on expenditures, employment, and labor income in the SLT California Study Area economy. Table 12 shows that the LTA tourism in the Nevada Study Area created an additional $1.63 million in economic activity in the SLT California Study Area through multi-regional indirect and induced economic activity. LTA tourism expenditures in the Nevada Study Area directly hired 26.2 employees and created a total employment impact in the SLT California Study Area of 11.4 employees through its economic linkages. Finally, LTA tourism in Nevada created a total of $1.27 million in labor income which resulted in $924.7 thousand in labor income in the SLT California Study Area through its multi-regional indirect and induced linkages.

Table 12. Spillover Economic, Employment, and Labor Income Impacts from Visitors in the Nevada Study Area on the California Study Area Economy by Lake Tahoe Airport Landing Parties.			
Impact Type	Value of Output	Employment	Labor Income
Direct Effect	$0	0.0	$0
Indirect Effect	$583,920	4.3	$292,173
Induced Effect	$1,044,246	7.1	$632,568
Total Effect	$1,628,166	11.4	$924,741

Tax Revenue Collections for the City of South Lake Tahoe from Lake Tahoe Airport Activities

Using results of the multi-regional impact analysis for Construction, Tenants, Operations, Tourism in California, and Tourism in Nevada, revenues to the City of South Lake Tahoe were estimated. From the City of South Lake Tahoe, California annual budget (2020) and IMPLAN database (2020a). It was estimated that Transient Occupancy Tax revenues to City of South Lake Tahoe under average visitor conditions at a 12% would be approximately $167,925 or at 14% TOT revenues would be estimated to be $195,911. The sales tax rate for the City of South Lake Tahoe is 0.05%. Therefore, under average visitor conditions, sales tax revenues are estimated to be $11,452. However, to derive the impacts to revenues, contribution procedures[1] should be employed. That is tourist activity was increased by 32.5% to incorporate tourism expenditures of tourists who would have come to South Lake Tahoe, California regardless of the existence of the airport. Also, visitor expenditures were estimated at their highest per visitor rate, estimated TOT tax revenues under 12% rate would be $268,171 or at the 14% rate would be $312,867. Sales taxes to the City of South Lake Tahoe, California under contribution analysis procedures are estimated to be $15,552.

SECTION 6: CONCLUSION

The value of output, employment, labor income, and local government tax revenues presented in this report document the impacts of the Lake Tahoe Airport on the economies of South Lake Tahoe (SLT) California Study Area and the three aggregated zip codes in Nevada comprising the Nevada Study Area. Below are some summary statistics from the study:

- For the residents of the City of South Lake Tahoe, California and three aggregated zip codes in the state of Nevada, the Lake Tahoe Airport (LTA) provides access to airport services for this community and the South Lake Tahoe casino industry.
- To show economic linkages and spillover effects of the LTA activities and the Nevada casinos, a multi-regional input-output model was employed to derive these spillover impacts.
- LTA operations, tenants, and construction activities were derived from data and conversations with the LTA staff (2020).
- Tourism expenditures for the SLT California Study Area and Nevada Study Area were estimated from previous study by RRC Associates (2007).
- Table 13 shows the SLT California Study Area cumulative economic, employment, and labor income impacts from LTA operations, construction, tenants, tourism in the SLT California Study Area by person who deplaned at LTA, and spillover impacts of Nevada Study Area tourism on the SLT California Study Area by persons who deplaned at LTA.

Table 13. SLT California Study Area Cumulative Economic, Employment, and Labor Income Impacts from LTA Operations, Construction, Tenant, Tourism in SLT California Study Area, and Spillover from Nevada Study Area Visitors.

Impact Type	Value of Output	Employment	Labor Income
Direct Effect	$13,184,987	164.1	$4,996,476
Indirect Effect	$3,436,861	23.4	$1,425,910
Induced Effect	$4,027,523	27.8	$1,855,261
Total Effect	$20,649,371	215.3	$8,277,647

- From Table 13, cumulative direct economic activity from LTA on the SLT California Study Area was estimated to have direct impacts of $13.18 million and secondary impacts (indirect and induced) of $7.47 million for total impacts of $20.65 million. For employment, cumulative direct employment impacts were estimated to be 164.1 jobs, with secondary

impacts of 51.2 jobs, which yields total employment impacts of 215.3 jobs in the SLT California Study Area. As for labor income impacts from activities aligned with the LTA, cumulative direct labor income was $5.00 million. With secondary labor income impacts of $3.28 million, total labor income impacts in the SLT California Study area from the LTA was $8.28 million.

- Table 14 shows the Nevada Study Area cumulative spillover economic, employment, and labor income impacts from LTA operations, construction, tenants, tourism in the Nevada Study Area by person who deplaned at LTA, and spillover impacts of SLT California Study Area tourism on the Nevada Study Area by persons who deplaned at LTA.

Table 14. Nevada Study Area Cumulative Economic, Employment, and Labor Income Impacts from LTA Operations, Construction, Tenant, Visitors in Nevada Studuy Area Study Area, and Spillover from SLT Study Area Visitors

Impact Type	Value of Output	Employment	Labor Income
Direct Effect	$2,547,180	26.2	$1,087,556
Indirect Effect	$1,594,332	10.6	$492,346
Induced Effect	$1,194,424	27.8	$248,637
Total Effect	$5,335,936	64.6	$1,828,539

- From Table 14, cumulative direct economic activity from LTA on the Nevada Study Area was estimated to have direct impacts of $2.55 million and secondary impacts (indirect and induced) of $2.79 million, for total impacts of $5.34 million. For employment, cumulative direct employment impacts were estimated to be 26.2 jobs, with secondary impacts of 38.4 jobs, which yields total employment impacts of 64.6 jobs in the Nevada Study Area. As for labor income impacts from activities aligned with the LTA, cumulative direct labor income was $1.09 million. With secondary labor income impacts of $741.0 thousand, total labor income impacts in the Nevada Study Area from the LTA aligned activities was $1.83 million.

- Using data and procedures from RRC Associates (2017), City of South Lake Tahoe 2020 annual budget (2020), and IMPLAN model (2020b), impacts to City of South Lake Tahoe tax revenues are estimated. Under average tourism assumption, Transient Occupancy Tax (TOT) at 12% rate was estimated to be $167,925 and under 14% rate TOT revenues are estimated to be $195,911. Sales taxes for City of South Lake Tahoe under average conditions are estimated to be $11,452. When alternative assumption of contribution analysis and tourism at its highest levels, TOT revenues are estimated to be $268,171 under TOT rate of 12% or $312,867 under TOT rate of 14%, Sales taxes under contribution assumption and high tourism is estimated to be $15,552.
- In addition to its quantitative impacts of LTA, the presence of a local airport improves the region's attractiveness. Businesses consider airport proximity in their business locations.

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FOOTNOTES

[1]From a referenced study by Watson et al. (2007), economic contributions are defined as the gross changes in a study area's existing economy, that can be attributed to a given industry, event, or policy. Economic impacts should be reserved for narrow results where an industry, event, or policy has results for either new revenues that would not otherwise occur in the study area or keeping revenues in the study area that otherwise be lost to the study area.

[2]Using RCC, Associates (2017) study and information from the LTA manager (2020), the number of tourist impact analysis was derived. First from the LTA manager (2020), the number of aircraft operations in 2018 was derived. Second from RCC Associates (2017), the number of persons in each operation ranged between 2 to 5 people. Therefore, the average number of persons in each airport operation was estimated to be 3.5 people. Third, from RCC Associates (2017), the percent of aircraft operations made by City of South Lake Tahoe residents ranged between 7.5% and 15.0%. The average percentage for this analysis is 11.25%. Fourth from RCC Associates (2017), the percent of visitors that would have visited the City of South Lake Tahoe regardless of the existence of the LTA ranged between 25% and 40%. The average value used for this analysis was 32.5%. Fifth, the amount of tourism dollars expended ranged between $500 to $800 per visitor per visit. The mid-point expenditure per visitor per visit was assumed to be $650. Sixth, the percent of tourism expenditure spent in South Lake Tahoe, California ranged between 40% to 60%. The midpoint used for the analysis was 50%. Finally, from RCC Associates (2017), tourism expenditures were delineated by economic sector and by location either in South Lake Tahoe, California, or the Nevada Study Area.

Appendix A: Model and Data Used to Estimate Output, Employment, and Income Multipliers

The economic impacts and secondary benefits of economic activity presented in this report are measured by multipliers using an input-output model and data from IMPLAN, a model that is widely used by economists and other academics in the United States. A computer spreadsheet that uses state IMPLAN multipliers was developed by to enable community development specialists to measure the secondary benefits of the airport sector on state, regional, or county economies.

Input-output (I/O) analysis is designed to analyze the transactions among industries in an economy (Miernyk 1965). These models are largely based on the work of Wassily Leontief during the 1930s. Detailed I/O analysis captures the indirect and induced interrelated circular behavior of the economy. For example, an increase in the demand for airport services requires more equipment, more labor, and more supplies, which, in turn, requires more labor to produce the supplies, and so on. By simultaneously accounting for structural interaction between sectors and industries, I/O analysis gives expression to the general economic equilibrium systems. The analysis utilizes assumptions based on linear and fixed coefficients and limited substitutions among inputs and outputs. The analysis assumes that average and marginal I/O coefficients are equal. Nonetheless, the framework has been widely accepted and used by economists and policymakers. I/O analysis is useful when carefully executed and interpreted in defining the structure of a region, the interdependencies among industries, and forecasting economic outcomes. The I/O model coefficients describe the structural interdependencies of an economy. From the coefficients, various predictive devices can be computed, which can be useful in analyzing economic changes in a state, region, or county. Multipliers indicate the relationship between some observed change in the economy and the total change in economic activity created through the economy.

MicroIMPLAN is a computer program developed by the United States Forest Service to construct I/O accounts and models (Alward, et al. 1989). Typically, the complexity of I/O modeling has hindered practitioners from constructing models specific to a community requesting an analysis. Too often, inappropriate multipliers have been used to estimate local economic impacts. In contrast, IMPLAN can construct a model for any state, region, county, or zip code area in the United States by using available state, region, county, or zip code data. Impact analysis can be performed once a regional I/O model is constructed.

Five different sets of multipliers are estimated by IMPLAN, corresponding to five measures of regional economic activity: (1) total industry output, (2) personal income, (3) total income, (4) value added, and (5) employment. Three types of multipliers are generated. Type I multipliers measure the impact in terms of direct and indirect effects. Direct impacts are the changes in the activities of the focus industry or firm, such as the operation of the local airport. The focus business changes its purchases inputs because of the direct impacts. This produces indirect impacts in other business sectors. However, the total impact of a change in the economy consists of direct, indirect, and induced changes. Both the direct and indirect impacts change the flow of dollars to the state, region, or county's households. Subsequently, the households alter their consumption. The effect of the changes in household consumption on businesses in a community is referred to as an induced effect. To measure the total impact, a Type II multiplier is used. The Type II multiplier compares direct, indirect, and induced effects with the direct effects generated by a change in final demand (the sum of direct, indirect, and induced effects divided by direct effects). IMPLAN also estimates a modified Type II multiplier that also includes the direct, indirect, and induced effects. The Type III multiplier further modifies the induced effect to include spending patterns of households based on a breakdown of households by nine different income groups.

Additional information on the data, methodology, and software requirements of I/O modeling and IMPLAN analysis can be found in guides developed by Alward, et al., (1989), and Cheney (2017).